28th Annual
FLORIDA MASTER GARDENER CONTINUED TRAINING CONFERENCE

October 20-22, 2008

Coral Springs Marriott Hotel, Golf Club and Convention Center
Coral Springs, Florida

Proceedings
Hello Master Gardeners!

I am pleased to welcome you to the 2008 Florida Master Gardener Continued Training Conference. As we have done over the past few years, we move the conference out into the state on the even years, and this year the conference is being held in the Ft. Lauderdale area. All the sessions will be held at our host hotel, the Coral Springs Marriott. This is a great location with plenty of shopping and restaurants close-by.

The conference planning committee has done a great job putting together a program that contains more education hours than ever before. The conference is highlighted by our general session presenters. We have the ever popular Rick Schoellhorn back to talk about Global New Plants. Monica Elliott will present the latest information about Palm Problems and their Care. Ed Gilman will be talking about Tree Roots and Establishment and our final general session speaker is Sydney Park Brown talking about Fabulous Foliage. Our concurrent sessions are diverse enough to fit all interest areas and are filled by a line-up of amazing speakers.

We listened to your requests and have implemented a one-day registration fee for those people that can’t attend the entire conference. Hopefully this makes the event more available for everyone. We are making every effort to be more environmentally friendly by reducing printing and redundancy. The registrations this year were primarily handled electronically, saving a great deal of paper and will be the model for future years.

South Florida has so much to offer in the way of gardens, and unique places to visit. This is the perfect place to increase your knowledge, celebrate the past years great work at the awards banquet, meet new friends and have an amazing time at this year’s conference.

Have a great conference!!!

Sincerely,

Tom Wichman
Florida Master Gardener Coordinator
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(Coral Springs Marriott Hotel, Golf Club and Convention Center)
Conference Sponsors

A Very Special Thanks
to the following organizations for their support:

UNIVERSITY OF FLORIDA
IFAS Extension

Florida Yards & Neighborhoods

All the Master Gardeners and County Extension Offices who donated material for the Plant Auction
Program Committee

Terry DelValle
Duval County

Charles Fedunak
Lake County

Theresa Friday
Santa Rosa County

Adrian Hunsberger
Miami-Dade County

John Pipoly
Broward County

Tom Wichman
State Master Gardener Coordinator
# Program Agenda

The page number of the associated paper is indicated after the presentation title where applicable.  
*example:* (p. 3)

Rooms locations are indicated in brackets.  
*example:* .................................................[ROOM LOCATION]

## Sunday, October 19, 2008

1:30PM–7:30PM  **Optional Pre-Conference Tour**

## Monday, October 20, 2008

<table>
<thead>
<tr>
<th>Time</th>
<th>Event详情</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00AM–5:00PM</td>
<td>Conference Registration Opens [Palm/Pre-Function Hallway]</td>
</tr>
<tr>
<td>7:00AM–4:30PM</td>
<td>UF/IFAS Book Store [Coco plum]</td>
</tr>
<tr>
<td>7:30AM–9:30AM</td>
<td>4H Horticulture Judging Contest [Ibis/Egret]</td>
</tr>
<tr>
<td>10:00AM–10:30AM</td>
<td>Welcome and Announcements – Tom Wichman, Florida Master Gardener Coordinator, UF/IFAS [Great Cypress/Royal Poinciana]</td>
</tr>
<tr>
<td>10:30AM–1200PM</td>
<td>General Session – Global New Plants – Where do these plants come from? – Rick Schoellhorn – Proven Winners, Inc. – Join Dr. Rick Schoellhorn, of Proven Winners North America for a trip around the globe to discover where the plants in your garden come from. There is a story behind every plant and they are usually pretty funny, but sometimes they can explain a lot about why the plant does or does not do well in your garden. Learn where certain plants originated and where they have traveled in the hybridizing process to bring them to your door. Should be fun and interesting and if you do not like flying, a good way to see the world! (p. 104)</td>
</tr>
<tr>
<td>12:00PM –1:30PM</td>
<td>Lunch on own</td>
</tr>
<tr>
<td>1:30PM–2:30PM</td>
<td>Three Concurrent Sessions</td>
</tr>
<tr>
<td>A–1</td>
<td><strong>Invasive Animals</strong> – Learn what animals are becoming problems and how we should deal with them – Steven Johnson, UF (p. 46) [Sawgrass/Mangrove]</td>
</tr>
<tr>
<td>B–1</td>
<td><strong>Landscape Design</strong> – Learn the basics of landscape design – Gail Hansen, UF (p. 37) [Orchid]</td>
</tr>
<tr>
<td>C–1</td>
<td><strong>In Search of the Perfect Tomato</strong> – Learn what tomato varieties to grow and how to best grow them – Gene McAvoy, UF (p. 70) [Great Cypress/Royal Poinciana]</td>
</tr>
</tbody>
</table>
Monday, October 20, 2008 (continued)

2:30PM–2:45PM  Move to Next Concurrent Session

2:45PM–3:45PM  Three Concurrent Sessions

  A–2  Bamboo – Learn which varieties grow best and how to use them effectively – Robert Saporito, Owner of Tropical Bamboo Nursery, Loxahatchee, FL (p. 103) ................................................................. [SAWGRASS/MANGROVE]

  B–2  New Pests – Learn which pests we should be looking out for – Catherine Mannion, UF (p. 62) ........................................................................................................ [ORCHID]

  C–2  Tropical Fruits – Learn to grow a variety of tropical fruits and which ones will do best in containers – Jonathan Crane, UF (p. 6) ........................................................................................... [GREAT CYPRESS/ROYAL POINCIANA]

3:45PM–4:15PM  Viewing of County Exhibits/Displays ........................................................... [SANDPIPER]

3:45PM–4:15PM  Refreshment Break .................................................................................. [PRE-FUNCTION HALLWAY]

4:15PM–5:15PM  Three Concurrent Sessions

  A–3  Gardening Ergonomics – Learn what tools are available to make gardening easier – Christine Kelly-Begazo, UF (p. 50) ........................................................................ [SAWGRASS/MANGROVE]

  B–3  Landscape Design – Learn the basics of landscape design – Gail Hansen, UF (p. 37) ...................................................................................................................... [ORCHID]

  C–3  Vertical Gardening – Vines for Florida – Learn what vines to use and how to use them – Sydney Park Brown, UF (p. 87) ........................................................................................................ [GREAT CYPRESS/ROYAL POINCIANA]

5:30PM–7:00PM  Viewing of County Exhibits/Displays ........................................................... [SANDPIPER]

5:30PM–7:00PM  Welcome Reception ............................................................................. [BREEZES/LINKS RESTAURANT]

Tuesday, October 21, 2008

7:00AM–5:00PM  Conference Registration Open........................................... [PALM/PRE-FUNCTION HALLWAY]

7:00AM–4:30PM  UF/IFAS Book Store................................................................. [COCOPLUM]

7:00AM–8:00AM  Continental Breakfast......................................................... [BREEZES/LINKS RESTAURANT]

8:00AM–9:30AM  General Session – Palm Care and Problems – Monica Elliott, UF (p. 15) ......................................................................................... [GREAT CYPRESS/ROYAL POINCIANA]

9:30AM–10:00AM  Viewing of County Exhibits/Displays .............................................. [SANDPIPER]

9:30AM–10:00AM  Refreshment Break ............................................................... [PRE-FUNCTION HALLWAY]
Tuesday, October 21, 2008 (continued)

10:00AM–11:00AM  **Three Concurrent Sessions**

**A–4**  **Tropical Bulbs** – Learn what great variety of tropical bulbs can be grown in Florida – *Tom Wichman*, UF .............................................. [Sawgrass/Mangrove]

**B–4**  **Succulents: From Their Home to Yours** – Get tips to succeed in growing these fascinating plants – *Dennis Cathcart*, Owner of Tropiflora Nursery, Sarasota, FL .................................................. [Great Cypress/Royal Poinciana]

**C–4**  **Urban Nuisance Wildlife/African Bees** – Learn how to deal with nuisance wildlife and the latest on Africanized bees – *Bill Kern*, UF (p. 52).....[Orchid]

11:00AM–11:15AM  Move to Next Concurrent Session

11:15AM–12:15PM  **Three Concurrent Sessions**

**A–5**  **Florida Water Star in Your future** – Learn what strategies you can use to save water – *Teresa Watkins*, St. Johns River Water Management District .......................................................... [Sawgrass/Mangrove]

**B–5**  **Aquascaping** – Learn to landscape your waterfront or retention pond – *Ken Langeland*, UF ................................................... [Great Cypress/Royal Poinciana]

**C–5**  **FYN Demonstration Gardens Used as an Educational Tool** – See the large number of gardens around the state and how they are being used – *Marina D’Abreau*, UF (p. 8) ............................................................ [Orchid]

12:15PM–1:15PM  Viewing of County Exhibits/Displays ................................................[Sandpiper]

12:15PM–1:15PM  Boxed Lunches will be provided ........................................... [Breezes/Links Restaurant]

1:15PM–2:15PM  **Three Concurrent Sessions**

**A–6**  **Rainwater Harvesting: Going Beyond Rainbarrels** – Learn to save water using these home–made and commercially available products – *B.J. Jarvis*, UF (p. 44) .......................................................................... [Sawgrass/Mangrove]

**B–6**  **Butterfly Gardening** – Learn how best to cater to these beautiful creatures – *Mike Malloy*, UF (p. 57) ............................................. [Great Cypress/Royal Poinciana]

**C–6**  **Protecting the Quality of Florida Waters with "LID" Practices** – Learn how “Low Impact Development” storm water management practices are becoming essential tools in the effort to preserve water quality in Florida’s springs, lakes, and rivers – *Pierce Jones*, UF (p. 48) .......................................... [Orchid]

2:15PM–2:30PM  Move to Next Concurrent Session
Tuesday, October 21, 2008 (continued)

2:30PM–3:30PM  Three Concurrent Sessions

A–7  Water Efficient Irrigation and Retrofits – Learn what products are available and how to put them to work with your system – Jack Tichenor, UF (p. 106) .......................................................... [Sawgrass/Mangrove]

B–7  Fertilizer Rule, Ordinances, and BMP Training – Learn about the new fertilizer rule and how new ordinances may impact our gardening practices – Tom Becker and Stephen Brown, UF (p. 3, 5) ........................................................................... [Great Cypress/Royal Poinciana]

C–7  "Greening" Our Landscapes – Learning how FYN is helping builders and developers go green with Florida-friendly home and community landscapes – Ondine Wells, UF (p. 115)................................................................. [Orchid]

3:30PM–4:00PM  Viewing of County Exhibits/Displays ................................................. [Sandpiper]

3:30PM–4:00PM  Refreshment Break ..........................................................[Pre-Function Hallway]

4:00PM–5:00PM  General Session – Roots and Establishment – Managing Roots – What to do at planting and during the first 25 years – Ed Gilman, UF (p. 24) ........................................................................... [Great Cypress/Royal Poinciana]

5:30PM–7:00PM  Viewing of County Exhibits/Displays .................................................. [Sandpiper]

5:30PM–7:00PM  Horticultural Auction & Reception .......... [Great Cypress/Royal Poinciana]

Wednesday, October 22, 2008

7:00AM–8:00AM  Viewing of County Exhibits/Displays ................................................. [Sandpiper]

7:00AM–11:00PM  UF/IFAS Book Store ............................................................................ [Cocoplum]

8:00AM–9:00AM  Plated Awards Breakfast ......................................................... [Grand Floridian Ballroom]

9:00AM–10:30AM  Awards Program

10:30AM–11:00AM  Break .....................................................................................[Pre-Function Hallway]

11:00AM–12:30PM  Closing General Session – Fabulous Foliage – Plants with colorful foliage and how to use them – Sydney Park Brown – UF

Master Gardener Conference Concluded
Optional Pre-Conference Tour

Exciting Tour of Bonnet House Museum and Gardens

By the time early settler Hugh Taylor Birch purchased the Bonnet House site in 1895, the grounds had already witnessed 4,000 years of Florida history. A shell midden (piles of mollusk shells) left by the Tequesta people indicates that human activity on the site dates back to 2,000 B.C. while further archaeological evidence suggests that the grounds saw one of the first sites of Spanish contact with the New World.

Bonnet House’s modern history began when Birch gave the 35 acre property as a wedding gift to his daughter Helen and her husband, Chicago artist Frederic Clay Bartlett in 1919. The newlyweds began construction of Bonnet House in 1920, eager for a winter retreat where Frederic could pursue his artwork and Helen could compose music and poetry. Tragedy struck in 1925 when Helen died from breast cancer. Frederic’s visits to Bonnet House then became sporadic until 1931 when he married Evelyn Fortune Lilly. With this marriage, a renaissance occurred on the site as Frederic and Evelyn entered a prolific period of embellishing Bonnet House with the decorative elements that delight visitors to this day.

Bonnet House Museum & Gardens is accredited by the American Association of Museums. The site was listed on the National Register of Historic places in 1984 and declared a historic landmark by the City of Fort Lauderdale in 2002. In 2004, the National Trust for Historic Preservation included Bonnet House in its Save America’s Treasures program. Due to the threat posed by inappropriately massive nearby development, the National Trust and the Florida Trust for Historic Preservation designated listed Bonnet House as one of America’s 11 most endangered sites in 2008.

The Bonnet House has one of the last examples of a South Florida native barrier island habitat. Five distinct ecosystems can be found, including beach and primary dune, fresh water slough, the secondary dune which includes the house site, mangrove wetlands, and a maritime forest. The historic “Desert Garden’s,” plantings have been restored by the Florida Master Gardeners of Broward County. Their work has been heralded for this effort to improve Fort Lauderdale’s pre-eminent meeting place for local, state and national dignitaries. Our indefatigable Master Gardener project coordinators, Stephen Draft and Eugene Cain have made their work a true success story. The Bonnet House Board thought so much of their work that they were able to convince one of them, Stephen Draft, to join the staff as Interim Curator. Evelyn Bartlett was a passionate orchid collector and the varieties she left to Bonnet House comprise one of the largest collections of orchids in the Southeast United States. Various blooming examples are rotated regularly through the estate’s Orchid Showroom.

For a cost of only $45 you will have a half hour scenic tour through Broward County, followed by 2.5 hours at the Bonnet House, and 2 hours on Las Olas Boulevard, the heart of Fort Lauderdale and the center for investment, cuisine, fine art, and life in subtropical Florida. You’ll have plenty of time to sample from one or more of its 48 restaurants, cafés or bars, along a one mile stretch of street. You have never seen anything like it!
Pre-Conference Tour Agenda

**Sunday, October 19, 2008**

1:30pm   Board Bus at Hotel and depart
2:15pm-4:30pm  Tour Bonnet House Museum and Gardens
4:30pm   Board Bus and depart for Las Olas
4:35pm-6:45pm  Las Olas for shopping and/or dinner
6:45pm   Board Bus and depart for hotel
7:30pm   Arrive at Hotel
Speaker Papers
Listed alphabetically by first author.
Presenting author appears in bold.
On May 13, 2008, the Lee County Board of County Commissioners passed a new water quality ordinance regulating the application of fertilizers on lawns and landscapes within unincorporated areas of Lee County. The **Lee County Landscape & Fertilizer Best Management Practices (BMP) Ordinance** also provides guidelines to prevent excess nutrients from contaminating residential storm water runoff flowing into neighborhood drainage systems and coastal bays and estuaries. Provisions of the ordinance include:

- Homeowners are to follow the practices outlined and referenced in the ordinance and encouraged to seek education with the Lee County Florida Yards and Neighborhoods program.
- Grass clippings and other vegetation cannot be washed, swept or blown into storm water drains, ditches water conveyance systems, open water bodies or onto impervious surface areas like roadways, sidewalks, driveways and parking lots.
- Fertilizers can not be applied to any water bodies including municipal or private storm sewer systems [@inlets, conveyances & structures], ditches, swales, canals, creeks, rivers, streams, tidal waters, lakes, ponds, marshes, standing water, swamps, etc. or impervious surfaces.
- A fertilizer spreader with a deflector shield is required when applying fertilizer near all water bodies and wetlands.
- A minimum of 10 ft of shoreline or bank must be maintained as a fertilizer-free buffer zone between lawns and landscapes adjoining water bodies and wetlands measured from the top of the bank.
- All landscape businesses must be registered with Lee County.
- All professional landscapers must successfully complete the Green Industry Best Management Practices training course developed by the Florida Department of Environmental Protection with UF/ IFAS/ and receive a Certificate of Training.
- There must be at least one BMP-certified employee on site when fertilizer is being applied.
- Fertilizer containing nitrogen and/or phosphorus shall not be applied from June 1-September 30 each year.
- Fertilizer phosphorus content; 0.25 lbs/1000 ft$^2$ per application. Apply no more than 0.50 lbs. P$_2$O$_5$/1000 ft$^2$ per year.
- Fertilizer nitrogen content must contain no less than 50% slow release forms of nitrogen and apply no more than 4 lbs N/1000$^2$ in any calendar year.
• Lee County landscapers and residence have a (1) year grace period before the ordinance is enforced subject to code enforcement and penalties including a $100 penalty for first time violations up to $500 for three or more.

• The rule **exempts** the following fertilizer applicators: farm operators with or without pastures used for grazing livestock, specialized turf managers maintaining specialized turf and landscape areas and all golf course operators following the 2007 Florida DEP Golf Course BMP guidelines.
Comparison of Fertilizer Ordinances

Stephen H. Brown and Tom Becker
Lee County Extension Service, Fort Myers, FL

<table>
<thead>
<tr>
<th>Requirements</th>
<th>FL Green Industries Manual</th>
<th>SWFRPC Resolution</th>
<th>City of Naples</th>
<th>Sarasota County</th>
<th>Lee County</th>
</tr>
</thead>
<tbody>
<tr>
<td>N and P fertilizer black-out period</td>
<td>July 1 – Sept. 30 only when heavy rain is imminent</td>
<td>July 1 – Sept. 30</td>
<td>June 1 – Sept. 30</td>
<td>June 1 – Sept. 30</td>
<td>June 1 – Sept. 30</td>
</tr>
<tr>
<td>Max. P analysis for turf or landscape</td>
<td>Not specified</td>
<td>2%</td>
<td>2%</td>
<td>Not specified</td>
<td>Not specified</td>
</tr>
<tr>
<td>Max. N analysis for turf or landscape</td>
<td>Not specified</td>
<td>20%</td>
<td>Not specified</td>
<td>Not specified</td>
<td>Not specified</td>
</tr>
<tr>
<td>Min. % N as slow-release</td>
<td>Not specified</td>
<td>70%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Max. N application/1,000 sq. ft/year</td>
<td>1 pound</td>
<td>1 pound</td>
<td>1 pound</td>
<td>Not specified</td>
<td>Not specified</td>
</tr>
<tr>
<td>Max. N application /1,000 sq. ft/year</td>
<td>3 to 7 pounds</td>
<td>4 pounds</td>
<td>4 pounds</td>
<td>4 pounds</td>
<td>4 pounds</td>
</tr>
<tr>
<td>Total numbers of fertilizer applications/year</td>
<td>Turf species dependent</td>
<td>6</td>
<td>4</td>
<td>Not specified</td>
<td>Not specified</td>
</tr>
<tr>
<td>Keeping fertilizer off impervious surface</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Use of deflectors shield</td>
<td>10 feet without deflector, 3 feet with deflector</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Fertilizer free zone adjacent to waterbody</td>
<td>3 feet</td>
<td>25 feet</td>
<td>10 feet</td>
<td>10 feet from top of bank</td>
<td></td>
</tr>
<tr>
<td>Mow free zone adjacent to waterbody</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Voluntary</td>
<td>Voluntary 6 feet from waterbody</td>
</tr>
<tr>
<td>Reuse water free zone adjacent to waterbody</td>
<td>None</td>
<td>25 feet</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Exemption during new plant establishment</td>
<td>None</td>
<td>First 60 days</td>
<td>60 days</td>
<td>60 days</td>
<td>60 days</td>
</tr>
<tr>
<td>Exemption for vegetable gardens</td>
<td>None</td>
<td>Yes if &gt; 25 feet from waterbody</td>
<td>Yes</td>
<td>No</td>
<td>Yes if &gt; 15 feet from waterbody</td>
</tr>
<tr>
<td>Mulch and compost</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Title: *Ten Most Popular Tropical-Subtropical Fruits for Florida*
All the information from this presentation may be found on FruitScapes and EDIS.

**FruitScapes**

University of Florida  
Institute of Food and Agricultural Sciences  
Florida Cooperative Extension Service  
Horticultural Sciences Department, Gainesville, and  
Tropical Research and Education Center, Homestead

1. **What is FruitScapes?**

   Hundreds of thousands of homeowners have fruit trees in their home landscape and practical information on how to plant and care for these trees is important to their ability to enjoy this edible landscape. Fruit trees provide not only food but aesthetic beauty. FruitScapes is a University of Florida, IFAS website that focuses on growing temperate, subtropical and tropical fruit crops in the home landscape. The website provides information to homeowners, Extension Agents, Master Gardeners, landscapers, and other interested people in written and audio/video formats. The address for FruitScapes is [http://fruitscapes.ifas.ufl.edu](http://fruitscapes.ifas.ufl.edu) or [http://fruitscapes.info](http://fruitscapes.info).

2. **How can FruitScapes help me (a home-owner)?**

   FruitScapes provides current step-by-step information on how to plant and care for fruit trees in your home landscape. For many fruit crops, specific and detailed information may be accessed through the downloadable publications. The video clips provide additional information. Floridians that wish to speak with someone about planting and care of fruit trees in the home landscape may call their local County Extension Agent or Master Gardener. If the Agent or Master Gardener does not have an immediate answer the Agent or Master Gardener may contact Dr. Williamson or Dr. Crane at the University of Florida and get back to the person with an answer.

3. **Does FruitScapes provide information on rare tropical fruits?**

   FruitScapes provides information on over 50 fruit crops that may be grown under Florida’s climatic conditions. It does not provide information on many of the rare tropical fruit crops like mangosteen, breadfruit, and durian which are not adapted to the various climates found in Florida. True there are a few individuals who have found or created micro-climates where some of the very cold sensitive tropical’s may grow but, for the vast majority of areas in Florida these crops will not survive our winter temperatures.

4. **Who is involved in FruitScapes?**

   FruitScapes is a collaborative website between the Dr. Jonathan Crane, Dr. Jeffrey Williamson, Dr. Carlos Balerdi (retired), Mr. Al Williamson, and Mr. Ian Maguire. The website may be accessed directly or through the Solutions for Your Life website. We are continually improving and expanding the information provided by the FruitScapes website and encourage people to provide us with feedback on how useful they found FruitScapes.
5. Are fruit trees in the home landscape good for landscape? Examples?
   Fruit trees in the home landscape provide shade, texture, depth, variety, and best of all fresh fruit for the homeowner. In addition, local fauna like birds and squirrels sometimes benefit from a food supply and nesting area that fruit trees provide. For example, from an environmental effect on the landscape and energy efficiency standpoint for the home, banana plants placed adjacent to a sun exposed wall provide shade and cooling for the wall during the summer months thus lowering the heat load on the home and AC costs. In return, the warmth radiated from the wall during cool or cold weather provides some cold protection to the banana plant.

6. If I have a question about fruit-scaping whom should I call?
   People with questions about fruit trees in the home landscape should contact their local county Extension Agent. We have provided a direct link to all the Extension Offices on our website (Florida Extension Agent – Contact List).

-- Jonathan H. Crane
Extension Demonstration Gardens as Teaching Tools

Dr. Marina D’Abreau  
University of Florida, Hillsborough County Extension

Source: Brown, S.P.; Taylor, K.; & Eubanks, E.  
Demonstration Gardens in the University of Florida Cooperative Extension Service.  
EDIS Publication, ENH 865.

Listed below by county are the demonstration gardens of the University of Florida's Extension Service. Many are located at county Extension offices or UF/IFAS Research and Education Centers, while others are situated elsewhere in the community. Most of the gardens demonstrate the principles of the Florida Yards & Neighborhoods (FYN) program, emphasizing environmentally friendly (Florida-friendly) approaches to landscape design and maintenance.

Alachua County

Alachua County Extension/City of Gainesville Garden  
Westside Park  
NW 34th St. and NW Eighth Ave.  
Gainesville, FL 32609  
(352) 955-2402  
http://alachua.ifas.ufl.edu

Broward County

Winter Trial Garden  
Fort Lauderdale Research and Education Center  
College Ave.  
Fort Lauderdale, FL 33214  
(954) 577-6300  
http://flrec.ifas.ufl.edu/trial_garden/index.shtml

Living Lawn Demonstration Garden  
Fort Lauderdale Research and Education Center  
3205 College Ave.  
Fort Lauderdale, FL 33214  
(954) 577-6337  
http://grove.ufl.edu/~turf/living_lawn/index.html

Bradford County

Seasonal Butterfly Garden  
Bradford County Extension Office  
2266 N. Temple Ave.  
Starke, FL 32091  
(904) 996-2811  
http://bradford.ifas.ufl.edu/

Charlotte County

Environmental Campus Demonstration Garden  
Charlotte County Public Works  
7000 Florida St.  
Punta Gorda, FL 33950  
(941) 764-4340  
http://charlotte.ifas.ufl.edu

Demonstration Garden  
Charlotte County Extension Office  
25550 Harbor View Rd., Suite # 3  
Port Charlotte, FL 33980  
(941) 764-4340  
http://charlotte.ifas.ufl.edu

Brevard County

Xeriscape Garden  
Brevard County Extension Office  
3695 Lake Dr.  
Cocoa, FL 32926  
(407) 633-1702  
http://brevard.ifas.ufl.edu
Citrus County
Canning Center
Citrus County Canning Center
3405 W. Southern St.
Lecanto, FL 34461
(352) 527-5700
http://bocc.citrus.fl.us/commserv/extension/extension_services.htm

Florida-Friendly Learning Landscape
Citrus County Extension Office
3650 W. Sovereign Path
Lecanto, FL 34461
(352) 527-5700
http://bocc.citrus.fl.us/commserv/extension/extension_services.htm

Homosassa Water District
7922 W. Grover Cleveland Blvd.
Homosassa, FL 34446
(352) 527-5700
http://bocc.citrus.fl.us/commserv/extension/extension_services.htm

Clay County
Shade Garden
Clay County Extension Office
2463 State Road 16 West
Green Cove Springs, FL 32043
(904) 284-6355
http://clay.ifas.ufl.edu

Collier County
Southwest Florida Horticultural Learning Center
Collier County Extension Office
14700 Immokalee Rd.
Naples, FL 34120
(941) 353-4244
http://collier.ifas.ufl.edu/HomeGarden/HortLearningCenter.shtml

Columbia County
Columbia County Demonstration Garden
Columbia County Demonstration Garden
Route 18, Box 720
Lake City, FL 32025
(386) 752-5384
http://columbia.ifas.ufl.edu

Duval County
Mandarin Demonstration Garden
2892 Loretto Rd.
Jacksonville, FL 32223
(904) 387-8850
http://duval.ifas.ufl.edu/

Superior Street Vegetable and Herb Demonstration Garden
Duval County Extension Office
1010 N. McDuff Ave.
Jacksonville, FL 32254
(904) 387-8850
http://duval.ifas.ufl.edu/

Escambia County
Demonstration and Learning Garden
Escambia County Extension Office
3740 Stefani Rd.
Cantonment, FL 32533
(850) 475-5230
http://escambia.ifas.ufl.edu/

Flagler County
Wildlife, Butterfly and Herb Garden
Flagler County Extension Office
150 Sawgrass Road
Bunnell, FL 32110
(386) 437-7464
**Gadsden County**

**Trial and Demonstration Gardens**
North Florida Research and Education Center
155 Research Rd.
Quincy, FL 32351
(850) 875-7100
http://nfrec.ifas.ufl.edu

**Hernando County**

**Demonstration Garden**
Hernando County Extension Office
19490 Oliver St.
Brooksville, FL 34601
(352) 754-4433
http://www.hernandocounty.us/county_extension/

**Highlands County**

**Florida-friendly Garden**
Highlands County Extension Office
4509 George Blvd.
Sebring, FL 33875
(863) 402-6544
http://highlands.ifas.ufl.edu

**Hillsborough County**

**Bette S. Walker Discovery Garden**
Hillsborough County Extension Office
5339 County Road 579
Seffner, FL 33584
(813) 744-5519 ext. 146
http://hillsborough.extension.ufl.edu/HomeGardening/Discovery-Garden.html

**Teaching Garden and Arboretum**
1200 N. Park Rd.
Plant City, FL 33563
(813) 757-2286
http://gcrec.ifas.ufl.edu/pcc/Gardens/main.htm

**Indian River County**

**Color Garden**
Indian River Extension Office
1028 20th Place, Suite D
Vero Beach, FL 32960
(561) 770-5030
http://indian.ifas.ufl.edu/

**Lake County**

**Horticultural Learning Center**
Lake County Extension Office
1951 Woodlea Rd.
Tavares, FL 32778
(352) 343-4101
http://discoverygardens.ifas.ufl.edu/tour_our_gardens.htm

**Lee County**

**Cape Coral-Lee County Public Library**
Cape Coral-Lee County Public Library
921 SW 39th Terr.
Cape Coral, FL 33914
(239) 461-7526
http://lee.ifas.ufl.edu

**Demonstration Gardens**
Lee County Extension Office
3406 Palm Beach Blvd.
Fort Myers, FL 33916
(941) 461-7500
http://lee.ifas.ufl.edu

**Demonstration Landscape at Cape Coral Historical Museum**
544 Cultural Park Blvd.
Cape Coral, FL 33990
(239) 461-7526
http://lee.ifas.ufl.edu
Demonstration Landscape at Rutenberg Park
Lee County Parks & Recreation Eco-Center and FYN Classroom
6490 S. Pointe Blvd.
Fort Myers, FL 33919
(239) 432-2163 (on-site)
(239) 461-7526 (to schedule a tour)
http://lee.ifas.ufl.edu

The Fragrance Garden at Lakes Regional Park
7330 Gladiolus Drive
Ft. Myers, FL 33908
(239) 432-2002
http://lee.ifas.ufl.edu

Manatee Regional Park
10901 State Rd. 80
Fort Myers, FL 33916
(239) 461-7526
http://leeparks.org

Leon County
Demonstration Gardens
Leon County Extension
615 Paul Russell Rd.
Tallahassee, FL 32301
(850) 487-3004
http://leon.ifas.ufl.edu/

Manatee County
FYN Demonstration Gardens
Manatee County Extension Office
1303 17th St. W.
Palmetto, FL 34221
(941) 722-4524
http://manatee.ifas.ufl.edu/lawn_and_garden/fyn/demonstration-garden.shtml

Marion County
Taylor Garden
Marion County Extension Office
2232 NE Jacksonville Rd.
Ocala, FL 34470
(352) 620-3440
http://www.marioncountyfl.org/AC631/AG_home.htm

Miami-Dade County
North Miami-Dade Regional Library
2455 NW 183rd St.
Carol City, FL 33056
(305) 248-3311
http://miami-dade.ifas.ufl.edu/

Miami-Dade College, Environmental Center
11011 SW 104th St.
Miami, FL 33176
(305) 248-3311
http://miami-dade.ifas.ufl.edu/lawn_and_garden/fyn.shtml

Citrus Grove Elementary School
2121 NW Fifth St.
Little Havana, FL 33135
(305) 248-3311
http://miami-dade.ifas.ufl.edu/

Monroe County
FYN Landscape Demonstration Garden
Monroe County Extension Office
1100 Simonton St.
Key West, FL 33040
(305) 292-4501
http://monroe.ifas.ufl.edu/
Nassau County
Demonstration Garden
Nassau County Cooperative Extension--Yulee Office
96135 Nassau Place
Yulee, FL 32097
(904) 548-1182
http://nassau.ifas.ufl.edu/horticulture/demogarden/demogarden.html

Okaloosa County
Educational Landscape
Okaloosa County Extension Office
5479 Old Bethel Rd.
Crestview, FL 32356
(850) 689-5850
http://okaloosa.ifas.ufl.edu

Orange County
Central Florida Fairgrounds
Extension Demonstration Garden
4603 W. Colonial Dr.
Orlando, FL 32808
(407) 295-3247
http://ocextension.ifas.ufl.edu

Mid-Florida Research and Education Center Teaching Garden
2725 S. Binion Rd.
Apopka, FL 32703
(407) 884-2034 ext. 129
http://mrec.ifas.ufl.edu

Osceola County
Osceola County Master Gardener Demonstration Landscape and Edibles Garden
Osceola County Extension Office
Osceola Heritage Park
1921 Kissimmee Valley Lane
Kissimmee, FL 34772
(321) 697-3000
http://osceola.ifas.ufl.edu

Palm Beach County
Mounts Botanical Garden
Palm Beach County Extension Office
559 Military Trail
West Palm Beach, FL 33415
(561) 233-1751
http://mounts.org

Pasco County
FYN Demonstration Garden
Pasco County Extension
36702 State Road 52
Dade City, FL 33525
(352) 521-4288
http://gardeningpasco.ifas.ufl.edu/Plants_Demo_Garden.shtml

Hudson Public Library
Hudson Public Library
8012 Library Rd.
Hudson, FL 34667
(352) 521-4288
http://pasco.ifas.ufl.edu/

Pinellas County
The Florida Botanical Gardens
Pinellas County Extension Office
12520 Ulmerton Rd.
Largo, FL 33774
(727) 582-2200
http://www.flbg.org/

Polk County
Florida-friendly Landscape Demonstration Garden
Polk County Utilities
1011 Jim Keene Blvd.
Winter Haven, FL 33880
(863) 519-8677
http://polkfyn.ifas.ufl.edu
Demonstration Gardens
Polk County Extension Office
1702 Highway 17
South Bartow, FL 33831
(863) 519-8677
http://polkfyn.ifas.ufl.edu

St. Lucie County
Demonstration Garden
St. Lucie County Extension
8400 Picos Rd., Suite 101
Fort Pierce, FL 34945
(561) 462-1660
http://slucie.ifas.ufl.edu/

Teaching Garden
Indian River Research and Education Center
2199 South Rock Rd.
Fort Pierce, FL 34945
(772) 468-5668
http://irrecenvhort.ifas.ufl.edu/virtualgarden/index.htm

The Linear Garden
Indian River Research and Education Center
2199 South Rock Rd.
Fort Pierce, FL 34945
(772) 468-3922 ext. 132
http://irrec.ifas.ufl.edu

St. Johns County
Demonstration Arboretum
St. Johns County Extension Office
3125 Agricultural Center Dr.
St. Augustine, FL 32092
(904) 824-4564
http://stjohns.ifas.ufl.edu

Santa Rosa County
Milton Gardens
5988 Highway 90, Bldg. 4900
P.O. Box 3634
Milton, FL 32583
(850) 983-5216
http://wfrec.ufl.edu/milton_gardens/WebMiltGard/index.htm

Panhandle Butterfly House
Highway 98 at the foot of the Navarre Bridge
Navarre, FL 32566
(850) 623-6321
http://www.panhandlebutterflyhouse.org

Teaching and Demonstration Garden
Santa Rosa County Extension Office
6263 Dogwood Dr.
Milton, FL 32570
(850) 623-3868
http://santarosa.ifas.ufl.edu

Sarasota County
Florida House Learning Center
Sarasota County Technical Institute
4600 Beneva Rd. S.
Sarasota, FL 34233
(941) 316-1200
http://sarasota.extension.ufl.edu

FYN Demonstration Garden
Sarasota County Extension Office
6700 Clark Rd.
Twin Lakes Park
Sarasota, FL 34241
(941) 861-9886
http://sarasota.extension.ufl.edu

Seminole County
Demonstration Gardens at the Student Museum
301 W. Seventh St.
Sanford, FL 32771
(407) 320-0520
http://www.seminolecountyfl.gov/coopext/
**Sumter County**

**Florida-friendly Garden**  
Sumter County Extension Office  
7620 SR 471  
Bushnell, FL 33513  
[http://sumter.ifas.ufl.edu/horticulture.shtml](http://sumter.ifas.ufl.edu/horticulture.shtml)

**Volusia County**

**Demonstration Garden**  
Volusia County Extension Office  
Volusia County Agricultural Center  
3100 E. New York Ave.  
DeLand, FL 32724  
(386) 822-5778  
[http://volusia.org/extension/](http://volusia.org/extension/)

**Wakulla County**

**The Master Garden**  
Wakulla County Extension Office  
84 Cedar Ave.  
Crawfordville, FL 32327  
(850) 926-3931  
[http://wakulla.ifas.ufl.edu](http://wakulla.ifas.ufl.edu)
Palm Problems: Field and Laboratory Diagnosis

Monica L. Elliott and Timothy K. Broschat
University of Florida – IFAS, Fort Lauderdale Research and Education Center

Introduction

Palms growing in the landscape and field nurseries are susceptible to a wide range of diseases and disorders. Diagnosis of a particular palm problem often requires either a comprehensive understanding of all of the possibilities, or a systematic key to help the diagnostician focus on the cause of the problem. A key to the most common diseases and disorders affecting landscape palms in the continental United States is now available at flrec.ifas.ufl.edu/palm_prod/palm_problems.shtml. Some insect pests are included in the key, as the damage they cause may appear similar to some diseases or disorders.

The information in this document includes tips to determine when laboratory diagnostics may be useful and how to interpret and/or integrate field and laboratory diagnoses. References regarding palm horticulture, physiological disorders (e.g., nutrient deficiencies), diseases, and insects are listed at the end of this document.

A Dead Palm Tells No Tales

Scientists and palm specialists often receive photographs of dead palms, with no other accompanying material and with the following question attached: What killed my palm? In most cases, it is not the least bit obvious what has killed the palm! Diagnosticians (be it in the field or in the laboratory) need clues. The best clues come from palms that are still living and from the people who are growing the palms (especially if they have been closely observing the palms). Background information can be critical for making the correct diagnosis. This includes information about the palm itself, its surrounding environment and also recent weather events. Even with plenty of clues, it still may not be possible to determine exactly what is affecting the palm. We can only make an educated guess. Diagnosing palm problems can be as much an art as it is a science, and experience is invaluable.

Field Diagnosis vs. Laboratory Diagnosis

Since few people have immediate access to analytical laboratories, the diagnostic key “http://flrec.ifas.ufl.edu/palm_prod/palm_problems.shtml” is based solely on visible symptoms. Fortunately, visual symptoms are sufficient to diagnose many palm problems. Visual symptoms are also the first step in determining which diagnostic lab to use for further analysis, and which tissue should be sampled for analysis. Table 1 provides guidelines regarding tissue to sample. For most plant diseases, plant diagnostics is not nearly as sophisticated as human medical diagnostics. A laboratory analysis should always be used in conjunction with the field diagnosis of the problem. Never rely on a laboratory diagnosis without also making a good faith attempt at the field diagnosis. The two diagnoses should agree.

Just because a laboratory report suggests deficiencies of one or more nutrient elements or the presence of one or more potential pathogens does not mean that those deficiencies or pathogens are the actual cause of the particular problem. "False positives" are common, and often misleading. This is one weakness of laboratory diagnostics when used as the sole method of diagnosis. In the case of
palm diseases, "false negatives" are also a common problem, especially when the wrong tissue is sampled or a sample of poor quality is submitted to the laboratory. If the two diagnoses (field and lab) do not agree, then re-examine the problem to determine which diagnosis is more likely to explain the symptoms being observed (compare to descriptions and photos in reference materials), and if you sampled the correct material for the laboratory diagnosis. Alternatively, you may need to start at the beginning as neither diagnosis may be correct.

**Laboratory Disease Diagnosis**

A laboratory disease diagnosis may be required to confirm the field diagnosis, as it may not be readily apparent which pathogen is causing the symptoms observed in the field. Sometimes a laboratory diagnosis is necessary because two diseases have identical symptoms. For example, Fusarium wilt and petiole (rachis) blight of Canary Island date palm (*Phoenix canariensis*) have similar symptoms but one is lethal (Fusarium wilt) and one is not. If confirmation of a field disease diagnosis is necessary, it should be conducted by a qualified plant disease diagnostic laboratory. For example, molecular tests are necessary to confirm Fusarium wilt, Fusarium decline, lethal yellowing and Texas Phoenix palm decline, but only the University of Florida currently offers these services in Florida (http://plantpath.ifas.ufl.edu/pdc/default.htm).

Sampling the correct tissue is critical for an accurate laboratory diagnosis. For example, lethal yellowing is confirmed from internal trunk corings, while petiole (rachis) blight pathogens only infect the palm petiole or rachis. In both cases, sampling leaflet tissue of a palm affected by either of these diseases would have yielded a false negative. Thus, it is imperative to make the field diagnosis as accurate as possible in order to determine which tissue to sample. Many "potential" plant pathogens are naturally part of the palm environment, so it is easy to isolate these "potential" pathogens rather than the actual pathogen causing the symptoms observed. The laboratory is analyzing the tissue that you provide. Sampling the proper tissue and providing adequate background information on the problem increases the likelihood of obtaining an accurate diagnosis. A good series of photographs illustrating the problem is always helpful.

One common error in diagnosing palm problems is to sample roots. In the landscape and field nursery, root rots of palms are uncommon, and are usually the secondary result of a palm being planted incorrectly or in the wrong environment. Examples include planting *Phoenix dactylifera* in soils that are routinely water-logged or planting any palm too deep. A diagnostic laboratory will usually be able to isolate potentially pathogenic fungi from roots, but these fungi are seldom the primary cause of the problem observed. This is an important distinction for management purposes, as one needs to first correct the primary cause, if possible. Likewise, soil sampling for potential pathogens is not recommended because there are always "potential" pathogens in the soil. Root rots of palms growing in containers are more likely to occur because of the poor soil aeration.

Sometimes it is not possible to make a confirmation of a field diagnosis until a dead or dying palm is cut down. For example, palms affected by Ganoderma butt rot may die without producing conks (basidiocarps) from the lower trunk area. However, when the palm is cut down and multiple cross-sections are made of the trunk, the disease will be easily confirmed based on the pattern of rot within the trunk, and without the necessity of a laboratory diagnosis. Another example concerns damage to the apical meristem (bud or heart). Many abiotic and biotic problems may kill the bud, but you may not be able to determine or confirm the cause until longitudinal sections are made through the bud.
Leaf Nutrient Analysis

Most nutrient deficiency problems can be readily diagnosed by visual symptoms alone. For most palm species, diagnosis should rely on visual symptoms rather than a leaf nutrient analysis. Baseline data for nutrient sufficiency has been developed for only a few palm species. Therefore, without a comparison to a known nutrient sufficient palm of the same species, a leaf nutrient analysis can be misleading.

There are situations where multiple deficiencies may be present on a single palm. Symptoms of these deficiencies may be present on different parts of the palm (e.g., old vs. new leaves), but may occasionally be superimposed on the same tissue. A common example of the latter is potassium and magnesium deficiency symptoms, both being present to some degree on the older leaves of a palm. For these situations, leaf nutrient analysis can be useful for distinguishing multiple deficiencies where the symptoms of one deficiency may mask those of another.

Leaf analysis can also be used to confirm or clarify a diagnosis based on visual symptoms. However, there are exceptions. For example, leaf analysis is not particularly useful for diagnosing iron deficiency in any plant, and leaf analysis may not accurately assess the boron sufficiency status of a palm at any given time, due to the often transient nature of boron deficiency.

In order to obtain useful results from a leaf analysis, the proper leaves must be sampled. Leaf nutrient analyses are based on samples of several leaflets (pinnate-leaf palms) or leaf segments (fan leaf palms) taken from the center of the youngest, fully expanded leaf (Figs. 1 and 2). Depending on the nutrient deficiency, this may or may not be the leaf exhibiting symptoms. In pinnate-leaf palms, this youngest, fully-expanded leaf should have all of its basal leaflets (or spines in some species) expanded out and perpendicular to the petiole axis, as in older leaves (Fig. 1).

Figure 1. The feather palm leaf on the left has been sampled correctly for tissue nutrient analysis (middle leaflets are removed). The leaf on the right should not be sampled as all of the leaflets have not fully expanded. Note that the leaflets closest to the petiole base of the leaf are not yet at a right angle to the petiole.
Leaf Disease vs. Nutrient Deficiency

Too complicate matters even further, it is possible to have both a nutrient deficiency and a leaf spot disease. Furthermore, some nutrient deficiencies look like a leaf spot disease. If you cannot decide which problem you are observing, then collecting samples for both a disease diagnosis and leaf nutrient analysis may be necessary. However, this will require duplicate samples and may require sampling different tissue on the same plant. As explained above, leaf nutrient analysis is based on leaflets from the youngest fully expanded leaf. Leaf disease samples should be the leaves exhibiting the leaf spot or leaf blight symptoms.

Soil Nutrient Analysis

Soil nutrient analysis has often been employed in the diagnosis of plant problems in the landscape and field nursery. Unfortunately, this technique has limited value for this purpose, and often leads to erroneous conclusions. Just because a nutrient element is found to be "deficient" in the soil, does not mean that the plant is unable to extract sufficient amounts of that element from the soil. Alternatively, a palm may be suffering from a deficiency of an element that is present in "sufficient" levels according to soil tests.

Soil analysis can be useful for diagnosing problems such as high soluble salts, a disorder with symptoms very similar to those of chemical toxicities or even potassium deficiency in some species. Soil analysis may also provide useful information regarding soil pH, which could affect your choice of corrective fertilizers or explain why a deficiency is occurring. For example, manganese availability in the soil is soil pH dependent.

When collecting soil samples for laboratory analysis, it is best to scratch away the mulch or other surface covering and obtain a cup or more of soil from the top 4 to 6 inches of the soil profile. Sample several areas under the canopy of a single palm, or from under the canopies of several palms, if they are all affected by a single problem. These samples should be thoroughly mixed, and about one cupful of the mixture taken to a soils laboratory for analysis.
More Information

Once a diagnosis is made, treatment for that particular problem can be obtained from the appropriate University of Florida/IFAS Extension documents on the web. These documents contain discussions and illustrations of the palm diseases, physiological disorders and insect problems included in the key and should be used in conjunction with the key. A set of plastic-coated cards that illustrates the more common palm diseases and disorders is also available. You should also consult with your local Cooperative Extension Service office for local updates. (link to county offices and maps at: http://solutionsforyourlife.ufl.edu/map/index.html.

- Broschat, T.K. and M.L. Elliott. 2005. Disorders and Diseases of Ornamental Palms. SP360. University of Florida, IFAS Extension, Gainesville, FL. This is a set of plastic-coated, color cards (3 x 4 inches) with 45 photos of common disorder and disease symptoms. 800/226-1764 (credit card orders only) (http://ifasbooks.ufl.edu) -- under "Landscapes and Lawns" and then click on "books".
- EDIS (electronic publication site for UF/IFAS information) has publications on palms at (http://edis.ifas.ufl.edu). Type "palm" into the search engine. Many of these publications are new as of 2005. A few are major revisions. As new information becomes available, these publications are updated and new ones are added.
- Fort Lauderdale Research and Education Center web page on Palm Production and Maintenance has links to EDIS publications and additional files on "hot topics" at (http://flrec.ifas.ufl.edu/ ) -- then click on "Palm Production and Maintenance".
- Featured Creatures is the UF Dept. Entomology & Nematology/DPI web site at (http://creatures.ifas.ufl.edu).
Table 1. Tissue to sample for laboratory diagnosis, after a preliminary field diagnosis has been made.

<table>
<thead>
<tr>
<th>Field Diagnosis</th>
<th>Palm Tissue to Sample for Laboratory Diagnosis(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bud Rot</td>
<td>Spear leaf or next youngest leaf exhibiting typical disease symptoms. If bud is already rotted, it is often not useful to sample the tissue as secondary microorganisms hinder isolation of the primary pathogen.</td>
</tr>
<tr>
<td>Fusarium Wilt</td>
<td>Leaf exhibiting typical symptoms of the disease: entire leaf or, at a minimum, leaf petiole base (petiole portion from trunk to beginning of leaflets)</td>
</tr>
<tr>
<td>Fusarium Decline</td>
<td>Leaf exhibiting typical symptoms of the disease: entire leaf or, at a minimum, leaf petiole base (petiole portion from trunk to beginning of leaflets or leaf blade)</td>
</tr>
<tr>
<td>Ganoderma Butt Rot</td>
<td>Laboratory diagnosis is not usually possible. Field diagnosis is based on presence of conk or on multiple cross-sections through lower 3-4 feet of trunk.</td>
</tr>
<tr>
<td>Graphiola Leaf Spot (False Smut)</td>
<td>Laboratory diagnosis is not necessary because fungal structures can be easily observed with hand magnifying glass.</td>
</tr>
<tr>
<td>Leaf Spots or Leaf Blights (numerous pathogens)</td>
<td>Leaf exhibiting typical symptoms of disease: entire leaf or, at a minimum, 5 to 8 leaflets or leaf segments with symptoms.</td>
</tr>
<tr>
<td>Nutrient Deficiency</td>
<td>Select the youngest, fully-expanded leaf. Remove 4 to 6 leaflets on both sides of rachis of a feather-leaf palm. Remove 4 to 6 leaf segments from blade of fan-leaf palm.</td>
</tr>
<tr>
<td>Petiole (Rachis) Blight (numerous pathogens)</td>
<td>Leaf exhibiting typical symptoms of disease: entire leaf or, at a minimum, leaf petiole base (petiole portion from trunk to beginning of leaflets or leaf blade).</td>
</tr>
<tr>
<td>Trunk Rot</td>
<td>Select a cross-section of the trunk that has both rotted and healthy trunk tissue. The interface between diseased and healthy tissue is the ideal sample.</td>
</tr>
</tbody>
</table>

\(^{1}\)Unless otherwise instructed, plant tissue samples for disease diagnosis should NOT be placed in a plastic bag. Instead, place tissue in a plain paper bag or in a box and pack with newspapers. If sending entire leaves or portions of the petiole, it is acceptable to cut the leaf or petiole into smaller sections and bundle together with tape or string. See the home page for the University of Florida Extension Plant Disease Clinic at http://plantpath.ifas.ufl.edu/pdc for further information on submission, submission sample form and pricing.

Footnotes
1. This document is PP 246, one of a series of the Plant Pathology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date June 2008. Visit the EDIS Web Site at http://edis.ifas.ufl.edu.
Useful Palm Publications and Web Sites

Compiled by Monica L. Elliott  
University of Florida, Fort Lauderdale Research and Education Center  

August 2008

➢ **NEW**

- “Palm Problems: Field and Laboratory Diagnosis” at http://edis.ifas.ufl.edu/PP166 with link to “Palm Problems” web site at: http://flrec.ifas.ufl.edu/palm_prod/palm_problems.shtml

➢ **BOOKS**


➢ **ID CARD DECK**

- Broschat, T.K. and M.L. Elliott. 2005. Disorders and Diseases of Ornamental Palms. SP 360. This is a collection of plastic-coated, color cards (3 inches x 4 inches) with 45 photos of common disorder and disease symptoms and a short explanation of the symptoms. 800/226-1764 (credit card orders only) http://ifasbooks.ufl.edu (go to “Landscapes and Lawns”, and then “books”)

➢ **Fairchild Tropical Botanic Garden** (http://www.fairchildgarden.org)  
  - Fairchild Guide to Palms is located at http://www.palmguide.org/index.php

➢ **Montgomery Botanical Center** (http://www.montgomerybotanical.org)  
  - Links under “Research,” “Education” and “Collections”

➢ **EDIS** (electronic publication site for UF-IFAS information) publications on palms at http://edis.ifas.ufl.edu. Type “palm” into the search engine. Many of these publications are new
as of 2005, while a few are major revisions. If you have a hardcopy in your files, check on-line to be sure it is the most current version before using as a handout.

**Environmental Horticulture (http://edis.ifas.ufl.edu/EP###)**
- Nutrient deficiencies of landscape and field-grown palms in Florida (EP273)
- Fertilization of field-grown and landscape palms in Florida (EP261)
- Nutrition and fertilization of palms in containers (EP262)
- Physiological disorders of landscape palms (EP263)
- Boron deficiency in palms (EP264)
- Iron deficiency in palms (EP265)
- Magnesium deficiency in palms (EP266)
- Manganese deficiency in palms (EP267)
- Nitrogen deficiency in palms (EP268)
- Potassium deficiency in palms (EP269)
- Transplanting palms (EP001) [updated revision coming soon]
- Palm seed germination (EP238)
- Container production of palms (CN010)
- Normal “abnormalities” in palms (EP344)
- Pre- and postemergence herbicides for use around palms and cycads (EP335)

**Plant Pathology (http://edis.ifas.ufl.edu/PP###)**
- Ganoderma butt rot of palms (PP100)
- Fusarium wilt of Canary Island date palm (PP139)
- Thielaviopsis trunk rot of palm (PP143)
- Bud rots of palm (PP144)
- Graphiola leaf spot (false smut) of palm (PP140)
- Pestalotiopsis (Pestalotia) diseases of palm (PP141)
- Petiole (Rachis) blight of palm (PP145)
- Lethal yellowing (LY) of palm (PP146)
- Leaf spots and leaf blights of palm (PP142)
- Texas Phoenix palm decline (PP163)
- Palm Problems: Field and Laboratory Diagnosis (PP166) [has link to Palm Problem key]

**Entomology and Nematology (http://edis.ifas.ufl.edu/IN###)**
- Palmetto weevil (IN139)
- Red ring nematode (IN392)
- Royal palm bug (IN254)
- Silky cane weevil (IN210)
- Cabbage palm caterpillar (IN252)
- Red palm mite(IN711)

**FEATURED CREATURES** (UF Dept. Entomology & Nematology/DPI web site)
- Ambrosia beetle: http://creatures.ifas.ufl.edu/trees/beetles/platypus.htm
- Coconut mite: http://creatures.ifas.ufl.edu/orn/palms/Aceria_guerreronis.htm

**FLORIDA ENTOMOLOGIST**
- http://www.fcla.edu/FlaEnt/fe83p290.pdf (article on palmetto weevil)

**University of Florida’s Fort Lauderdale Research and Education Center** web page on Palm Production and Maintenance has links to EDIS publications and additional files on “hot topics” at [http://flrec.ifas.ufl.edu/](http://flrec.ifas.ufl.edu/), then click on “Palm Production and Maintenance”

- **Fusarium Decline**
  - http://flrec.ifas.ufl.edu/palm_prod/pdfs/New-Disease-Queen-Palms-Mexican-Fan-Palms-July.pdf (article on Fusarium Decline)
  - http://flrec.ifas.ufl.edu/palm_prod/fusarium.shtml (photos of Fusarium Decline)

- **New Sabal Palm Disease**
Introduction

Trees growing in urban and suburban landscapes offer many benefits to the community. However, when a tree or part of a tree breaks, it can cause extensive damage to people and property (Figure 1). A preventive pruning program is an important tool to minimize the risks of tree defects. The most common defects are codominant stems and aggressive low branches that either split from the tree or result in large pruning cuts upon removal (Figure 2). Problems such as these result in tree stress, reduce the life span of the tree, and place people and property at risk. Preventive pruning helps to promote good structure, making trees more resistant to storms and other natural forces. A research study in 2006 suggests that pruning trees significantly reduces trunk movement and damage when exposed to 120-mph winds.

Trees with good structure are characterized by a single dominant leader, strong branch unions without bark inclusions and a balanced canopy (Figure 3). Preventive or structural pruning is a process that can help to promote these attributes in trees.
Determine Your Objectives

The major objective of preventive structural pruning is to direct the growth of the tree so that it forms a sustainable structure. This is accomplished by pruning stems and branches that are not growing in the correct direction or position.

<table>
<thead>
<tr>
<th>Structural issues that cause trees to fail</th>
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<tbody>
<tr>
<td>Codominant stems</td>
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<tr>
<td>Included bark</td>
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<tr>
<td>Unbalanced canopy</td>
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<tr>
<td>Lions-tailing or over-lifting</td>
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<tr>
<td>Large lower limbs</td>
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</table>

Correction of Structural Issues

**Codominant Stems and Included Bark**

Codominant stems are stems of equal size originating from the same point on the tree. Included bark is bark pinched between two stems creating a weak union. Codominant stems with a ‘V’ shaped union are often accompanied by included bark (Figure 4). This union is weak because the bark inclusion prevents any physical connection between the two stems. Instead of overlapping wood creating a strong connection, the two stems push each other apart as they grow and a crack develops.

Researchers at the University of Florida have visited several hurricane sites, and found time and time again that trees failed due to structural issues like codominant stems and bark inclusions.
Strong branch unions are ‘U’ shaped and have a prominent collar (Figure 5). The collar is a swelling formed by overlapping trunk and branch wood. This forms a strong union resistant to breakage.

**Unbalanced Canopy**

An unbalanced canopy occurs when one side of the tree canopy is much heavier than the other, or when most of the canopy weight is at the tips of branches. The later is a product of lions-tailing or over-lifting, a poor pruning practice that removes all of the live foliage along the lower and interior parts of the main branches (Figure 6). Lions-tailing is generally accepted by professionals as a poor pruning practice that makes trees more susceptible to wind damage. Lions-tailing encourages more growth at the tips of the branches, resulting in a taller and wider tree. This results in foliage exactly where it is unwanted; that is, higher off the ground. Lions-tailing is often performed as a type of thinning; however, this type of pruning routinely encourages sprouting along the main branches and the canopy quickly fills back in with foliage. These sprouts often have weak connections to the stems and break easily in storms. In addition, lions-tailed trees that are damaged in storms are difficult to restore because the branches arborists would normally cut back to have already been removed.

**Large Lower Limbs**

Removal of lower limbs is important in order to provide clearance for pedestrian and vehicular traffic. Too often lower limbs are removed only when they have become large and have started to droop, many years after planting. Removal of large branches can initiate decay in the trunk, especially in species prone to decay (Figure 7). Large limbs left to grow may also develop structural defects such as excessive end weight. This defect can increase the likelihood of branch failure. It is important to keep in mind that low branches on young trees are temporary and will have to be removed in the future. Manage lower branches to prevent structural defects from forming.
Pruning to Promote Strong Structure

Developing a preventive pruning program requires that managers be familiar with the techniques of structural pruning. Structural pruning should be practiced for the first 15 to 25 years of a tree's life. This is the amount of time required to establish strong structure in the canopy and will help to make the tree more resistant to storm damage (Figure 8). In structural pruning, reduction and removal cuts are used to slow the growth of large or rapidly growing branches that compete with the leader. This encourages the one stem you chose as the leader to grow faster.

<table>
<thead>
<tr>
<th>Components of Structural Pruning</th>
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<tbody>
<tr>
<td>1. Develop or maintain a dominant leader</td>
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<tr>
<td>2. Identify the lowest branches in the permanent canopy</td>
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<tr>
<td>3. Prevent branches below the permanent canopy from growing too large</td>
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<tr>
<td>4. Keep all branches less than one half the trunk diameter</td>
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<tr>
<td>5. Space main branches along one dominant trunk</td>
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<tr>
<td>6. Suppress growth on branches with included bark</td>
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</table>

Component 1

**Developing or Maintaining a Dominant Leader**

Developing a dominant leader starts by identifying the stem that will make the best leader; typically it is the largest stem. This might be easy for some trees and more difficult in others. If all stems are about the same diameter, pick the one that is closest to the center of the canopy as the leader. Then determine which stems are competing with that leader, and decide where to shorten these competing stems (Figures 8 and 9).
Figure 9
Before and after structurally pruning a young live oak. Notice the arrow indicating where the stem on the left side of the leader has been reduced.

Figure 10
All existing branches on these recently planted trees along a street will eventually have to be removed in order to provide clearance for buses, garbage trucks, and tractor trailers.

All are temporary branches

Street

Curb
Component 2

Identifying the Lowest Branches in the Permanent Canopy

First, recognize that branches do not change their position on the trunk as the tree grows. In fact, it may be surprising for some to realize that all branches on trees with less than about 4” caliper will eventually be removed. Identifying the lowest branches in the permanent canopy will facilitate management of lower temporary branches (Figures 10 and 11).

Component 3

Prevent Branches below the Permanent Canopy from Growing Too Large

The lowest permanent branch on many shade trees should be at least 15 to 20 feet off the ground; all lower branches are eventually removed under ideal management. Lower branches should be subordinated (reduced) early to prevent them from becoming too large. This prevents the tree manager from having to make large pruning wounds on the trunk. We do this with reduction cuts to slow growth on these aggressive low branches. This helps to push new growth higher up in the canopy, and will minimize the amount of large cuts that need to be made on the trunk.
Component 4

**Keep All Branches Less than Half the Trunk Diameter**

Branches more than one-half the diameter of the trunk lack a branch protection zone. This zone inside the branch union is rich in chemicals that inhibit spread of organisms and decay from the pruning wound into the trunk. Keeping branches less than half the trunk diameter ensures that the branch collar and branch protection zone remain intact.

Component 5

**Space Main Branches along One Dominant Trunk**

Ideally, main branches (also called scaffold limbs) should be spaced along the dominant leader in two or more rotations around the trunk so that no branch is directly above another (Figure 12). Spacing scaffold limbs allows for the trunk and leader to develop properly, gives the canopy a more balanced form, and reduces wind resistance.

Component 6

**Suppress Growth on Branches with Included Bark**

Suppress growth on branches with included bark (Figure 13) to minimize the chance of breakage. As mentioned earlier, included bark is a structural defect that causes the union between branch and trunk to be very weak. Reduce branches with included bark to slow their growth until you are ready to remove them.

**Figure 12**
Major scaffold branches on this mahogany tree (right) have been spaced evenly throughout the canopy so that no branch is directly above another, making the tree more structurally sound (left).

**Figure 13**
Variations of included bark on four different trees.
Determining Pruning Cycle and Pruning Dose

**Pruning Cycle**

The next step in developing a preventive pruning program is to determine the pruning cycle and pruning dose. A pruning cycle is the interval of time between each pruning event. The interval is affected by many factors. For instance, trees coming from a nursery with sound pruning practices will have a better structure to start out with than trees coming from a nursery with poor pruning practices. These low quality trees may require more pruning at a higher interval than the high quality trees.

Pruning cycles are also affected by growth rate, climate and species. In warm climates where trees grow faster, the intervals between pruning events should be shorter. Species that are prone to decay should also be pruned more often so that the need to make large cuts can be avoided. A typical pruning cycle for an active, preventive urban forestry pruning program in Florida is about three years. If the pruning cycle is too long, defects may become more severe. This results in having to make large pruning cuts, which can initiate pockets of decay in the trunk and branches. A pruning cycle of 3-5 years will require a higher pruning dose to achieve pruning objectives. Conversely, a pruning cycle of 1-2 years will require a smaller dose.

<table>
<thead>
<tr>
<th>Suggested minimum pruning cycle</th>
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<tbody>
<tr>
<td>At planting</td>
</tr>
<tr>
<td>Year 2 or 3</td>
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<tr>
<td>Year 5 or 6</td>
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<tr>
<td>Year 8 to 10</td>
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<tr>
<td>Year 13 to 15</td>
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**Pruning Dose**

The pruning dose is the amount of live tissue removed from the entire tree at one pruning. More than this can be removed from any particular stem or branch. Typically, arborists estimate this by evaluating how much foliage was removed by the pruning. Customer expectations, size of stems and pruning cycle can influence the pruning dose (Table 1).

With a large pruning dose, you create large pruning wounds and a large void in the canopy, encouraging growth in unpruned portions of the tree. Conversely, a small pruning dose creates smaller pruning wounds and a smaller void in the canopy, encouraging modest growth in the unpruned portions of the tree. Large pruning doses are typically employed only on young trees. Municipalities often use larger pruning doses where aesthetics is less of a concern. A smaller pruning dose along with a shorter pruning cycle is nicely suited for residential and commercial properties where aesthetics are more of a concern. Pruning dose on mature trees should be less than 10% unless there is a good reason (e.g. a major defect) to remove more.

<table>
<thead>
<tr>
<th>Table 1. Uses of high and low pruning doses</th>
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<tbody>
<tr>
<td>LOW PRUNING DOSE (5-20% of foliage removed)</td>
</tr>
<tr>
<td>Mature or recently planted</td>
</tr>
<tr>
<td>Cooler climates with short growing seasons</td>
</tr>
<tr>
<td>Decay-prone species (poor compartmentalizers)</td>
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</tbody>
</table>

Good compartmentalizers of decay (i.e. trees that resist decay following pruning) are those trees such as live oaks and mahogany that resist decay following an injury such as a wound or a pruning cut. When planning a pruning dose for your tree, you might want to set the maximum diameter of pruning cut smaller for a more decay-prone species (Table 2). The limit should be set for both reduction and removal cuts (Figures 14 and 15). Ideally, limit pruning cuts to 2-3 inches on decay-prone trees and 4-6 inches on decay-resistant trees. Large trees that are capable of forming heartwood will begin forming it as branch size increases to 8 inches or more. Exposing heartwood can initiate decay in certain species of trees. Professional arborists keep records of when species begin forming heartwood. This should help them decide when low interfering branches should be removed from trees.

<table>
<thead>
<tr>
<th>Table 2. Guidelines for determining maximum branch diameter to prune.</th>
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</thead>
<tbody>
<tr>
<td>BRANCH SIZE</td>
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<tr>
<td>Less than 1/3 trunk diameter</td>
</tr>
<tr>
<td>1/3 to 1/2 trunk diameter</td>
</tr>
<tr>
<td>More than 1/2 trunk diameter</td>
</tr>
<tr>
<td>Large enough to have heartwood</td>
</tr>
</tbody>
</table>
Executing the Pruning Plan

Making Proper Pruning Cuts

An important component of a good preventive pruning program is making proper pruning cuts. There are two types of pruning cuts; these are reduction cuts (Figure 14), and removal cuts (Figure 15).

A good pruning cut begins with an undercut about 12 inches from the trunk (Figure 16). A top cut is then made further out from the limb or directly above the undercut. The majority of the limb is safely removed in this step without causing any damage to the tree. (Disregarding these first two steps could cause damage to the trunk because the branch is often too heavy to hold itself up causing tissue to tear down through the collar.) The last step is to remove the remaining stub with a final cut, being careful not to cut flush against the trunk. It is very important to leave the collar intact (Figure 17). A branch collar is a swollen area at the base of the branch where it joins the trunk. The tissue is rich in energy reserves and chemicals that hinder the spread of decay. Good pruning cuts avoid cutting into the collar and typically leave a round-shaped wound, whereas flush cuts are oval-shaped (Figure 18). The branch bark ridge is where trunk bark pushes up into the union as it grows against branch bark (Figure 19). This indicates a strong union. Never cut off the branch bark ridge since this removes the branch protection zone inside the collar. The protection zone helps prevent decay organisms from entering the trunk.

Bad cuts are called flush cuts and are unacceptable in a preventive pruning program (Figure 20). Flush cuts remove the top of the branch bark ridge, and prevent the wound from sealing over properly. Flush cuts typically expose more bark on top of the cut than on the sides and bottom. These cuts typically close first on the sides then on the top and bottom. Severe decay can occur behind flush cuts, especially when they are large in diameter.

**Figure 14**
A reduction cut shortens the length of a stem by pruning back to a smaller limb large enough to assume dominance.

**Figure 15**
A removal cut prunes a branch back to the trunk or parent branch.

**Figure 16**
There are three steps to making a proper pruning cut that will minimize damage to the tree.
Figure 17
A close-up illustration showing where to make a removal cut.

Figure 18
A proper removal cut is made by cutting on the dotted line (A). When done correctly, a removal cut leaves the collar intact (B). The wound from a removal cut should be round in shape (C). Callus formation around a proper removal cut wound should be symmetrical (D). A good way to teach yourself and others how to properly prune is to practice making cuts to look like C and D.

Figure 19
The “yes” (dotted) line represents an appropriate removal cut. Cutting through the “no” (solid) line cuts through the collar and represents a flush cut.

Figure 20
Flush cuts remove the top of the branch bark ridge, and typically expose more bark on top of the cut than on the sides and bottom (top). Flush cuts prevent the wound from sealing over properly, and typically close first on the sides then on the top and bottom (bottom). Severe decay can occur behind flush cuts, especially large ones.
Pruning Plans

With six to seven pruning events in the first 25 to 30 years after planting, a good structure can be developed that will place the tree on the road to becoming a permanent fixture in the landscape. Less frequent pruning may be required if good quality nursery trees were planted with a dominant leader and trees were irrigated appropriately until established. However, even well structured nursery trees will require regular pruning after planting. The following is an example pruning program for the first 30 years of a tree’s life.

**First Five Years after Planting**

In the first five years after planting, most of the branches are temporary; however, do not remove more than 35% of the live foliage at any one pruning visit. This will minimize any stress the tree may experience from loss of foliage. Reduce all branches greater than 1/2 the diameter of the trunk. Select one stem to be the leader, and reduce or remove all branches competing with it. Reduce and/or remove large, vigorous branches low in the canopy, and remove any broken, cracked, or severely damaged branches. The pruning cycle and dose for these first five years should be determined individually for each tree type and size—for example, a pruning visit could be scheduled for year two and year four, or only one visit may be necessary during this period.

**Five to Twenty Years after Planting**

During this portion of the pruning program do not remove more than 25-30% of the live foliage at one time. Select the lowest permanent limb in the canopy and reduce/remove branches lower than this. Continue to reduce all branches greater than 1/2 the diameter of the trunk. Identify the largest scaffold limbs of the permanent canopy and reduce branches within 18 inches of these. Reduce branches with included bark, and reduce or remove competing leaders. This can be done in stages if there are more than three competing leaders. Again, the pruning cycle will vary. At least three pruning visits should be scheduled during this period.

**Twenty to Thirty Years after Planting**

Remove all branches below the first permanent limb by twenty to thirty years after planting. Identify 5-10 permanent scaffold limbs, and reduce branches within 18-60 inches of these to avoid clustered branches. Continue to prevent the development of defects by reducing branches with included bark and those branches competing with the main leader.

**Additional Reading**

**Illustrated Guide to Pruning**

**Landscape Plants**
http://hort.ifas.ufl.edu/woody/pruning
Pruning shade trees in the landscape

Structural pruning of shade trees

Edward F. Gilman1 and Nathan J. Eisner²

Introduction: Many shade trees in the forest grow straight, tall trunks as they compete with neighboring trees for sunlight. In the landscape, however, the abundance of sunlight encourages trees to develop multiple, competing trunks or leaders. This type of structure is susceptible to mechanical breakage and can reduce tree longevity. But trees with one, dominant leader and small, well-spaced branches, like trees in the forest, are less likely to suffer this type of mechanical failure. The dominant leader structure also makes trees better able to retard the spread of decay within the tree.

Structural pruning in the landscape aims to develop the strong tree structure we see in the forest. Structural pruning selectively favors a single, dominant leader by suppressing competing leaders using reduction cuts. Reduction cuts shorten stems back to lateral branches at least one-third the diameter of the cut stems. Structural pruning on shade trees should occur regularly when the tree is less than about 20 inches trunk diameter to establish good form early. It is normally performed every few years to gradually encourage more growth in the selected leader. Proper structural pruning should be performed on most tree species that become large at maturity to promote longevity, decrease future maintenance costs, and reduce conditions in the tree that could place people or property at risk.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
<th>Solution</th>
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<tbody>
<tr>
<td>Before pruning, the young to medium-aged tree has three developing leaders or codominant stems (a, b and c). These are likely to develop into multiple leaders, which are considered weaker than trees with one trunk. Large maturing trees usually perform best and last longest if they grow with one main leader. Structural pruning helps the tree develop one main trunk.</td>
<td>Reduce the length of (subordinate) leaders ‘a’ and ‘c’ using a reduction cut to encourage leader ‘b’ to grow faster. This will help leader ‘b’ become the dominant trunk by slowing growth on leaders ‘a’ and ‘c’ and allowing more sunlight to reach ‘b’. In most cases on large-maturing trees, branches in the lower 15-20 feet of the tree should be kept smaller than half the trunk diameter using this technique.</td>
<td>This moderate pruning treatment is similar to the light pruning treatment. The main difference is here we are more aggressive. Larger holes are left in the canopy following moderate pruning. This might be appropriate if trees cannot be pruned for several years, or if they might never be pruned again. Up to about 40% of foliage could be removed on young trees if necessary.</td>
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Objective: Increase structural integrity by pruning to one dominant leader.

Execution: Prune to maintain a dominant leader (one main trunk) by reducing the length of or removing competing leaders. Do not allow branches with included bark to grow too large because they could split from the tree. This is accomplished by shortening the branch. Regularly reduce the length of low vigorous branches and limbs that will be in the way later and have to be removed. Strive to prevent branches from growing larger than half the trunk diameter. Older trees (see figure below) can be pruned in a similar manner to create or preserve good structure.

**Problem:** This medium-aged tree has four main limbs (a, b, c, d) all originating from one point on the trunk. Each limb appears to be equally dominant. This form is considered weaker than the single-trunk form where one stem dominates and is bigger than all others. Large maturing trees usually perform best and last longest if they grow with one main leader and trunk. This tree was tipped at about the position of the line drawn through the canopy causing the proliferation of sprouts at the canopy edge. Tipping also encourages development of codominant stems.

**Solution:** Reduce the length of limbs ‘a’, ‘c’ and ‘d’ using reduction cuts and removal cuts. After pruning, the tip of limb ‘b’ should be higher than the tops of all other limbs. This will help limb ‘b’ become the dominant trunk by 1) slowing growth on limbs ‘a’ , ‘c’ and ‘d’ and 2) increasing growth rate on ‘b’ by providing more sunlight to ‘b’. In most cases on large-maturing trees, branches in the lower 15-20 feet of the tree should be kept smaller than half the trunk diameter using this technique. And they should not be allowed to grow up into the tree to become a permanent part of the canopy. Note that no small diameter interior branches were removed.

**Solution executed:** Small holes were created in the canopy by removing branches from the outer portion of the canopy. These holes will fill with new branches as growth resumes. Trees can receive this light pruning treatment each year to encourage development of good structure. Regular pruning may be required for ten years or more to develop a structure that the tree can sustain. A more aggressive pruning treatment would be to make reduction cuts back to lower lateral branches than indicated above. This would leave larger holes in the canopy but would require less frequent pruning to reach the objective of developing one trunk.

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Landscape Design: Ten Important Things to Remember

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When designing a residential landscape the most important step is to put a plan on paper. Developing a master plan will save you time and money and is more likely to result in a successful design. A master plan is developed through the ‘design process’; a step-by-step method that considers the environmental conditions, your desires, and principles of design. The goal is to organize the natural and man-made features in your yard into an aesthetic, functional, and environmentally sustainable landscape.

The Design Process
The five steps of the design process include: 1) conducting a site inventory and analysis, 2) determining your needs, 3) creating functional diagrams, 4) developing conceptual design plans, and 5) drawing a final design plan. The first two steps establish the aesthetic, functional, and horticultural requirements for the design. The last three steps then apply those requirements to the creation of the final design.

The process begins with a site inventory and analysis of soil, drainage, climate conditions, and existing vegetation. This is a critical step for both plant selection and placement and locating family activities and functions. It’s important because the same climate conditions that affect the plants - temperature, humidity, rain, wind, and sunlight - also affect you, the user. The next step is to make a list of your needs and desires- this helps you determine how your landscape will be used. The site and user analyses will also help you establish a theme for the form and style of your design. The functional diagram is then used to locate the activity spaces on the site and from this diagram a conceptual plan is developed. The last step is a final design that includes all the hardscape and planting details that are necessary for installation. In the design process there are ten important things to consider:

1. **Understand your site** for plant selection and activity location
2. **Remember the user** by considering what you want and need
3. **Use a form and/or style theme** to help select shapes and organize spaces
4. **Create and link spaces** by connecting activity areas with built elements
5. **Consider the function of plants** for both the environment and the user
6. **Structure the plantings** by using massing and layering techniques
7. **Highlight important points** such as transition areas and focal points
8. **Pay attention to detail** in the materials, the colors, and the surface textures
9. **Take time into account** for the growth and maintenance of plants
10. **Protect your resources** by using Florida-friendly design practices

1. **Understand Your Site**
A thorough inventory and analysis of the site is important to determine the environmental conditions for plant growth and the best use of the site. Issues of concern include the soil type, topography and
drainage, and the regional climate. Climate factors include temperature, wind, moisture, and length of sun exposure.

The type of soil determines the nutrients and moisture available to the plants. It is always best to use plants that will thrive in the existing soil. Although soil can be amended it is often costly and most times ineffective. Existing vegetation can provide clues to the soil type. Where plants grow well, note the soil conditions and use plants with similar growing requirements. Pay particular attention to areas where plants are not doing well and adjust when choosing new plants. Topography and drainage should also be noted and all drainage problems corrected in the proposed design. A good design will move water away from the house and re-route to other areas of the yard.

Climate concerns begin with temperature- plants must be able to survive the average high and most importantly, the average low temperatures for the region. Use the USDA Plant Hardiness Zone Map (www.usna.usda.gov/Hardzone/) as a starting point to choose plants appropriate for your zone, but remember microclimates within your yard can offer alternatives. Sun/shade patterns (the amount and length of exposure to sun or shade) create microclimates (sometimes called microhabitats). Recording site conditions and existing vegetation on a base map will reveal the location of microclimates within your yard. Plants usually fall into one or two of four microclimate categories-full sun, partial shade, shade and deep shade. It is important to remember that sun/shade patterns change with the seasons and over time as trees get larger. Wind is also a factor to consider because it tends to dry out plants (evapotranspiration) and increase the need for irrigation...

It is important to note all of the existing conditions on an accurate base map when doing the site inventory. Utilities such as power lines, septic tanks, underground utilities and roof overhangs determine plant location. Use a surveyor’s plat of your property for the boundaries and location of your home. Measure and note on the survey other structures and hardscape such as a patio, driveway, or sidewalk. It is very important to hire a surveyor if you do not have a plat; guessing the location of boundaries can end up being a costly mistake.

2. Remember the User
The users are typically you, your family, the family pets, and visitors, and each have their own needs. There are five things to consider: 1) how do you currently use the yard, 2) how do you want to use the yard, 3) aesthetically, how do you want it to look, 4) what is your maintenance style, hands-off or hands-on, and, 5) what is your budget. It is very important to consider how you currently use the yard. For example- which entry is used by whom, where do the kids play and where does the dog usually run? Thinking about how you currently use the yard and how you want to use it in the future determines the need for new spaces and amenities and the re-organization of old spaces. It is also important to remember the vehicles used by your family; driveways and parking are space intensive. Budget concerns include the materials, initial installation costs and the on-going maintenance costs. Determine the time and money you are willing to put into maintaining the plants and hardscape-be realistic about your intentions and ability.

3. Use a Form and/or Style Theme
There are many different landscape themes- from simple to complex- but it is important to choose one to guide your plant and material selection. Think of a theme as the inspiration for your garden. Many people find it helpful to look in gardening magazines and books for ideas. This is a good start, but be aware that the gardens in the photos were picked because they are outstanding examples. Look at the photos with a critical eye to gather ideas that you can adapt to your passion level, your
budget and your site. Before choosing a theme it is important to look at the surrounding views of your property. Decide if you want to open your yard, close your yard, or a little of both, to these views. In other words, do you want the garden to enclose the space around you and relate mostly to the house, or do you want the garden to open views and look outward, relating to the surroundings? This will give you a starting point to think about a theme. Care should be taken to choose appropriate themes for your yard based on the architecture, the type of neighborhood, the topography, and the regional landscapes. This is called “sense of place”- which means it fits with the surroundings.

There are both form themes and style themes. Every garden should have a form theme, but not all gardens have a style theme. In fact, many residential gardens have no particular style except to blend with the house by repeating details from the architecture such as materials, color, and form. All gardens, however, should use a form theme to create spaces for activities. In a form theme the organization and shape of the spaces in the yard is based either on the shape of the house, the shape of the areas between the house and the property boundaries, or a favorite shape of the homeowner. The form theme determines the shape and organization (the layout) of the spaces and the links between them. Common themes include geometric, such as a circle, square, and rectangle, or naturalistic, such as irregular (organic edge) or curvilinear (meandering lines). Form themes are usually combined; geometric shapes are used for the hardscape and naturalistic shapes for the plantings. For example, plant bedlines are often curvilinear while the hardscape is square in form.

Style themes are most often related to the architecture and have a specific form that is customary to the style of the home. A style theme can simplify the design of a residential yard because materials and form are to some extent pre-determined. Many style themes today are a contemporary version of traditional garden designs. Architecture is usually the primary source of a theme, but they can also represent a time, a culture, a place, or a feeling, such as serenity or calmness.

The advantage of using a style theme is that it is an established set of forms and elements that have historically worked well together and endured the test of time. Because architectural styles typically fall into a formal (symmetric) or informal (asymmetric) category; the landscape theme tends to be either formal or informal. Formal architectural and garden styles that can be used for inspiration include French, Spanish, Italian, and Middle Eastern. Less formal designs include Oriental, English, and American. Style themes can also apply to the planting plan and include tropical, desert, meadow, woodland, marsh, or coastal plantings. Themes can be simple- such as a color mix or individual plants with a distinct character-such as grasses or palms-used repeatedly in the composition.

4. Create and Link Spaces
The yard is an extension of the home where a variety of activities take place. A yard can generally be divided into three areas: public (the front yard), private (the back yard) and service (typically the side yard). The location of activity areas depends primarily on the type of area, the size of space needed, the type of activity, and the desired proximity to other activities and structures. A few examples of spaces include the front entry area that brings you and your visitors to your home, a cooking/eating/entertaining area (patio or deck), a play area, a dog run, a secret garden/relaxation area, a vegetable garden or hobby area, and a trash/compost/work area.

Perhaps the most important spatial concept for successful garden design is the creation of outdoor rooms in the yard. These spaces are often separated through the use of plant beds, planters, garden
walls, fences, arbors, level changes, paved surfaces, furniture, and garden ornaments. These features are used to enclose or define the spaces and give them a room-like feel. For psychological comfort creating spaces that are human scale is important because most people prefer to be in places that feel protected and sheltering, rather than open and exposed. The outside wall of the house often serves as the first wall or starting point of an outdoor room. Use the same construction material from the house for continuity or flow from the house into the garden. Functionally, the creation of outdoor rooms is critical to the success of the design. Uses that are not compatible should be separated and related activities, such as cooking and dining, should be close to make the yard more efficient and enjoyable.

Pedestrian circulation in the landscape is important to move people through the yard and provide organizational structure. Outdoor rooms are typically linked by pathways, walkways or openings with gates, trellis, and arbors that encourage exploration and use of the entire yard. These spaces can also be linked by visual features such as a creek bed (wet or dry) that meanders through or beside several spaces, or a garden wall that begins at a patio, moves along a turf area and ends along a planted area. Using similar hardscape features and repeating plants serves to pull the eye around the garden. Important points along the link can be emphasized with plantings or features that draw attention and encourage movement in a particular direction. Moving along the path takes a person from one area to the next and allows the user to have a variety of experiences. In an informal garden the curves and bends of the path should partially conceal what lies ahead. This provides a sense of mystery that encourages exploration and discovery of the landscape.

5. Consider the Function of Plants
Plant materials have three major functions in the landscape: structural, aesthetic, and environmental. Structurally, plants organize and define spaces, aesthetically they create a visually pleasant environment, and environmentally they create natural areas that benefit the local ecology. Additionally, plants can transform the environment for the comfort of the user by modifying light, temperature and humidity. For psychological comfort plants are used for physical or implied barriers for privacy and safety. Physical barriers block both the view and access to a space and include fences, walls and plant hedges. Implied barriers, typically low growing plants, block access but not the view. Other functions of plants include cleaning the air, preventing erosion and soil loss, retaining moisture in the soil, and returning organic matter to the soil. Plants can also be used to control noise and odor, and provide food for homeowners and wildlife.

For these reasons it is important to consider plants in the early stages of planning— not necessarily the exact plant, but the type of plant, such as tree, shrub or groundcover. These types are chosen for their functional capabilities so that their future purpose and required space can be considered at the same time. Functionally, trees and large to medium shrubs are the most important plants in the landscape, they contribute the most to microclimates, spatial organization, and security concerns. The size, form and texture (density) are the three dominant characteristics that determine how the plant can be used to make more pleasant microclimates and create a more functional, organized, energy efficient yard.

6. Structure the Plantings
Plants provide structure in the garden in the same way as the walls of a building. Shrubs can act as walls in a space and the branches of trees form a ceiling canopy overhead. The ground plane, the vertical plane and the overhead plane should all be considered when enclosing a space. Openings between plant materials serve as windows and doors. Once the shape of a plant bed has been
established, the plants should be massed (grouped) and layered to achieve visual unity and the desired amount of enclosure. The size of a plant mass will depend on the total size of the yard, the size of the individual plants in the mass, and the emphasis or impact desired of the plant material. Overlapping the masses of plants so that they are layered, both horizontally and vertically links the plants with an interconnecting pattern. Each plant mass is in front of, behind or next to, another mass. Repeating plants within a mass and repeating masses with the same plants ties the garden together.

The individual plant characteristics must be considered to successfully layer and mass plants. Each plant should complement or contrast a neighboring plant. All plant compositions begin with the main structure plants- the large, evergreen plants, usually with a compact (more solid) or clean form. These plants separate or enframe spaces, control the size of the space, and provide the starting point for choosing the appropriate characteristics of the second layer of plants- the massing and infill plants. The final layer of plants includes the plants that enhance the theme or provide emphasis or focal points.

7. Highlight Important Points

Important points in the garden should be highlighted by the use of unique plants, distinct structures, or garden ornaments. Marking thresholds or entrances to spaces can be done with gates, arbors, and steps, or through the use of unique and colorful plants. The form and/or style theme of the garden will often help determine the important points and how they should be highlighted. Some styles, for example, have signature elements- such as a type of statuary or water feature- that are the hallmark of the style. Another important place is a focal point, which is used to visually organize a landscaped area. The type of focal point often depends on the viewing perspective. Different perspectives or viewpoints can reveal different compositions in the landscape that may require a variety of focal points. Contrasting texture, shape, size and color will capture and hold the eye.

8. Pay Attention to Detail

Detail in the landscape is derived from the visual quality of plants, hardscape and garden ornaments. Sensual qualities such as scent, sound, and touch also add detail to the landscape. Various combinations of form, color, texture, and size also create aesthetic qualities. Plants come in various forms-such as round, columnar, weeping, and spreading- that compliment or contrast with each other depending on how similar or different they are. Form is the most enduring quality of a plant and thus the most important characteristic. After form, texture is the next dominant feature of a plant; coarse, medium and fine textures can be used for contrast and emphasis in the landscape. Form and texture both trump color in the garden for most of the year. However, during certain seasons, color will be the most noticeable characteristic of the garden. To extend color displays throughout the year, use plants that have color in numerous plant parts, such as the foliage, bark, and fruit. Various color schemes, based on color theory, are used for contrast or unity in a garden. Typically one color, two contrasting colors, or several analogous (similar) colors are repeated throughout the garden. Both color and texture affect distance and can change the perceived size of a space- warm colors and/or coarse texture make a space feel smaller; cool colors and/or fine texture make a space feel larger.

The characteristics of individual plants affect balance, unity and emphasis in the composition. Dark colors and coarse textures make a plant look heavier and larger (more visual weight) and must be balanced with the same or with a larger mass of bright or light colors with fine or medium texture. Massing plants with similar colors and textures provide unity, but contrasting plants should be included for emphasis.
To fully appreciate and experience a garden all of the senses must be considered. The pleasant scent of plants, the sound of wind in the trees, the sound and texture of water, and the colors and textures of sculptures, pots and garden furniture all add to the experience of the garden. One detail that is often overlooked is the affect of light on the aesthetics of the plants. Light shining through a plant - such as a feathery grass- can change the appearance of the plant. The entire garden changes in function and appearance over the course of the day, and the course of a year, as the light and temperature changes from morning to night and season to season.

**9. Take Time into Account**
Plant selection must consider a plant’s growth rate, its mature size and form, and the maintenance it will require. Fast growing plants may or may not be desirable depending on the size of the site, the design intent, and the expected level of maintenance. It is important to know the eventual mature size of plants so they can be placed in the right location and spaced properly when they are installed. Giving plants room to grow is a challenge because the mature size is typically based on optimal growing conditions and the environmental conditions of a site may cause a plant to grow larger or stay smaller. If plants are spaced too closely (to simulate a fully grown landscape) the overcrowded plants will present a maintenance issue. Provide enough space so that when fully mature the plants are barely touching a neighboring plant and a somewhat solid growing mass is formed. It is important, however, to leave space so the plant does not touch the side of the house- leave space for air circulation and home maintenance. A common mistake is to plant to close to utilities such as AC units and meters.

**10. Protect Your Resources**
Be a good steward of the land through the wise use of water, plants, and building materials. The three areas of greatest impact include the use of resource-efficient plants, the management of water, and the use of environmentally sound hardscape materials.

Before you remove any plant material consider how you might be able to enrich your existing ecological capital. That is, look at what you have and decide if it is worth saving. Some plant material may simply be in the wrong place and can be transplanted. Look for resource-efficient plants when choosing new plants. Florida-friendly plants are long lived, insect and disease resistant, and don’t demand frequent trimming, fertilizing, and watering.

The design phase is the time to consider incorporating the development of a rainwater catchment system. The availability of water will no doubt be limited in the future so you must decide the role of water in your design- where will you get irrigation water and how you will manage it? The most obvious source will be rainwater and the use of a catchment system to capture, move, and store it. The system can be an aesthetic design element if planned for early in the process. It is typically the first element to be installed because it sometimes requires earthmoving and underground piping.

Protecting resources also includes the use of environmentally friendly hardscape materials and non-toxic preservatives, stains, and paints. Reusing construction materials will reduce the environmental impact of using new materials and keep old materials out of the waste stream. Before any demolition starts on your old patio, pool deck, arbor, etc., consider how you might reuse the material in your new design. In addition to helping the environment it will also help your budget. If you will not be doing any demolition work in your yard, look for other sources of used material in your community.
Summary
Your yard is a very important natural resource that adds value to your home and enjoyment to your
life. It contributes to a desirable, healthy community. Several important concepts will help you
create an aesthetically pleasing, functional, and sustainable design. First remember to put your ideas
on paper- create a design plan. Use the design process to identify and understand your site and your
needs. Use a theme to guide your decisions- professional designers always look to the existing
conditions for inspiration and material and plant choices. Create spaces like garden rooms- this is an
essential concept of design- both for functionality and psychological comfort human scaled spaces
are the most desirable. Use plant material to create the walls, ceilings and floors of the rooms for a
physically comfortable microclimate. Remember that plants change over time- plan for this and you
will find that observing the changes is one of the most rewarding aspects of your garden. In many of
our urban areas private yards represent the last remnants of green space, think about how your yard
fits into the big picture and what you can do to have a positive impact on the environment.

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Rainwater Harvesting: More Than Just Rain Barrels

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In a state surrounded on three sides by water, who would think that Floridians would need to conserve water? But with an uneven distribution of rainfall throughout the year and periodic droughts, it can be difficult for Floridians to maintain beautiful gardens while being kind to our environment. Couple this with a rapidly growing population and over-mined groundwater supplies make Florida’s water story is bleak.

In a “normal” year, Florida is blessed with between 50 and 65” of annual precipitation depending upon the area. Spread evenly over the year, this would equal about 1” of rainfall weekly. Unfortunately about two-thirds of that rainfall occurs during the three summer months, leaving the remainder of the year with precious little to meet plant and human needs.

Gardeners therefore have a vested interest in protecting our precious water resources. Depending upon the area, Floridians are estimated to use about half of all drinkable water outdoors. Finding ways to utilize water wisely to maximize rainfall will not only improve plant performance but will reduce the demands on Florida’s drinkable water.

There are four water conservation techniques that can be employed in the garden without sacrificing landscape quality, maintaining our own quality of life. Rain barrels, cisterns, rain gardens and roof gardens are four ways to catch and use rainwater later, flattening out the demand cycle.

Rain barrels collect and store rain water runoff, typically from a roof. Whether from gutters and downspouts or merely from placed to catch the sheet flow from a roof, rain barrels have become quite popular. They are so popular that the once-abundant empty pickle barrel is now a commodity that can be hard to come by. Typical food grade barrels collect about 55 gallons per rainfall event. However, during winter, when rain is often scarce, heavy dew can also yield additional water to be used later in the garden.

To work most effectively, be sure to elevate the barrel to allow gravity to carry rainwater to the vegetable garden or to new landscape plants. Add screen to exclude female mosquitoes from laying their eggs on the water, keeping the biting population down. This also minimizes the debris that can get into the barrel increasing the frequency of cleaning.

For greater water needs, multiple barrels may be interconnected. However, for larger scale gardens or those with high water-need plants, a cistern can increase the water-holding potential.

Collecting water in cisterns was an ancient necessity. Cistern water is THE source of water for many island counties and isolated areas. Many Caribbean islands and the US Virgin Island require cisterns in all new construction. For Florida, cistern water can be used to decrease use of potable water to irrigate, wash cars and windows, or have as an emergency supply of non-drinkable water. Since these uses for water are non-potable, no disinfection is needed.
Placing cisterns above ground, below ground or half-submerged are all options. Cement or polypropylene tanks are the two standard storage devices. One drawback to a cistern is that it typically requires a pump to allow the water to move away from the tank and into the garden.

Many prohibit use of this water for indoor uses in Florida and special rules govern use for greywater purposes. Some communities have rules prohibiting cisterns, so check all local regulations before starting this project.

Rain gardens are another method of utilizing rain water for outdoor use. These natural or created depressions catch rainfall and allow the earth to absorb what would otherwise have run off. They are being used all over the country to direct storm water runoff from roofs, driveways, parking lots and other pavement into gardens specifically designed to absorb the excess water. The gardens also filter out pollutants and help improve water quality.

For businesses, the gardens can beautify existing storm water retention areas, or can be integrated into the storm water plans for new projects. For both businesses and homes, rain gardens can provide attractive and creative solutions for specific runoff problems.

Rain barrels, cisterns and rain gardens are relatively low-tech water catchment solutions. The fourth type, a green roof, is a little more complex, yet still a viable option for new construction or an existing structure. Green roofs work for both flat and angled roofs, moderating building temperature and catching run off.

Often used in large cities where ground space for gardening is limited, Chicago, Seattle and New York City boast numerous rooftop gardens. But lack of in-ground garden space is not the only reason to have an elevated garden. University of Central Florida found that their experimental garden on top of the Student Union significantly reduced air and other pollutants. An estimated 50% energy savings is also expected.

To properly create a green roof is a bit more challenging with weight of the plants, water and other materials some important factors. Local regulations are more complex and engineering assistance is also important to be successful.

Regardless of the type of rainwater harvesting method employed, use of good garden sense is a must. Planting the right plant in the right place, developing drought tolerance prior to a severe drought, proper fertilizing and pruning techniques all help plants to weather periods of low rainfall. Working with Mother Nature will help assure a properly watered garden in an environmentally-friendly manner.
Invasive Animals in Florida: Problems and Solutions

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Florida is home to a great diversity of native birds, reptiles, amphibians, and mammals. However, many species of introduced (= nonindigenous) vertebrates now reside in the state as well. Although most of these nonindigenous animals appear not to have any negative impacts, some are invasive. I define an invasive animal as one that occurs outside of its native range due to the actions of humans and causes harm ecologically or economically, or degrades the quality of life for Floridians (e.g., it is a nuisance)—the worst invasive species are guilty of all three.

Problems associated with invasive species are not limited to Florida, but Florida is among the top three states in the US in terms of number of invasive species and problems associated with them. Invasive species are a global problem, and invasive plants and animals occur in terrestrial, freshwater, and marine habitats and on all continents. They cause a plethora of environmental and human-health related problems. For example, invasive species rank second only to habitat loss among threats to native ecosystems and species in the US. They also incur significant economic harm to society at large. In the US alone, it is estimated that damages and costs of management of invasive species exceed $130 billion annually, and this is probably an underestimate. In Florida, costs associated with controlling invasive plants each year is in the tens of millions of dollars. Economic damage is not the only negative impact invasive species are having.

Invasive species compete with native species for space and other essential resources. Invasive plants crowd out native plants and if left unchecked some invasive plants can eventually dominate once natural habitats. Invasive animals are often predators of native animals, and in extreme situations, such as on oceanic islands, many species have perished as a direct cause of predation. This is especially true for native, island-dwelling birds. Humans may also be negatively impacted by invasive species. For example, red imported fire ants inflict painful stings, as anyone who has gardened much in Florida is well aware. Cuban Treefrogs invade peoples homes (they even get into toilets) and can leave unsightly droppings on doors and windows.

As mentioned above, Florida ranks very high among US states in terms of established invasive species, including many invasive animals. Below is a brief look at a few of these animals, the problems they cause in Florida, and some potential solutions—this is not an exhaustive list. These and others will be discussed during my presentation.

**Cuban Treefrogs**: This invasive amphibian showed up in Florida in the late 1920’s as a stowaway in cargo from its native land of Cuba. Cuban Treefrogs are now firmly established throughout the peninsula and are showing up with greater frequency in the panhandle and elsewhere in the Southeast. The large frogs (females grow to 6 inches) eat native treefrogs and numerous other native animals, their tadpoles are known to be superior competitors with tadpoles of several native frogs, and they appear to be causing declines of some native frogs. They invade homes and show up in toilets and have even been known to clog sinks. They are responsible for power outages in central Florida because they get into electrical power switches and cause short circuits. Their calls can be annoying and they defecate on windows and doors of peoples homes. PVC pipes can be used to attract Cuban Treefrogs, which then can be captured and euthanized. A commercially available
chemical deterrent also looks promising. Cover vent pipes on your roof to keep Cuban Treefrogs from entering your home.

**Feral Hogs**: Feral hogs are one of the worst invasive mammals in the US, and especially in Florida. One estimate is that there are approximately 500,000 feral hogs roaming the forests in Florida. Feral hogs are believed to have been introduced into the US in the 1500’s by early Spanish explorers. Although they are hunted across the state, feral hogs have such a great reproductive potential that hunting alone is insufficient to control their numbers. Hogs eat a great variety of foods, including acorns, and are believed to compete with native wildlife, such as deer and wild turkeys, for this valuable resource. They are extremely powerful animals and their rooting activities destroy native habitats, lawns, and gardens. As human development continues to encroach on natural places, human-hog conflicts are on the rise. Adult hogs can be aggressive and quite dangerous to people and pets. Hogs also carry diseases such as cholera, pseudorabies, and brucellosis. Hogs can be excluded from property by erecting stout fencing. Hogs can also be shot on private property, where they are considered property of the land owner.

**Burmese Pythons**: Every Florida resident has no doubt heard about the pythons in the Everglades. Scientists have confirmed that these large snakes (maximum length of over 20 ft.) are now established and breeding in the Everglades. Hundreds have been captured and removed during the past few years. Pythons negatively impact the environment of South Florida through predation of native species. They are known to eat deer, alligators, native rodents, birds, and many other animals, including some imperiled species. The original pythons introduced into the Everglades were initially people’s pets, and when the snakes grew too large to care for, irresponsible pet owners released them into the wild. Not only is the against state law, releasing an exotic pet into the wild is unethical, because most such pets end up dying soon after they are released—some do survive, however. It is important for people to do their homework before they buy any exotic animal as a pet. Never turn loose a pet animal into the wild and educate others. Ownership of burmese pythons and several other large reptile species are now regulated by the state.

**Monk Parakeets**: Also called Quaker Parrots, these boisterous green and gray birds are another product of the pet industry—birds escaped captivity or were purposely released. Monk Parakeets are native to subtropical and temperate South America. They have been breeding in Florida since the late 1960s and are predominately found in Miami-Dade and Pinellas Counties, although there are scattered populations across the state. Monk Parakeets are unique among parrots in that they do not nest in tree cavities; instead they build large nests of sticks and many birds may inhabit a single communal nest. Unfortunately, these industrious birds often construct their nests on electrical power poles and on equipment in substations, which poses a hazard. The USDA is exploring a non-lethal method to sterilize problem birds at electrical utility sites. Monk Parakeets initially were thought to be agricultural pests, but that never materialized in the US.

These and additional species of invasive and introduced animals will be discussed at my presentation.
The Situation

Residential construction is a primary driver of Florida’s economy. For most of the last 15 years, Florida has led the country in new single-family detached home permits, peaking at over 208,000 homes in 2005 alone. Direct consequences of this growth include a steadily increasing demand for energy, water and land for urban uses.

Most of Florida’s new residential developments are master planned communities. These community planning efforts require cross disciplinary collaboration between building professionals, local governments, water management districts, and other agencies. Established in 2004, the Program for Resource Efficient Communities (PREC) works with these collaborators to achieve their goals while mitigating the consequences of growth.

Our Mission

The Program for Resource Efficient Communities promotes the adoption of best design, construction and management practices that measurably reduce energy and water consumption and environmental degradation in new residential community developments. Our focus extends from lot level through site development to surrounding lands and ecological systems. We support the implementation of resource efficient community development practices through:

- Direct training education and consulting activities,
- Applied research projects/case studies,
- Graduate student projects and internships, and
- Partnering with “green” certification programs.

We recognize that the Program’s success depends on building and maintaining an inclusive, multi-disciplinary team focused on community needs to reduce energy and water use in all aspects of residential design and management.

The Madera Model Center is an example of a resource efficient PREC designed home.

What We Do

Builder/Developer Collaboration: PREC services include model landscape designs, ordinance compliance assistance, low-impact development (LID) principles and practices support, review of CCRs and related documents for resource efficient standards, residential plan reviews for energy efficiency and water conservation, and diagnostic testing for home energy performance. PREC’s approach of working in the field with real development projects on key practices is exemplified by:

- Baldwin Park, Orange County-phosphate nutrient loading control
- Lake Jovita, Pasco County-soil moisture sensors in landscape irrigation
- Sorrento Village, Lake County–urban forest, low impact landscape
- Brytan, Alachua County-LEED, for Neighborhood Development pilot
- Harmony, Osceola County– conservation and wildlife areas
- Restoration, Volusia County- enhanced stormwater basins, clustering / conservation easements
- Avington Park, Lake County–swales, pervious roads, exfiltration tanks, shallow and enhanced retention ponds
- Indian Springs, Lake County-water conservation, low impact landscaping for source control
- Wildwood Springs, Sumter County-springs protection / low impact landscaping for source control

Certification: We evaluate third-party certification programs from the perspective of best design and management practices as endorsed by University of Florida specialists, and we provide guidance on incorporating low impact development practices into community-wide standards. Certification agencies we work with include Audubon International, the Florida Green Building Coalition, the US Green Building Council and the St. Johns River Water Management District (SJRWMD)’s Florida Water StarSM program.

Local Government Training: PREC offers educational workshops on the implementation of LID and best design practices at the house, lot and community levels, with an emphasis on local governmental incentives that encourage adoption of the practices. LID workshops educate local policy makers, governmental staff, and building related professionals on surface water and groundwater issues associated with residential development. Workshops began in 2004 with SJRWMD funding to develop a curriculum (A Practicum for Public Officials on Resource Efficient Communities). Lake County participated in the first LID workshop and eleven counties have since participated with 5 more counties on the agenda for 2008.
Continuing Education: PREC develops and delivers continuing education courses and associated certifications for professionals involved in the design, construction and operation of residential community developments, including "Build Green & Profit," and "Low Impact Development (LID) Practices for Florida: Stormwater."

Continuing Education Programs for Licensed Building Professionals (ongoing): Since 1996, the group has held 600 classes reaching 15,000 participants at Extension offices statewide. Courses are continually updated and reviewed to present the latest in land development and construction technologies and introduce the latest building codes.


My Safe Florida Home (2007): Under funding from the Florida Department of Financial Services, PREC has delivered training and testing to wind mitigation inspectors for the My Safe Florida Home grant program.

Research: We identify and prioritize applied research topics related to the resource efficient design, construction and operation of residential communities. The Program actively seeks applied research grants covering high priority issues in residential development and works with development projects to identify opportunities to document performance of effective practices and develop case studies.

Teaching: PREC supports graduate students whose applied research addresses critical resource efficiency issues; provides case studies related to impacts of specific practices; and develops training materials for use in professional continuing education courses. The Program also promotes student internships with developers, certification groups, government agencies and others that offer real-world, interdisciplinary experience related to the Program’s mission.

Other Demonstration and Outreach Activities:

Madera (2004): Faculty collaborating with PREC participated in the design and development of Madera, an 88-home for-profit community developed by GreenTrust, LLC on a wooded 44-acre site adjacent to the University of Florida campus in Gainesville, FL. More specifically, PREC collaborators designed and financed construction of the Madera sales/model center, a high-performance green home with a Florida-friendly landscape. Madera showcases low-impact development through features such as clustered housing, preservation of low-lying areas for natural stormwater management, narrow curvy roads, elimination of roadway curb and gutter, and wooded buffers for wildlife habitat.


Florida Water StarSM Developer Education Program (2007): A SJRWMD provided funding to develop a field guide for development professionals on soil moisture sensors.

Florida Department of Environmental Protection, Florida Energy Office (2008): PREC received funding to participate in a public awareness campaign promoting the effective use of energy in the state and discourage energy waste through a series of publications available on the web.

Stormwater Ecological Enhancement Project: A 3-acre enhanced stormwater basin on the UF campus developed by a PREC wetland faculty member demonstrates water quality and community amenity potential of such enhancements, allowing engineers, developers and policy makers to tour and see in practice the multifunctional benefits at a scale appropriate for a residential development.

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Gardening is one of America’s favorite pastimes; it is estimated that over 84 million households garden on the weekends (National Gardening Association). Due to poor body positioning, incorrect tool engineering and improper usage, many of these people wake-up Monday morning with aches and pain that might need a visit to the doctor’s or chiropractor’s office. Using correct body positioning and tools that have been ergonomically designed to reduce injury and increase efficiency will help the gardener enjoy the fruits of their labor once again.

Ergonomics is a word that was invented in the mid-1980’s by Wojciech Jastrzebowski and at the time it simply meant “the study or science of work”. Today that definition includes recreational and sports activities as well, and implies that the task must be manipulated to fit the person and not the other way around. One of the dangers of weekend gardening is that the average body is no longer used to strenuous activity. Most people have sedentary jobs where they are sitting for the majority of the day with little activity that could compare to gardening. Another problem is that when there is time to garden (such as on the week-end or vacation) people have a tendency to want to get quite a lot done in a short period of time which leads to too much activity at once.

Correct body positioning while gardening is very important in order to avoid injury. Back injuries are one of the most common injuries for gardeners. Heavy lifting, stretching, bending and moving objects all contribute to back pain and injury. Care must be taken to minimize the stress of strained physical activity by not overestimating your abilities; ask for help, use a wheelbarrow, keep your spine straight and don’t force yourself to move or pick something up that does not give easily. Warming the body up and cooling down properly before and after gardening with help minimize injuries. Gardening is a sport like any other and the muscles and joints need to be ready for the week-end marathon in your yard. It is important to take periodic breaks in order to stretch, rest your body and rehydrate. Repetitive movements over long periods of time will also contribute to an injury, especially if you do not have the proper tools that fit your hand and body size.

Tools that are developed with ergonomics in mind are easier to use, reduce repetitive strain injuries (RSI) and increase efficiency. It is recognized though that each individual is different and therefore no one tool is perfect for every user or every situation. The end user must evaluate different available tools and determine for him/herself what works best. With regard to developing gardening tools there are four different design goals that will decrease the following:

* Force or grip strength need for tool usage
* Vibration from the tool to the hand and wrist
* Repetitive motion related to the particular task and tool required
* Uncomfortable positions of the body and extremities when using a tool

It is also necessary to factor in the size, weight and gender of the person utilizing a particular tool in order to make the design more ergodynamic. Factors that will decrease grip strength or the amount of force needed to use a particular tool are longer, wider or thicker handles, cushioned and/or fingered grips, and appropriately sized gripping diameter. For most people, the gripping diameter of a cylindrical handle should be no more than 1.5 inches (Agrability Project, 2007).
Vibration with a gardening tool can be destructive without much notice; most repetitive vibration is caused by power tools but there are some tasks that can cause vibration, especially for the hand and wrist. There are some insulating gloves with special material that will reduce vibration to some extent, but the best solution to a vibration situation is to change tools and/or take breaks on a regular basis to rest your hands and wrists. There are power tools on the market that will reduce vibration but the rate of reduction varies and diminishes over time with usage.

Repetitive strain injuries (RSI) are very common with gardeners that do some of the same tasks over and over again without interruption. These injuries can be sustained in the neck, shoulders, back, elbow, arms, wrists and hands and they affect muscles, tendons, nerves and joints. There are some new tools on the market that will reduce stress and injury associated with repetitive work, generally because they decrease the amount of time that it takes to complete the task (i.e., saw blade that cuts in both directions, adjustable spring-loaded mechanisms).

Gardeners are also placing themselves in awkward positions that contribute to stress and strain on the body. Using tools that reduce odd placement of extremities, stretching beyond the body’s limits and heavy pushing or pulling will reduce injuries and allow the gardener to look forward to working in the garden again. Lawn tools that adjust to your height and arm length or are curved appropriately will help to keep your body in proper alignment and reduce strain. Equipment that is made of lighter materials will decrease the weight load that you are carrying and hand tools that align your hands and wrists accordingly will make you feel less fatigued. When buying ergonomically-designed tools look for features that augment your own strength so you are not straining your muscles. Proper maintenance of gardening tools is very important as well because it will reduce the amount of effort used for the task involved. Tools should be sharpened regularly, cleaned after every use and oiled on a monthly basis.

References:

Websites For Ergonomic Gardening Tools:
Allsop http://www.allsopgarden.com/
Ames True Temper http://www.ames.com/
Corona http://www.coronaclipper.com/
Fiskars http://www.fiskars.com/content/garden_en_us/Garden/Home
Radius Garden Tools http://www.radiusgarden.com/
Ryobi http://www.ryobitools.com/
Oxo http://oxo.com/
Nuisance Wildlife, Vertebrate Pest Control, and Africanized Honey Bee Recommendations

Dr. William Kern, Jr.
Ft. Lauderdale Research and Education Center, University of Florida

EFFECTIVE: July 1, 2008.


Any person owning property may take nuisance wildlife or they may authorize another person to take nuisance wildlife on their behalf except those species listed in subsection (1) below on their property by any method except those methods listed in subsection (2) below. Persons responsible for government owned property are considered “landowners” for the purpose of this rule. The executive director or a designee may authorize the take of additional species of wildlife or additional methods of take for justifiable purposes by permit issued pursuant to 68A-9.002 F.A.C.

1) Wildlife that may not be taken as nuisance wildlife:
- (a) Species listed in Chapter 68A-27 F.A.C.
- (b) The following mammals:
  - 1. Black bear.
  - 2. Deer.
  - 3. Bats - Except that bats may be taken either when:
    - a. That take is incidental to the use of an exclusion device, a device which allows escape from and blocks re-entry into a roost site located within a structure at any time from August 15 to April 15 or
    - b. That take is incidental to permanent repairs which prohibit the egress of bats from a roost site located within a structure provided an exclusion device as described in sub-subparagraph a. above is used for a minimum of four consecutive days/ nights for which the low temperature is forecasted by the U.S. National Weather Service to remain above 50°F prior to repairs and during the time-period specified.
- (c) The following birds:
  1. All birds listed in 50 C.F.R. §10.13 as protected by the Migratory Bird Treaty Act unless the take is authorized by the U. S. Fish and Wildlife Service by a permit or depredation order.
  2. Bobwhite quail.
  3. Wild turkey.

2) Methods that may not be used to take nuisance wildlife:
- (a) Gun and light, except as provided in paragraph (4)(b) below.
- (b) Steel traps.
- (c) Poison, other than those pesticides that are registered by the Florida Department of Agriculture and Consumer Services without additional authorizations and are only used in a manner consistent with the product labeling.
- (d) Bat exclusion devices or any other intentional use of a device or material at a roost site which may prevent or inhibit the free ingress and/or egress of bats from April 16 through August 14.
(3) Transportation and release of nuisance wildlife.
• (a) Live captured nuisance wildlife transported under authority of this section may be done only for the purpose of euthanizing the nuisance wildlife, provided any euthanasia shall be humane as defined by the American Association of Zoo Veterinarians. Euthanasia of those species listed in 68A-6.0022(2) is not required.
• (b) Live captured nuisance wildlife may be released on the property of the landowner provided the release site and capture site are located on one contiguous piece of property.

Bat Exclusion Season
August 15 to April 15

Mole Control Options
• Tolerance
• Repellents – Castor oil emulsions
• Traps
  – Live pitfall traps.
  – Lethal traps – choker loop, harpoon, cinch, etc.
• The use of poisons registered with FDACS to kill moles is now legal, as of July 1, 2008.

Southeastern Pocket Gopher Control Options
• Tolerance – just knock down the mounds.
• Exclusion – underground fences to protect root crops and ornamentals in the garden.
• Traps
  – Live stovepipe traps.
  – Lethal traps – choker loop, cinch, etc.
• The use of poisons registered with FDACS to kill pocket gophers with is legal, as of July 1, 2008.

Rodents – Control of Roof rats, Norway rats, and House mice
Rodenticide Changes
• EPA has classified all bait products containing the single-dose anticoagulant active ingredients brodifacoum, bromadiolone, and difethialone as restricted use pesticides
• EPA is proposing to require that all outdoor, above-ground placements of bait products containing second-generation anticoagulants be contained in tamper-resistant bait stations
• EPA has required that any rodenticide bait product available for sale to a consumer must be sold in a tamper-resistant bait station, with solid bait blocks as the only permissible bait.

Roof Rat Control
• Exclusion and prevention.- Screen Sewer Stacks
• Habitat modification
• Snap Traps are Humane and Effective especially in Trap Stations
• Rat Trap Secured to Conduit, Pipe, or Rafter with rubber bands
• Glue traps and Live traps. Electrocuting Rodent Trap
• Poison Baits in Tamper-Resistant Bait Stations (the last option for an occupied structure). Top Loading Bait Station
**Green Iguana**  *Iguana iguana*

Iguana Options

- Tolerance – Don’t Feed Them
- Harassment - scare them away often
- Electric Fence or Exclusion Cage
- Live Trap – baited with ripe fruit.
- Snare
- Shooting is usually not an option because most Iguanas are in suburban/residential areas.
- Capture by hand or noose

**Burmese Python**

- Native to SE Asia
- Size to 24 ft.
- Released pets now established in Everglades National Park.
- Eat any animal up to size of deer and alligators.

**Armadillo**

- Trapping Armadillos Is Easy cover wire, no bait, drift fence to guide them in.

**Raccoon, *Procyon lotor***

**Raccoon Problems**

- Can be a nuisance around the landscape.
- Getting into garbage cans looking for food.
- Denning in attics, sheds, etc..
- Digging holes in turf areas and plant beds looking for earthworms and turtle eggs.
- They are a potential vector of Rabies and Distemper in the Southeast.

**Raccoon Control Options**

- Don’t feed raccoons. It is illegal. This creates un-naturally high local populations. Don’t leave pet food out at night.
- Tolerance. A raccoon does not need to be trapped and removed because you see it on your course.
- Exclusion. Electric fences on the ground or on top of wooden privacy fences stops raccoons from entering areas.
- Cover steps of pool with plastic sheeting to prevent raccoons from defecating in the pool.

**Feral Domestic Waterfowl**

- Muscovy ducks
- Non-migratory Mallards (summer)
- Peking ducks (white mallard)
- Chinese and African geese, Geese, and Swans
Problems with Non-native Waterfowl

- Geese and swans are effective grazers and don’t differentiate between weeds and landscape plantings and flowers.
- Both ducks and geese produce about $\frac{1}{2}$ lb. of manure per day. This causes public health, wildlife health, water quality, and esthetic problems.
- Feral domestic ducks can hybridize with native desirable ducks, like Florida’s Mottled duck.

Control of Feral Waterfowl Problems

- Discourage feral waterfowl – harassment.
- Don’t feed them.
- Reduce populations by finding the nests and
  - Shake the eggs and return them to the nest.
  - Replace the eggs with plastic eggs.
  - Remove all but one or two of the eggs.
  - Removal of all the eggs just causes the hen to lay a new clutch.
- Catch them on your property and sell or eat them.
- Feral livestock belongs to the property owner.

Unprotected Exotic Birds

- English Sparrows (House Sparrows)
- European Starling
- Common Myna, Crested Myna, Hill Myna
- Numerous Parrots 44 present +3 established
- Red Whiskered Bulbul
- Eurasian Collared-Dove
- Spotted-breasted Oriole
- Others in small local populations

Feral Domestic Birds

- Feral Chickens
- Feral Peafowl
- Feral Guineas
- Feral Pigeons

Plants Heavily Damaged by Peafowl

- Impatiens
- Tomatoes and Peppers
- Red salvia, Datura, Burgmansia, Begonias, Petunias, Gazanias, Dianthus, Echuanacia, Rudbeckias, Lilies, Pellitory, Spiderwort, Purslane, Portulaca, Carnations, Pansy, Liriope, Orchids, Nasturtiums.
Peafowl Control
• As feral livestock, feral peafowl belong to the property owner and can be trapped, caught, and sold.
• If they are trespassing livestock, the damage they cause is the legal responsibility of the owner.
• WARNING: Some local governments have passed ordinances to protect peafowl and other domestic birds. While this may be unconstitutional, you don’t want to fight it to the State Supreme Court.

Africanized Honey Bees?
What do you do if you disturb an AHB colony?
• Run, Run, then Run some more!
• Get inside a closed vehicle or structure.
  — The 10 bees that come inside with you are much less dangerous then the 3,000 waiting outside.
• Do not jump into a pool or pond.
  — They can wait longer than you can.
What you can do to protect yourself, family and pets.
• Inspect your property regularly for large numbers of bees and colonies.
• If feral colonies are found, have them destroyed by trained Pest Management Professionals who are knowledgeable about AHB.
• Disturbing a defensive colony by untrained personnel could endanger people and pets up to 150 yds away from the colony.

Swarm on a Building
Never Use Wasp and Hornet Spray on Bees or You Will Get Stung!
Danger Zones
If you disturb an AHB, they will defend to 150 Ft. and you will be stung repeatedly, from 150ft out to 450 ft you will likely be stung.
Butterfly Gardening
With
Native Plants

N = nectar source                 H = host plant (larval food)

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aster carolinianns</td>
<td>Climbing Aster</td>
</tr>
<tr>
<td>Sambucus simpsonii</td>
<td>Elderberry</td>
</tr>
<tr>
<td>Sophora</td>
<td>tomentosa Necklace Pod</td>
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<tr>
<td>Lantana involucrata</td>
<td>White Wild Sage</td>
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<tr>
<td>Salix caroliniana</td>
<td>Coastal Plain Willow</td>
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<tr>
<td>Phyla nodiflora</td>
<td>Carpetweed</td>
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<tr>
<td>Bacopa spp.</td>
<td>Water Hyssop</td>
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<tr>
<td>Boehmeria cylindrical</td>
<td>False Nettle</td>
</tr>
<tr>
<td>Borrichia spp.</td>
<td>Oxeye Daisy</td>
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<tr>
<td>Asclepias tuberosa</td>
<td>Butterfly Weed</td>
</tr>
<tr>
<td>Conoclinium coelestinum</td>
<td>Mist Flower</td>
</tr>
<tr>
<td>Rivina humilis</td>
<td>Rouge Plant</td>
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<tr>
<td>Hypericum perforatum</td>
<td>St. John’s Wort</td>
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<tr>
<td>Hedeoma pulegioides</td>
<td>Penny Royal</td>
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<tr>
<td>Coreopis leavenworthii</td>
<td>Tickseed</td>
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<tr>
<td>Helianthus debilis</td>
<td>Beachsunflower</td>
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<tr>
<td>Mimosa strigillosa</td>
<td>Sunshine Mimosa</td>
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<td>Lantana depressa</td>
<td>Pineland Lantana</td>
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<tr>
<td>Cordia globosa</td>
<td>Bloodberry</td>
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<tr>
<td>Erythrina herbacea</td>
<td>Coral Bean</td>
</tr>
<tr>
<td>Hamelia patens</td>
<td>Firebush</td>
</tr>
<tr>
<td>Gaillardia pulchella</td>
<td>Blanket Flower</td>
</tr>
<tr>
<td>Flaveria linearis</td>
<td>Yellowtop</td>
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<tr>
<td>Persea borbonia</td>
<td>Red Bay</td>
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<tr>
<td>Magnolia virginiana</td>
<td>Sweet Bay Magnolia</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Common Name</td>
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<tr>
<td>---------------------------------</td>
<td>-----------------------------</td>
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<tr>
<td>Glandularia tampensis</td>
<td>Tampa Vervain</td>
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<tr>
<td>Passiflora incarnata</td>
<td>Purple Passionflower</td>
</tr>
<tr>
<td>Passiflora suberosa</td>
<td>Corky Stem Passionflower</td>
</tr>
<tr>
<td>Heliotropum angiospermum</td>
<td>Scorpion Tail</td>
</tr>
<tr>
<td>Solidago sempervirens</td>
<td>Seaside Goldenrod</td>
</tr>
<tr>
<td>Bidens pilosa</td>
<td>Spanish Needle</td>
</tr>
<tr>
<td>Lonicera sempervirens</td>
<td>Coral Honeysuckle</td>
</tr>
<tr>
<td>Duranta repens</td>
<td>Golden Dew Drop</td>
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<tr>
<td>Ruellia succulenta</td>
<td>Wild Petunia</td>
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<tr>
<td>Viburnum obovatum</td>
<td>Walter’s Viburnum</td>
</tr>
<tr>
<td>Cassia ligustrina</td>
<td>Privet Senna</td>
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<td>Stachytarpheta jamaicensis</td>
<td>Blue Porterweed</td>
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<tr>
<td>Lysiloma latissilga</td>
<td>Wild Tamarind Tree</td>
</tr>
<tr>
<td>Salvia coccinea</td>
<td>Tropical Sage</td>
</tr>
<tr>
<td>Psychotria nervosa</td>
<td>Wild Coffee</td>
</tr>
<tr>
<td>Zanthoxylum fagara</td>
<td>Wild Lime</td>
</tr>
<tr>
<td>Zamia floridana</td>
<td>Coontie</td>
</tr>
<tr>
<td>Jacquemontia pentantos</td>
<td>Key’s Morning Glory</td>
</tr>
<tr>
<td>Lepidum virginicum</td>
<td>Pepper Grass</td>
</tr>
<tr>
<td>Citharexylum fruticosum</td>
<td>Fiddlewood</td>
</tr>
<tr>
<td>Aster dumosus</td>
<td>Bushy Aster</td>
</tr>
<tr>
<td>Plumbago scandens</td>
<td>Leadwort</td>
</tr>
</tbody>
</table>

Mike Malloy
University of Florida
Butterfly Nectar Plants
This is a partial list of nectar plants for butterflies of Southwest Florida

<table>
<thead>
<tr>
<th>Plant Species</th>
<th>Plant Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruby Red Pentas (<em>Pentas lanceolata</em>)</td>
<td>Impatiens (<em>Impatiens wallerana</em>)</td>
</tr>
<tr>
<td>Porter Weed (<em>Stachytarphaeta urticifolia</em>)</td>
<td>Beach Sunflower (<em>Helianthus debilis</em>) *</td>
</tr>
<tr>
<td>Moss Verbena (<em>Glandularia pulchella</em>)</td>
<td>Indigo Spires (<em>Salvia faranacea x longispicata</em>)</td>
</tr>
<tr>
<td>Tropical Sage (<em>Salvia coccinea</em>) *</td>
<td>Phlox (<em>Phlox spp.</em>)</td>
</tr>
<tr>
<td>Mexican Sage (<em>Salvia leucantha</em>)</td>
<td>Philippine Violet (<em>Barleria cristata</em>)</td>
</tr>
<tr>
<td>Mexican Petunia (<em>Ruellian brittoniana</em>)</td>
<td>Zinnia (<em>Zinnia spp.</em>)</td>
</tr>
<tr>
<td>Golden Dewdrop (<em>Duranta repens</em>)</td>
<td>Bloodberry (<em>Cordia globosa</em>) *</td>
</tr>
<tr>
<td>Blanket Flower (<em>Gaillardia pulchella</em>) *</td>
<td>Blackeyed Susan (<em>Rudbeckia hiata</em>) *</td>
</tr>
<tr>
<td>Fire Bush (<em>Hamelia patens</em>) *</td>
<td>Plumbago (<em>Plumbago ariculata</em>)</td>
</tr>
<tr>
<td>Butterfly Bush (<em>Buddleia davidii</em>)</td>
<td>Scorpion Tail (<em>Heliotropium angiospernum</em>) *</td>
</tr>
<tr>
<td>White Shrimp plant (<em>Justicia brandegeana</em>)</td>
<td>Purple Coneflower (<em>Echinacea purpurea</em>)</td>
</tr>
<tr>
<td>Tampa Verbain (<em>Glandularia tampensis</em>)</td>
<td>Mist Flower (<em>Conoclinium coelestinum</em>) *</td>
</tr>
<tr>
<td>African Bush Daisy (<em>Euryops hybrid</em>)</td>
<td>Lantana (<em>Lantana spp.</em>)</td>
</tr>
<tr>
<td>Cigar Plant (<em>Cuphea meuillea</em>)</td>
<td>Seaside Goldenrod (<em>Solidago sempervirens</em>) *</td>
</tr>
<tr>
<td>Marigolds (<em>Tagetes spp.</em>)</td>
<td>Butterfly Weed (<em>Asclepias tuberosa</em>) *</td>
</tr>
<tr>
<td>Tickseed (<em>Coreopsis spp.</em>)</td>
<td>Blazing Star (<em>Liatris spp.</em>) *</td>
</tr>
<tr>
<td>Jatropha (<em>Jatropha integerrima</em>)</td>
<td>Spanish Needle (<em>Bidons pilosa</em>) *</td>
</tr>
<tr>
<td>Bougainvillea (<em>Bougainvillea glabra</em>)</td>
<td></td>
</tr>
</tbody>
</table>

* Native plants that require less water.

Remember, there are many other butterfly nectar plants. Most of these can be found in local and native plant nurseries. The more plant varieties you have, the more varieties of butterflies you will attract to your yard. Florida has a year round butterfly season so it is important to plant nectar plants that bloom at different times of the year.

* Mike Malloy
  University of Florida
# Butterfly Larvae Host Plants

This is a partial list of host plants and the butterflies they attract in Southwest Florida.

<table>
<thead>
<tr>
<th>Butterfly</th>
<th>Host Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Swallowtail</td>
<td>Parsley (<em>Ptilimnium capillaceum</em>)</td>
</tr>
<tr>
<td></td>
<td>Fennel (<em>Foeniculum vulgare</em>)</td>
</tr>
<tr>
<td></td>
<td>Dill (<em>Anethum graveolens</em>)</td>
</tr>
<tr>
<td>Zebra Longwing</td>
<td>Passion Vines – Maypop (<em>Passiflora incarnata</em>)</td>
</tr>
<tr>
<td></td>
<td>Corkey-Stemmed (<em>Passiflora suberosa</em>)</td>
</tr>
<tr>
<td></td>
<td>Incense (<em>Passiflora incense</em>)</td>
</tr>
<tr>
<td>Polydamas (Gold Rim)</td>
<td>Dutchman’s Pipe (<em>Aristolochia elegans</em>)</td>
</tr>
<tr>
<td></td>
<td>(<em>Aristolochia gigantea</em>)</td>
</tr>
<tr>
<td>White Peacock</td>
<td>Water Hyssop (<em>Bacopa monnieri</em>)</td>
</tr>
<tr>
<td></td>
<td>Frog Fruit (<em>Lippia nodiflora</em>)</td>
</tr>
<tr>
<td>Monarch</td>
<td>Milkweeds - Scarlet (<em>Asclepias curassavica</em>)</td>
</tr>
<tr>
<td></td>
<td>Giantica (<em>Asclepias ginantea</em>)</td>
</tr>
<tr>
<td></td>
<td>Swamp (<em>Asclepias perennis</em>)</td>
</tr>
<tr>
<td>Great Southern White</td>
<td>Pepper Grass (<em>Lepidium virginicum</em>)</td>
</tr>
<tr>
<td>Julia</td>
<td>Passion Vines – Maypop (<em>Passiflora incarnata</em>)</td>
</tr>
<tr>
<td>Gulf Fritillary</td>
<td>Corkey-Stemmed (<em>Passiflora suberosa</em>)</td>
</tr>
<tr>
<td></td>
<td>Incense (<em>Passiflora incense</em>)</td>
</tr>
<tr>
<td>Cloudless Sulfur</td>
<td>Cassias – Desert (<em>Cassia nemophila</em>)</td>
</tr>
<tr>
<td></td>
<td>Bahama (<em>Cassia bicapsularis</em>)</td>
</tr>
<tr>
<td></td>
<td>Candle Plant (<em>Cassia alata</em>)</td>
</tr>
<tr>
<td>Buckeye</td>
<td>Frogfruit – (<em>Lippia nodiflora</em>)</td>
</tr>
<tr>
<td></td>
<td>Plantains</td>
</tr>
<tr>
<td><strong>Butterfly</strong></td>
<td><strong>Host Plants</strong></td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Queen</td>
<td>Milkweeds - Scarlet (<em>Asclepias curassavica</em>)</td>
</tr>
<tr>
<td></td>
<td>Giantica (<em>Asclepias ginantea</em>)</td>
</tr>
<tr>
<td></td>
<td>Swamp (<em>Asclepias perennis</em>)</td>
</tr>
<tr>
<td>Orange Barred Sulfur</td>
<td>Cassias – Desert (<em>Cassia nemophila</em>)</td>
</tr>
<tr>
<td></td>
<td>Bahama (<em>Cassia bicapsularis</em>)</td>
</tr>
<tr>
<td></td>
<td>Candle Plant (<em>Cassia alata</em>)</td>
</tr>
<tr>
<td>Malachite</td>
<td>Green Shrimp Plant (<em>Blechum brownei</em>)</td>
</tr>
<tr>
<td></td>
<td>Mexican Petunia (<em>Ruellia</em>)</td>
</tr>
<tr>
<td>Painted Lady</td>
<td>Mallows (<em>Malva spp.</em>)</td>
</tr>
<tr>
<td>Red Admiral</td>
<td>Nettles (<em>Boehmeria cylindrica</em>)</td>
</tr>
<tr>
<td>Giant Swallowtail</td>
<td>Citrus</td>
</tr>
<tr>
<td></td>
<td>Wild Lime (<em>Zanthoxylum fagara</em>)</td>
</tr>
<tr>
<td>Cassius Blue</td>
<td>Plumbago (<em>Plumbago auriculata</em>)</td>
</tr>
<tr>
<td>Large Orange Sulfur</td>
<td>Cassias – Desert (<em>Cassia nemophila</em>)</td>
</tr>
<tr>
<td></td>
<td>Christmas (<em>Cassia bicapsularis</em>)</td>
</tr>
</tbody>
</table>

These are the most frequent visitors to my garden.

Planting some host plants in sun will attract different butterflies than when planting them in the shade. A Julia or a Gulf fritillary will lay her eggs on a passion vine planted in the sun while a Zebra Longwing will be attracted to the same passion vine in the shade.

*Mike Malloy*
University of Florida
One of the biggest problems in pest management is the introduction and establishment of invasive pests, and Florida is a hotbed of new pest invasions. Some of the recently introduced pests in south Florida include ficus whitefly, fig wax scale, weeping ficus thrips, a new genus of soft scale, chili thrips, *Icerya genistae*, and the red palm mite.

**Ficus Whitefly (*Singhiella simplex*)**

- New U.S. continental record
- Currently in Miami-Dade, Broward, and Palm Beach Counties
- Causes extensive defoliation
- Found on both upper and lower leaf surface
- The adult has a faint grey band on the middle of the wings
- Life cycle - 3 to 4 weeks (under laboratory conditions; 80°C)
  - Adult - 2-4 days
  - Eggs - 10 days
  - 1st instar (crawler) – 4.2 days
  - 2nd instar – 3.7 days
  - 3rd instar – 3.3 days
  - 4th instar – 5.8 days
- Another whitefly (*Tetraleurodes fici*) is also sometimes found on ficus but does not cause the severe defoliation
- Some of the nymphal stages of the ficus whitefly can be very difficult to see because they can be very flat and translucent. In the 4th instar the eyes become more apparent making this stage easier to see.
- This whitefly only attacks ficus, but it has been reported on several ficus species which include:
  - *F. benjamina* (weeping fig)
  - *F. altissima*
• *F. bengalensis* (“banyan tree”)
• *F. aurea* (strangler fig)
• *F. microcarpa* (Cuban laurel)
• *F. maclellandii* (banana-leaf fig)

- Ficus species that have been test and shown to get high populations of this whitefly are *F. benjamina, F. microcarpa* (Cuban laurel), and *F. binnenijkii “Alii”. Ficus species that were exposed to the whitefly but were not infested were *F. microcarpa “Green Island”, F. elastica “Burgundy”, and F. religiosa.

- Five beetle predators, two parasites and also lacewings have been identified on plants infested with the whitefly

- Management in the Landscape
  - Monitor for early signs of infestation and natural enemies
  - When pruning trees and hedges either leave leaves to dry out or remove by bagging
  - Note that whitefly that has reached the final instar can survive on fallen leaves

- Current pesticide recommendations
  - Apply a systemic insecticide to the soil
    - Clothianadin *(Arena, Aloft*)
    - Thiamethoxam *(Flagship, Meridian)*
    - Imidacloprid *(Merit, Marathon, Coretect, Discus*, Allectus*)
    - Dinotefuran *(Safari)*
      (*combination products with a neonicotinoid and a pyrethroid)*
  - Limited foliar recommendations - Although these insecticides may provide some quick control, they will not provide long-term control. Some of these insecticides (i.e. pyrethroids) may disrupt the natural enemies and should be used very selectively. Although the neonicotinoid insecticides can also be used a foliar application and provide control, DO NOT use them as both a foliar and drench application. Longer term control is achieved with the soil application.
    - Abamectin *(Avid)*
    - Acetamiprid *(TriStar)*
    - Azadirachtin *(Azatin XL)*
• *Beauveria bassiana* (BotaniGard)
• Bifenthrin (Talstar)
• Buprofezin, (Talus)
• Clothianidin (Arena)
• Endosulfan (Endosulfan; Thiodan)
• Flonicamid (Aria)
• Horticultural oil
• Imidacloprid (Merit, Marathon, Discus, Allectus)
• Pymentrozine (Endeavor)
• Pyriproxyfen (Distance)
• Spiromesifen (Judo)

**Fig Wax Scale (Ceroplastes rusci)**

• First found in Florida in the mid 1990’s; reported as a pest of *Ixora* spp, however, there have been recent, massive outbreaks in the Miami area on large ficus trees. Understory plants become infested as well.
• Broad range of host plants (22 plant families)
• Produce a large amount of honey dew which leads to excessive sooty mold
• Adult females are found on twigs; eggs hatch to crawlers which move to feed on the leaves, after about one month the 2nd instar nymphs migrate to the leaf petioles or to new shoots.
• Parasites present (6 parasites have been identified)
• Light infestations can be controlled with horticultural oil or insecticidal soap
• Heavy infestations may require insecticides (use insecticides recommended for scale control)
• Large trees may require a soil application of a neonicotinoid to take advantage of the systemic properties and long term control

Other New Pests of Ficus
• Blister galls caused by a small wasp
  – Reported in 2007 in Naples only the Cuban-laurel.
• Fig gall midge – reported in the Naples area on *F. microcarpa*

Weeping Ficus Thrips (*Gynaikothrips uzeli*)
• First noted in 2003 due to heavy damage on *Ficus benjamina* in south Florida
• Prefer tender, new foliage
• Feeding causes sunken, reddish spots on leaves. Leaves tend to curl and fold inward.
• Monitor new foliage which is what they prefer; remove folded leaves
• Landscape – may not be economic to control (natural enemies)
• Oils and soaps would probably will not work well
• Pesticides that can be used include abamectin (Avid), acephate (Orthene), acetamiprid (TriStar), azadirachtin (Azatin), cyfluthrin (Decathlon), dinotefuran (Safari) imidacloprid (Merit), novaluron (Pedestal), and spinosad (Conserve)*. (*Currently cannot use any product containing spinosad in Broward and Palm Beach Counties)
• Thrips peak in late spring and late summer
• The predatory bugs were able to bring the populations back down after these peak periods
• Orthene and Safari (drench treatments) provided control – may only be needed during peak thrips populations
• All insecticides tested reduced the number of predators
• Overall, the level of damage did not differ much between the insecticide treatments and the control treatments over the long term

**Chili Thrips (Scirtothrips dorsalis)**

- Originally from south Asia; found in Florida in 2005
- Currently found in numerous counties from Key West to Gainesville
- Feeds on a variety of wild and cultivated plants including ornamentals, fruits and vegetables
- Capable of spreading at least 3 viruses including tomato spotted wilt virus.
- Life cycle - 14-20 days; 60 to 200 eggs per female
- Eggs are inserted in plant tissue
- Immatures are pale in color and very small
- Pupation may occur in the soil or on the plant.
- Adults are small (0.5 -1.2 mm), pale yellow to gray in color with incomplete dark stripes on the upper surface of the abdomen.
- Various foliar and drench treatments, alone or combined with oil have achieved some success
- Pesticides that can be used include abamectin (Avid), acephate (Orthene), acetamiprid (TriStar), azadirachtin (Azatin), cyfluthrin (Decathlon), dinotefuran (Safari) imidacloprid (Merit), novaluron (Pedestal), and spinosad (Conserve)*. (*Currently cannot use any product containing spinosad in Broward and Palm Beach Counties)
**Icerya genistae**
- New scale first found in Florida in 2005 on a legume and was considered a new continental U.S. record
- Attacks numerous ornamental plants; currently only found on plants in the legume family
- Economic significance is unknown
- Can reach high populations on a greater host range than anticipated

**Exotic Soft Scale**
- 2008 - Reported in Florida; new to science
- Biology – unknown
- Hosts – Numerous hosts; croton is common; many native plants in Florida
- Damage - Can build up to high densities on some hosts; plant decline

**Red Palm Mite (*Raoiella indica*)**
- Previously found in India, Philippines, Mauritius, Reunion, Malaysia, Israel and Egypt
- Since 2004 spreading through the Caribbean
- Currently in Miami, Palm Beach and Broward Counties.
- Palms known to become infested:
• Coconut – *Cocos nucifera*
• Manila - *Adonidia merrillii*
• Date – *Phoenix dactylifera*
• Areca (Butterfly) – *Dypsis lutescens*
• Christmas – *Veitchia merrillii*
• Hurricane or Princess – *Dictyosperma album*
• Also found on other types of plants which include banana, ginger, bird of paradise and other plants within the Musaceae

• Causes chlorosis and necrosis of the leaf tissue
• Mites found on the underside of the leaves
• These mites are small (0.01 inches), flat, oval, red and usually feed on the underside of the leaf
• Newly hatched larva has 3 pairs of legs
• Total development: 21 – 33 d; 20 to 50 eggs over lifetime

**Cultural Control**

• Prune heavily infested (damaged) plants, double bag and dispose. DO NOT move infested plants or plant parts.

**Biological Control**

• Some natural enemies have been identified; work is in the early stages.

**Insecticides**

• Although, there are miticides available, chemical management in the landscape will be difficult
• Not all miticides will be efficacious; there are no systemic miticides
Web Resources

- http://trec.ifas.ufl.edu/mannion/
- http://mrec.ifas.ufl.edu/lso/IAWG/
- http://edis.ifas.ufl.edu/
- http://creatures.ifas.ufl.edu/
- Pest Alerts
  - University of Florida (http://extlab7.entnem.ufl.edu/pestalert/)
  - DOACS (http://doacs.state.fl.us/~pi/enpp/pi-pest-alert.html)
Tomatoes 101
Growing Tomatoes in Florida

Gene McAvoy
Hendry County Extension
LaBelle, Florida

Tomatoes
- Gardening is the countries national pastime
- Tomatoes are America’s favorite vegetable
- Americans consume 90 pounds per person per year

A Native American
- The tomato, like its relative the potato, originated in South America
- It was domesticated in Mexico
- It’s name is derived from the Aztec "tomatl"

World Traveler
- Spanish explorers introduced the tomato to Europe in the 1600’s
- It was embraced by the Spaniards and Italians
- Northern Europeans suspected the "wolf peach" was poisonous and only grew it for decoration
- Some felt it was an aphrodisiac and began calling it the "love apple"

Homeward Bound
- The tomato arrived in America in the late 1700’s along with all of the myth surrounding it
- Adventurous gardeners, like Thomas Jefferson, helped it gain popularity
- By 1835, tomatoes were widely consumed in the US

Fruit or Vegetable
- Botanically a fruit – the mature ovary of a plant
- A vegetable is the edible part of a plant such as a root, stem or leaf
- The U.S. Supreme Court ruled the tomato was a vegetable in 1893 (NIX v. HEDDEN, 149 U.S. 35)
You’ve Come A Long Way - Baby

- Fruit or vegetable – tomatoes have come a long way from their humble beginnings
- Amateur and commercial breeders have produced thousands of varieties
- Improved quality and disease resistance, as well as a wealth of sizes, colors and flavors for the consumer to enjoy

Climate

- Warm season
- Tomato plants grow best between 68°F and 80.6°F
- Fruit set is reduced if temperature exceeds 86°F or below 50°F
- Plant early fall – early spring

Varieties

- How to chose?
- Do your homework – “nothing more optimistic than a seed catalog”

Determinate vs Indeterminate

- Determinate plants stop growing once the flower buds emerge
- Fruit ripens within a short window of time - 10 – 20 days
- Smaller size bush may not need staking or caging, but providing support can improve the quality of the fruit
- Indeterminate varieties continue to grow and set fruit throughout the season
- Good for the gardener who prefers to have a fewer number of tomatoes over a longer period of time

Varieties

- Days to maturity – “early,” “midseason,” or “late” - indicate when the variety should start ripening
- Disease Resistance - VFN
- Best to choose tried and proven varieties at first

- Large fruited types - Better Boy, Celebrity, Duke, Floramerica, Flora-Dade, Floradel, Manalucie, Solar Set, Sun Coast, Walter

Tomato Varieties

- Beefsteak
  - Bragger, Beefmaster, Beefsteak, Super Beefsteak
- Pear or Plum
  - Roma, La Roma
- Heirlooms
- Small Fruit
- Cherries
  - Chelsea, Cherry, Cherry Grande, Sugar Lump, Sweet 100, Tiny Tim, Florida Basket, Florida Lanai, Florida Petite, Micro Tom, Patio Cherry
- Grapes – Santa, Juliet
Experiment

- Talk to other gardeners
- That heirloom while ugly and susceptible to disease may produce the world’s most delicious tomatoes
- Experimentation is part of the joy of gardening, and part of your harvest is the knowledge you gain along the way

Preparation

- Clear debris, sod & plants/weeds
- Test soil pH (adjust if needed)
- Cultivate soil
- Amend soil with organic matter

Soil pH

- Acidity/alkalinity
- Best range: 5.8-6.5
- Soil test
- Too acid? Lime with Dolomite
- Too alkaline?
  - Add micro-nutrients
  - Add sulfur only if over-limed

Organic Matter

- Use liberally
- Conditions soil
- Improves water holding
- Improves nutrient holding
- Supplies nutrients – slow release
- Buffers soil
- Increases soil “life”
Fertilizing Tomatoes

- Tomatoes are "heavy feeders"
- Growth of, branches, leaves, blossoms and roots; and developing, nurturing and ripening fruits > 20 lbs per plant
- All this work requires a steady diet of water and nutrients

Plant Nutrients

- **Macro-nutrients**
  - Primary
    - N (nitrogen)
    - P (phosphorus)
    - K (potassium)
  - Secondary
    - Ca (calcium)
    - Mg (magnesium)
    - S (sulfur)
- **Micro-nutrients**
  - B (boron)
  - Cl (chlorine)
  - Cu (copper)
  - Fe (iron)
  - Mn (manganese)
  - Mo (molybdenum)
  - Zn (zinc)

Fertilizer

- NPK plus micro-nutrients
- Organic vs inorganic - plants don’t care
- Cost, convenience, availability
- Folliar feeding
- Fertigation

Inorganic Fertilizers

- N-P-K - with minors
- Low analysis, slow release forms are best
- High N levels early in crop can interfere with fruit set
- Convenient
- May burn crops
- Leaching
- No weed and feed!

Organic Fertilizers

- Usually low analysis - need large amounts
- Contains minor elements, weak in P
- Slowly available
- Analysis inconsistent
- Doesn’t usually burn
- May not be available under all conditions
- Other benefits
Florida Garden

Amounts

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>N-P-K Ratio</th>
<th>Amount banded per 10 ft row</th>
<th>Amount broadcast per 100 sq ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand, marl or clay</td>
<td>6-6-6</td>
<td>5 oz</td>
<td>2-3 lbs</td>
</tr>
<tr>
<td>Organic (muck or peat)</td>
<td>0-12-20</td>
<td>2 oz</td>
<td>1-2 lbs</td>
</tr>
</tbody>
</table>

Fertilizing the Garden

Soil Type

- **Rates:**
  - Before planting broadcast 25-100 lbs / 100 sq. ft. or more
  - Supplement with 2-3 lbs fertilizer
  - After planting side dress 5 lbs / 100 sq. ft.

- Compost to avoid food borne pathogens

Fertilizer Tips

- Avoid high-nitrogen fertilizers such as urea, ammonium sulfate or fresh manure too much N will produce tall, dark green plants with few tomatoes.
- Start side-dressing when the first tomatoes have just formed - when they’re about the size of golf balls
- Repeat side-dressings every three weeks

Fertigation

- Fertigation
- Spoon feeding
- Apply small amounts of N and K on a daily basis
- P and micros in the soil
- Foliar feed???
Bedding
- Water control - drainage
- Elevated rows - 6-8 inches high
- 12-48 inches wide
- Hills (mounds 12-18 inch wide)
- Different techniques

Transplants
- Advantages
  - Early start
  - Avoid bad weather
  - Choice of plants
  - Instant success
  - Ideal seed germination
  - Reduce pest and disease control

Buy or grow your own

Success with Transplants
- Select only strong, stocky, healthy, disease-free plants
- Younger plants produce better plants that are too old or too hard
- Transplant late in the day, after a rain or when overcast
- Protect new transplants if needed

Setting Plants
- 4-6 weeks old
- Do not disturb roots
- Set in moist soil
- Water around roots
- Set at proper depths
- Starter solution helpful

Spacing
- rows 36 - 48" apart
- 18 - 24" between pla
Watering
- Tomatoes need 1 – 2 inches of water per week depending on season, soil, stage of growth etc.
- One inch of water equals about 60 gallons for each 100 square feet of garden
- Water young plants frequently, older plants more but less often

Overhead Sprinklers
- Overhead sprinkler irrigation is most commonly used
- Overhead irrigation is inefficient and may contribute to disease problems
- Water early in the day to allow drying

Drip Irrigation
- Drip irrigation on mulched beds is hard to beat
- Although efficient in terms of water use, drip irrigation is somewhat technical
- It is expensive and requires good quality water supplies

Other methods

Considerations
- Water quality – pH, salinity, other
- Over watering can cause numerous problems
- Fertilizer and water management are closely linked - the goal is to keep the irrigation water and the fertilizer in the root zone
- Water conservation techniques
- Supply the proper amount of water at the proper time

Mulching
- Retains soil moisture
- Reduces weeds
- Moderates soil temperatures
- Less fruit disease (no contact with soil)
**Benefits of mulch**
- Conserves nutrients
- Reduced leaching
- Reduces diseases and losses due to nematodes
- Enables plants to better cope with stress

**Mulches**

**Organic Mulches**
- Hay/pine straw
- Leaves
- Bark/wood chips
- Yard waste
- Sawdust
- Peanut hulls

**Inorganic Mulches**
- Poly-plastic
- Newspaper
- Cardboard
- Carpet

**Mulch effects**
- No mulch - more disease
- Mulch - less disease

**Staking, Trellising etc**

**Benefits**
- Optimize space
- Reduce disease problems
- Cleaner fruit
- Earlier fruit

**Problems**
- Wind
- More BER
- Cracking
- Access
- Difficult to spray

**Trellising Methods**
- Stakes – single, multiple
- Cages
- Spirals
- Tripods, Quadrapods
- European trellis
Pruning Tomatoes

**Purpose**
- Larger fruit
- Train indeterminate types
- Optional
- Remove young suckers
- Leave two main stems
- Don’t remove leaves on main stems – avoid excessive pruning

Troubleshooting Tomato Problems

- Everyone likes tomatoes
- Biotic causes
- Weeds
- Insects
- Diseases
- Nematodes
- Abiotic Causes

Who done it?
"Blossom-End Rot"  
Calcium Deficiency

Catfacing – deformed fruit

Hail Damage

Blossom drop

Weeds
- Normally not a major problem
- Compete for water and nutrients
- Harbor pests and diseases

Control
- Mulches
- Cultivation
- Hand pulling
- Off season control
  important
**Nematodes**
- Microscopic soil dwelling worms
- Aboveground symptoms
  - Stunting
  - Yellowing
  - Wilting
- Root knots or galls

**Managing Nematodes**
- Crop rotation
- Resistant varieties
- Organic matter
- Cover crops
- Flooding
- Marigolds
- Soil solarization
- Chemical
- Other measures?

**Soil Solarization Steps**
- Remove all vegetation
- Add soil amendments (compost, etc)
- Turn/roto-till soil
- Wet soil to activate nematodes
- Cover with plastic (1-6 mil, UV resistant)
- Bury edges of plastic for a good seal
- Leave plastic in place for 4-6 weeks (June-September best)

**Insects**
- Many good insects
- Proper identification is important
- Thresholds
- Control on an as needed rather than preventative basis

**Chewing Insects**
(Insects that damage leaves and fruits)
- Worms/Caterpillars *
- Beetles
- Grasshoppers
Many different kinds in a variety of colors and sizes—armyworms, cutworms, loopers, pinworms.
Control is easy when young.
Hand pick when only a few are present.
Biological control—*Bacillus thuringiensis* (Bt), many wasps parasitize caterpillars.
Chemicals—malathion, pyrethrin, rotenone, Sevin.

**Conserving Cotesia**

- *Cotesia*—piercing-sucking insects
  - Whiteflies
  - Aphids
  - Spider mite
  - Thrips
  - Leaf-footed plant bug
  - Squash bug
  - Stink bug
  - Leafhoppers

Many transmit diseases and/or cause physiological disorders.
Whiteflies

- Tiny white insects that fly up in a cloud when disturbed
- Secrete honeydew
- Sucking insects that generally weaken plants and spread a number of virus diseases – such as the tomato yellow leaf curl virus

Whiteflies

- Whitefly feeding can also result in several physiological disorders – Irregular ripening in tomato
- Biocontrol - Beauvaria
- Chemical controls include soaps, oil, malathion, pyrethrins

Spider Mites

- Spider mites are very small and are easily visible only under magnification
- Mite populations can build quickly in dry weather
- Look for infestations to start along edges and sides of garden

Mites

- Foliage silvers, browns and plants may die
- Control with oil, soaps, sulfur
- Short life cycle – timing is important

Stinkbug

- Piercing sucking mouth parts can damage and distort fruit
- Numbers are often low and may not require control
- Some are beneficial
- Chemical controls include malathion, pyrethrin, Sevin and soaps

Thrips

- Small slender insects that feed in flowers and on tender leaves
- Active insects which move quickly and are difficult to observe
- Rasping sucking mouthparts cause dimpling and browning of affected parts
Thrips

- Numbers and amount of damage may not warrant control measures
- Overuse of pesticides may cause thrips to become problematic by reducing beneficial insect populations
- Controls: Conserve, malathion, pyrethrin, and rotenone

Leafminers

- Leafminers damage tomatoes and many other crops
- Larvae burrow inside leaf reducing photosynthesis
- Damage is often cosmetic
- Heavy infestation can cause leaf desiccation and abscission

Leafminers

- Stippling pattern and serpentine mines in leaves are indicative of leafminers
- Beneficial wasps provide some control
- Feeding habits can make leafminers difficult to control
- Oils, Neem, Systemic products like dimethoate provide the most effective control

Managing Insects

- Timely planting
- Scout & handpick
- Beneficial insects and fungi
- Soap & Oil Sprays, Bt, Neem
- Chemical insecticides

Tomato Diseases

- Susceptible host, pathogen, proper environment must all be present
- Unlike insects, many diseases must be prevented with protective sprays of fungicides or other strategies (rotation, solarization, etc)

Late blight

Disease Triangle

Host
Pathogen
Environment
Man
Tomato diseases
- Rots, spots, wilts, blights, mosaic, mildews
- Bacteria, fungi, virus
- Roots, stems, leaves, fruit can all be affected

Disease Control
- **Biological**
  - Resistance varieties, beneficial organisms, antagonism
- **Physical**
  - Soil solarization, pruning
- **Cultural**
  - Rotation, Mulching, staking, irrigation management
- **Chemical** – Fungicides, bactericides

Chemical Disease Control
- **Disinfectants** – ZeroTol, Oxidate, StorOx
- **Protectants** must be present on surface of plant to prevent infection by pathogen
  - Copper compounds
  - Various fungicides – Bravo, Dithane
- **Systemic chemical** can be translocated internally throughout host plant and can kill or prevent fungal reproduction
  - Benomyl, mefenoxam

Florida Tomato Scouting Guide
with Insect and Disease Identification Keys
http://ftsg.ifas.ufl.edu
Root/Stem Problems
- Southern blight
- Fusarium crown rot

Viruses
- Tobacco etch
- Tomato Yellow Leaf Curl
- Tomato Mottle
- Cucumber mosaic virus

Fruit Spots and Rots
- Early Blight
- Bacterial speck
- Late blight
- Buckeye rot

Use Pesticides Safely
- Follow the label
- Use on listed crops only
- Measure correctly
- Follow application intervals
- Wear protective gear
- Use, store, and dispose of containers correctly
- Wash produce before eating

Tasty Tomatoes
- Variety – personal preferences
- Proper nutrition and water
- Disease control – protect the foliage
- Long days
- Let mature on vine
- Store properly > 55° F
Sources

- Vince and Linda Sepp
- Tomato Growers
  Supply Company
- P.O. Box 2237
- Fort Myers, FL 33902
- Phone 239-768-1119
- Email - http://www.tomatogrowers.com/

Cross Country Nurseries
- 199 Kingwood-Locktown Road
- Rosemont, NJ 08556-0170
- Phone: 908-996-4646
- Fax: 908-996-4638
- www.chileplants.com

Share the fun

Questions
Many flowering vines thrive in Florida's mild climate. By carefully choosing among this diverse and wonderful group of plants, you can have a vine blooming in your landscape almost every month of the year.

Vines can function in the landscape in many ways. When grown on arbors, they provide lovely "doorways" to our homes or provide transition points from one area of the landscape to another. Undesirable trees, posts, and poles can be transformed using vines to alter their form, texture and color. Vines can be used to soften and add interest to fences, walls and other hard spaces.

A deciduous vine grown over a patio provides a cool retreat in summer and a sunny outdoor living area in winter. Muscadine and bunch grapes are deciduous vines that fulfill that role and produce abundant fruit. For more information on selecting and growing grapes in Florida, go to http://edis.ifas.ufl.edu/AG208 or contact your county extension office for a copy.

Vines can be used as living walls that provide privacy and/or screen unsightly views. Narrow plant beds are the perfect spot to "vertically garden" with a vine and, finally, vines attract wildlife. They provide protective cover and nesting areas for birds, and many flowering vines are rich nectar sources for butterflies and hummingbirds.

Unfortunately, despite their many uses, vines are seldom seen in most Florida landscapes. This publication will introduce you to many plants that deserve more use. Cultural information and growth characteristics for the most desirable vines for Florida are presented in Table 1. The vines listed are some of the best choices for Florida, but many others exist.

How Vines Climb

Vines need some type of support when grown upright in the landscape. To choose the right support for a particular vine, it is important to understand how the vine is going to climb. Vines can be separated into three basic types: clinging, twining, and sprawling.

Clinging vines attach to surfaces using specialized organs such as roots or tendrils. English Ivy (Hedera helix) and Trumpet Creeper (Campsis radicans) are examples of vines with adhesive rootlets. They can be difficult to remove and their roots can loosen mortar between bricks or concrete blocks in masonry walls. Other types of clinging...
Flowering Vines for Florida

vines include Passion Vine and Cross Fine that climb by means of tendrils that curl around supports in response to friction. These can be used to cover lattice, wire mesh, or other supports that spread horizontally. Examples of vines that climb by tendrils include painted trumpet (*Clytostoma callistegioides*) and passion vines (*Passiflora* species). Clinging vines are often used to cover solid upright surfaces such as trees, fences, or walls. Vines grown on wooden walls or fences may prevent the wood surface from drying and increase the chance of decay.

Twining vines climb by encircling upright vertical supports. They are often used on poles, vertical wires, or lattice structures. Most of these vines will spiral in only one direction characteristic of the species. If made to spiral in the opposite direction, most will not cooperate and the vine may be damaged. Twining vines include mandevilla (*Mandevilla splendens*), Confederate jasmine (*Trachelospermum jasminoides*), and allamanda (*Allamanda cathartica*).

Sprawling or clamboring vines are basically shrubs that produce long runners, but have no means of attaching themselves to a support. This type of vine needs to be manually wound around a support or braced up in some way. With age, they usually become woody and self-supporting. *Bougainvillea* is an example of a sprawling vine.

**The Planting Site**

As with all plants, the "right plant/right place" rule applies. As you read through Table 1, note which area(s) of the state (north, central or south) each vine is adapted to. Vines grown in the cooler northern areas of Florida may not be adapted to warmer regions. Conversely, many tropical or subtropical vines grown in south Florida will not survive the winters of north Florida. Others are killed to the ground by frost or freeze, but sprout back from the roots the following spring.

Although Florida is typically divided into three regions (north, central, and south), the limits of each region for a given plant cannot be exactly defined. Local conditions such as elevation, bodies of water, proximity to the coast, and other factors influence temperature. Yearly fluctuations in temperature also complicate determinations.

Choose a vine according to the "function" it will play in your landscape (i.e., screening, softening, color, hummingbird attractor, etc.). Consider planting one or more vines together so that when one finishes blooming, another begins, creating a tapestry of foliage and flowers.

Consider how you will support the vine. Many vines, such as Cross Vine and Trumpet Creeper, will grow as tall as their support will allow. Foliage and flowers often are sparse near the ground and greatest near the uppermost parts of the plants. Flowering can be concentrated at any particular height by providing a "stopping point," or limiting the vertical height of a trellis to the height at which you want the most flowers.

A trellis or other support should be placed several inches away from walls. Such placement allows air movement between wall and vine, reducing humidity and possible mold and mildew growth on surfaces. Vines should be kept off the roof to avoid damage to shingles. Vines can also damage or separate siding if grown on or too close to siding-covered buildings.

Where a plant is located in a landscape will also influence how well it will tolerate cold temperatures. Tender species of vines can be planted on the south and east sides of buildings where they are more protected from cold northwestern winds. Vines planted beside buildings, or under overhangs or trees, get more protection from cold than the same vines planted in exposed locations. Plants in locations that are shaded early in the morning may also suffer less cold damage.

Site characteristics such as amount of sun or shade, salt spray, water drainage and soil type also help determine the type of vine that can be grown and its placement within the landscape.

The amount of sunlight required by vines varies, but most vines grow and flower best in full sunlight to partial shade.
The tolerance of vines to salt water and salt spray is of particular concern to home gardeners living on Florida's coast. Vines can be selected that are adapted to soils and exposures of coastal areas.

Poor soil drainage causes the roots of some vines to decay while others are adapted to wet areas. However, even tolerant species are normally nursery-produced in well-drained potting soils and may not withstand the transition to a wet site. The best solution is to correct the drainage problem if possible or to plant the vine on a mound (see below).

Like most plants, vines grow best in a slightly acid (pH 5.5-6.5), loose, well-drained soil. When conditions differ from this, select vines which are adapted rather than amending or changing soil conditions to suit a particular type of vine.

Selecting Vines

As with all plants, the "right plant/right place" rule applies. As you read through Table 1, note which area(s) of the state (north, central or south) each vine is adapted to. Vines grown in the cooler northern areas of Florida may not be adapted to warmer regions. Conversely, many tropical or subtropical vines grown in south Florida will not survive the winters of north Florida. Others are killed to the ground by frost or freeze, but sprout back from the roots the following spring.

Although Florida is typically divided into three regions (north, central, and south), the limits of each region for a given plant cannot be exactly defined. Local conditions such as elevation, bodies of water, proximity to the coast, and other factors influence temperature. Yearly fluctuations in temperature also complicate determinations.

Choose a vine according to the "function" it will play in your landscape (i.e., screening, softening, color, hummingbird attractor, etc.). Consider planting one or more vines together so that when one finishes blooming, another begins, creating a tapestry of foliage and flowers.

Consider how you will support the vine. Many vines, such as Cross Vine and Trumpet Creeper, will grow as tall as their support will allow. Foliage and flowers often are sparse near the ground and greatest near the uppermost parts of the plants. Flowering can be concentrated at any particular height by providing a "stopping point," or limiting the vertical height of a trellis to the height at which you want the most flowers.

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This publication emphasizes flowering vines. Table 2 provides a list of vines grown for their foliage and Table 3 provides a brief list of vines that grow as seasonal annuals.

Planting and Care

Planting

Vines can be planted throughout the year in Florida. In north and central Florida, fall and winter planting of cold hardy vines is ideal because plants have time to develop new roots and become established before they resume top growth in the spring. In southern Florida, temperatures are warm enough for year-round planting and growth. However, planting from June through September takes advantage of the rainy season and reduces the amount of irrigation needed to establish plants.

Vines are planted in the same manner as other plants. The planting hole should be dug two to three times the diameter of the root ball and as deep as the root ball is tall. In cases where the soil is hard, compacted or poorly drained, it may be advisable to dig the planting hole half as deep. Then mound the soil to cover the sides of the root ball. A plant installed in this manner may require more frequent irrigation during dry periods, but it is not likely to suffer from subsurface drainage problems.

Water the vine well while it is still in the pot, then carefully remove it from the container. Gently place the plant straight in the hole and be sure the top
of the root ball is no deeper than the existing soil surface. Fill the hole with the removed native soil. Research has shown that backfilling with organic matter or other amendments is not necessary. Gently firm the soil with your hands; do not pack it with your feet. Water thoroughly. Use the extra backfill soil to construct a saucer-like basin over the root ball. This will help hold water until it drains down to the plant's roots.

**Mulching**

Vines should be mulched with 2 to 3-inches of organic or inorganic material. Mulches insulate the soil and roots, conserve moisture, help control weeds, add organic matter to the soil and improve the appearance of the landscape.

Recommended organic mulches include leaves, pine needles, bark and wood chips. Inorganic materials like gravel and stone can also be used. Avoid using black plastic around plants which will act as a barrier to water and gas exchange. Woven plastic fabric or other types of porous ground cloth can be used to help stabilize the soil, reduce weed penetration and conserve moisture. These materials should be covered with a mulch to prevent their degradation by sunlight and to increase the landscape's aesthetic quality.

Keep a one- to three-inch area around the stems of plants free of mulch to decrease the chance of stem rot.

**Watering**

The success or failure of a planting often depends on whether the plants receive adequate moisture. Vines require months to extend roots into the surrounding soil; therefore, they should be watered frequently until they are well established. Start with daily watering for a week or two, then decrease the frequency to two or three times a week. Gradually reduce watering until the plant appears to be capable of surviving on automatic irrigation or rain alone. Time of year, location in the state and the landscape, as well as rainfall amounts will influence how frequently vines need water.

**Fertilization**

Establish a newly planted vine by fertilizing two to three times in the first year or two. One application is normally scheduled around February (south Florida) or March (central and north Florida) and another September (north) or October (central and south). The third application can be made during the summer if needed. If the foliage is green and the plant is flowering well, fertilization can be postponed or eliminated.

The amount of fertilizer to apply will depend on the age and size of the plant. Keep in mind that the roots of most established plants, including vines, extend two to three times beyond the plant. Fertilization may be justified when faster growth is desired or when plants exhibit nutrient deficiencies. Phosphorus content of the fertilizer should be 0 - 2% P2O5. Historically, the ratio of nitrogen (N) to potassium (K2O) for landscape plants has been in the range of 1:1 to 2:1. An example of a granular landscape fertilizer which fits these criteria is 15-0-15 or something similar. Due to the prevalence of magnesium (Mg) deficiency on certain landscape plants in many parts of the state, up to 2.5 pounds Mg/1000 ft/year may be applied to address this problem. Micronutrients can be applied at specified rates and timing to achieve fertilization objectives.

Well-established vines often don't require fertilizer. Over-fertilizing induces excessive, aggressive growth and increases pruning requirements.

**Pruning**

Vines, by nature, are vigorous plants which will require occasional pruning to keep them in bounds and on their supports. Vines growing up walls should be kept off the roof to avoid damaging shingles.

Flowering vines should be pruned shortly after the blooming period. Later pruning may damage next year's buds and earlier pruning could remove the current season's flowers.

Your county Extension office can provide more information: http://solutionsforyourlife.ufl.edu/map/
References:

Some of the information in this fact sheet was previously published as: Vines for Florida by Robert J. Black, retired Professor Emeritus, Environmental Horticulture Department, University of Florida/IFAS, Gainesville.
Table 1. vines for Florida. Section of State: S = South Florida; C = Central Florida; N = North Florida; Areas in parentheses ( ) are marginal for that vine. Habit: C = Clinging by roots or tendrils; T = Twining stems; S = Sprawling - Plant has no means of attaching itself; support must be provided. 

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<thead>
<tr>
<th>Scientific Name Common Name</th>
<th>Section of State</th>
<th>Flower Color</th>
<th>Flower Season</th>
<th>Florida Native</th>
<th>Persistence</th>
<th>Light Requirement</th>
<th>Salt Tolerance</th>
<th>Climbing Habit</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Akebia quinata</em> Five-leaf Akebia, Chocolate Vine</td>
<td>N</td>
<td>Purple-brown</td>
<td>Spring</td>
<td>No</td>
<td>Evergreen Perennial</td>
<td>Sun</td>
<td>Unknown</td>
<td>T</td>
</tr>
<tr>
<td><strong>Notes:</strong> Slender twiner with an open growth habit. Adapted only to NW Florida. Vigorous growth, requires pruning. Flowers fragrant, 1&quot; across.</td>
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<tr>
<td><em>Allamanda cathartica</em> Brown Bud Allamanda</td>
<td>CS</td>
<td>Yellow and Rose</td>
<td>All Year</td>
<td>No</td>
<td>Evergreen Perennial</td>
<td>Sun/Partial shade</td>
<td>Moderate</td>
<td>T</td>
</tr>
<tr>
<td><strong>Notes:</strong> Glossy foliage, large flowers and long blooming period. Fast grower. 'Cherries Jubilee' has rose-red flowers.</td>
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<tr>
<td><em>Antigonon leptopus</em> Coral Vine</td>
<td>(N)CS</td>
<td>Pink</td>
<td>Summer-Fall</td>
<td>Noo</td>
<td>Evergreen Perennial</td>
<td>Sun</td>
<td>None</td>
<td>C-tendrils</td>
</tr>
<tr>
<td><strong>Notes:</strong> Profuse bloomer in warm months. White and red forms are available. Attracts hummingbirds. May freeze but recovers rapidly in the spring. Tolerates poor sandy soil. Use with caution - may escape cultivation.</td>
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<tr>
<td><em>Aristolochia littoralis</em> Calico Flower, Pipevine</td>
<td>(N,C)S</td>
<td>White/purple-brown</td>
<td>Summer-Winter</td>
<td>No</td>
<td>Evergreen Perennial</td>
<td>Sun/Shade</td>
<td>Unknown</td>
<td>T</td>
</tr>
<tr>
<td><strong>Notes:</strong> Slender, twining stems. Flowers shaped like a pipe. Larval plant for the Spicebush Swallowtail butterfly. Use with caution, can escape cultivation.</td>
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<tr>
<td><em>Beaumontia grandiflora</em> Herald's Trumpet</td>
<td>S</td>
<td>White</td>
<td>Early Spring</td>
<td>No</td>
<td>Evergreen Perennial</td>
<td>Sun/Shade</td>
<td>Slight</td>
<td>T</td>
</tr>
<tr>
<td><strong>Notes:</strong> Massive vine that needs strong support. Large, trumpet-like flowers are fragrant and about 5&quot; long. Leaves may be 9&quot; in length.</td>
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<tr>
<td><em>Bignonia capreolata</em> Cross Vine</td>
<td>NC</td>
<td>Orange-yellow outside</td>
<td>Early Spring</td>
<td>No</td>
<td>Evergreen Perennial</td>
<td>Sun/Shade</td>
<td>Unknown</td>
<td>C-tendrils</td>
</tr>
<tr>
<td><strong>Notes:</strong> North Florida native. Readily climbs trees with small, adhesive discs on tendrils. Trumpet-shaped flowers are 2&quot; long. Hummingbird attractor. Improved cultivars include: 'Tangerine Beauty' and 'Shalimar Red'.</td>
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<tr>
<td><em>Bougainvillea</em> species Bougainvillea</td>
<td>CS</td>
<td>Red, purple, white, pink or coral</td>
<td>Spring-Fall</td>
<td>No</td>
<td>Evergreen Perennial</td>
<td>Sun</td>
<td>Moderate</td>
<td>T</td>
</tr>
<tr>
<td><strong>Notes:</strong> Showy, colorful petal-like bracts. Stems thorny. Many cultivars available with different flower colors. Blooms on new growth.</td>
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<tr>
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<td>Florida Native</td>
<td>Persistence</td>
<td>Light Requirement</td>
<td>Salt Tolerance</td>
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<tr>
<td>Campsis radicans</td>
<td>Trumpet Creeper</td>
<td>NC</td>
<td>Orange-Red</td>
<td>Spring-Summer</td>
<td>Yes</td>
<td>Evergreen</td>
<td>Perennial</td>
<td>Sun or Shade</td>
</tr>
<tr>
<td>Notes:</td>
<td>Native vine that climbs tree trunks readily. Deciduous for short time in late winter. Flowers tubular, to 3&quot; long. Hummingbird attractor. 'Flava' is a yellow cultivar. Suckers from roots and can become weedy.</td>
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<tr>
<td>Campsis grandiflora</td>
<td>Chinese Trumpet Creeper</td>
<td>NC</td>
<td>Orange</td>
<td>Spring-Summer</td>
<td>No</td>
<td>Deciduous</td>
<td>Perennial</td>
<td>Sun or Shade</td>
</tr>
<tr>
<td>Notes:</td>
<td>Asian counterpart to our native Trumpet Creeper (C. radicans), but more refined, less aggressive and less weedy. Deciduous for a short time in late winter. ‘Morning Calm’ is an approved cultivar with tubular, orange flowers up to 3&quot; wide. Campsis x tagliabuana, Hybrid Trumpet Creeper, is a hybrid of C. radicans and C. grandiflora. ‘Madame Galan’ is an improved cultivar with 3&quot; tubular, apricot-colored flowers.</td>
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<tr>
<td>Clerodendrum x speciosum</td>
<td>Java Glory Vine</td>
<td>(C)S</td>
<td>Red</td>
<td>Spring-Fall</td>
<td>No</td>
<td>Evergreen</td>
<td>Perennial</td>
<td>Sun</td>
</tr>
<tr>
<td>Notes:</td>
<td>A cross between Clerodendron splendens and C. thomsoniae. The showy red flower clusters are set off nicely by the dark-green leaves. The light red calyces persist after the flowers drop and extend the show of color.</td>
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<tr>
<td>Clerodendrum thomsoniae</td>
<td>Bleeding Heart</td>
<td>(C)S</td>
<td>Red and white</td>
<td>Spring-Fall</td>
<td>No</td>
<td>Evergreen</td>
<td>Perennial</td>
<td>Part shade</td>
</tr>
<tr>
<td>Notes:</td>
<td>Flowers in large clusters. White calyx surrounds the scarlet corolla tube. ‘Delectum’ is a red cultivar; ‘Variegata’ has variegated leaves.</td>
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<tr>
<td>Clitoria ternata</td>
<td>Butterfly Pea</td>
<td>(NS)</td>
<td>Blue, Lavender</td>
<td>Spring-Fall</td>
<td>No</td>
<td>Annual (NS)</td>
<td>or weak perennial (CS)</td>
<td>Sun/Part shade</td>
</tr>
<tr>
<td>Notes:</td>
<td>Well-behaved vine that blooms lovely deep blue or purple flowers almost year-round. Single and double-flowered forms exist. May die back in winter, but reseeds or rebounds from roots. Not a butterfly attractor; name is derived from shape of flower.</td>
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<tr>
<td>Clytostoma callistegioides</td>
<td>Painted Trumpet</td>
<td>NCS</td>
<td>Lavender with purple streaks</td>
<td>Spring</td>
<td>No</td>
<td>Evergreen</td>
<td>Perennial</td>
<td>Sun</td>
</tr>
<tr>
<td>Notes:</td>
<td>Glossy, dark green foliage, attractive all year. Flowers abundant in spring, 5&quot; long and trumpet-shaped.</td>
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<tr>
<td>Combretum aubletii</td>
<td>Monkey's Brush</td>
<td>S</td>
<td>Orange-red with yellow</td>
<td>Fall - Late Spring</td>
<td>No</td>
<td>Evergreen</td>
<td>Perennial</td>
<td>Sun</td>
</tr>
<tr>
<td>Notes:</td>
<td>Vigorous, woody climber suitable for a heavy arbor, trellis or pergola. Flowers are brush-like.</td>
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</tbody>
</table>
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<th>Salt Tolerance</th>
<th>Climbing Habit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congea tomentosa Woolly Congea</td>
<td>(C)S</td>
<td>White to pink bracts</td>
<td>Late Winter</td>
<td>No</td>
<td>Evergreen Perennial</td>
<td>Sun</td>
<td>Moderate</td>
<td>S</td>
</tr>
<tr>
<td>Notes: White bracts below flowers fade to pink and persist for several weeks. Attractive, fuzzy foliage. Prune after flowering to keep in bounds.</td>
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<tr>
<td>Cryptostegia grandiflora Palay Rubber Vine</td>
<td>(C)S</td>
<td>Deep lavender</td>
<td>Summer-Fall</td>
<td>No</td>
<td>Evergreen Perennial</td>
<td>Sun</td>
<td>Moderate</td>
<td>T</td>
</tr>
<tr>
<td>Notes: Vigorous. 5&quot; long leaves are dark green, glossy and leathery. Dense growth makes a good screen. Prolific bloomer. Flowers funnel form, to 3&quot;.</td>
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<tr>
<td>Cydista aequinoctialis Garlic Vine</td>
<td>(C)S</td>
<td>Lavender pink</td>
<td>Spring-Fall</td>
<td>No</td>
<td>Evergreen Perennial</td>
<td>Sun/Part Shade</td>
<td>Low</td>
<td>C-tendrils</td>
</tr>
<tr>
<td>Notes: Flowers 2-3&quot; long, funnelform, in large showy clusters. Foliage has garlic odor when crushed. Sometimes grown on tree trunks.</td>
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<tr>
<td>Decumaria barbara Climbing Hydrangea</td>
<td>NC</td>
<td>White</td>
<td>Spring</td>
<td>Yes</td>
<td>Deciduous Perennial</td>
<td>Sun/Part Shade</td>
<td>Unknown</td>
<td>C-roots</td>
</tr>
<tr>
<td>Notes: Native deciduous climber with clusters of flowers 4&quot; across. Leaves glossy green. Flowers fragrant. Requires moisture.</td>
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<tr>
<td>Dalechampia dioscoraefolia Bow Tie Viine</td>
<td>(C)S</td>
<td>Fuchsia-colored bracts</td>
<td>Year-round; Peaks in summer</td>
<td>No</td>
<td>Evergreen Perennial</td>
<td>Sun/Part Shade</td>
<td>Unknown</td>
<td>T</td>
</tr>
<tr>
<td>Notes: Vigorous grower and bloomer. Flat violet-pink, serrated bracts with crepe paper texture as wide as 5-6&quot; across. Protect from cold. Blooms best when provided adequate moisture.</td>
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<tr>
<td>Dolichos lablab Hyacinth Bean, Lablab</td>
<td>N(CS)</td>
<td>Purple</td>
<td>Spring-Fall</td>
<td>No</td>
<td>Annual (CS) or Perennial (N)</td>
<td>Sun/Part Shade</td>
<td>Unknown</td>
<td>T</td>
</tr>
<tr>
<td>Notes: This vine is quite showy with its bright purple, fragrant flowers and shiny, flat purple seed pods. Some selections produce young pods and beans which are edible. Caution: dried beans are toxic. Short-lived perennial in south and central Florida; killed to the ground in north Florida, but usually rebounds.</td>
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<tr>
<td>Gelsemium sempervirens Yellow Jessamine</td>
<td>NCS</td>
<td>Yellow</td>
<td>Late Winter-Early Spring</td>
<td>Yes</td>
<td>Evergreen perennial</td>
<td>Sun/Part Shade</td>
<td>Low</td>
<td>T</td>
</tr>
<tr>
<td>Notes: Native vine producing abundant, fragrant flowers. Dark green foliage is not dense. All plant parts are poisonous. Cultivars include ‘Butterscotch’ (TM), ‘Lemon Drop’ (PPAF), and the double-flowered ‘Pride of Augusta’.</td>
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</tr>
</thead>
<tbody>
<tr>
<td><em>Gloriosa rothschildiana</em></td>
<td>Gloriosa Lily</td>
<td>NCS</td>
<td>Red and yellow-orange</td>
<td>Summer</td>
<td>No</td>
<td>Deciduous</td>
<td>Perennial</td>
<td>Sun/Part Shade</td>
<td>Unknown</td>
</tr>
<tr>
<td>Notes:</td>
<td>Twining vine that grasps with tendrils that form at the tips of the leaves. The flower is both spectacular and bizarre in form. Individual vines grow rapidly from a tuber, bloom then die. The vines are sparse and weak and are best combined with another vine or allowed to climb over shrubs. All parts are poisonous.</td>
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</tr>
<tr>
<td><em>Holmskoldia sanguinea</em></td>
<td>Chinese Hat Plant</td>
<td>(N)CS</td>
<td>Orange-red</td>
<td>Summer-Fall</td>
<td>No</td>
<td>Evergreen</td>
<td>perennial</td>
<td>Sun/Part Shade</td>
<td>Unknown</td>
</tr>
<tr>
<td>Notes:</td>
<td>Provide support for this clambering vine/shrub which reaches 6’. Crimson petals surrounded by orange to red calyces.</td>
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<tr>
<td><em>Hylocereus undatus</em></td>
<td>Night Blooming Cereus</td>
<td>CS</td>
<td>White</td>
<td>Summer Nights</td>
<td>No</td>
<td>Evergreen</td>
<td>perennial</td>
<td>Sun/Shade</td>
<td>High</td>
</tr>
<tr>
<td>Notes:</td>
<td>This cactus climbs on masonry walls or palm trunks. Spectacular, foot-wide blossoms open at night. Stems triangular.</td>
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<tr>
<td><em>Ipomoea horsfalliae</em></td>
<td>Cardinal Creeper</td>
<td>S</td>
<td>Rose-purple</td>
<td>Winter</td>
<td>No</td>
<td>Evergreen</td>
<td>perennial</td>
<td>Sun</td>
<td>Low</td>
</tr>
<tr>
<td>Notes:</td>
<td>Flowers off and on throughout the year - heaviest in winter. Attractive palmately-divided foliage. ‘Briggsii’ is a popular cultivar</td>
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<tr>
<td><em>Jasminum polyanthum</em></td>
<td>Pink Jasmine</td>
<td>CS</td>
<td>White</td>
<td>Winter</td>
<td>No</td>
<td>Evergreen</td>
<td>perennial</td>
<td>Sun/Part Shade</td>
<td>Unknown</td>
</tr>
<tr>
<td>Notes:</td>
<td>Well behaved vine with fine textured pinnate leaves. Clusters of very fragrant white flowers emerge from showy pink buds.</td>
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<tr>
<td><em>Lonicera sempervirens</em></td>
<td>Trumpet Honeysuckle</td>
<td>NC</td>
<td>Orange-Scarlet, Yellow inside</td>
<td>Spring-Summer</td>
<td>Yes</td>
<td>Evergreen</td>
<td>perennial</td>
<td>Sun/Shade</td>
<td>Moderate</td>
</tr>
<tr>
<td>Notes:</td>
<td>Native to most of the state. The tubular, 2” long flowers are borne in clusters. Does not become a pest like <em>L. japonica</em>, Japanese Honeysuckle.</td>
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<tr>
<td><em>Mandevilla species and hybrids</em></td>
<td>Mandevilla</td>
<td>(C)S</td>
<td>Pink, white, red</td>
<td>Spring-Fall</td>
<td>No</td>
<td>Evergreen</td>
<td>perennial</td>
<td>Sun</td>
<td>Moderate</td>
</tr>
<tr>
<td>Notes:</td>
<td>M. splendens has rose-pink flowers - ‘Alice DuPont’ is a popular cultivar; M. boliviensis has white flowers. Long blooming period. Dense foliage is dark green. Flowers are 4” wide and funnelform. Red cultivars include ‘Red Velvet’ and ‘Red Riding Hood’.</td>
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<tr>
<td><em>Manettia luteobractea</em></td>
<td>Candy Corn Vine, Brazilian Firecracker Vine</td>
<td>NCS</td>
<td>Red and Yellow</td>
<td>Summer-Fall</td>
<td>No</td>
<td>Evergreen</td>
<td>perennial</td>
<td>Part Shade</td>
<td>Unknown</td>
</tr>
</tbody>
</table>
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<tr>
<th>Scientific Name Common Name</th>
<th>Section of State</th>
<th>Flower Color</th>
<th>Flower Season</th>
<th>Florida Native</th>
<th>Persistence</th>
<th>Light Requirement</th>
<th>Salt Tolerance</th>
<th>Climbing Habit</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Mascagnia macroptera</em></td>
<td>NCS</td>
<td>Yellow</td>
<td>Spring-Fall</td>
<td>No</td>
<td>Evergreen/Deciduous perennial</td>
<td>Sun/Shade</td>
<td>Unknown</td>
<td>S</td>
</tr>
<tr>
<td>Butterfly Vine, Brazilian Golden Vine</td>
<td></td>
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<tr>
<td>Notes: Yellow, five-petaled flowers are followed by interesting seed pods shaped like butterflies. Deciduous in north Florida.</td>
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<tr>
<td><em>Millettia reticulata</em></td>
<td>NCS</td>
<td>Purple</td>
<td>Summer</td>
<td>No</td>
<td>Evergreen/Deciduous perennial</td>
<td>Sun</td>
<td>Unknown</td>
<td>T</td>
</tr>
<tr>
<td>Evergreen Wisteria</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Notes: Dark violet, pea-like flowers form in mid-summer. Not a true wistera. Semi-evergreen to deciduous in north Florida.</td>
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<tr>
<td><em>Pandorea jasminoides</em></td>
<td>CS</td>
<td>White and pink</td>
<td>Spring-Fall</td>
<td>No</td>
<td>Evergreen perennial</td>
<td>Sun/Part Shade</td>
<td>Low</td>
<td>T</td>
</tr>
<tr>
<td>Bower Plant</td>
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<tr>
<td>Notes: Funnelform flowers are 1 1/2 to 2&quot; long. Their attractiveness is enhanced by the bright green, dense foliage. 'Southern Belle' is a bushier form; 'Variegata' has attractive green and white leaves.</td>
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<tr>
<td><em>Passiflora caerulea</em></td>
<td>NC</td>
<td>White and purple</td>
<td>Spring-Summer</td>
<td>No</td>
<td>Evergreen perennial</td>
<td>Sun</td>
<td>Low</td>
<td>C-tendrils</td>
</tr>
<tr>
<td>Blue Passion Flower</td>
<td></td>
<td></td>
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<tr>
<td>Notes: This is the only passion flower that is reliably evergreen in north Florida. Leaves have five lobes. Fruit is edible but of inferior quality. 'Constance Elliot' is a cultivar with white flowers.</td>
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<tr>
<td><em>Passiflora coccinea</em></td>
<td>CS</td>
<td>Scarlet</td>
<td>Spring-Summer</td>
<td>No</td>
<td>Evergreen perennial</td>
<td>Sun</td>
<td>Low</td>
<td>C-tendrils</td>
</tr>
<tr>
<td>Red Passion Flower</td>
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<tr>
<td>Notes: Rusty-hairy stems with leaves to 6&quot; long and 3&quot; wide, downy beneath. Flowers are 5&quot; across. Fruit of inferior quality. Rapid, dense growth. May be deciduous in north Florida.</td>
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<tr>
<td><em>Passiflora edulis</em></td>
<td>(C)S</td>
<td>White and purple</td>
<td>Spring-Summer</td>
<td>No</td>
<td>Evergreen perennial</td>
<td>Sun</td>
<td>Low</td>
<td>C-tendrils</td>
</tr>
<tr>
<td>Purple Granadilla</td>
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<tr>
<td>Notes: Glossy, deeply 3-lobed leaves are up to 8&quot; wide. Fragrant flowers are up to 3&quot; wide. Round, 2 1/2&quot; fruit has juicy, edible pulp. Rampant dense growth. Land uses: arbor, fence, trellis. May be deciduous in north Florida</td>
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<tr>
<td><em>Passiflora incarnata</em></td>
<td>NCS</td>
<td>White and purple</td>
<td>Spring-Summer</td>
<td>Yes</td>
<td>Evergreen perennial</td>
<td>Sun</td>
<td>Low</td>
<td>C-tendrils</td>
</tr>
<tr>
<td>Passionvine</td>
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<tr>
<td>Notes: Native with 3-lobed leaves to 6&quot; wide and dull above. Striking flowers are 2 1/2&quot; wide. Fast and dense growing. Fruit edible but of inferior quality.</td>
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<tr>
<td><em>Petrea volubilis</em></td>
<td>CS</td>
<td>Purple, White</td>
<td>Spring-Summer</td>
<td>NoN</td>
<td>Evergreen Perennial</td>
<td>Sun/Part Shade</td>
<td>Low</td>
<td>T</td>
</tr>
<tr>
<td>Queen's Wreath</td>
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</tbody>
</table>
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<th>Salt Tolerance</th>
<th>Climbing Habit</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Phaseolus coccineus</em></td>
<td>Scarlet Runner bean</td>
<td>(N)CS</td>
<td>Red</td>
<td>Late Winter/Spring</td>
<td>No</td>
<td>Annual (N) or perennial (C,S)</td>
<td>Sun</td>
<td>Unknown</td>
<td>T</td>
</tr>
<tr>
<td>Notes:</td>
<td>Striking flowers are in drooping 8-12&quot; clusters which resemble Wisteria. Petals fall, leaving the long-lasting calyx. Eight inch long leaves have sand-papery surfaces. 'V. albiflora' has white flowers.</td>
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<tr>
<td><em>Pondranea ricasoliana</em></td>
<td>Ricasol Pandorea</td>
<td>NCS</td>
<td>Light pink striped with red</td>
<td>Spring mainly</td>
<td>No</td>
<td>Evergreen perennial</td>
<td>Sun</td>
<td>Low</td>
<td>T</td>
</tr>
<tr>
<td>Notes:</td>
<td>Needs full sun to flower profusely. The 2&quot; flowers are funnelform. Vigorous grower once established.</td>
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<tr>
<td><em>Pseudogynoxys chenopodioides</em></td>
<td>Mexican Flame Vine</td>
<td>(C)S</td>
<td>Orange, darkening to reddish-orange</td>
<td>Spring-Summer mainly</td>
<td>No</td>
<td>Evergreen perennial</td>
<td>Sun/Shade</td>
<td>Moderate</td>
<td>T</td>
</tr>
<tr>
<td>Notes:</td>
<td>Daisy-like flower heads are 1 to 1 1/2&quot; across, borne in terminal clusters. Four-inch leaves are coarsely toothed. Fast grower.</td>
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<tr>
<td><em>Pyrostegia venusta</em></td>
<td>Flame Vine</td>
<td>CS</td>
<td>Orange</td>
<td>Winter</td>
<td>No</td>
<td>Deciduous Perennial</td>
<td>Sun</td>
<td>High</td>
<td>C-tendrils</td>
</tr>
<tr>
<td>Notes:</td>
<td>One of the most spectacular vines, blanketing its support with dense foliage and flowers. Vigorous grower to 80'. Prune hard after flowering to control growth.</td>
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<tr>
<td><em>Quisqualis indica</em></td>
<td>Rangoon Creeper</td>
<td>(C)S</td>
<td>White changing to pink then red</td>
<td>Summer</td>
<td>No</td>
<td>Deciduous Perennial</td>
<td>Sun/Shade</td>
<td>Low</td>
<td>T</td>
</tr>
<tr>
<td>Notes:</td>
<td>Fragrant flowers are 2-3&quot; long, in drooping clusters, change color as they age. Rampant grower with thorny stems. Needs space and strong support.</td>
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<tr>
<td><em>Rosa spp.</em> (hybrids and cultivars) Climbing Roses</td>
<td>NCS</td>
<td>Pink, white, red, yellow</td>
<td>Summer-Fall</td>
<td>No</td>
<td>Deciduous or Evergreen</td>
<td>Sun</td>
<td>Moderate</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Notes:</td>
<td>Climbing roses that have been grown successfully in Florida include: <em>Rosa banksiae</em> (cultivars 'Lutea' and 'Alba'), <em>Rosa laevigata</em>, cultivars ‘Crépuscule’, 'Fellembarg', 'Maréchal Neil', 'Don Juan', 'Blossomtime', 'Catherine Nelson', 'Spectra'.</td>
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<th>Salt Tolerance</th>
<th>Climbing Habit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saritaea magnifica</td>
<td>Glow Vine</td>
<td>S</td>
<td>Rose-purple</td>
<td>Winter</td>
<td>No</td>
<td>Evergreen perennial</td>
<td>Sun/Part shade</td>
<td>Unknown</td>
<td>C- tendrils</td>
</tr>
<tr>
<td>Solandra maxima</td>
<td>Chalice Vine</td>
<td>S</td>
<td>Cream, turning to dark yellow</td>
<td>Fall, Winter</td>
<td>No</td>
<td>Evergreen perennial</td>
<td>Part shade</td>
<td>Low</td>
<td>C-roots</td>
</tr>
<tr>
<td>Solanum jasminoides</td>
<td>Potato Vine</td>
<td>NCS</td>
<td>White</td>
<td>Spring-Fall</td>
<td>M</td>
<td>Evergreen perennial</td>
<td>Part Shade/Shade</td>
<td>Low</td>
<td>T</td>
</tr>
<tr>
<td>Solanum wendlandi</td>
<td>Costa Rican Nightshade</td>
<td>(N)CS</td>
<td>Lavender-blue</td>
<td>Spring-Summer</td>
<td>No</td>
<td>Evergreen Perennial</td>
<td>Part Shade/Shade</td>
<td>Low</td>
<td>T</td>
</tr>
<tr>
<td>Symphyotrichum carolinianum</td>
<td>Climbing Aster</td>
<td>N C</td>
<td>Lavender</td>
<td>Fall</td>
<td>Yes</td>
<td>Deciduous Perennial</td>
<td>Sun</td>
<td>Unknown</td>
<td>S</td>
</tr>
</tbody>
</table>

Notes: Tubular flowers are 2-3" wide, in clusters. Highly ornamental vine attractive at all times. May be trained as a shrub.

Notes: Large flowers, up to 9" long, resemble long-stemmed goblets. They are fragrant at night. Needs a heavy trellis for support.

Notes: Leaves are shiny, about 3" long, fairly dense. Stems are slender and twining. Star-shaped flowers 1" across, are in clusters. A variegated form exists.

Notes: RAMPANT grower with stout stems and a few thorns. Leaves up to 10" long, also with a few thorns. Large flowers, 2 1/2" across, form showy clusters up to 1' wide.

Notes: Fragrant, tubular, waxy flowers 1-2" long are in clusters of 5-8. Four-inch long leaves are thick and glossy. Flowers used for wedding bouquets.

Notes: Spectacular, claw-shaped flowers in hanging clusters five feet long. Needs sturdy support. Pollinatated by bats.

Notes: Florida native. Provide support.
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<th>Climbing Habit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tecoma capensis</strong></td>
<td>Cape Honeysuckle</td>
<td>CS</td>
<td>Orange-red</td>
<td>Spring-Winter</td>
<td>No</td>
<td>Evergreen perennial</td>
<td>Sun/Part shade</td>
<td>Moderate to High</td>
<td>T</td>
</tr>
<tr>
<td><strong>Notes:</strong> Deep rose waxy flowers with cream-colored throats are produced on old stems. Handsome palmate leaves and black stems.</td>
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</tbody>
</table>

| Thunbergia alata | Black-eyed Susan Vine       | (N)CS             | Yellow, orange, white, pink | Late Summer | No             | Evergreen perennial (CS) or Annual (NC) | Sun/Part shade | Unknown | T              |
| **Notes:** Funnelform, 3" long flowers are in elongated racemes. Visited by hummingbirds. Leaves pinnately compound, fine texture. Often a clipped shrub. |

| Thunbergia battiscombei | Blue Glory | (N)CS | Blue-purple | Year-round | No             | Evergreen perennial | Sun | Unknown | S              |
| **Notes:** Slender stems and small leaves to 3" give a delicate cover to a trellis. Flowers are 1 1/2" wide and fragrant. Seeds spread by birds so may become weedy. Killed to the ground or completely in North Florida. |

| Thunbergia grandiflora | Sky Vine, Bengal Clock Vine | (N)CS | Sky blue | Summer | No             | Evergreen perennial | Sun | Low     | T              |
| **Notes:** Extremely vigorous and fast growing; has escaped cultivation in S. Florida; The 3" wide flowers are bell-shaped. Provides lush coverings for walls and fences. Usually killed to the ground each winter in N. Florida. |

| Trachelospermum jasminoides | Confederate Jasmine | NCS | White | Spring | No             | Evergreen perennial | Sun/Shade | Moderate | T              |
| **Notes:** Very fragrant white flowers about 3/4" across are borne in great profusion. The dark green leaves are up to 4" long. Will climb tree trunks. 'Pink Showers' is a cultivar with light pink flowers. |

| Vigna caracalla | Snail Vine | (N)C | White with pink tones | Summer-Fall | No             | Evergreen perennial | Sun | Unknown | T              |
| **Notes:** Vigorous vine that produces fragrant, coiled, 1 1/2 - 2 inch flowers. |

| Wisteria frutescens | American Wisteria | NC | Blue-violet | Spring | Yes             | Deciduous perennial | Sun/Shade | Low     | T              |
Table 2. Evergreen Vines Grown for Foliage

<table>
<thead>
<tr>
<th>Vine Name</th>
<th>Species</th>
<th>Sun/Light</th>
<th>Growth</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cissus species</td>
<td>Grape Ivy</td>
<td>(C)S</td>
<td>Shade</td>
<td>W</td>
</tr>
<tr>
<td>Epipremum pinnatum</td>
<td>CS</td>
<td>Shade</td>
<td>C</td>
<td>Not to be confused with E. aureum which is invasive.</td>
</tr>
<tr>
<td>Fatshedera lizei</td>
<td>Bush Ivy</td>
<td>NCS</td>
<td>Shade</td>
<td>T</td>
</tr>
<tr>
<td>Ficus pumila</td>
<td>Climbing Vine</td>
<td>NCS</td>
<td>Sun/Part Shade</td>
<td>C</td>
</tr>
<tr>
<td>Hedera canariensis</td>
<td>Algerian Ivy</td>
<td>N</td>
<td>Shade</td>
<td>C</td>
</tr>
<tr>
<td>Hedera helix</td>
<td>English Ivy</td>
<td>N</td>
<td>Shade</td>
<td>C</td>
</tr>
<tr>
<td>Monstera spp.</td>
<td>(C)S</td>
<td>Shade</td>
<td>C</td>
<td>Ripe fruit can be eaten fresh or used in jams and jellies</td>
</tr>
<tr>
<td>Philodendron species and hybrids</td>
<td>(C)S</td>
<td>Shade</td>
<td>C</td>
<td>P. 'Autumn', P. goeldii, P. hastatum, P. speciosum</td>
</tr>
</tbody>
</table>

Table 3. Flowering Vines Commonly Grown as Annuals

<table>
<thead>
<tr>
<th>Vine Name</th>
<th>Species</th>
<th>Season</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clitoria ternata</td>
<td>Butterfly Pea</td>
<td>NCS</td>
<td>Warm-season</td>
</tr>
<tr>
<td>Dolichos lablab</td>
<td>Hyacinth Bean</td>
<td>NCS</td>
<td>Warm-season</td>
</tr>
<tr>
<td>Ipomoea calonyction</td>
<td>Moon Flower</td>
<td>NCS</td>
<td>Warm-season</td>
</tr>
<tr>
<td>Ipomoea pupurea and I. tricolor and hybrids</td>
<td>Morning Glories</td>
<td>NCS</td>
<td>Warm-season</td>
</tr>
<tr>
<td>Ipomoea quamoclit</td>
<td>Cypress Vine</td>
<td>NCS</td>
<td>Warm-season</td>
</tr>
<tr>
<td>Ipomoea x sloteri</td>
<td>Cardinal Climber</td>
<td>NCS</td>
<td>Warm-season</td>
</tr>
<tr>
<td>Lathyrus odorata</td>
<td>Sweet Peas</td>
<td>NCS</td>
<td>Cool-season</td>
</tr>
<tr>
<td>Lophospermum erubescens</td>
<td>Creeping Gloxinia, Climbing Snapdragon</td>
<td>NCS</td>
<td>Cool-season</td>
</tr>
<tr>
<td>Mina lobata</td>
<td>Spanish Flag/ Firecracker Vine</td>
<td>N.C</td>
<td>Warm-season</td>
</tr>
<tr>
<td>Rhodochiton atrosanguineum</td>
<td>Purple Bell Vine</td>
<td>NCS</td>
<td>Cool-season</td>
</tr>
<tr>
<td>Phaseolus coccineus</td>
<td>Scarlet Runner Bean</td>
<td>NCS</td>
<td>Warm-season</td>
</tr>
</tbody>
</table>
### Table 3. Flowering Vines Commonly Grown as Annuals

| **Thunbergia alata**  
<table>
<thead>
<tr>
<th>Black-eyed Susan Vine</th>
<th>NCS</th>
<th>Warm-season</th>
<th>May grow as a perennial in Central and South FL. Yellow, orange, white, pink cultivars; see Table 1.</th>
</tr>
</thead>
</table>
| **Tropaeolum majus**  
<table>
<thead>
<tr>
<th>Nasturtiums</th>
<th>NCS</th>
<th>Cool-season</th>
<th>Select vining cultivars; edible flowers and foliage with peppery flavor. Orange, red, and yellow flowers</th>
</tr>
</thead>
</table>
Introduction to Ornamental Tropical Bamboos

When discussing the use of bamboo in gardens, a common misconception is that bamboos are invasive and “will take over the neighborhood.” People are often surprised to discover that there are tropical, clumping bamboos and that many of these species are available in the limited subtropical areas of the United States.

There are two main types of growth, determined by the root, or 'rhizome' structure: **clumpers** (sympodial) and **runners** (monopodial). In general, the clumpers are tropical and the runners are of temperate climates.

Aside from its beauty, bamboo's most striking characteristic is its immense vitality. It is the fastest-growing woody plant on Earth. A small bamboo start can reach maturity within 3–4 years. Bamboo offers almost instant solutions for privacy screening issues.

Tropical Bamboo Species Are:

- **Reliable in form** – grows in a small, circular clump; very different than the northern, temperate bamboos.
- **Hurricane tolerant** – Flexible & strong, a good combination for any plant in a storm.
- **Earth-friendly** – Bamboo sequesters more CO₂ and produces more oxygen of any other plant of equal mass.

**Many Species Choices for a Variety of Landscape Applications**–

These include options in an exotic rainbow of culm colors, striation, leaf variegation and overall form. Mature heights range from 6’ to 60’ – the vast majority within 20’ – 40’ tall.

**Synopsis**–

There are more than 1,500 known bamboo species; however, approximately 10% of these species are desirable for landscape applications. Like all garden plants, it is important to choose the right bamboo species for the right location (within the garden as well as climate zone). Good references for tropical bamboo species information are:

- The American Bamboo Society – [www.americanbamboo.org](http://www.americanbamboo.org)
- The Florida/Caribbean Chapter of the ABS – [www.tropicalbamboo.org](http://www.tropicalbamboo.org)
- Books:
  - Bamboo World by Victor Cusack
  - Bamboo for Gardens by Ted Meredith
  - The Bamboos by F.A. McClure

-- Robert Saporito

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Proven Winners is a national brand of flowering and foliage plants selecting for the best gardens performers using trials conducted over a 2-3 year time frame. Trials are conducted in FL, MI, NH, CA, Germany, and Japan. In the course of working with plant breeders around the world I’ve always found the story behind the plant is as interesting as how the plant does in my yard. It helps flesh out the plant and give it something more than just a name.

How Plants come into the system:
- Plant Breeders use traditional breeding methods (pollen to stigma)
- Someone finds a natural mutation or hybrid in their greenhouse or garden
- A plant explorer collects a totally new plant from the wild

Who breeds plants for Proven Winners?
- 60+ breeders around the world
- 20+ plant finders
- 10+ random mutations found by consumers

What factors does Proven Winners select for in their trials?
- Garden performance
- Habit & Branching
- Heat tolerance
- Size
- Flower size
- Clean flower color
- Flower number etc…

<table>
<thead>
<tr>
<th>The United States</th>
<th>South Africa</th>
<th>Flying Colors™ Diascia</th>
<th>Nemesia</th>
<th>Laguna™ Lobelia</th>
<th>Soprano® Osteospermum</th>
<th>Gerbera Daisy in New Guinea Impatiens</th>
<th>The UK</th>
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<tr>
<td></td>
<td>Stratosphere™ Gaura</td>
<td>Solaire™ Bidens</td>
<td>Gaillardia Fanfare</td>
<td>Dolce® Heuchera</td>
<td>Sweet Potato</td>
<td>Intensia® Phlox</td>
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<tr>
<td>New Zealand</td>
<td>Festival Star Gypsophila</td>
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</tbody>
</table>

Notes:

Thank you!

*Bringing you the best in flowers from the around the world!*

**Dr. Rick Schoellhorn**  
Director of New Products  
7421 NW 176th Street, Alachua, Florida 32615  
Office (386) 462-0463 FAX (386) 462-0431 Mobile (352) 226-0006  
Email rick@provenwinners.com

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Water Efficient Irrigation & Retrofits
Cutting water waste in landscape irrigation.
Jack Tichenor, Water Conservation Agent
Manatee County Extension Service
(941) 722-4524
Email - jtichenor@ifas.ufl.edu
Website - http://manatee.ifas.ufl.edu

 Interest in Fact
Based on over 2,000 irrigation evaluations, approx. 1/3 of irrigation water is wasted due to inefficient design and maintenance.*

Water Use Zones - “Hydrozones”
Separate irrigation zones by plant water needs:
- Shrubs in mulched beds
- Grass – uses 2 to 3½ times more water than mulched shrubs

Landscape Irrigation System
- The largest appliance – 50% of home’s use
- Overlooked and potentially wasteful

Improving Irrigation Efficiency
- Landscape
- Irrigation Install. & Control
- Irrigation Management
- Retrofitting to Micro

Join Plants Into 1 Landscape Bed
Eliminate Narrow Grass Strips

Improving Irrigation Efficiency
- Landscape
- Irrigation Install. & Control
- Irrigation Management
- Retrofitting to Micro

Automatic Irrigation Controller
- Time-based only.
- Turns system on/off on pre-set schedule.
- No awareness of:
  1. Weather
  2. Seasonal changes
  3. Soil moisture

Improving Automatic Control
1. Rain Sensor – Keeps system off after adequate rainfall
2. Soil Moisture Sensor – Keeps system off if soil moisture is adequate
3. Weather Based Control – Instead of time based control

Use a Rain Gauge
Rain of ½ inch or more; skip irrigation. Empty and clean often.

1. Rain Sensor
- Turns system off after adequate rain (Fla law on installations since 1991)
- Check often for proper operation

Clear view of sky. 5 ft.
2. Soil Moisture Sensor

- Measures soil moisture in root zone.
- Overrides controller when soil moisture is above set point.
- Adjust to soil type.

UF Research on Soil Moisture Sensors

- Tested 4 brands of SMS in home landscapes.
- Compared to std. irrigation timer controllers.
- Results: 56% less water used and -
- No visual difference in turf quality.

3. Weather Based Control

Based upon real-time evapo-transpiration (ET) calculations:
- Temperature
- Humidity
- Wind
- Solar Radiation

Weather Based Control

- Requires weather data input (+/- $4 monthly sub.)
- Initial cost about $400 & up
- Tedious set up process
- UF research incomplete but looks promising

Lawn Sprinkler Types

Rotors for large, open areas

Sprayers for small, irregular areas

Don’t mix sprayers & rotors in same zone!

1. Sprayer
   PR = 2”/hour

2. Rotor
   PR = .5”/hour
Rotor Adapter available for spray heads. Precipitation rate comparable with rotors.

“Head to Head” Spacing
Install sprinklers so water from one sprinkler almost touches next. See EDIS Bulletin 320.

Improving Irrigation Efficiency

- Landscape
- Irrigation Install. & Control
- Irrigation Management
- Retrofitting to Micro

Repair Broken Sprinkler Heads

Repair Leaks and Broken Piping

Clear Blocked Spray Patterns
Adjust for Minimal Over Spray

Adjusting the Irrigation Controller - 3 main settings:
1. What day to water?*
2. Start Time?*
3. Run Time?
* By WMD’s rules.

1. What Day to Water?
- Only on allowed day.
- BUT-only as needed (at first signs of wilt).
  Tricky on 1 day a week.

1. Use a Rain Gauge
- If rain of ½ inch or more; skip irrigation.
- Empty and clean often.

2. Start Time?
Must follow WMD rules
- Generally - No irrigation during the day
- Only 1 complete irrigation

2. Start Time?
- Less wind
- Sunlight dries leaves
- Less evaporation
- Foliage already wet
- Best time to irrigate is early morning.
- To find start time:
  • add all run times together from step 3
  • subtract from sunrise time
3. Run Time (how long to water)?

Usually the most puzzling step

- ¾” of water per irrigation cycle.
- But controller settings are minutes, not inches of water. What to do?

3. Run Time (how long to water)?

(IFAS Recommendation)

- ¾” will water 8-9 inches deep.
  (IFAS Recommendation)

Calibration Test

1. Mark ¾ inch depth line inside 6–10 cans.
2. Place cans randomly within a zone.
3. Run zone until water reaches lines (average).
4. Note watering time in minutes.
5. Set timer accordingly for that zone.
6. Repeat steps 1–5 for each zone.

Calibrate Each Zone

done with empty, straight sided cans

Can vs. Sprinkler Gauge
**Improving Irrigation Efficiency**

- Landscape
- Irrigation Install. & Control
- Irrigation Management
- Retrofitting to Micro

The pathway to using micro-irrigation in the landscape is to water flowers, shrubs or trees separately from grass.

**4 Types of Micro-Irrigation**

- Micro-Sprayer
- Dripper
- Micro-Bubbler
- Drip Tubing

**Retrofitting to Micro**

- Grass w/ sprayers
- Shrubs w/ micro – irrig. connected to former spray zone

**Point 1 (of 6)**

Conversion materials are available:

- Change-over kits for pop-up sprayers (pictured on next two slides)
- Wide assortment of PVC/poly pipe fittings

**Pop-up Sprayer Kit**
Multiple Outlet Device

Point 2
Plan for function & uniformity:
- Separate grass & shrub zones
- Each zone gets only the water needed
- No overlapping coverage between zones

Point 3
Best if entire zone is changed to micro-irrig.
- Micro-irrig. may have a different application rate than rotors & sprayers.
- Micro-irrig. operates on a different schedule.

Point 4
Include filtration and pressure regulation.
- Micro-irrig. uses tiny openings that can clog easily.
- Lake/pond water -- additional clogging problems.
- Operating pressure for micro-irrig. is 20 – 30 PSI.

Point 5
Controller should have dual programs (allows diff. schedules)
- Conventional irrig. sch. on program A
- Micro-irrig. sch. on program B

Point 6
Water flow rate in zone may change
If zone flow rate is much less than original:
- Control valve may not work well at less than about 2 GPM.
- Local well & pump – may cycle on/off too quickly & burn out motor.
Summary

• Landscapes typically use up to 50% of residential water supply.
• Significant savings are possible by:
  • Properly plan & manage irrigation
  • Reduce thirsty plant area in landscape
  • Water shrubs and grass separately
  • Use micro-irrigation in shrub areas

Sources for Further Information:

Extension Publications: www.SolutionsForYourLife.com
  www.antelco.com
  www.digcorp.com
  www.mrdrip.com
  www.mrlandscaper.com
  www.hunterindustries.com
  www.lnelson.com
  www.rainbird.com  www.toro.com

Irrigation Manuf.
Websites:

Watering Restrictions: www.WaterMatters.org
  and local government

Questions?
“Greening” the Landscape

Ondine Wells
Statewide Builder & Developer Coordinator, Florida Yards & Neighborhoods, University of Florida, Gainesville, FL

Florida is one of the fastest growing states in the country. Even with a slowed housing market, development continues to place increasing demands on our natural resources. The Florida Yards & Neighborhoods’ Builder and Developer program encourages the use of Florida-friendly landscapes in new construction as a way to lessen the impact of growth on our natural resources.

Green Building
“Green” has moved into the mainstream and green building is no exception. Builders and developers realize that homeowners pay a premium for green construction and proximity to clean water, wildlife and preserved areas. They are, as a result, seeking out certification programs such as Energy Star, Florida Water Star, Florida Green Building Coalition and USGBC’s LEED program. Many of these certification programs advocate for Florida-friendly landscapes that conserve water and provide valuable wildlife habitats.

FYN Builder & Developer Program
FYN provides a variety of resources that help builders and developers achieve points towards these certification programs. FYN coordinators help them install and maintain Florida-friendly landscapes by providing the following:

- Design review;
- On-site consultations;
- Florida-friendly Covenants, Conditions and Restrictions;
- Continuing Education credits for Landscape Architects;
- Awards for Outstanding Florida-Friendly Communities; and
- Educational materials for new homeowners.

Around the state, FYN is helping communities take innovative steps forward to preserve valuable habitats, conserve water and protect natural resources.
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Speaker Biographies

Tom Becker
Tom Becker is a program extension agent for the UF/IFAS/Florida Yards and Neighborhood (FYN) program in Lee County (Southwest Florida). Prior to his appointment in Lee County, Tom coordinated the state’s builders and developer’s FYN program in Gainesville in early 2004. Before moving to Florida in June, 2003, Tom taught commercial and consumer horticulture as an extension agent for Penn State Extension in York, Pennsylvania (South-central PA) for 18 years. In addition, Tom served as an interim County Extension Director, 2001-2002 while working in the York office. Tom also taught sustainable food crop research and vegetable gardening at EPCOT in Orlando, FL during the 2001 International Flower and Garden Festival. Tom is a member of the Coccoobra chapter of the Florida Native Plant Society and a board member for SWFCEE, the Southwest Florida Council for Environmental Education. Tom enjoys gardening, using native plants and better site design techniques, including rain gardening and rain water harvesting and working with youth to demonstrate ways to preserves Florida’s sensitive natural habitats and plant communities. Contact Tom at 239-533-7515 or email, tbecker@leegov.com.

Stephen Brown
Stephen Brown received his M.S. in Soils Fertility and Plant Nutrition from the University of Florida in 1981. He has worked as an Extension Agent in Jamaica, Los Angeles, California and has been with the Lee County Extension Service since September, 1993. Stephen is the Master Gardener Coordinator for the county and works closely with commercial landscapers and the nursery industry. He has actively participated in the formulation of the Lee County Fertilizer Ordinance which was passed by the county's Board of Commissioners in May, 2008.

Dennis Cathcart
For many years herpetology was my avocation, and in pursuit of this interest I spent many happy days on field trips to the Caribbean and Latin America. It was here that I became acquainted with exotic plants, sparking a new interest that has spanned over 40 years both as a collector and grower.

My wife Linda and I own and operate Tropiflora, established in 1976, which remains one of the largest collector-oriented exotic plant nurseries in the United States. Tillandsias and other bromeliads are a specialty as well as a wide assortment of orchid species and hybrids, rare succulents, myrmecophytes, cycads and more. Through our publication, the 'Cargo Report', we stay in touch with our customers throughout the world and try to bring them into the world we know, a fascinating one of adventure and beauty.

Our work with exotic plants, collecting, studying, photographing, writing and speaking about them takes us to many countries around the world. Exploring for new plant varieties is still one of our favorite activities, and we have made over 100 collecting trips to more than twenty seven countries from the Caribbean and Latin American to Australia, South East Asia, Africa and Madagascar. Linda often is a part of these travels and has been in many different countries, roughing it along side of me. Our explorations have resulted in the introduction of a number of new species of bromeliads to science and cultivation. Three species of bromeliads, an Aechmea, a Neoregelia and a Vriesea, carry the specific epithet cathcartii.
Jonathan Crane  
Education: B.S., M.S. and Ph.D. in Horticultural Science, Employment: 1987-1989, Multi-County Tropical Fruit Crops Extension Agent; 1989 to present - Tropical Fruit Crops Specialist Extension Program: Primary focus - commercial tropical fruit production; Secondary focus - growing tropical fruits in the home landscape, Research Program: Plant nutrition, tree training and pruning, effect of PGRs on flowering.

Marina D’Abreau  
Born in Trinidad & Tobago, Marina settled in Tampa, Florida in 1986. With a University of Florida background (B.S. and M.A.Ed.) in Wildlife Ecology and Environmental Education, she was the Florida Yards & Neighborhoods Coordinator with the Hillsborough County Extension office from 2001 to 2007. After completing her Doctorate in Organizational Leadership in 2007, she became the Urban Horticulture Agent, where she shares the joys and benefits of sustainable, Florida-friendly landscaping and outdoor water conservation practices with the residents of Hillsborough County.

Monica Elliott  
Monica L. Elliott received M.S. and Ph.D. degrees in Plant Pathology from Montana State University and a J.D. from Nova Southeastern University. She has been with the University of Florida since 1987 and is currently a professor in the Plant Pathology Department located at the Fort Lauderdale Research and Education Center with a 70% research and 30% extension appointment. She is also Associate Center Director for the FLREC. While initially focusing on turfgrass diseases, she has shifted her research and extension programs to examine palm diseases in field nurseries and the landscape. She is senior editor of the "Compendium of Ornamental Palm Diseases and Disorders" and co-author of the University of Florida’s ID card deck "disorders and Diseases of Ornamental Palms".

Edward Gilman  
Dr. Gilman received his PhD from Rutgers and has been on the faculty since 1986 as professor in the Environmental Horticulture Department at the University of Florida in Gainesville. He teaches arboriculture, conducts research on planting and pruning and works extensively with industry. He is the author of six books on trees and landscape plants, many software programs, and web sites that have received numerous awards. Ed wrote “Illustrated guide to pruning” which is in its second edition. He is a Florida chapter ISA past-president. He received the Authors Citation Award in 1999, the Educators Award in 2003, and the research award in 2007 from the ISA for sustained excellence in research, publishing and teaching timely information on tree care. He has published more than 70 scientific peer reviewed journal articles in his 30 years in academia and industry.
Gail Hansen
Gail Hansen, PhD Environmental Horticulture Department, University of Florida-Professional
Dr. Hansen is an assistant professor who specializes in landscape design. Her teaching and extension programs address best design practices for residential and urban landscape design, with a focus on design as it relates to quality of life. Topics include design practices and principles that affect mental, physical, and financial health of citizens and the ecological health of the environment. Dr. Hansen worked for a private landscape architecture firm in Gainesville, Florida for eight years and returned to UF to teach in the landscape architecture department as adjunct faculty for seven years. During this time she graduated with a PhD in landscape architecture. She is currently teaching a studio course in residential landscape design and working toward developing a comprehensive landscape design program.

Education
Ph.D. Landscape Architecture, Univ. of Florida M.LA Masters Landscape Architecture, Univ. of Florida M.S. Exercise Physiology, Univ. of Arizona

Professional Membership
American society of Landscape Architects

Research/Projects
Green Roof Systems Teaching Modules
Kincaid Neighborhood Design Standards
Alachua County Forever Site Design Standards for Recreation Facilities The Marjorie Harris Carr Cross Florida Greenway- Interpretation Master Plan and Recreation Site Design Standards

BJ Jarvis
BJ Jarvis is the Urban Horticulture Agent and County Extension Director for Pasco County, a rapidly-growing area in west-central Florida. Ms. Jarvis has Bachelor's degrees in Horticulture and Environmental Interpretation from The Ohio State University, and a Master’s degree from University of Phoenix in Organizational Management. During her career, BJ has taught horticulture at some of the well-respected botanical gardens in the US before coming to Pasco Extension, including Brooklyn Botanic Garden, Callaway Gardens and Missouri Botanical Garden. Droughts and cyclical rain variations through-out the US have allowed BJ to develop water conserving gardening practices.

Stephen Johnson
Steve A. Johnson, Assistant Professor of Wildlife Ecology at the University of Florida, holds a 60% teaching and 40% extension position. His tenure home is the Department of Wildlife Ecology and Conservation, but he is housed at the Gulf Coast Research and Education Center, near Tampa. There he teaches wildlife ecology courses that contribute to a BS program in Natural Resource Conservation. Before joining the University of Florida in 2004, Dr. Johnson worked as a research wildlife biologist with the US Geological Survey in Gainesville, FL. Dr. Johnson’s area of expertise is natural history and conservation of amphibians and reptiles, and he has worked extensively with imperiled species. His current extension and research programs at the University of Florida emphasize invasive wildlife biology, ecology of pond-breeding amphibians, venomous snake identification/safety, and urban wildlife education. He holds a Ph.D. from the University of Florida and BS and MS degrees from the University of Central Florida. Steve is a native Floridian and a beer snob.
**Pierce Jones**  
Pierce Jones graduated from UF in 1980 with a PhD in Mechanical Engineering. He is a Professor in Agricultural and Biological Engineering Department in the Institute of Food and Agricultural Sciences at the University of Florida. He directs the Program for Resource Efficient Communities, an interdisciplinary, self-funded, entrepreneurial group that promotes the adoption of “best design, construction and management practices” in new, master planned residential developments. Under his direction the Program for Resource Efficient Communities is directly participating in land development and building projects that adopt and demonstrate “green” practices.

**Christine Kelly-Begazo**  
Christine Kelly-Begazo is the director for in Indian River County extension and coordinates the educational outreach programs for the University of Florida Institute for Food and Agricultural Sciences. She manages a diverse group of extension agents with specialties ranging from 4-H and youth development to water quality and environmental horticulture. Ms. Kelly-Begazo is also the agriculture agent and develops technical programs for local cattle producers and small-scale farmers. She received her M.S. degree in agronomy from the University of Florida and has been working for UF ever since. Prior to her current position, Ms. Kelly-Begazo was the statewide coordinator for the “Florida Yards and Neighborhoods” program at the University of Florida in Gainesville. She also coordinates the Master Gardener program in Indian River County and her interest in gardening has inspired her to evaluate many different types of tools and to determine their usefulness in a practical setting.

**Bill Kern**  
Bill Kern is an Associate Professor in the Department of Entomology & Nematology at the Ft. Lauderdale Research and Education Center of the University of Florida. Bill received his B.S. in Life Science and Chemistry and M.A. in Life Science from Indiana State University in Terre Haute, IN. He earned his Ph.D. in Entomology and Zoology from the University of Florida in 1993. He served as an Assistant Extension Scientist (Central Florida Wildlife Extension Specialist) with the Department of Wildlife Ecology & Conservation, University of Florida from 1993 until 2000. He served as an Assistant Professor (2000-2007), and Associate Professor (2007-present) in the Department of Entomology & Nematology at the Ft. Lauderdale Research and Education Center. His areas of expertise are Urban Entomology, Africanized Honey Bee Management, Vertebrate Pest Management, Nuisance Wildlife Management, and Medical / Veterinary Entomology.
Kenneth Langeland
Professor in Weed Science, UF, IFAS, Agronomy Department and Center for Aquatic and Invasive Plants, where he specializes in management and ecology of weed in aquatic habitats and natural areas. He received a B.A. degree from the University of South Florida (Botany) in 1971, M.A. degree from Virginia Polytechnic Institute and State University (Weed Science) in 1978, Ph.D. from the University of Florida (Agronomy) in 1982. After three years as Assistant Professor at North Carolina State University, he joined the Agronomy Department of the University of Florida in 1986, reaching the rank of Professor in 1994. He has been president and served on the Board of Directors for the Florida Aquatic Plant Management Society, and has been editor for Aquatics magazine. He has served on the Board and as Chair of the Florida Exotic Pest Plant Council. His awards include the Florida Aquatic Plant Management Society Presidential Award, the Florida Weed Science Society Weed Scientist of the Year, the Florida Lake Management Society Paper of the Year award, the Florida Native Plant Society Green Palmetto Award, and the Florida Exotic Pest Plant Council President’s Award. He has authored several books and over 150 scientific articles and extension fact sheets.

Mike Malloy
As the new FYN Outreach Coordinator, Mike Malloy is the University of Florida contact person for the Florida Yards & Neighborhoods program in Collier County. Mike was in the commercial landscaping business for nearly 40 years and is an avid butterfly enthusiast. In 2007, he published a small book, "Butterfly Gardening made Easy for Southwest Florida", and is currently a member of the Tropical Lepidopterists Society, North American Butterfly Association, and the National Wildlife Federation, just to name a few. In his spare time, Mike pursues his love of nature and art by creating beautiful Butterfly Boxes.

Catherine Mannion
Catharine Mannion is an Associate Professor and Extension Specialist with the University of Florida, Tropical Research and Education Center located in Homestead, Florida. She is responsible for developing a research and extension program on integrated pest management of ornamental plants with an emphasis on invasive pests. She has focused her research on several of the introduced pests such as cycad aulacaspis scale, lobate lac scale, root weevils, thrips, and most recently a new whitefly. She works with extension personnel, growers, landscapers and state regulators to solve pest problems in nurseries and the landscape. She received a B.S. degree in Biological Sciences from University of California, a M.S. degree in Entomology from North Carolina State University, and a Ph.D. in Entomology from the University of Florida.

Eugene McAvoy
Eugene McAvoy graduated with a BS and a MS in Horticulture from Rutgers University. He is the UF/IFAS Hendry County Extension Director and Regional Vegetable Agent in SW Florida since 1997. Over 30 years experience in the vegetable industry including 14 years in the tropics. Gene worked on a vegetable farm and picked tomatoes to help fund his college education and has a long working relationship with this vegetable.
Sydney Park-Brown
Sydney was a horticulture extension agent and Master Gardener coordinator in Hillsborough County before assuming the position of Extension Specialist in Consumer Horticulture in 2007. In addition to developing educational resources for urban audiences, Sydney coordinates the horticulture teaching program at UF’s Plant City campus. A graduate of the University of Florida, she enjoys gardening, traveling, cooking, and reading.

Robert Saporito
Robert Saporito is the president of the Florida/Caribbean Chapter of the American Bamboo Society. As an active American Bamboo Society member, he has been involved in the bamboo import & quarantine system that has introduced more than 150 new tropical bamboo species to the U.S. within the past 15 years.

As a helicopter mechanic & pilot during the 1980s and 90s, Robert often worked in remote areas of the world – sometimes tropical jungles. Plant collecting was a hobby and it was in South America and the West Indies that Robert discovered timber bamboos. The importation of live bamboo into the U.S. was, and is, prohibited by the USDA. The American Bamboo Society provided the experimental & scientific loophole required to allow limited importation. Quickly, the plant collection hobby became bamboo-specific and it eventually became a business - Robert is the owner of Tropical Bamboo Nursery & Gardens. The former career, helicopters, is now one of his hobbies.

Rick Schoellhorn
Rick Schoellhorn is the Director of New Products for Proven Winners L.L.C. In English this means that Rick travels around the world meeting plant breeders and looking for the best new plants to add to the Proven Winners marketing programs. Proven Winner’s goals include becoming the most respected brand of flowering plants in the US, providing consumers with tested, trialed and true plants that will do well in almost every region of the US. For Rick this means that he travels about 60% of the year, spending much of his time in Germany and the Netherlands, Japan, Israel, and traveling around the United States and Canada. According to Rick he has the best job in the world, according to Linda (Rick’s wife) he is gone too much of the time! Rick manages not only finding the new plants but then putting them through an intensive 2 year trialing process with trials in FL, MI, NH, CA, Germany and Japan. He monitors to make sure that each plant is free of over 28 different viruses, and that those production facilities in Costa Rica, Guatemala, Germany and other locations have the plant to begin production. Rick’s job is working with plants that are 3-5 years from the shelves of your local garden center, so he is often unsure of both where he is and what year it is…

Jack Tichenor
Jack leads the educational component of Manatee County’s outdoor water conservation program. His extension service group develops and presents educational programs on efficient irrigation and water wise landscaping. Their mobile irrigation lab service has performed over 750 landscape and irrigation evaluations for homes and businesses saving the participants a total of 18 million gallons of water annually. Jack earned bachelor's and master’s degrees in agriculture from the University of Florida (go Gators!), was a project engineer on farm and industrial settings before becoming an extension agent in 2001. He is a member of The Irrigation Association, Florida Irrigation Society and The American Society of Agricultural and Biological Engineers. Jack was recognized by The South West Florida Water Management District in 2004 for Outstanding Leadership in Water Conservation and is a Certified Landscape Irrigation Auditor. He’s a native Floridian, married, with two children and seven grandchildren.
Teresa Watkins
Teresa Watkins, Florida Water Star Specialist for the St. Johns River Water Management District is a recognized leader on water conservation principles in "environmentally-friendly" landscapes. Over 20,000 Central Florida homeowners have learned from her landscaping programs in the last seven years earning Teresa the Florida Water Education Association’s 2007 Public Education Award. Watkins’ clients include cities, counties, public and private water suppliers in their water conservation and stormwater pollution education efforts with homeowners. Watkins works with builders and developers with the Florida Water Star certification program. Teresa provides down to earth advice in her ‘Gardening with Soul’ articles. National business publications, green builder magazines, Internet websites, and gardening magazines have quoted Teresa’s articles and philosophy of ""ecologically-aware"" gardening.

An award-winning gardening show radio host of ""In Your Backyard"", Teresa Watkins designed the landscaping of the ""first energy and environmentally efficient"" DREAM home in the state of Florida to be certified as a ""green home"" by the Florida Build Green Coalition and Florida Solar Energy Center.

A Class VII Fellow and Vice President on the Board of Directors for UF/IFAS Florida Natural Resource Leadership Institute 2007 Alumni Association, Teresa was the environmental landscaping consultant for the Green Builder - Vision House 2008, which was showcased at the 2008 International Home Builders Show in Orlando, Florida.

Professional Memberships
Florida Master Natural Resource Leadership Institute Alumni Association Florida Association of Natural Resource Professionals Central Florida Association of Environmental Professionals National Garden Writers Association

Ondine Wells
Ondine Wells is the Statewide Builder and Developer Coordinator for the Florida Yards and Neighborhoods (FYN) program. She provides resources and training on how to establish Florida-friendly landscapes in new home and community landscapes throughout the state. While working towards her masters at UF, she developed a campus water quality monitoring program to assess the quality of campus creeks. Before moving to Gainesville, FL in 2003, she served as the founder and director of a non-profit environmental education program for at-risk youth in Washington, DC.
Map of Florida Counties