32nd Annual

FLORIDA MASTER GARDENER
CONTINUED TRAINING
CONFERENCE

October 1-3, 2012

Clearwater Beach Hilton
Clearwater Beach, Florida

Proceedings
Dear Master Gardeners!

I am excited to welcome you to the 2012 Master Gardener Continued Training Conference. The conference this year was scheduled to be held in SW Florida which is why we selected Clearwater and the Clearwater Beach Hilton. This location is right on the beach and there are plenty of shops and unique restaurants within walking distance. I think the planning committee has done a great job creating a diverse schedule providing something for everyone.

We again started things off with optional pre-conference tours. These tours took place on the afternoon of Sunday, Sept. 30th. One exposed MGs to six landscapes designed by renowned landscape architect Phil Graham Jr. The second trip visited the beautiful Florida Botanical Gardens and also made a stop at the historic Sunken Gardens. Both the trips provided all with a great deal of information and a fun experience.

The conference formally kicks off on Monday, Oct. 1st with two great general session presentations. Ed Gilman will share his insights on trees and Laurie Trenholm will help you learn how to manage turf for low maintenance. The afternoon is filled with your choice of a wide range of concurrent presentations. The afternoon sessions end with Russ Mizell teaching you on what plants you should add to your gardens to attract beneficial insects. The evening wraps up with a beachside welcome reception where you can meet new friends and catch up with previous acquaintances. The rest of the evening is yours to enjoy the many area attractions.

Tuesday, Oct. 2nd begins with a general session dealing with climate change and information on how to get involved with plant phenology monitoring. We then proceed with two concurrent session groups for you to continue a morning of learning. Following lunch, we are holding the 4-H Plant ID and Judging Competition. Make sure your county fields a team or compete on your own to test your knowledge. If you are not competing in the contest, there will be an opportunity for you to interact with other MGs and learn from their experiences. Following the competition, the education continues with one more round of concurrent sessions all before the always-entertaining horticulture auction. The proceeds of the auction go to recognize volunteers for their service and innovative programming. The evening is free to spend with your new Master Gardener friends.

Wednesday, Oct. 3rd begins with the Awards breakfast. This is followed by the awards program to recognize the Awards of Excellence winners and to recognize Master Gardeners for their years of service. Following the awards, the always popular Rick Schoellhorn will share his insight on Hot New Plants.

While attending the conference, be sure to visit the county display room and see what great things are going on around the state. As always the IFAS Bookstore will be on site with a selection of publications and logo merchandise. Also be sure to thank our sponsors, the planning committee and the Pinellas County Master Gardeners for all their hard work.

The conference is filled with lots of opportunities to learn and to share information with other volunteers. While here, you will learn the latest information, meet new Master Gardener friends from around the state and hopefully enjoy all that Southwest Florida has to offer. Welcome to this year’s conference.

Sincerely,

Tom Wichman
Florida Master Gardener Coordinator
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Conference Sponsors

A Very Special Thanks

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GOLD SPONSOR

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Florida-Friendly Landscaping™ PROGRAM

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

Theresa Badurek  
– Pinellas County

Terry Delvalle  
– Duval County

Charles Fedunak  
– Lake County

Theresa Friday  
– Santa Rosa County

Nicole Gonzalez  
– Hillsborough County

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Sydney Park-Brown  
– Hillsborough County

Crystal Sutherland  
– Master Gardener Office

Ed Thralls  
– Orange County

Wendy Wilber  
– Alachua County

Pinellas County Master Gardeners
Pre-Conference Events
Sunday, September 30, 2012

Buses Load at 12:15pm
   – Please meet at the lower level entrance of the hotel at the front drive and walk to the sidewalk on Mandalay Avenue.

Buses Depart at 12:30pm
Buses return by 5:30pm

Landscape Tour of Clearwater Beach and Downtown St. Petersburg

This tour will visit six landscapes designed by renowned Landscape Architect, Phil Graham, Jr. Phil has been practicing Landscape Architecture in the Tampa Bay Area for more than 30 years, and has worked on projects all across the globe. We were lucky enough to have Phil available to guide this tour and it should be a remarkable experience.

Participants should wear comfortable walking shoes and be prepared to walk at least 1 mile throughout the length of the tour. The tour will end at the Salvador Dali Museum gift shop where participants will have a chance to purchase a memento to remember the event should they choose to do so. The tentative agenda for the tour is as follows; Sandpearl Resort, Private Belleair Residence, Gizella Kopsick Palm Arboretum, Pioneer Park, Poynter Institute for Media Studies, Salvador Dali Museum.

Florida Botanical Gardens and Sunken Gardens

Pinellas County is home to many botanical wonders. On this tour you will get the opportunity to visit two different garden sites. The Florida Botanical Gardens is adjacent to the Pinellas County Extension Service and is comprised of over 30 acres of cultivated gardens and 90 acres of natural area. Planning for the garden began in 1991 with the garden opening to the public in December 2000. While there you will see a wide variety of garden areas and exhibits.

Sunken Gardens is a small 4 acre garden that began in 1903. The gardens contain over 500 species of tropical and subtropical plants. Sunken gardens in probably the oldest tourist attraction on Florida’s west coast. The garden atmosphere is peaceful and contains many mature plants.

Participants should wear comfortable clothing and walking shoes and be prepared to walk a considerable amount between the two sites. Be sure to bring sun screen, hats and rain protection.
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]

Monday, October 1, 2012

7:00am-5:00pm  Registration Open .................................................................[Grand Ballroom Foyer]
7:30am-8:30am  Continental Breakfast .................................................................[Grand Ballroom Foyer]
8:00am-5:00pm  Auction Donations Check-in/Viewing .........................................[Citrus/Mangrove Rooms]
8:30am-9:00am  Welcome and Opening Remarks – Tom Wichman, UF ...........[Grand Ballroom DEF]
9:00am-10:00am General Session 1 – What’s New in Tree Care and Establishment (p. 24, 28)
                    – Ed Gilman, UF
10:00am-10:30am  Beverage Break ........................................................................[Grand Ballroom Foyer]
10:30am-11:30am  General Session 2 – Selecting and Maintaining Turf for Low Maintenance – Laurie Trenholm – UF
11:30am-1:00pm  Lunch on Own [Hotel to offer special menu]
                    View County Displays .................................................................[Executive Conference/Mandalay Rooms]
11:30am-5:00pm  IFAS Bookstore Open ......................................................................[Tarpon Room]
1:00pm-2:00pm  Concurrent Session 1
A-1  Florida Friendly Ground Covers (p. 126) – David Shibles, UF .................................[Grand Ballroom DEF]
B-1  Heirloom Vegetables (p. 13) – Aparna Gazula, UF ........................................[AB Salon]
C-1  Cut Arrangements from the Landscape (p. 31) – Janice Hamlin, Manatee County MG ......................................................................................................................[Waters Edge A]
D-1  Tree Cultivars – The Best of the Best (p. 26) – Ed Gilman, UF ..................[G Salon]
2:00pm-2:15pm  Move to Next Session
2:15pm-3:15pm  Concurrent Session 2
A-2  The New World of Smart Irrigation Equipment – Michael Dukes, UF .................................................................[Waters Edge A]
B-2  Organic Gardening (p. 95) – Sydney Park-Brown, UF ....................................[AB Salon]
C-2  Orchid Basics – Carolyn Saft, UF .................................................................[Grand Ballroom DEF]
D-2  Creating a Backyard Habitat and Providing for Bats (p. 87) – Holly Ober, UF .................................................................................................................................[G Salon]
3:15pm-3:45pm  Refreshment Break and Move to Next Session ......................[Grand Ballroom Foyer]
                    View County Displays .................................................................[Executive Conference/Mandalay Rooms]
Monday, October 1, 2012 (continued)

3:45pm-4:45pm  **Concurrent Session 3**

A-3  **How to Get Master Gardeners Involved with Community Outreach Programs?**  (p. 85, p. 40) – Esen Momol and Doris Heitzmann, UF ...........................................[Waters Edge A]

B-3  **Florida-Friendly Butterfly Scaping** (p. 77) – Kathy Malone, FFL................................................................................................................[Grand Ballroom DEF]

C-3  **Clumping Bamboo for Florida** – Richard Lindberg, Bamboo expert in Jacksonville, Florida .........................................................[AB Salon]

D-3  **Creating a Bee Friendly Garden** (p. 114) – Michelle Peterson, St Lucie MG .................................................................................................[G Salon]

4:45pm-5:00pm  Move to Next Session

5:00pm-6:00pm  **General Session 3** – Plants to Attract Beneficial Insects and Trap Crops (p. 79) – Russ Mizell, UF .................................[Grand Ballroom DEF]

6:00pm-7:30pm  Welcome Reception Beachside Decks [Heavy Hors D’ oeuvres and County Pictures]

Dinner on Own

Tuesday, October 2, 2012

7:00am-5:00pm  **Registration Open** .................................................................[Grand Ballroom Foyer]

7:00am-8:00pm  Continental Breakfast .................................................................[Grand Ballroom Foyer]

7:30am-5:00pm  IFAS Bookstore Open ...................................................................[Tarpon Room]

8:00am-9:30am  **General Session 4** – Climate Variability and Change in Florida (p. 129) – David Zierden, FSU and Plant Phenology Monitoring (p. 50) – George Kish, USGS ..................................................................................[Grand Ballroom DEF]

9:30am-10:00am  Beverage Break and Move to Next Session ..............[Grand Ballroom Foyer]

View County Displays ..................................[Executive Conference/Mandalay Rooms]

10:00am-11:00am  **Concurrent Session 4**

A-4  **Landscape Design with Edibles** (p. 37) – Gail Hansen, UF .........................[G Salon]

B-4  **Backyard Chickens** (p. 29) – Randy Gornto, UF ...................................[AB Salon]

C-4  **The Amazing World of Succulents** (p. 61, 63) – Keri Leymaster, UF .................................................................[Grand Ballroom DEF]

D-4  **Youth Gardening Activities** (p. 128) – Wendy Wilber, UF .................[Waters Edge A]

11:00am-11:15am  Move to Next Session
Tuesday, October 2, 2012 (continued)

11:15am-12:15pm  Concurrent Session 5

A-5  Florida-Friendly Plants for Retention Ponds (p. 33) – Gail Hansen, UF .................................................................[Waters Edge A]
B-5  Preserving What You Produce (p. 42, 49) – Mary Keith, UF .........................[AB Salon]
C-5  Online Training Resources Developed for Master Gardeners (p. 127)
     – Stephanie Stocks, UF ........................................................................[Grand Ballroom DEF]
D-5  Composting for Everyone (p. 3) – Lynn Barber, UF ........................................[G Salon]

12:15pm-1:15pm  Boxed Lunch ................................................................................[Grand Ballroom Foyer]
                    View County Displays .......................................................... [Executive Conference/Mandalay Rooms]

1:15pm-3:15pm  Hort. ID and Judging Contest ........................................................................ [Waters Edge B/C]

1:15pm-3:15pm  3 County Interaction Sessions – Moderated by County Agents

(1:15 – 2:00)  Demo Garden ..................................................................................[G Salon]
               Fundraisers and Budgeting .....................................................................[AB Salon]
               Innovative Projects and Youth Gardening ........................................... [Waters Edge A]

(2:15 – 3:00)  Demo Garden ..................................................................................[G Salon]
               Fundraisers and Budgeting .....................................................................[AB Salon]
               Innovative Projects and Youth Gardening ........................................... [Waters Edge A]

3:15pm-3:45pm  Beverage Break and Move to Next Session ....................................[Grand Ballroom Foyer]
                    View County Displays .......................................................... [Executive Conference/Mandalay Rooms]

3:45pm-4:45pm  Concurrent Session 6

A-6  Invasive Plants and the IFAS Assessment (p. 56) – Ken Langeland, UF .................................................................[AB Salon]
B-6  Citrus Pest Update (p. 4) – Steve Futch, UF .....................................................[G Salon]
C-6  Great Native Plants for Florida (p. 70) – Brightman Logan, All Native, LLC .................................................................[Grand Ballroom DEF]
D-6  FAWN Weather Resources (p. 76) – Rick Lusher, UF .................................[Waters Edge A]

4:45pm-5:00pm  Move to Grand Ballroom for Auction

5:00pm-6:30pm  Horticulture Auction & Light Refreshments ..................................[Grand Ballroom DEF]

Dinner on Own
### Wednesday, October 3, 2012

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<thead>
<tr>
<th>Time</th>
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<th>Location</th>
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<tr>
<td>7:30am-11:00am</td>
<td>Registration Open</td>
<td>[Grand Ballroom Foyer]</td>
</tr>
<tr>
<td>7:30am-10:30am</td>
<td>IFAS Bookstore Open</td>
<td>[Tarpon Room]</td>
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<tr>
<td>8:00am-9:00am</td>
<td>Plated Awards Breakfast</td>
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<tr>
<td>9:00am-10:00am</td>
<td>Florida Master Gardener Professorship &amp; Awards Program</td>
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<tr>
<td>10:00am-10:30am</td>
<td>Beverage Break</td>
<td>[Grand Ballroom Foyer]</td>
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<tr>
<td>10:30am-12Noon</td>
<td><strong>General Session 5 – Hot New Plants</strong> (p. 124) – Rick Schoellhorn, Proven Winners</td>
<td>[Grand Ballroom]</td>
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<tr>
<td>12:00 Noon</td>
<td>Conference Closes</td>
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Speaker Papers

Listed alphabetically by first presenting author.
Presenting authors appears in bold.
Composting, part of the Recycling principle, turns yard and kitchen waste into a rich soil amendment.

**Compostable Kitchen and Yard Waste Materials**
A combination of green (nitrogen) and brown (carbon) materials is needed. Green materials include processed herbivore manures, kitchen scraps, coffee grounds, egg shells, fresh landscape prunings and grass clippings*. Brown materials include newspaper, cardboard, chipped tree limbs and sawdust.

**Building a Compost Pile**
Mix browns and greens before adding to the pile. Or add layers of browns and greens. Water each layer. Start and end with brown layers on top and bottom.

**Managing the Compost Pile**
Create one batch at a time. Let the 1st batch finish/cure and start a new batch in another location. Let compost finish at lower temperatures. If odors are present, turn the pile, add carbons/browns and be sure to bury food scraps. If dry, add water. If wet, add newspaper/cardboard. If not decomposing quickly, add nitrogen fertilizer.

Grass clippings are best left on the lawn to decompose and add nutrients to the soil.

**Compost Bin Types**
- **Holding Units:**
  - Simple containers/open piles
  - Small volume
  - Slow results 6-24 months
- **Turning Units**
  - Rotating barrel/2-bins
  - Large volume
  - Mix/layer turn
  - Fast results 6-12 weeks

**Compost Methods**
- Hot/Fast/Aggressive
  - Kills weed seeds, pests and plant pathogens
  - Minimum size of 3’ x 3’ x 3’
  - Blend of greens and browns
  - Proper moisture content (wring out sponge)
  - Frequent turning to aerate
  - Particle size of 2-3 inches
  - Cold/Slow/Passive
  - Top dress soil sheet composting
  - Dig trenchy hole
  - Create a pile/heap of compost materials

**Compost Uses**
- Soil amendment
- Potting soil
- Mulch
- Compost tea

*All materials must be organic in nature and free of weed seeds, disease vectors and harmful pesticides.

Sponsored by Hillsborough County and University of Florida/IFAS, Extension and Tampa Bay Water.
Citrus Diseases

Greasy spot

- Swelling on lower leaf surface.
- Yellow mottle appears at the corresponding point on upper surface.
- Swollen tissue starts to collapse, turns brown and eventually black in color.
- Infection causes premature leaf drop which occurs mostly in winter and early spring.

Scab

- Small, somewhat circular, elevated spots on leaves and fruit.
- Infection becomes wart-like structures, covered with a corky pale tissue.
- Pustules may group together.
- Can be severe on Temples, lemons, Murcotts, Minneola, grapefruit.

Recommended Chemical Controls for Citrus Scab

<table>
<thead>
<tr>
<th>Pesticide</th>
<th>Rate/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper fungicide</td>
<td>Use label rate.</td>
</tr>
</tbody>
</table>
Melanose on fruit

- Lesions are small, raised, superficial dots, pustules and irregularly shaped spots ranging from brick red to black.
- They feel like sandpaper when touched.
- Pustules are larger on grapefruit than other varieties.
- Fruit becomes resistant to infection at about 12 weeks after petal fall.
- Spores develop on twigs that have recently died.

Alternaria brown spot

- The fungus attack fruit, leaves and young shoots of susceptible varieties.
- First appears as small, slightly depressed black spots which can cause young fruit and leaves to fall.
- Fruit usually immune to infection after reaching 3-4 months of age.
- Infects Dancy, Minneola, Murcotts and other varieties.

Foot rot

- Lesions on tree trunk usually on the bark at or just above the budunion on susceptible scions.
- Lesions first appear as a drop of gum on the surface of the bark.
- Brown, discolored, necrotic, slippery areas will be found under the bark.
- Lesions can eventually girdle the entire tree trunk.
- Can occur when bark is damaged with tools as this allows easy entry of the disease into the tree.
- Planting at proper height in soil minimizes problem.

Citrus Canker (Xanthomonas axonopodis)

Citrus Canker

- Lesions are produced on young fruit and leaves of citrus.
- Bacteria are produced under moist conditions and dispersed by windblown rains.
- Bacteria enters leaf stomates or wounds on leaves, twigs or fruit.
- No chemical control.
- Can use copper to suppress disease.
Canker Suppression

- Remove infected plant material (i.e. infected fruit and/or leaves).
- Spray with copper at 21-day intervals from after bloom until late summer.
  - Grapefruit and Hamlin oranges require more sprays than Valencia
- More frequent flushes the greater the problem in infected areas.

Canker Suppression

- Remove infected plant material (i.e. infected fruit and/or leaves).
- Spray with copper at 21-day intervals from after bloom until late summer.
  - Grapefruit and Hamlin oranges require more sprays than Valencia
- More frequent flushes the greater the problem in infected areas.
- Minimize wetting the foliage with irrigation.

Citrus Greening

Greening has been found Statewide.

Citrus Greening

- Caused by one fungal pathogen with two names
  - Guignardia citricarpa (sexual)
  - Phyllosticta citricarpa (asexual)
- Affects all citrus varieties
  - Sweet oranges, grapefruit and lemons are highly susceptible
- Fungus spreads in warm wet conditions in the presence of susceptible fruit when inoculum is present
- Present in a few counties in South Florida.

Citrus Black Spot

- Primary inoculum is from leaf litter
- Spores are ejected when leaf litter is wet
- Spores move with wind current

Citrus Black Spot Spread

- Symptomatic fruit is not acceptable in the fresh markets
- Lower fruit often have more symptoms
- Does not cause internal decay
- Symptoms will most likely appear about a month before harvest on sunny side of tree
- Four symptom types: hard spot, cracked spot, false melanose and virulent spot

Fruit Symptoms
Sample Submission

- For Citrus Black Spot – contact local FDACS office to collect sample.
- For Citrus Canker – contact FDACS or a local county citrus extension agent to determine if it is citrus canker.
- For HLB / greening – samples can be submitted to either Southern Gardens lab or to Southwest Florida Research & Education Center in Immokalee.
- All samples that are delivered to Extension offices should be placed in plastic bags and disposed in normal trash.

Citrus Mites

Citrus rust mites

- Damages epidermal cells of leaves and fruit using piercing-sucking mouthparts.
- Body is elongated wedge-shaped.
- Magnification is required.
- Color ranges from light yellow to straw.
- Peak populations usually occur during June and July.

Citrus rust mite damage to fruit

- Extensive CRM feeding on fruit surface will result in surface blemishes, lower external grade, reduce fruit size and increase fruit drop.
- When fruit is injured in summer or fall, the injured surface is smooth and dark in color, “bronzing”.
- When fruit is injured in the spring, damage is lighter in color than later damage, “sharkskin”.

Scale Insects

Citrus snow scale

- Adult female is 1.5 – 2.25 mm long.
- Female armor is shaped like an oyster shell, brownish purple to black.
- Immature male scale armor is white with parallel sides and three longitudinal sections, one central and two marginal ridges.
- Adult male is winged and light yellow.
- Citrus snow scale primarily attack the trunk and large limbs, but can be found on leaves, twigs and fruit.
Florida red scale

- Florida red scale has circular armor made up of three concentric rings.
- Dark reddish brown with a conspicuous light brown center.
- Adult male is gnat-like and free flying.
- Florida red scale is under biological control.

Caribbean black scale

- Female is 3-5 mm long and brown to black in color.
- Ridges along outer scale body form an ‘H’.
- Adult males are free flying.
- Crawlers are 0.34 mm long and light brown.
- Found on young fruit, stems, and twigs.
- Scales secrete prolific amounts of honeydew which support the growth of sooty mold.
- Usually under biological control.

Insect Pests

Orangedog

- Larval stage feed on young foliage causing extensive damage and defoliation.
- Larval stage is brown and white caterpillar which resembles bird droppings.
- Approximately 1-2 inches in length.
- Adult stage is the swallowtail butterfly.

Citrus leafminer

- Adults are minute moths, with ¼ inch wingspread.
- Females lay eggs in evening or early morning on young foliage.
- Larvae are translucent greenish.
- Upon larva entering the leaf, they begin to feed producing a serpentine larval mine.
- Damage results in leaf distortion, leaf drop and possible stem dieback.
Citrus Leafminer Suppression

- Spray young growth flushes with insecticide.
- Use product that contains imidacloprid.

Soft-Bodied Insects

Sooty Mold

- Dense, black fungus that grows on the honeydew secreted by insects like aphids, scales, whiteflies and mealybugs.
- Found on leaves, stem, and fruit.

Aphid Damaged Twig

Asian Citrus Psylla, *Diaphorina citri* (Kuwayama)

Asian Citrus Psylla

- Primary vector of citrus greening disease.
- Adult psylla are sexual and can survive for extended periods of time feeding on mature leaves and forego reproduction until new leaves are available.
- Eggs are laid only on new flushes.
- Juvenile psylla deform flush terminals, causing a distinctive pinching and twisting of leaves.
- Honeydew is waxy and viscous, forming curly white strands producing less sooty mold than aphids.
- For young trees, use products that contain imidacloprid.
Nutritional Deficiencies

**Nitrogen deficiency**
- Deficiency is expressed by light green to yellow foliage over entire tree in absence of any distinctive leaf patterns.
- As deficiency progresses leaves become lighter in color.
- Nitrogen deficiency will limit tree growth and fruit production.
- Excessive nitrogen produces excessive vegetative growth at the expense of fruit production, reducing fruit quality.

**Yellow vein chlorosis**
- With yellow vein chlorosis, the midribs and lateral veins turn yellow while the rest of the leaf remains a normal green.
- This chlorosis is frequently attributed to girdling of individual branches or tree trunk.
- May also occur with the onset of cooler weather in the fall and winter due to reduced nitrogen uptake by the plant from the soil.

**Magnesium deficiency**
- First symptom is a yellowish green blotch near the base of the leaf between the midrib and the outer edge.
- The yellow area enlarges until the only green remaining is at the tip and base of the leaf as an inverted V-shaped area on the midrib.
- Dolomite will correct mild foliage symptoms in soils with low to neutral pH.
- Magnesium deficiency occurring in calcareous soils may have to be corrected with foliar sprays.

**Manganese deficiency**
- Deficiency appears as dark green bands along the midrib and main veins surrounded by light green interveinal areas giving a mottled appearance.
- As severity increases, the light green interveinal areas give way to a yellow-bronze coloration.
- Deficiency occurs on calcareous soils.
- Soil and foliar application may be effective in correction of manganese deficiency.

**Zinc deficiency**
- Early stages appear as small blotches of yellow between green veins on the leaf.
- With severe deficiency, leaves may become increasingly yellow except for the green veinal areas.
- Under severe conditions, leaves will also be small with narrow pointed tips on terminal growth.
- Foliar fertilizer applications are usually recommended for correcting zinc deficiency.
- Trees with citrus blight also show leaf zinc deficiency.
Iron deficiency

- In mild cases, leaf veins are slightly darker green than interveinal areas with symptoms appearing first on new foliage.
- In severe cases, interveinal areas become increasingly yellow with the entire area eventually becoming ivory in color.
- Usually a greater problem on calcareous soils.
- Trees which have been flood damaged will also show iron deficiency.

Fertilization of Citrus

Suggested fertilization schedule

<table>
<thead>
<tr>
<th>Tree Age</th>
<th>Lbs N/tree/yr</th>
<th>Lbs N/tree/yr</th>
<th>Lbs Fertilizer/tree/yr</th>
<th>Applications/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.15-0.30</td>
<td>2.5-5.0</td>
<td>1.8-3.8</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>0.30-0.60</td>
<td>5.0-10.0</td>
<td>3.8-7.5</td>
<td>5</td>
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<td>3</td>
<td>0.45-0.90</td>
<td>8.0-15.0</td>
<td>5.6-11.3</td>
<td>4</td>
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<td>4</td>
<td>0.80-1.0</td>
<td>13.0-17.0</td>
<td>10.0-12.5</td>
<td>8.5-12.5</td>
</tr>
<tr>
<td>5+</td>
<td>1.1-1.4</td>
<td>18.0-23.0</td>
<td>13.8-17.5</td>
<td>11.0-14.0</td>
</tr>
</tbody>
</table>

Tree age = years planted, with year 1 beginning right after planting.
Do not use a fertilizer with higher than an 8-8-8 analysis on young trees during years 1-3.

When to fertilize

- Young trees
  - Apply at 6-week intervals
  - Fertilizer should be applied beginning in:
    - Late February-early March
    - Ending in late September
  - Remember local fertilizer rules against applying some nutritional materials during summer time period.

- Mature trees
  - Apply 3 applications per year
    - Late February-early March
    - Mid May
    - Mid-late September
  - Avoid applications during summer rainy months due to potential leaching
  - Remember: local fertilizer rules may prohibit applying some nutritional materials during summer time period.

How to apply the fertilizer

- Young trees
  - Apply fertilizer uniformly in a 3 foot diameter circle around the tree

- Mature trees
  - As the tree becomes older, increase area covered with fertilizer
  - Fertilize an area twice the diameter of the tree canopy
  - Do not apply against the tree trunk
Soil pH

- Adjust soil pH up to approximately 6.0-6.5
  - Materials for pH adjustment include
    - Dolomite
    - High calcium lime
  - For high pH soils, > 7.0-7.5
    - Very difficult to reduce soil pH
    - Many micro nutrients may need to be applied to the foliage of the tree

Questions?
Successful Heirloom Vegetable Production

Dr. Aparna Gazula & Barton Wilder
UF-IFAS Alachua County Extension
Dr. Danielle Treadwell
UF-IFAS Horticultural Sciences

What is an Heirloom?
- Always open pollinated, never hybrids
- An “old variety”
- Must have a history of its own

Heirlooms Are Open Pollinated
Open Pollinated varieties:
- Have seeds that breed true ($F_1 = F_2 = F_3$)
- Are traditional varieties that have been selected for desirable traits over a long time
- Are often suitable for low-input production systems
- Can adapt to local ecosystems over generations
- Have little commercial incentive to produce new open pollinated varieties

Heirlooms Are Not Hybrids
Hybrids varieties:
- $F_1$ (first generation) offspring of two different but compatible parents
- Typically do not breed true, over time they will revert to characteristics of the parents
- Are often selected for shipping qualities
- Typical in high-input, commercial horticulture

Heirlooms are Old
- How old is old? Here are some opinions:
  - In production before 1950 (availability of hybrid seeds)
  - In production during the WWII Victory Gardens 1940’s
  - Traditional Native American crops (over 200 yrs old)
  - Old European crops (400 yrs old)
- Should varieties be excluded from Heirloom classification just because they were commercially successful?

Heirlooms Have History
- The tomato cultivar ‘Mortgage Lifter’ was developed in the 1930’s by “Radiator Charlie” Byles by crossing a variety of tomato cultivars with a German Johnson until he was happy.
- He sold the plants for $1.00 each, and paid off his mortgage.

From Living on Earth: www.loe.org
Heirlooms are Popular

What You Should Know About Heirlooms
- Require trial and error to produce consistent quality and yield
- Select varieties suited for our area
- Quirky growing characteristics
- Many varieties lack modern-day disease resistance
- Many varieties are indeterminate, and may have poor canopy cover
- Subject to physiological disorders
- Variable shape and soft skin make pack-out difficult
- Best for direct markets

Field Production
- Heat and high humidity facilitate the onset of disease.
- Lack of resistance exacerbates the problem, necessitating a number of preventative and curative sprays
- For these reasons, drip irrigation is preferred vs. overhead.

Shade Houses

High Tunnels
Greenhouses

Grafting

- Grafting provides site-specific management tool for soilborne disease
  - Bacterial Wilt (Ralstonia solanacearum)
  - Fusarium Wilt (Fusarium oxysporum f.sp. lycopersici)
  - Root-knot Nematodes (Meloidogyne spp.)
  - Verticillium Wilt (Verticillium dahliae (race 2))
  - Southern Stem Blight (Sclerotium rolfsii)

Grafting

- ~25 days early season extension with high tunnels.
- Total productivity was higher in the tunnel system.
- Beaufort and Maxifort show higher yields under no soilborne disease pressure.

Physiological Disorders

- Catfacing
- Zippering
- Blossom End Rot
- Sun scald

Tomato
**Tomato**

- Large, red slicers are in demand
- Cherries, grapes require additional time and labor to harvest
- Varieties grown in Florida include:
  - Brown Betty (brown cherry)
  - Mortgage Lifter (giant red slicer)
  - German Johnson (red cherry)
  - Amish Paste (red-orange elongated)
  - Striped Roman (red w/yellow stripes plum)

**Selected chemical composition of heirloom cultivars produced in spring 2007 at Live Oak, FL.**

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Vitamin C (mg/100g)</th>
<th>pH</th>
<th>TSS (°Brix)</th>
<th>TTA (% citric acid)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas Traveler</td>
<td>19.7bc</td>
<td>4.54</td>
<td>4.81cd</td>
<td>0.34bc</td>
</tr>
<tr>
<td>Brown Berry</td>
<td>26.18a</td>
<td>4.32c</td>
<td>5.97a</td>
<td>0.44b</td>
</tr>
<tr>
<td>Cream Sausage</td>
<td>14.66cd</td>
<td>4.22d</td>
<td>5.49c</td>
<td>0.49d</td>
</tr>
<tr>
<td>Juane Flame</td>
<td>17.66cd</td>
<td>4.05d</td>
<td>4.80cd</td>
<td>0.59a</td>
</tr>
<tr>
<td>Nyagous</td>
<td>13.40d</td>
<td>4.7a</td>
<td>5.53b</td>
<td>0.26c</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Field production</th>
<th>Shade house production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas Traveler</td>
<td>19.7bc</td>
<td>26.18a</td>
</tr>
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<td>13.40d</td>
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</tr>
</tbody>
</table>

*Mean separation (in column) by Duncan’s Multiple Range Test (α = 0.05).*

**Taste Test Results of Three Heirloom Cultivars Produced in Spring 2007 at Live Oak, FL.**

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Treatments</th>
<th>Sensory quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Field</td>
<td>Shade</td>
</tr>
<tr>
<td>Tomato flavor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweetness</td>
<td>4.2a</td>
<td>3.6a</td>
</tr>
<tr>
<td>Acidity (sourness)</td>
<td>3.7bc</td>
<td>4.6ab</td>
</tr>
<tr>
<td>Overall preference</td>
<td>5.2a</td>
<td>4.6abc</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tomato</td>
<td>Field</td>
<td>Shade</td>
</tr>
<tr>
<td>Flavor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweetness</td>
<td>5.9ab</td>
<td>3.6a</td>
</tr>
<tr>
<td>Acidity (sourness)</td>
<td>4.6ab</td>
<td>4.6abc</td>
</tr>
<tr>
<td>Overall preference</td>
<td>5.2a</td>
<td>4.6abc</td>
</tr>
</tbody>
</table>

**Take Home Message**

- Recommended varieties for field production:
  - Brown Berry
  - Cream Sausage
  - Juane Flamme
- Recommended varieties for shade house production:
  - Brown Berry
  - Cream Sausage
  - Mortgage Lifter
- Anecdotally I have had good success with:
  - Tommy Toe
  - Yellow Pear
- Heirloom cultivars are suitable for direct market, but none would be suitable for large-scale commercial production.

**Beans**

- Thousands of cultivars with variations in – size, color, markings, and climate adaptability.
- Generally not cross-pollinated.

**Saving Seed**

- Separate plantings by enough distance to avoid vines from intertwining.
- Allow seed to mature thoroughly on the vine.
- Pull the entire plants and place them in shade to dry out for 1-2 weeks.
- Bring inside under a protected structure in case of rains. Shell and store in a cool, dry place. Preferably in paper bags.
- Bean and cowpea seeds keep for three or more years.
Lima/Butter Beans

‘Christmas Lima’ - does well in hot humid climates.

‘Jackson Wonder’ – drought resistant and does well in hot, dry conditions.

Pole, Snap, and Dry Beans

‘Cherokee Trail of Tears’ – these pole beans were carried by the Cherokee Indians on the ‘Trail of Tears’. Pods are purple in color and seeds are black in color.

Pole, Snap, and Dry Beans

‘Greasy Cutshort’ pole beans – these beans have shiny leaves, giving a greasy appearance. They are good for use as snap beans.

Pole, Snap, and Dry Beans

‘Jacobs Cattle’ – Originally from Germany. Pure white beans with deep maroon splashes are produced on 24” plants. Excellent for use in soups and baking.

Peas

• Saving Seed: Peas are handled the same way as beans.
• ‘Calico Crowder’ is a medium sized climbing pea.
• White with maroon splatches.
• Good fresh or dried

‘Pink-Eye Purple Hull’ Pea

• Has cream colored seeds with maroon eyes in pods which turn purple at maturity.
• Vigorous, heat loving and drought tolerant plants with little vining.
Heirloom Potatoes

- Come in different unusual colors, shapes and flavors.
- **Saving Seed**: Heirloom potatoes are saved from year to year as tubers.
- Easy to maintain and stay true to type.

'Russian Banana' Potato

- Fingerling Potato, thought to have originated from Russia.
- Yellow fleshed with waxy texture.
- Medium-sized, lavender-flowered plants are resistant to scab and somewhat resistant to late blight.
- Late maturity, good yield, stores well.

'Yellow Finns' Potato

- Exceptional buttery sweet flavor.
- This is the classic European gourmet potato.
- Good for boiling, mashing, frying or baking.
- Productive plants, tubers are spread out over larger area than most potatoes.
- Excellent keeper, 95-100 days.

'Ruby Crescent Fingerling' Potato

- Origin: Andes Mountains Heirloom.
- Ruby red skin with deep yellow flesh.
- Has small tubers, 2-3” long.
- Excellent grilled, sautéed, deep fried, boiled and roasted.
- Great in salads.

'All Blue' Potato

- Origin: Maybe US or the UK in the late 1900s.
- Very uniform, oblong to oval shape.
- Deep purple skin with netted texture.
- Flesh is purple streaked with white and its defining characteristic, a white ring beneath the skin.
- Excellent for steaming, mashing, microwaving, brightly colored salads. Keeps color when cooked.
- Moderately resistant to late blight, hollow heart, second growth, shatter bruise, PVA, PVM, PVX, PVS.
- Susceptible to PVLR, PVY, common scab, bacterial ring rot, black leg, golden nematode Ro1.

'All Blue Potato'

- Origin: Andes Mountains Heirloom.
Squash and Pumpkins

- Exception to the open pollinated feature of heirlooms.
- Squash and pumpkins readily cross pollinate. Offspring are nothing like the parent plants.
- No cross pollination between different species.
- **Saving Seed:** Grow only one variety of the same species. Separate by ½ mile radius or hand pollinate to maintain seed purity.
- Commonly grown species: banana, buttercup, cushaw and hubbard squash; butternut squash; acorn, crookneck, scallop squash, zucchinis, and most pumpkins.

‘Cushaw Green-Striped’ Squash

- Upto 20" long, and weigh 10-20 lbs.
- The pumpkins have a long curved neck.
- The skin is white with green stripes and has thick yellow flesh.
- Good for pies and baking.
- Drought tolerant and stores well.

Cinderella Pumpkin

- French heirloom pumpkin.
- Fruits are deeply ridged, exceptionally flattened, burnt orange to red, 1-2 feet across, and weigh 25-35 lbs.

‘Connecticut Field’ Pumpkin

- Origin: Grown by the North American Indians prior to European settlement.
- Globe shaped deep orange yellow pumpkins.
- Flesh is yellow, thick, coarse and stringy.
- Good for making canned pumpkin or baking.

‘Small Sugar’ Pumpkin

- An older, smaller variety of the Connecticut Field pumpkin.
- Sweet, tasty pumpkins 9-10" in diameter. 8-10 lbs in weight.
- Good for making pies.
- Deep orange-yellow skin. It is very fine-grained, sweet and sugary, and keeps well.
- Prolific bearer.

Pest Control
**Tobacco Hornworm**
- White diagonal lines on abdomen
- Red dorsal horn on tip of abdomen

**Tomato Pinworm**
- Small caterpillars that cause leaf and fruit damage
- Cause injury similar to leaf miners
- Cause pin size holes in fruit which can lead to secondary infection

**Tomato Pinworm**

**Tomato Fruit Worm**
- Also known as corn earworm
- Prominent yellowish or orangish head
- Body has small dark bumps
- Usually brown and green, sometimes pink, yellow and bronze

**Cabbage Looper**
- 1 to 1.5 inches long
- Thin white lines along the side of body
- Cabbage “loops” when it moves

**Beet Armyworm**
- Beet armyworm originally from SE Asia
- Newly hatched larvae are pale green
- As they mature become darker on top
- Yellow striped armyworm Native to N. America
- Mature larva have dark brown stripe surrounded by 2 yellow bands

**Yellow Striped Armyworm**
Leaf Footed Bug
Stink Bug
- Leaf footed bus have a stripe across elytra
- Stink bugs can be green or brown
- Both are piercing-sucking insects
- Both are usually not a serious problem
- Large populations can cause premature fruit drop and leaf wilting
- Can spread plant viruses

Aphids
- Piercing-sucking insects
- Various colors
- Can cause serious leaf damage
- Leaf necrosis, rolling, stunting, wilting

Insecticides
Nature and the pesticide industry apparently have decided that the best way to poison an animal is through its nervous system.
- Daniel Shankland (1976)

Control
- Caterpillars
  - Bt, Spinosad, Pyrethroids, Acetamiprid, or Carbaryl
- Leaf footed bugs/stinkbugs
  - Again, only a problem in large numbers
  - Pyrethroids, Carbaryl, Malathion
- Aphids
  - Neem oil, Horticultural oils, Insecticidal soaps
  - Neonicotinoids
  - Pyrethroids
  - Malathion

Bt (Group 11)
- Approved for organic production
- Fermented spores and crystalline delta endotoxins of Bacillus thuringiensis
- Stomach activity only, insect must ingest insecticide
- Effective on the caterpillars with high gut pH
  - Good, most of the destructive caterpillars have high gut pH
- Most common strains, Bacillus thuringiensis spp kurstaki and Bacillus thuringiensis spp aizawai
- Causes gut paralysis and ruptures stomach wall
- Only affects larval lepidopteron insects
- Very low mammalian toxicity
- Low impact on beneficial insects
**Spinosad (Spinosyns A&D) (Group 5)**
- Most formulations are approved for organic production
- Generic, many brand names
- It is a fermented metabolite of the bacteria *Saccharopolyspora spinosa*
- Nerve toxin
- Low mammalian toxicity
- Low impact on beneficial insects
- Contact and stomach activity
- Caterpillers (worms), thrips, leafminers, and Colorado potato beetle
- Very low use rates
  - 18-40 grams per acre

**Pyrethrin (Group 3)**
- Most formulations are approved for organic production
- Extracted from chrysanthemum flowers
- Very fast acting, contact activity
- Low mammalian toxicity
- Nerve toxin
- Axonic poison: sodium channel blocker
- Broad spectrum: effective against every known crawling and flying insect
- **VERY HARD ON BENEFICIAL INSECTS**

**Neem Oil**
- Oil from the seeds of the neem tree (*Azadirachta indica*)
- Insect growth regulator, interferes with the juvenile molting hormone
- Very low mammalian toxicity
- Very effective against aphids, scales and other soft body insects
- Has stomach and contact activity
- Low impact on beneficial insects

**Horticultural Oils**
- Similar to neem oil in effectiveness
- Works against aphids, scales and other soft body insects
- Contact activity
- Smother insects
- Low impact on beneficial insects
- **All horticultural oils including neem oil can burn foliage if temperatures are too high**
- Spray in evening or early morning
- Low impact on beneficial insects

**Carbamates (Group 1A)**
- Not approved for organic production
- Derived from carbamic acid
- Only 1 left for homeowner use: Carbaryl sold as Sevin®
- First invented in 1956
- Contact activity, Nerve toxin
- Synaptic poison: cholinesterase inhibitor
- Low mammalian toxicity
  - Mammals can quickly metabolize carbaryl and break it down, insects cannot
  - **Other carbamates can be extremely toxic**
- Very broad spectrum
- **VERY HARD ON BENEFICIAL INSECTS**

**Organophosphates (Group 1B)**
- Not approved for organic production
- Only 1 left for homeowner use: malathion
- Contact activity, Nerve toxin
- Similar to the carbamates: synaptic poison cholinesterase inhibitor
- Low mammalian toxicity
  - Mammals can quickly metabolize malathion and break it down, insects cannot
  - **Most other organophosphates are extremely toxic**
- **VERY HARD ON BENEFICIAL INSECTS**
### Neonicotinoids (Group 4A)
- Not approved for organic production
- Two products for homeowner use: Imidacloprid and Acetamiprid
- Systemic, moves in xylem tissue of plant
- Modeled after natural nicotine
- Nerve toxin
- AChE mimic, targets insects synaptic ganglion
- Moderate mammalian toxicity
  - Neonicotinoids target neural pathway that is more abundant in insects
- CAN BE TOXIC TO BEES DEPENDING ON RATE, TIME OF DAY, AND HOW IT IS APPLIED

### Fungicides
- Copper (organic)
- Sulfur (organic)
- Mancozeb
  - Dithane® and many other brand names
- Chlorothalonil
  - Daconil®, and many other brand names
- All are protectant fungicides
  - Must be applied preventatively
  - Sulfur and chlorothalonil can cause severe leaf burns if applied under very hot conditions
  - Excessive copper application can cause toxic levels to build up in the soil

### Additional Resources
- Southern Exposure Seed Exchange
- Grafted heirloom tomatoes produced in high tunnels
- Growing Bell Peppers under shade
  [http://edis.ifas.ufl.edu/hs368](http://edis.ifas.ufl.edu/hs368)
- UF-IFAS Small Farms website
  [http://smallfarms.ifas.ufl.edu/](http://smallfarms.ifas.ufl.edu/)
- University of Kentucky publication – Heirloom Vegetables
  [http://www.uky.edu/Ag/NewCrops/introsheets/heirloom.pdf](http://www.uky.edu/Ag/NewCrops/introsheets/heirloom.pdf)
Pruning at Planting

Start structural pruning at planting to correct poor structure by shortening upright stems that compete with the leader. This directs future growth into the leader because pruned stems grow slower (Fig. 1). As a result the aspect ratio (branch diameter compared to trunk diameter) is smaller 4 years after pruning (Fig. 2, center) and much smaller 10 years after pruning (Fig. 2, right) making the union strong.

Subordinate left stem 10 years later is much smaller than leader. See close-up of strong union Fig. 2, right.

Figure 1. Prune at planting to reduce all but one upright stem (left). Subordination over 10 years leads to strong unions, and trees that are easy to maintain. One of two stems on the larger tree (right) needs subordination now to correct the weak union halfway up the tree.

Reduction cut slows growth on cut stem. Leader grows faster.

Weak union, both stems same diameter (codominant).

Strong union, one stem smaller than the other.

Figure 2. Before pruning 4 years later 10 years later

Structural pruning starting at planting and repeated as needed leads to strong unions when employed over a 10 year period. Even young (pencil size) stems with the same diameter (or nearly so) as the leader that occur in the top half of the crown should be subordinated or removed. Branches lower in the crown with a large aspect ratio should also be subordinated or removed (Fig. 3).

Figure 3. Prune more from branches that have a large aspect ratio. Some large branches may need as much as 30-60% of their foliage removed. Branches with a small aspect ratio may need little or no pruning because they are not competing with the leader.

Pruning needed not needed

Large Small aspect aspect

Branches with a small aspect ratio need little or no pruning because they are not competing with the leader.
Use reduction cuts where possible on nursery trees to subordinate branches competing with the leader (Fig. 4). Some upright stems and crowded branches can be removed entirely. This directs growth into the leader. Heading cuts may have to be used on small-diameter branches to subordinate growth.

Figure 4. Reduce or remove upright stems (dotted lines) at planting.

Without pruning, codominant stems at the top of recently-planted trees continue to grow. The result is a weak structure on a sizable tree 10 years later (Fig. 5). The aspect ratio remains the same over 10 years (Fig. 6).

Figure 5. Without pruning at planting, both codominant stems grow, resulting in weak structure 10 years later. Contrast with Fig. 1.

Figure 6. Unions with stems of equal diameter (large aspect ratio) are weaker than unions with smaller branches growing from a larger trunk (small aspect ratio). Contrast with Fig. 2.

Thanks to California Department of Forestry and Fire for also supporting this project.
Ed Gilman
University of Florida

**Tree Grading Cue Card**

1. Look inside the crown of the tree at the trunk form.

2. Check branch arrangement.

3. Choose appropriate tree matrix type.
   - **Type 1**: spreading and rounded shapes.
     - ex. live oak, dogwood, black olive, gumbo limbo
   - **Type 2**: pyramidal shapes.
     - ex. river birch, bald cypress, cedar, pine
   - **Type 3**: columnar / upright shapes.
     - ex. "East Palatka" holly, schefflera, italian cypress
   - **Type 4**: vase shapes.
     - ex. crape-myrtle, buttonwood, ligustrum, redbud
   - **Type 5**: oval shapes.
     - ex. red maple, podocarpus, tabebula, dahoon holly

   Refer to the matrix tables in the Grades and Standards when necessary to determine proper root ball size, container size, crown spread, and height.

4. Measure the caliper of the trunk.
   Trunk caliper is measured 8 inches from the ground on trees up to and including 4 inches in caliper, and 12 inches above the ground for larger trees. This measure at 8 1/4 feet (2.5m) is not recommended as an appropriate measurement for nursery trees.

5. Grade the tree based on crown spread.
   If the crown spread does not look proportional to the tree, use the matrix table you selected above along with the trunk caliper measurement to determine the crown spread for the tree.
   For this step select a grade based on crown spread only.

6. Grade the tree according to structural uniformity.

7. Make note of the lowest grade determined in steps 1, 2, 5, and 6.
8. Reduce grade determined in step 7 by one grade if any one of the following is true.
   ✓ Tree with a trunk caliper >1” needs a stake to hold it upright.
   ✓ The root ball or container is undersized. (consult tree matrix)
   ✓ B&B root ball is not properly pinned, tied or wired.
   ✓ Tree is excessively root-bound.
   ✓ Evidence of large roots growing out of container (1/2 trunk diam)
   ✓ Crown is thin and sparsely foliated. (allow for harvesting time of year)
   ✓ More than 5% of branches have tip dieback.

9. Reduce grade determined in step 8 by one grade if two of the following are true.
   If only one is true, do not reduce the grade. However, it takes only one true statement to reduce a Florida Fancy to a Florida #1.
   If more than two of the following are true reduce the grade by two.
   ✓ Tree height is not in proper proportion (consult tree matrix)
   ✓ Flush cuts were made when pruning branches from the trunk.
   ✓ Branch stubs are left beyond the branch collar.
   ✓ Open trunk wounds or other bark injury is evident.
   ✓ Graft unions are not complete.
   ✓ More than the lower 40% of the trunk is free of branches.
   ✓ More than 5% of canopy is chlorotic/pest & disease damaged.
   ✓ Most leaves are smaller than normal.
   ✓ Included bark between main trunks or trunk and major branch.
   ✓ Trunks and/or major branches are touching.

10. Tree is a cull if it has a root greater than 1/10th the diameter of the trunk circling around more than 1/3rd of the trunk in the top half of the root ball.

Important Grading Notes

☞ Remember that grading a tree should be a quick process. Once you are familiar with the process it should only take a few seconds to grade a single tree.

☞ When grading small maturing trees such as crape-myrtle, cattley guava, wax privet, yaupon holly, lignum-vitae, wax myrtle or other small-maturing trees skip steps 1, 2, and 4.

☞ Trunks do not have to be straight to be a Florida Fancy or Florida #1. See drawings for Florida Fancy and Florida #1 in step one.

☞ A trunk dogleg is defined as a significant ‘s’ shaped deformation in the trunk. This is illustrated in the figure to the right. The angle ‘A’ can be no more than 30°. The distance ‘B’ can be no more than the trunk diameter.

This tree grading cue card was provided to you courtesy of the Roots Plus Field Growers Association of Florida

Growing Quality Field-Grown Trees
Consistent root management in the nursery promotes structurally stable and healthy trees in the landscape. Improperly managed root balls can form permanent defects, such as circles and bends on the periphery. Follow these guidelines for managing roots to reduce defects on young trees.

The root ball should be inspected at each shift to a larger container starting with the liner (the young tree in its original container, Fig. 1A). Root pruning on the periphery and bottom of liner root ball removes most defects (Fig. 1B).

Cut a root back to the point just behind the bend (Fig. 2A) to remove the bend. Cutting the root at a point after the bend (Fig. 2B) is less effective because the bend remains. Roots that grow down and around the sides of the liner root ball become woody as they enlarge in diameter (Fig. 3, right). These woody roots retain their original deflected orientation, which can cause health and stability problems for the tree.

Figure 3. A quality root system develops if the roots of liners (see Fig. 1) are properly pruned when the tree is shifted to a larger container (left). A poor root system develops when deformed roots are not pruned during shifting (right).

Pruning a tree’s roots when shifting it to a larger container or before planting it in the landscape improves the root system because it cuts roots back to straight, radial root segments attached to the trunk (Fig. 4). A pruned root ball will be smaller than it was before pruning. Certain types of containers reduce root growth on the periphery of the root ball, so less root pruning may be needed. In some instances, root defects develop further inside the root ball. In these cases, prune root balls deep enough to remove defects.

In the weeks and months following root pruning, new roots grow away from the cut ends in a fanlike manner (Fig. 5). These new roots provide greater stability and should not girdle the tree.

Whether root defects can be corrected depends on their location in the root ball, severity, tree species, water management, size of roots, and time of year. It is easier to cut defective roots when a tree is younger than when it is older (Fig. 6).

Ideally, roots should be inspected and defective roots pruned at each shift to a larger container, reducing the need to heavily prune larger roots.

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Backyard Chickens
By
Randy Gornto
Highlands County Livestock Agent

Deciding whether raising backyard chickens is right for you

- Are you allowed to?
- Can you handle talking with your neighbors?
- Are you willing to give the time and effort?
- Eggs?
- Meat?
- Pet?

What type of chickens?

- Egg Production
- Meat Production

Housing

Feed and Water

Factors that influence
- Age of birds
- Temperature/weather
- Purpose
- Outside sources

Benefits

- Pest Control
- Education factor
- Pet fun factor
- Fertilizer
- Fresh Eggs
- Meat
- Income
- Knowledge of where your food comes from and how it was raised
Cost

- Birds
- Housing
- Feed
- Water
- Time
- Neighbors
- Noise
- Dust
- Predators
- Pest
- Disposal

Questions?

Additional Information

- http://edis.ifas.ufl.edu/an239
- http://edis.ifas.ufl.edu/vm015
- http://edis.ifas.ufl.edu/an182

Thank You
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Cut Arrangements from the Landscape

Janice Hamlin
Manatee County Master Gardener

Living in Florida – land of flowers and exotic plants, one cannot help but be inspired by the beautiful plant materials found in our gardens and along our roadsides. It is easy to cut a beautiful flower or branch and just put it in a vase with water and call it a day. But with a few floral design tips, one can create floral designs that are creative, affordable, and beautiful.

Geometry of Design and Plant Materials

*Traditional flower arrangements are based on geometric forms.*
Cylinder - the shape for straight line arrangements.
Pyramid - basis for most angular arrangements
Sphere - circular arrangements are based on a sphere form

*A floral designer classifies plant materials according to their physical qualities.*
Linear plant materials are used to establish the “skeleton” or basic shape of the design. Some examples of easily found linear plant materials are Aspidistra, Cyperus, Iris foliage, Sabal palmetto, Sansevieria, Beautyberry, Cattails, Liatris, Driftwood or weathered wood.

Round, and colorful, forms are used to create a focal point in the design and add interest. Examples include Roses, Zinnias, Hydrangeas, Ginger flowers, small Succulents, Bromeliad plants, Philodendron leaves. Even though they are not round forms, one might also include flowers with more angular shapes such as Bird of Paradise and Heliconia in this category.

Transitional materials are used to fill in the overall shape and provide interest and added variety in the arrangement. Examples are Ferns, Coleus, Croton, Liatris, Pittosporum and wax myrtle.

Cutting and Conditioning of Plant Materials

Cut materials either early in the day or late in the afternoon. Avoid cutting plant materials during the hottest part of the day.

Once cut, place flowers or foliage in deep water and place in a cool place to “condition”. This step allows cut materials to absorb a maximum amount of water and the cut materials will stay fresh longer. Commercial floral preservatives are readily available and can be used to condition the plant materials. Most foliage can be completely submerged for a few hours. This also helps remove dust or dirt. A finished design will last longer if the water is kept clean and changed each day.

Containers and Mechanics

For a beginner, a wide shallow container is easy to use. Avoid containers with deep and narrow openings. Show examples.

Commercial floral foam, sometime referred to as “oasis” is easy to find and use. Pinholders are effective and a more environmentally correct choice. They can be purchased at craft stores or
floral supply stores. Show examples. Chicken wire can be crumpled and placed inside a deep container. One then places stems through the openings in the wire.

Floral tape is used to hold floral foam in place and can be used to make a “grid” across the openings of a deep container or vase. Floral wire can be used to strengthen a weak stem or to straighten or curve stems.

Making the Arrangement
Decide upon the shape and size of finished arrangement. The inspiration for a design can come from many things – a particular type of flower or leaf, a container, a piece of wood, etc.

Gather appropriate plant materials and condition flowers and foliage. When choosing plant materials, keep in mind the scale and proportion of the plant materials to each other and to the finished size of the design.

Select an appropriate container and decide upon the mechanics that will be needed.

Place the main lines – establish the skeleton of the design.

Develop the focal point of the design. Use round forms and transitional materials to fill in the shape and give interest. Larger flowers and leaves should be placed toward the bottom of the arrangement. Smaller flowers and forms should be placed higher in the design. This will help establish rhythm and balance in the finished design.

Keep the arrangement well watered and enjoy.

Slow Flower Movement
Just like the “slow food” movement, the slow flower movement emphasizes the use of locally and sustainably grown flowers in floral design. Consumers are beginning to ask about the environmental impacts of their flower choices and are learning to appreciate the beauty of plant materials that are local and seasonal to their particular geographical area. What better way to join this movement, than to responsibly grow and design with plant materials from one’s own garden.

Floral Arranging Classes
The Florida Federation of Garden Clubs, Inc. sponsors Floral Design Study Units in both basic floral design and more advanced design. Classes are taught by accredited flower show judges. Many local garden clubs will either sponsor these classes or will be able to direct one to a garden club that has classes.

References
*Your Florida Guide to Perennials*, Sydney Park Brown and Rick K. Schoellhorn
*A Cutting Garden for Florida*, Betty Barr Mackey and Monica Moran Brandies
*The 50 Mile Bouquet-Seasonal, Local and Sustainable Flowers*, Debra Prinzing
Florida Federation of Garden Clubs, Inc., website is: www.ffgc.org
Florida-Friendly Plants for Retention Ponds

Gail Hansen
University of Florida, Environmental Horticulture Department, Gainesville, Florida

Selecting aquatic and shoreline plants for stormwater ponds is more challenging than selecting plants for a typical landscape. The site conditions can vary greatly and are more difficult to control. For example, water depth sometimes fluctuates widely, creating wet and dry conditions, water quality also varies with rainfall and fertilizer inputs, and steep slopes can make plant establishment difficult. The concept of using the right plant in the right place is particularly important in the shoreline environment because the planting area includes a dry slope and a littoral shelf with shallow water and deep water areas. Three questions to ask when selecting plants include: 1) environmentally what conditions does the plant need to grow? Functionally what do you want the plant to do? And aesthetically what do you want the plant to look like?

Growing Conditions

A site inventory and analysis will guide plant choices by noting environmental conditions in the pond and on the shoreline. Conditions that affect plants in aquatic habitats include water depth, fluctuating water levels, foraging fish, soil structure, the slope of the littoral shelf, and light availability. Conditions that affect landside plants include bank slope and soil structure.

Water Depth
Water depth must be considered when choosing plants because wetland plants grow in three different zones with varying water depths. Emergent wetland plants are rooted in the soil in the shallow water of the upper littoral zone with the upper portion of the plant out of the water. Emergent wetland plants are further divided into short-stemmed marginal plants that do well in wet mud or sand and marginal plants that grow on the bank and prefer changing water levels. Submerged plants grow entirely underwater and are typically located in the lower littoral zone where the water is deepest. The floating wetland plants have roots that dangle and are rooted in the pond bottom in the middle littoral zone. Creating deeper areas by excavation can help expand the size of planted areas.

Fluctuating Water Levels
Ponds that have fluctuating water levels present a challenge when selecting plants. The plants need to thrive in both wet and dry conditions, sometimes for extended periods. Emergent plants that are more tolerant of drawdowns (exposed pond soil) include: Pickerel-weed, (Pontederia spp.), Duck Potato (Sagittaria lancifolia), Bulrush (Scirpus spp.), Golden Canna (Canna flaccida), Spike Rush (Eleocharis spp.) and Blue Flag Iris (Iris virginica).

Controlling Grass Carp
Although grass carp (sterile triploid) are sometimes used for biological control of aquatic vegetation they can present problems with new plantings. Grass carp prefer submersed plants, but they also browse on the tips of young tender emergent plants. To prevent loss of new plants install a barricade around the plants, such as four wire fencing or plastic net fencing from the pond bottom to the top of the water until the plants are larger and less tender.
Soil Structure
Soil (substrate) conditions are important for plant growth. Rocky bottoms in the pond are too hard for plant roots to penetrate and muck soil is too soft and unstable to anchor plants. Sandy soil with some organic matter (between rocks and muck) is usually best. Too much organic matter can create high levels of acids, methane, ethylene, and alcohols which are toxic to plants.

Slope of Littoral Shelf
Steep slopes, that create excessive changes in water levels and growing conditions make establishment more difficult. It is important to determine the average water level along the shoreline on a yearly basis because many plants will die if they are too wet or too dry for long periods. Manipulating the depth and slope with grading is one of the best ways to encourage plant growth. Littoral zone width often increases as the pond gets older because increased sedimentation and water movement decreases the depth of the lake.

Slope of Pond Bank
The slope of the bank leading to the water’s edge can present challenges for the establishment of the no-mow or no-maintenance zone. Several techniques can be used to prevent erosion and capture irrigation water for the slope plants. Installing mini-baffles (landscape timbers or bio-logs) on the downhill side of plants will hold water and keep soil from eroding. Porous landscape fabric such as burlap or jute will also trap sediment and water. Rip rap made from stone, concrete rubble or pavers can help slow water runoff at out-falls, and creating swales and berms along the bank will intercept and slow water movement allowing it to percolate.

Light Availability
Light availability is the most important factor in plant growth and is primarily determined by water clarity and depth. Water clarity is determined by organic color and suspended particles, both organic and inorganic. Bottom feeding fish such as carp and catfish can increase suspended sediment which blocks light and may limit plant growth. Slowing surface runoff with plant buffers and no-mow zones and using rip-rap at drain discharge areas will help decrease turbidity caused by water movement. Nutrient levels in ponds, both soil and human-caused, can affect light availability by increasing algal growth which decreases water clarity.

Function
When selecting plants it is important to consider the function of the plants for that particular site. Functional characteristics include density of foliage to block views, density and depth of root mass to prevent erosion, density of stalks to buffer water movement, and ability to take up nutrients and pollutants to improve water quality.

Erosion Control
Trees in the water at the pond edge can help control erosion by breaking up the wind and wave action that contributes to shore erosion. Large trees that do well in wet conditions include: Red Maple (Acer rubrum), Loblolly Bay (Gordonia lasianthus), and Bald Cypress (Taxodium spp.). Strongly rooted emergent plants also help prevent erosion by blocking the wave action that undermines landside plant roots. Emergent plants include: Bulrush (Scirpus spp.), Spike Rush (Eleocharis app.), Pickerel weed (Pontederia cordata), and Duck Potato (Sagittaria lancifolia).
Aesthetics

Most people enjoy a variety of color, texture, and forms to create a pleasing composition that enhances the aquatic habitat. In aquatic environments people generally prefer plants that grow in clumps with large, coarse textured green foliage and colorful flowers. Aesthetically they also prefer plants that don’t block the water view, are neatly organized in the landscape through repetition and have a less weedy or messy look.

Color
Color is usually the most attractive visual characteristic of plants, but it also is the most fleeting, as most plants only display prominent color during short bloom periods. Light qualities of the site—sunny or shady areas—affect the perception of color. Warm colors such as white, yellow, orange, and red show up more in aquatic and shady environments because they contrast with the darker blues, greens, and browns of water and foliage. Cool colors such as blues and dark purples are less noticeable because they tend to blend with greens. Including a variety of greens in the aquatic plants will create interest year-around.

Texture
Textures are typically described as coarse (large, broad leaves and big stems) medium (average leaves and stems), or fine (tiny leaves, thin stems). Texture can provide contrast and interest, particularly when there is a lack of variety in color. Stormwater ponds are often viewed from a distance so bold textured plants with large, broad leaves and big flowers show better. Use a fine textured plant, such as a grass, to contrast with the bold texture and provide more interest.

Form
Growth habit or form is the most recognizable quality of a plant. Choose the plant form most appropriate for the desired function. It is important to remember that plants change over time as they grow. Form also helps determine if plant material should be used in masses or as individual specimens. In large open areas such as ponds large upright plants with well-defined leaves that grow in large clumps are often preferred. Floating plants with broad flat leaves, such as water lilies, work well as long as they don’t spread and cover the entire pond surface.

Size
It is important to consider the size of the plant when it is fully mature. Tall plants can sometimes block views when they are mature so consider height as well as spread. The slope to the water affects the visual height of the plant depending on the location of the plant on the slope. Tall plants at the top of the slope will block the view of the water so locate low growing plants at the top of slope and taller plants at the bottom.

Recommended Plants
Although Florida-Friendly plants include native and non-native plants the plants recommended for the water edge zone are natives, which are required by Florida regulations for planting in water bodies. Native plants are not required on the bank slope zone but the recommended plants typically do well on dry slopes. Generally the plants in Table 1 were selected for their foliage size, variety of textures, flower color, growth habit and height, survivability in varying water depths, ability to withstand wet and dry conditions, and ability to grow in a wide range of zones.
<table>
<thead>
<tr>
<th>Water Edge Zone</th>
<th>Height</th>
<th>Light</th>
<th>Water Depth</th>
<th>USDA Zone</th>
</tr>
</thead>
</table>
| Blue Flag Iris  
*Iris virginica*                 | 2 ft.  | partial shade    | moist to wet; water edge    | Zones 8b-11   |
| Duck potato  
*Sagittaria lancifolia*        | 3 ft.  | full sun to partial shade | 6-12”                | Zones 6-10    |
| Fragrant Water Lily  
*Nymphaea odorata*               | floating | full sun to partial shade | 30-36”             | FL Statewide  |
| Golden canna  
*Canna flaccida*                | 3 ft.  | full sun to partial shade | 12-18”               | Zones 8-10    |
| Pickerelweed  
*Pontederia cordata*            | 3 ft.  | full sun to partial shade | 6-18”                | Zones 3b-10   |
| Sand Cord Grass  
*Spartina bakerii*              | 4 ft.  | full sun          | dry to wet; water edge      | Zones 8b-11   |
| Spikerush  
*Eleocharis cellulosa & interstincta* | 2.5 ft. | full sun to partial shade | 6-12”                | FL Statewide  |
| Swamp lily  
*Crinum americanum*             | 2 ft.  | partial shade     | 3”                         | Zones 7-11    |

<table>
<thead>
<tr>
<th>Bank Slope Zone</th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| African Iris  
*Dietes iridioides*             | 3 ft.  | full sun to partial shade | dry to wet           | Zones 8b-11   |
| Blue Mistflower  
*Conoclinium coelestinum*        | 2 ft.  | full sun to partial shade | moist               | Zones 4-11    |
| Blue Porterweed  
*Stachytarpheta jamaicensis*     | 2 ft.  | full sun          | dry to moist               | Zones 9-11    |
| Fakahatchee Grass  
*Tripsacum dactyloides*         | 4 ft.  | full sun to partial shade | dry to moist          | Zones 8-11    |
| Florida Gamagrass  
*Tripsacum floridanum*          | 3 ft.  | full sun to partial shade | dry to wet            | Zones 8-11    |
| Muhly Grass  
*Muhlenbergia capillaris*        | 3 ft.  | full sun          | dry to wet                | Zones 7-11    |
| Passion Vine  
*Passiflora incarnata*          | 0.5 ft. (GC) | full sun | moist               | Zones 8-11    |
| Scorpion Tail  
*Heliotropium angiospermum*      | 1.5 ft. | full sun to partial shade | dry                | Zones 10-11   |

References


A visually appealing edible landscape is created from the artful combination of edibles and traditional ornamentals in the garden. Although basic design principles apply, the substitution of edible plants for ornamental plants can present some challenges and opportunities. The principal challenge is maintaining a healthy looking garden year-around with the short life span of most edibles. The key to making gardens last is to mix evergreen ornamentals, flowers, and traditional short-season edibles with long-season edibles and non-traditional edibles such as berry shrubs, fruiting trees, and ground covering herbs. The large varieties of new edibles on the market provide opportunities to select edible plants for their aesthetic appeal as well as their taste appeal. New varieties offer compact sizes, dramatic foliage and irregular forms, showy colors with stripes, variegated leaves, and colorful stalks and unique fruits and vegetables with unusual forms and colors.

When designing the landscape arrange edibles following the same design principles used to organize shrubs, annuals, and perennials. Start with a design style or theme to guide the layout, which can be formal, with straight edges and geometric shapes, or naturalistic, with meandering edges and organic shapes. Use a variety of textures and sizes, including vertical height, for interest, and repeat plants for unity. A color scheme can also be used to unify the landscape by choosing harmonious colors and repeating them throughout the garden. It’s important to remember your edible garden is not a production food garden- the goal is not to produce as much produce as possible- rather the goal is to produce enough edibles of high quality and variety to make the effort worth it.

Although design basics for edible ornamental landscapes are essentially the same, there are a few details that will ensure the success of the landscape. Gardens that change considerably with the seasons rely more on an organized, yet interesting layout, appealing support structures, functional pathways, and colorful containers and planters to provide interest and beauty when the plants are not taking center stage. There are ten important things to consider when creating a successful edible ornamental garden.

Ten ideas to create an edible landscape

1. Combine reliable, low maintenance ornamentals with edible plants. Use evergreen ornamentals in the same way that they are used in a typical landscape- to maintain enough green structure in the landscape so cool season bare areas are not noticeable. A colorful mix of landscape plants, trees, flowers, herbs, and vegetables will help maintain the planted appearance all year.

2. Use support structures for aesthetic appeal and proper growing practices. Tomato cages, trellises, arbors, pole supports, teepees, and espaliers are some of the structures that can be used to support plants and provide beauty. Use structures that are designed to stand on their own as decorative features. Well-built structures with architectural details can provide visual appeal in place of plants in slow seasons. Structures can also provide organization to the garden, keeping plants neat and easy to care for. Use them to create comfort zones with
shade and seating in the garden, and provide opportunities for color and art in the garden. Think of unique and different ways to repurpose materials and build sustainable structures.

3. Containers keep the garden neat and provide interest with color and texture. Planters keep plants within reach, make the soil easier to amend, and provide more protection from slugs, snails, and trampling. Unusual containers and planters can set a style or theme for the garden. A garden dining table with a planter down the center allows diners to clip and eat their own salad at the table. Use containers that drain properly and won’t absorb heat unless you want plants to get an early start in cooler weather. A colorful, well-designed compost bin can be centrally located for easy access.

4. Create hard edges on the beds to keep the garden neat and organized. Garden walls, edging, wattle, borders, curbing, and raised planters can organize the space and help maintain a clean appearance, especially when plants are starting to fade. Edge elements can be made from typical materials such as brick, stone, pavers, and concrete, or from recycled materials such as twigs, wine bottles, street signs, bowling balls, and used timber.

5. Use pathways to link and organize the planted areas, and provide easy access to the plants. Pathways act as a wide border to separate beds and create a clean edge. A variety of materials, including brick, pavers, gravel and mulch will allow water to drain. Landscape fabric under gravel or mulch will keep weeds down and allow water to drain.

6. Create visually pleasing combinations using color, texture, form, and size. Follow standard design principles by using a color theme, mixing coarse, medium, and fine textures for contrast, creating interest with a variety of forms, and selecting plants that will fit in the space allowed. Plants that overflow their boundaries become a maintenance problem and add to an unkempt appearance.

7. Start small and keep it simple. Begin with one small bed or several containers and play with different plants and combinations. A small area with one structure, such as an arbor can serve as support for several plants and keep plants corralled in a defined space.

8. Use gardening and growing techniques to create interest in the garden. Cloches, melon nets, shade houses, cold frames, and even hay bales can be used as aesthetic elements that also extend the growing seasons and improve plant health. Top a hay bale with a thin layer of good top soil and start lettuce, tomato, and pepper seeds in the soil. The plants will draw nutrients for the hay which will also improve the soil beneath it as it breaks down.

9. Select visually appealing, easy to grow plants you most want to eat. Also consider plants that are not readily available at the local farmers market. Think beyond the standard edibles; include fruit trees, lemon grass, berry bushes, and edible flowers that provide color to the garden and color to your plate. Choose double-duty plants such as blueberry shrubs for a hedge and strawberries for a great groundcover.

10. Don’t get rid of plants too quickly- let them live out their life cycle but choose plants with leaves that hold up for the entire growing season. Let plants go to seed, allow some plants to grow larger, such as rainbow chard, just for the looks, and some plants to grow longer, such as dill and chives for their flower.
**Unusual and aesthetic edibles**

Some edibles are beautiful plants that have the aesthetic qualities of many perennial ornamentals. Many tropical edibles are more useful for spices and flavorings and may require special harvesting and care.

<table>
<thead>
<tr>
<th>Front Yard Edibles (Zones 8 to 10)</th>
<th>Tropical Edibles (Zones 10 to 11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artichokes (<em>Cynara scolymus</em>)</td>
<td>Coffee (<em>Coffea arabica</em>)</td>
</tr>
<tr>
<td>Corn (<em>Zea mays</em>)</td>
<td>Fig (<em>Ficus carica</em>)</td>
</tr>
<tr>
<td>Kale (<em>Brassica oleracea</em>)</td>
<td>‘Meyer’ lemon (<em>Citrus limon</em>)</td>
</tr>
<tr>
<td>Lettuce (<em>Lactuca sativa</em>)</td>
<td>Naranjilla (<em>Solanum quitoense</em>)</td>
</tr>
<tr>
<td>Peppers (<em>Capsicum annuum</em>)</td>
<td>Orangeberry (<em>Glycosmis pentaphylla</em>)</td>
</tr>
<tr>
<td>Sweet Bay (<em>Laurus nobilis</em>)</td>
<td>Tree Tomato (<em>Cyphomandra crassicaulis</em>)</td>
</tr>
<tr>
<td>Chard (<em>Beta vulgaris</em>)</td>
<td>Yerbea mate (<em>Illex paraguariensis</em>)</td>
</tr>
<tr>
<td>Basil (<em>Ocimum spp.</em>)</td>
<td>Australian Finger Lime (<em>Citrus australasica</em>)</td>
</tr>
<tr>
<td>Sage (<em>Salvia officinalis</em>)</td>
<td>Cinnamon (<em>Cinnamomum zeylanicium</em>)</td>
</tr>
<tr>
<td>Eggplants (<em>Solanum melongena</em>)</td>
<td>Rose Apple (<em>Syzygium jambos</em>)</td>
</tr>
<tr>
<td>Bluberries (<em>Vaccinium spp.</em>)</td>
<td>Sugar Cane (<em>Saccharum officinarum</em>)</td>
</tr>
<tr>
<td>Lemon Grass (<em>Cymbopogon citratus</em>)</td>
<td>Sunquat (*Citrofortunella ‘Sunquat’)</td>
</tr>
<tr>
<td>Paddle Cactus (<em>Opuntia ficus-indica</em>)</td>
<td>Banana (<em>Musa species</em>)</td>
</tr>
<tr>
<td>Passionflower (<em>Passiflora spp.</em>)</td>
<td>Avocado (<em>Persea americana</em>)</td>
</tr>
<tr>
<td>Rosemary (<em>Rosmarinus officinalis</em>)</td>
<td>Calamondin Orange (<em>Citrofortunella</em>)</td>
</tr>
<tr>
<td>Beans (<em>Phaseolus, Vicia, and Vigna spp.</em>)</td>
<td>Citrumelo (<em>Citrus x paradise x Ponciris trifolia</em>)</td>
</tr>
<tr>
<td>Pineapple Guava (<em>Feijoa selloana</em>)</td>
<td>Kumquat (<em>Fortunella spp.</em>)</td>
</tr>
</tbody>
</table>

**References**


Getting Master Gardeners Engaged with Community Outreach

Doris Heitzmann
Community Outreach Coordinator Florida-Friendly Landscaping Program™, UF IFAS Extension, Pinellas County, Largo, Florida

This class provides Master Gardeners an overview of how the Florida-Friendly Landscaping™ (FFL) Program brings education to Community Associations and how Master Gardeners can assist in supporting the numerous benefits provided by following FFL Principles.

**What is FFL community outreach and who is their target audience?**
FFL community outreach provides valuable expertise and instruction to: board of directors, property managers, landscaping committees and architectural review committees of community associations which include mobile home parks, homeowners associations, condominium associations, civic and neighborhood associations.

**What is the objective of FFL community outreach?**
The immediate objective is water conservation in the landscape with a long-term goal of fostering an environmentally responsible behavioral change of the decision makers based on the principles of Florida-Friendly Landscaping™.

**What makes community outreach different from educating individual homeowners?**
Community associations, even if receptive to the FFL concept, are not able to make decisions or to change landscaping practices in an instant. There is a process that needs to be followed by the decision making group that includes acknowledging the necessity of change, multiple benefits from changing landscape practices and any cost associated with current landscape maintenance practices. The board of directors has to determine if funds are available and has to approve any project that is taken on.

**What is considered success?**
**Short-term:** Communities who adopt one or more principles of FFL can be considered a success. Applying mulch for instance or watering efficiently are two good examples. A newly installed FFL that is attractive and functional is a success. Visual improvements to the landscape of common areas probably have the biggest impact on the community and are an excellent example of successful outreach.

**Long-term:** Residents taking ownership of their community FFL (common areas) by getting involved in landscape projects contributing added value to the community. Other long-term successes may include reduction in water bills as well as decreased fertilizer and pest control applications that may reduce costs.

**How do you identify opportunities and what are the steps Master Gardeners can take?**
**Lead by Example**
- Setting daily examples by practicing the nine principles of FFL.
- Maintaining your own landscape, making sure that it looks appealing to the neighbors at all times.
- Following the FFL Best Management Practices from design, plant installation and accurate plant spacing to properly maintaining your own yard.
Be Informed
- If living in a Deed Restricted Community familiarize yourself with the effects of Florida Statute 373.185.

Get involved
- Volunteer to improve the landscape of your community common areas.
- Invite the FFL Coordinator of your respective county to attend organizational meetings for the purpose of introducing the FFL program, sharing expertise and making recommendations.
- When attending community meetings support FFL Coordinator's justifications and recommendations.
- Throw your hat in the ring. Run for a board of directors’ position or join or form a landscape committee.
- Offer to support a Neighborhood Newsletter with lawn care and gardening tips based upon FFL Principles.

How does understanding the role of decision makers and committee members make a Master Gardener’s support more effective?
Communities’ decision makers are equipped with various levels of knowledge on how to govern a community association. They might present diverse and conflicting interests and may not be ready to take on landscaping recommendations and changes right away. Supporting FFL education and reassuring them that FFL guidance remains available provides a Master Gardener a unique opportunity to support FFL outreach efforts. Remember, your initiative is important and should be built upon.

Conclusion
Prompt action and immediate results from educational outreach efforts seldom occur in a short period of time. Patience and perseverance are key characteristics for successfully working with community associations and your support is valued and much appreciated.
Preserving What You Produce: Keeping It Safe Short & Long Term

Mary Keith, PhD, LD Extension Agent IV
Univ of Florida IFAS/Hillsborough County Extension

Objectives:
- Participants will understand:
  - How to keep produce safe from garden to table.
  - The factors affecting the safety of home canning procedures.
  - Critical steps in home canning procedures
  - The importance of using reliable home processing methods and recommendations
  - What can or cannot be changed in a procedure without affecting the safety of the food.

Basic Handling
- Wash, wash, wash!
- Humid but not damp
- Refrigerate
- Perfection is over-rated
- Preservation options

What to Wash
- Hands! Your 10 fingers are all carriers.
- Harvesting and work equipment
  - Knives and shears
  - Baskets and trugs

What to Wash
- Produce – wash just before you use it
  - Brush off visible dirt.
  - But keep it dry until use.
  - Water promotes bacterial and mold growth.
- Use potable water - water from hoses can be stagnant, stale, contaminated...

Humid but Not Damp
- Keep it crisp.
  - Make it hard for bacteria to get in.
  - Use the crisper drawer.
- Drops of water allow bacterial and mold growth.
- Do not seal bags.
  - Build-up of ripening gases speeds internal spoilage.
REFRIGERATE
- Keep the refrigerator between 34° and 40°F.
- Cold enough to slow bacterial and mold growth.
- Not cold enough to cause ‘cold chill injury’.

PERFECTION IS OVER-RATED!
- Shape doesn’t indicate flavor or nutrition.
- Mold or decay can be trimmed from FIRM produce.
- Soft produce with decay or mold should be discarded.
  - Toxins can migrate further.

PRESERVATION OPTIONS
Freezing
- Blanching stops flavor changes.
- Blanching holds color better.
- As long as the freezer stays on the food is SAFE.
- But quality can suffer.
  - Time
  - Packaging
  - Temperature variations

PRESERVATION OPTIONS
Canning
- Boiling Water Canning is safe for
  - Fruits
  - Pickles, quick or fermented
  - Jams, jellies, sweet preserves
  - Tomatoes – WITH added acid
- Pressure Canning is ABSOLUTELY NECESSARY for Vegetables, meats and seafood.

CLOSTRIDIUM BOTULINUM
- Produces a neurotoxin.
- Only grows in an AIR-FREE environment – as inside a sealed jar.
- Will not grow in the presence of acid pH less than 4.6.
- Produces heat-resistant spores.

QUALITY IN HOME CANNED FOODS
- Color
- Texture
- Flavor
- Nutrition
- Can be safe but bad quality.
- Can be unsafe but look or smell good.
- We want both safety and quality!
### The Steps of Home Canning

- Food is
  - Prepared
  - Packed into glass canning jars
  - Closed with 2-piece canning lids
  - Processed
    - Boiling water bath
    - Pressure canner
  - Cooled, labeled, stored

### Processing

- Method depends on the food
- Must be hot enough
- Long enough
- To remove air from jar (maintain quality)
- To inactivate enzymes (maintain quality)
- To kill spoilage bacteria
- To kill pathogens (C. bot)

### What Affects Processing?

- How the food was packed
  - Raw – put in jar raw
  - Hot – cooked before put in jar
- Size of pieces
- Tightness of packing
- Acid
- Fat, bones
- Starch, thickeners
- Amount and type of liquid

### Packing

**Raw Pack**
- Sliced, diced, etc
- Put in jar
- Hot liquid added
- Faster
- Easier
- More air left in tissues
- May get poorer quality long term

**Hot Pack**
- Sliced, diced, etc
- Pre-cooked
- Put in jar, add liquid
- Softer
- Get more in jar
- Hot all ready
- Less air left in tissues
- Often better quality

### Acid

- Affects whether bacteria can grow.
- Affects how fast heat will kill bacteria.

- **DO NOT REDUCE OR OMIT ACID.**
- **DO NOT CHANGE PROPORTIONS** of acid to low-acid ingredients.
- **DO NOT CHANGE ACIDS** unless recipe offers options.
  - Lemon juice, vinegar, ascorbic acid are not equal.

### Packing

Softer pieces will pack more tightly.

Smaller pieces will pack more tightly.

Distribute food into specified number of jars.

Because if it’s packed too tightly

**HEAT WON’T PENETRATE AS FAST.**

**FOLLOW PACKING DIRECTIONS!!**
FLAVORS

- If it’s too sour, add a little sugar.
- Okay to change seasonings.
- Okay to add spices (e.g., cinnamon to blueberries).
- Okay to omit spices (e.g., no mustard seed).
- Okay to change the herbs in tomato sauce.

- But do NOT change the vegetable:tomato balance, or amount of vinegar or salt in pickles.

TOMATOES

- On the line between acid and low acid
- Acidity can vary depending on
  - Variety
  - Soil, moisture
  - Sun, temperature when picked
  - Ripeness
  - If frosted.

- ADD LEMON JUICE
  - 1 Tbsp per pint, 2 Tbsp per quart

THICKENERS

- Starch will slow heat penetration.
- Don’t thicken with starch or flour.
- Don’t add rice or pasta to soups.
- Some products such as pumpkin pie filling recipes have been removed from directions because they’re too thick.

- EXCEPTION: ClearJel® for some pie fillings.

STANDARD CANNING JARS

- Made for multiple uses.
- Made for multiple heating and cooling cycles.
- Have standard thread angle.

- Non-canning jars may crack.
- Wider jars might not give correct heat penetration.
- Lids might not fit exactly.

PREPARING JARS

- Jars for jams, jellies, sweet preserves or anything that only needs 5 minutes processing in boiling water must be PRESTERILIZED.
- This is by boiling empty jars, upright, in water to cover, for 10 minutes.

- All other products only need clean, warm jars. They will be sterilized during processing.
- Prepare lids according to package directions.

2-PIECE CANNING LIDS

- History of reliable use.
- Easy to tell if sealed.
- Can only be used once.

- Non-standard lids are more difficult to see seal.
- “Re-usable” may have more failures.
HEADSPACE
- Space between food/liquid and lid.
- Depends on the food and process method, how much food will expand in jar during process.

In general:
- Jams, jellies, preserves ¼"
- Fruits, pickles, tomatoes ½"
- Vegetables 1"
- Meats, seafood 1 to 1¼"

Pack food in jar.
Add liquid.
Remove bubbles.
Add/remove liquid to adjust.
Tighten lids just finger-tight.

Too little space – jar may not seal.
Too much space – food may darken.

BOILING WATER CANNER
- Any kettle
- Deep enough for jars
- With 2 inches of water above jars
- And rack under jars
- Plus room to boil.

Rack protects jars from heat shock against metal pot.

FILLING THE CANNER
- Don’t let jars or food cool before going into canner.
- Water in canner should be approximately the temperature of jars of food.
  • Jelly boils at 220°F, so water should be boiling.
  • Hot pack water can be simmering.
  • Raw pack water should be warm.
- Jars should not touch each other or canner.
- When canner is full, turn up the heat!

PROCESSING
- Process time starts when WATER REACHES A FULL ROLLING BOIL.
- Process for specified time for your product.
- If boil stops for more than 1 minute – START TIMING OVER AGAIN when back to boil.
- Adjust times for higher elevations.

AFTER PROCESSING
NEW – CHANGE!
- When time is up, remove canner from heat.
  ALLOW JARS TO SIT IN CANNER FOR 5 MINUTES.
- Remove jars from canner to towel or tray.
- Allow to cool overnight.
- REMOVE RINGS/SCREW BANDS.
- Label and date.
- Store cool, dark for best quality.
PRESSURE CANNERS

- Properly operated will reach 240°F at 10 psi.
- Must be able to hold at least 4 qt jars.
- Too small will heat and cool too quickly.

PRESSURE CANNING

- Only need 3 inches of water.
- MUST EXHAUST OR VENT THE CANNER.
  - Close lid, but not vent
  - Allow to blow steam
  - When feel steady stream
  - Time for **10 minutes**
  - Then close vent or place weight
  - Start timing when at 10 psi

Air insulates. Must remove all air to reach 240°F.

TYPES OF PRESSURE CANNERS

- DIAL GAUGES
  - Pressure Indicators
  - Operator is regulator
  - Check yearly for accuracy.

- WEIGHTS
  - Pressure Regulators
  - 1 or 3 piece models
  - May rock, rattle, hiss
  - Not interchangeable
  - Know how your canner operates!

PRESSURE CANNING

- Adjust time or pressure for elevation.
- Must maintain pressure for full time.
- START TIMING OVER if drops for >1 minute.
- When time is complete remove from heat.
- ALLOW TO COOL NATURALLY!
  - Shortened cooling time allows bacteria to survive.
  - Quick cooling can break jars or prevent sealing.

AFTER PROCESSING

NEW – CHANGES!

- When time is up, remove canner from heat.
- WAIT 2 MINUTES.
- Open vent or petcock.

ALLOW JARS TO SIT IN CANNER FOR 10 MINUTES.

- Remove jars from canner to towel or tray.
- Allow to cool overnight.
- REMOVE RINGS/SCREW BANDS.
PECTIN-THICKENED PRODUCTS

- Regular pectin requires both acid and sugar, cannot reduce either one and get good texture.
- "Long cook" method concentrates natural sugar and pectin, yields about same calories.
- Specially purified pectins can use less sugar.
- But sugar is preservative -
  - For color – may darken faster
  - Might have shorter shelf life
- Follow the recipe!

SUMMARY - ALL THESE AFFECT SAFETY

Preparation
- Raw or Hot pack
- Piece size
- Jar type, size
- Processing
  - Boiling or Pressure
  - Elevation
  - Cooling/holding
  - Storing
- Acid
- Acid/low acid balance
- Thickeners, viscosity
- Sugar
- Fat
- Bones

Don’t risk botulism or wasted food by altering them.

SUMMARY - THESE CAN BE ADJUSTED

- Spices
- Seasonings
- Herbs
- Sugar – slightly, except with pectin
- Salt – except in pickles

RELIABLE RESOURCES

- USDA Guide to Home Canning, 2009
  http://nchfp.uga.edu/publications/publications_usda.html
  • Available on-line
  • For Sale by Purdue University: The Education Store
    http://mdc.itap.purdue.edu
- University of Georgia National Center for Home Food Preservation website
  http://nchfp.uga.edu
  • Fact sheets
  • Videos
  • So Easy to Preserve – includes canning, freezing and drying
- Check with your local Extension office.
  http://edis.ifas.ufl.edu
- Hillsborough County website:
  http://hillsboroughnutrition.ifas.ufl.edu/CanningFreezing

THANK YOU VERY MUCH!

Mary Keith, PhD, LD
Extension Agent IV, Foods, Nutrition & Health
University of Florida IFAS/Hillsborough County Extension
mkeith@ufl.edu
SAFE PRODUCE HANDLING FROM YOUR GARDEN

Mary Keith, PhD, LD Hillsborough County, Food, Nutrition and Health Agent IV

WASH, WASH, WASH

Wash HANDS - People carry many bacteria.

Wash HARVESTING EQUIPMENT - Knives, shears, baskets, trugs.

Wash PRODUCE ONLY if it’s dirty, Otherwise just brush it clean. Especially things that grow on ground. Keep it as clean and dry as possible.

Wash most produce just before you use it. Water on it will make it spoil faster so keep it dry in the ‘fridge.

Use potable water, hoses can be iffy.

HUMID, NOT DAMP

Store fresh produce so that it can hold its natural crispness—in a crisper drawer.

Limp, wilting produce allows bacteria to enter stomata or cut veins.

Dampness allows bacteria and molds to grow.

Do not tie plastic bags shut. Keep open, or use paper bags.

PERFECT IS NOT NECESSARY

Misshapen produce is okay to use!

Trim bruised, diseased spots from firm produce. Trim more than just the obviously diseased area.

Soft produce such as tomatoes, berries or cucumbers with mold should be discarded.

Green on potatoes is toxic. Peel it all off.

REFRIGERATE

Bacteria and molds grow more slowly in the cold, 34° to 40°F.

PRESERVATION

Blanching before freezing improves texture and flavor.

As long as the freezer stays on the food will be safe, but quality may suffer.

ONLY use reliable canning directions, preferably the USDA 2009 Guide To Home Canning or University of Georgia’s So Easy to Preserve, or our website http://hillsboroughnutrition.ifas.ufl.edu/CanningFreezing
Backyard Plant Phenology: Citizen Science in a Changing Environment

George R. Kish

Florida Master Gardener Conference
October 2, 2012

Florida Friendly Landscapes?

Backyards as Habitats

Ecology Concepts

• Ecosystem – interacting network of living and non-living components
• Community – association of different species living and interacting in the same local area (habitat)
• Habitat – where “critters” live
• Biological Diversity – number and variety of species – important for sustaining the function of plant and animal communities

Benefits of Backyard Habitats

• Saves time, money, water and other resources
• Raises property values
• Maintain essential bond between people and nature – foster a sense of stewardship for the land
• Learning opportunities for students of all ages
• Aesthetics, contentment, serenity, spirituality

Need?

• Rapid population growth - urban expansion and development
• Habitat destruction – wild places lost to urban and residential land uses
• Habitat fragmentation into patches – decreases biodiversity
Fragmented Ecosystems in Subdivisions

- Challenge – incorporate natural elements into home landscapes (mini-ecosystems)
- Connecting habitats with neighbors (patch reversal)

Community ButterflyScaping

Built It

- Native plants and animals have co-existed for thousands of years
- Right plants - best suited to your Florida yard's conditions (Florida Friendly)
- Less maintenance, watering, and chemicals

They Will Come

- Blooming flowers plants attract pollinating insects
- Host plants are food sources for larval stages of butterflies and moths
- Fruits, seeds, nuts, and insects for birds

Timing of Berries for Birds

<table>
<thead>
<tr>
<th>Fruiting Shrubs</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
<th>Summer</th>
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<tr>
<td>Beautyberry</td>
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<tr>
<td>Elderberry</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>Highbush Blueberry</td>
<td>X</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Hollies (dahoon, yaupon)</td>
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<tr>
<td>Pokeweed</td>
<td>X</td>
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<td>X</td>
<td></td>
</tr>
<tr>
<td>Virginia Creeper</td>
<td>X</td>
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<td>Walter Viburnum</td>
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<tr>
<td>Wax Myrtle</td>
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<td></td>
</tr>
<tr>
<td>Wild Coffee</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Use Insecticides With Caution

- Very important for the health of your garden visitors – reduce or eliminate insecticides
- Insecticides reduce insect availability
- May poison wildlife that consumes them shortly after application
- By using native plants, most pest problems will take care of themselves naturally - -
- Think Ecosystem
**Phenology**

Timing of life-cycle events of plants and animals: causes and consequences

- Ideal for Citizen Scientists
  - Easy to observe
  - Sensitive to environmental variation
  - Scales from ‘ground to globe’

**Phenophase**

- Life cycle event
- Unfolding of first leaf, flowering, fruiting, animal migration, emergence, growth stages, breeding, nesting, hibernation, etc.

**Importance of Timing**

- Health (allergens and infectious diseases)
- Recreation (birding, fall colors)
- Agriculture (planting and harvest times, pest management)
- Natural resources management (water and timber)
- Hazards (monitoring and prediction of drought and fire risk)
- Conservation (abundance and diversity of plants and animals)

**A National Network of Integrated Phenological Observations Across Space and Time**

- to understand how plants, animals and landscapes respond to environmental variation and climate change
- to facilitate phenology science and research
- to conduct education and outreach

**Acer rubrum (red maple)**

- Small to large deciduous tree
- Leaves – opposite, simple, 3-5 lobed, serrate margins; upper surface green, lower surface gray to white
- Petioles and central veins are red
- Habitat - wetlands

- National plant and animal phenology observation program
- Thousands of citizen scientists observing plants and animals
- To understand biological responses to climate change and other environmental changes

usanpn.org
Example 1: January 10, 2012

*Acer rubrum* – open male flower (reproductive parts are visible)

Photo courtesy of Ellen Denny, Yale University

Example 2: January 10, 2012

*Acer rubrum* – open female flower

Photo courtesy of Ellen Denny, Yale University

Example 3: Observation Date January 21, 2012

*Acer rubrum* – Breaking leaf bud

- green tip is visible at the end of the leaf bud, but before it has fully unfolded to expose the petiole

Photo courtesy of Ellen Denny, Yale University

Example 4: February 28, 2012

*Acer rubrum* – Leaves (unfolded leaves and petiole are visible)

Photo courtesy of Nature Watch Canada

Example 5: December 1, 2012

*Acer rubrum* – ripe fruits

Photo courtesy of Ellen Denny, Yale University
Are You a Backyard Naturalist?

- Where? What species? When? What phenophase?
- Do you record your observations?
- Are you ready to become a Nature’s Notebook observer? Fill out the sign-up sheet to hear about a workshop near you coming soon . . .
- Or start today

Photo by G. Kish  www.birdjam.com

USA ntnp Taking the Pulse of Our Planet

[Website screenshots and form images are shown, but the text is not transcribed.]
Science Observation Needs

• Increasingly limited resources
• Public engagement
  – Students, citizen scientists
  – Involvement/ownership
  – Mentoring, training, QA/QC
    • Taxonomic ID
    • Phenophase ID
  – Enhance scientific investigations
Invasive Plants and the IFAS Assessment of Non-native Plants in Florida’s Natural Areas

Kenneth A. Langeland and S. Luke Flory
Agronomy Department and Center for Aquatic and Invasive Plants

Introduction

Botanical exploration was a major focus of the United States Department of Agriculture (USDA) during the later part of the 19th century and early 20th century. Their mission was “----- to help find the plant which will produce the best results of any that can be grown, on every acre of land in the United States.” USDA botanical explorers were dedicated to their task and highly successful. David Fairchild, an early botanical explorer (and namesake of Florida’s Fairchild Tropical Gardens), reported that “over a dozen new things a day are entered in the list of new arrivals” (Fairchild 1906). Over 31,000 “plant immigrants” had been introduced by the early 1900s (Fairchild 1911). That any of these plants would cause economic and/or environmental problems in the future could not be foreseen.

Land Grant Institutions would play a large part in establishing beneficial uses for many of these early plant introductions and, in later years, become involved in solving problems caused by some of them. The role of the Cooperative Extension Service, established in 1914 as the outreach mission of Land Grant Institutions, was to help bring the results of agricultural research to end users. Early efforts focused on rural agriculture but the role of Extension evolved over the years to include urban and suburban audiences. Across the years one of our traditional roles has been to recommend plant species for agricultural and landscape uses. We have had the luxury of a rich palette of plant taxa that began with the many introductions of the early botanical explorations. For many years we also had the benefit of recommending plants without concern for their invasive potential. However, plant invasions have been recognized in recent years as one of the major factors driving global environmental change.

Concerns about invasion of natural plant communities by non-native plant species increased significantly after the publication of Charles Elton’s, “The Ecology of Invasions by Animals and Plants” (Elton 1958). Subsequently, in 1986 efforts began to address problems associated with invasive plant species in Florida. Weeds, plants growing where we do not want them, have long been recognized as problems in crop production and landscapes. Weed Science has grown to be a major program area of Land Grant Institutions and developing and making weed control recommendations are another major role of Extension. More recently, invasive plants (i.e., ‘weeds’ in natural areas) have been a growing concern for natural areas in Florida and across the US. As a result, IFAS was called on to help evaluate and address plant invasions in Florida’s natural areas.

This paper provides background for the involvement of IFAS in addressing invasive plant species and explains the IFAS Assessment of Nonnative plants in Florida’s Natural Areas, the basis for our current policy for making recommendations of non-native plant species.
Florida Exotic Pest Plant Council (FLEPPC) List Stirs Controversy

In the early 1980s, a group of biologists, including IFAS Weed Science faculty, held meetings to discuss the encroachment of melaleuca from the East Everglades into Everglades National Park in southern Florida. The need to address other weeds in natural areas was realized during these meetings and as a result, in 1982, the Florida Exotic Plant Pest Council (FLEPPC) was established. In 1991, FLEPPC published in their first newsletter a list of 23 plant species considered by the Council to be invasive in Florida’s natural areas. In 1993, the list was increased to 126 species. Because this list contained economically important species it became controversial with the horticulture industry and was heavily criticized by IFAS Horticulturists. Industry and academic horticulturists disputed the invasiveness of many species on the FLEPPC list and their major criticism was that it was not clear how it was determined that these species were invasive. At the same time IFAS Weed Science faculty were called upon to help develop management practices and Extension information related to plant species on the FLEPPC list. IFAS administration was asked by FLEPPC (and affiliated state agencies such as the Florida Department of Natural Resources) why IFAS was still recommending the use of species considered invasive by FLEPPC, such as Brazilian pepper (*Schinus terebinthifolius*), West Indian marshgrass (*Hymenachne amplexicaulis*), and carrotwood (*Cupaniopsis anacardioides*). Subsequently, IFAS Weed Science faculty were called upon by administration to help resolve the issue.

In 1995, IFAS Weed Science Faculty submitted for internal review the book “Identification and Biology of Non-native Plants in Natural Areas of Florida” to provide information on non-native invasive plant species in Florida. This book provided peer-reviewed literature citations, personal communications, and references to various databases that explained why species were considered invasive. Again, because some of these species were economically important to the horticulture industry and reference was made to the 1995 FLEPPC list, opposition to publication of the book arose during the review process among certain IFAS audiences and within IFAS.

IFAS Invasive Plants Working Group is Established

In a 1995 memo from Vice President Joyce to IFAS Deans of Research and Extension, it was suggested that a working group to coordinate IFAS Research and Extension efforts related to “exotic plant recommendations” be formed. Subsequently, Extension Dean Christine Taylor Stephens convened a task force to address invasive plant issues within IFAS, “particularly the potential concerns with commercial invasive plants that have escaped cultivation, to identify which plants are of concern, and to recommend research or educational strategies.” A thirteen member multidisciplinary task force was formed with representation from the Departments of Agronomy, Environmental Horticulture, and Wildlife Ecology and Conservation. This task force became what is now the UF/IFAS Invasive Plants Working Group (IPWG) and includes the original participants as well as representatives from Food and Resource Economics, UF Department of Biology, and an industry representative from the Tampa Bay Wholesale Growers Association.

The IFAS Assessment of Non-native Plants in Florida’s Natural Areas

Because the IPWG did not want to rely on outside decisions on which plant species are considered invasive, and no quantifiable methods existed at the time for determining invasiveness, a subcommittee (comprised of Drs. Alison Fox, Doria Gordon, Joan Dusky,
Randall Stocker, and Linda Tyson) was formed to develop a well-defined, transparent system for distinguishing invasive non-native plant species from those that are not invasive in Florida’s natural areas. Efforts of this subcommittee and subsequent efforts of the IPWG have resulted in the IFAS Assessment of Non-native Plants in Florida’s Natural areas (IFAS Assessment), which consists of three parts, the Status Assessment, the Infraspecific Taxon Protocol, and the Predictive Tool. A separate assessment for aquatic plant species is under development. Any IFAS publications, including those developed by county faculty, are required, when describing features of non-native plants, to include a reference to “Conclusions” of the IFAS Assessment and to use terms relative to invasive plant species as defined in the IFAS Assessment. Conclusions and detailed information about the IFAS Assessment can be accessed at: http://plants.ifas.ufl.edu/assessment/.

**Status Assessment**

The Status Assessment was completed by the subcommittee, fully approved by the IPWG, and operational beginning in 2001. The Status Assessment is applied at the species level and only to those plants that already exist in Florida. It uses information on ecological impacts, potential for expansion, management difficulty, and economic value to determine invasiveness of species. A species may receive one of three major “Conclusions”: 1) “Invasive: Not recommended”, 2) “Caution: may be recommended but manage to prevent escape”, 3) “Not a problem species.”

**Infraspecific Taxon Protocol**

In most cases, the Status Assessment is applied to “resident species”, which refers to non-native species already found in Florida. The Infraspecific Taxon Protocol (ITP) was adopted in 2003 by the IPWG to determine whether recommendations about a particular infraspecific taxon (cultivar, selection, variety, or sub-species) should be the same or different from the resident species. There are a few examples where only the cultivar, variety or sub-species has been assessed (e.g. *Epripremnium pinnatum* Aureum). For an infraspecific taxon to be assessed with the ITP, the Assessment team must receive a request to do so. The request must include: supporting evidence that the infraspecific taxon is recognized as a distinct entity, can be consistently and verifiably labeled, and reasons for expecting the infraspecific taxon to behave differently. Hence, the taxon is expected to have different Conclusions from the resident species. Conclusions of an ITP assessment must be accepted by a majority vote from the IPWG.

The ITP has been used to assess cultivars of *Nandina domestica*, *Lantana camara*, and *Ruellia simplex*. *Nandina domestica* cultivars Firepower, Gulf Stream, and Harbour Dwarf have been concluded to be non-invasive (“Not a problem species”), while Harbour Belle retains the Conclusion “Invasive: Not Recommended” of the resident species because of seed production and viability. *Lantana camara* cultivars T-2, 3, 4, and 9 have all been assessed as non-invasive. *Ruellia simplex* cultivars Purple Showers, R10-108 and R10-102 have been assessed as non-invasive, while additional study on seed-production and sterility has been required of R10-105.

**Predictive Tool**

As directed by the Status Assessment, the Predictive Tool is used to assess 1) species that have not yet been introduced to Florida, 2) species that may be present in the state but not yet escaped into natural areas and are recent arrivals or are known to cause problems in areas with similar habitats and climate to Florida, or 3) species for which there is a proposed or new use for a
species that would result in higher propagule pressure or commercial cultivation of a species present in Florida for a new use or increase in acreage cultivated. The Australian Weed Risk Assessment and Pacific Second Screening have been adapted for the Predictive Tool of the IFAS Assessment. A species that is found potentially invasive with the Predictive Tool is given the Conclusion “Invasive: Not recommended” and footnoted in the Conclusions table that was found potentially invasive with the Predictive Tool.

The Predictive Tool has been predominantly used to assess invasiveness of proposed biomass crops. The Department of Agriculture and Consumer Services (DACS) promulgated law in 2006 to regulate planting of crops in Florida for biomass production (581.083 (4) F.S., 5B-57.011 F.A.C). The rule requires a permit to plant a biomass crop greater than 2 contiguous acres of any species not exempted by the rule. One of these exemptions is if DACS determines in conjunction with IFAS that the species is not invasive. DACS has requested IFAS to use the Assessment to determine invasiveness of proposed biomass crops (species and infraspecific taxon). It has been necessary to use the Predictive Tool because these taxa either do not yet occur in Florida or represent a new use that will increase propagule pressure.

Comparison of IFAS Assessment and FLEPPC List

Because the IFAS Assessment came about in response to controversy over the FLEPPC List, it is interesting to compare the two sources. The major differences between the FLEPPC List and the IFAS Assessment are: 1) the purpose of the lists and 2) the methods used to place species on the list or in categories. Since its beginning the purpose of the FLEPPC list has been to educate land managers of plants that need to be managed in natural areas and for homeowners to know those plants on their private properties that are considered by FLEPPC to be invasive in natural areas. Plants are placed on the FLEPPC list after all published and subjective information is discussed by a panel of qualified botanists and listing of the species is passed by majority vote. The purpose of the IFAS Assessment is, as described, an in-house policy for recommendations made by IFAS. Invasiveness of plant species is categorized using a transparent quantitative method of the IFAS Assessment.

The 2011 FLEPPC list (their most current) has 76 species listed as “Category I” in at least one region (north, central, south). These species are defined as “invasive exotics that are altering native plant communities by displacing native species, changing community structure or ecological functions, or hybridizing with natives.” This definition is similar to the reported behavior of species that is used to determine invasiveness by the IFAS Assessment.

Over 700 species have been assessed using the IFAS Assessment. Of these, 89 have received the “Invasive: Not recommended” conclusion from the Status Assessment for at least one zone (north, central, south). Of these 89, 50 “may be eligible for specific uses if approved by the IPWG” but this has happened for cultivars of only one species. Of the 700, 29 have received the conclusion “Invasive: Not recommended” because they have been predicted to be invasive using the Predictive Tool. 116 species have received the “Caution: may be recommended but manage to prevent escape” conclusion from the Status Assessment.

The list of species evaluated with the IFAS Assessment that also occur on the FLEPPC Category I list is in excellent agreement. Seventeen species listed as FLEPPC Category I are Concluded in the IFAS Assessment as “Not recommended” in any zones where the species is expected to grow based on cold hardiness and eighteen are designated as “Not recommended” or “Caution” in
some zones. Five species are not landscape or forage plants and, therefore, not recommended. Thirty are prohibited by State and/or Federal law and not assessed further with the IFAS Assessment. There are no species listed as FLEPPC Category I for which there is not agreement in some zones.

**Literature Cited**


The Amazing World of Succulents:  
Cacti and Succulents in the Landscape

Keri Leymaster  
Orange County Extension, Orlando, Florida

This handout is to guide to succulent plant selection for Florida.  
It is not all-encompassing, however these are plants that have been tested and proven to succeed.

Rosettes
- Echeveria ‘Pearl von Neuremburg’  
- Echeveria ‘Lola’  
- Echeveria ‘Black Prince’  
- Echeveria ‘Lipstick’  
- Echinocactus grusonii- Golden Barrel cactus  
- Painted Echeveria  
- Agave victoria-reginae  
- Sedum ‘Gold Glow’  
- Aloe ‘Pink Blush’

Upright
- Cereus 'Monstrosus’  
- Euphorbia lactea ‘White Ghost’  
- Senecio mandraliscae- Blue Senecio  
- Euphorbia lactea cristata- Elk Horn cactus  
- Sansevieria trifasciata ‘Black Coral’  
- Sansevieria trifasciata 'Moonshine'  
- Sansevieria trifasciata 'Black Gold’  
- Sansevieria ‘Zulu’  
- Sansevieria cylindrica - Snake Plant  
- Euphorbia tirucalli- Pencil Plant  
- Euphorbia tirucalli ‘Firesticks’

Agave-type
- Agave ‘Gainesville Blue’  
- Agave ‘Blue Glow’  
- Agave geminiflora  
- Agave lophantha- ‘Green Striped Agave’  
- Agave lurida  
- Agave ‘Reggae Time’  
- Aloe ‘Hercules’  
- Aloe maculata- Soap Aloe  
- Dyckia ‘Cherry Coke’  
- Furcraea foetida ‘Mediopicta’  
- Aloe squarrosa  
- Aloe striatula- Octopus Aloe  
- Agave americana ‘Marginata’
Paddle-shaped
- Opuntia
- Kalanchoe thysifolia - Flapjacks Plant
- Portulaca molikensis - Hawaiian Portulaca
- Kalanchoe thysifolia ‘Fantastic’
- Kalanchoe beharensis - Elephant Ear

Trailing and Groundcovers
- Doreanthus ‘Mezoo’
- Portulaca ‘Toucan Fuschia’
- String of Pearls
- Pepperomia ‘Ginny’
- Sedum ‘Sea Urchin’

Companion Plants
- Asparagus densiflorus 'Myersii' - Foxtail fern
- Euphorbia millii - Crown of Thorns
- Bromeliads
- Zamia pumilla - Coontie
- Bulbine
- Zamioculus zamifolias - ZZ Plant
- Pedilanthus tithymaloides - Devil’s Backbone
- Pedilanthus 'Silver Star'

EDIS Publications:
*Agave and Yucca: Tough Plants for Tough Times.* Available at http://edis.ifas.ufl.edu/ep419

Florida Growers:
Florida Cactus Inc., (407) 886-1833, 2542 Peterson Road, Apopka, FL 32703
Tropiflora, (800) 613-7520, 3530 Tallevast Road, Sarasota, FL 34243
The Amazing World of Succulents
Keri Leymaster
Residential Horticulture
Orange County Extension

Definitions

• **Cactus**: Any plant of the Cactaceae family that have succulent stems and branches with scales or spines instead of leaves and are found especially in dry areas (as deserts).

• **Succulent**: A plant having fleshy tissues to conserve moisture. -- From Merriam-Webster

Cultural Requirements

- **Soil and Drainage**: Good drainage is a must. In fast draining soils, no amendments may be needed. Containers need to have extra care taken for drainage.
- **Light**: Full sun to part shade.
- **Water**: Succulents do need water. Care must be taken to ensure that plants are watered properly and as needed.
- **Location**
Container Ideas

- Keys for success
  - Controlled irrigation
  - Good drainage
  - Turface MVP
  - Pot shards
  - Amendments

Single Specimen Containers

Repetition

Single Specimen Containers

Single plant collections

Mixed Plantings
Unique Containers

Table top Gardens

Form
- Rosettes
- Upright
- Agave-type
- Paddle-shaped
- Trailing & Groundcovers
- Companion Plants

Form
Rosettes
- Echeverias
- Semperviviums
- Sedums
- Aloe

Echeveria 'Pearl von Neurenburg'
Echeveria 'Lola'
Echeveria 'Black Prince'
Echeveria 'Lipstick'
Rosettes

*Echinocactus grusonii*, Golden Barrel cactus

Agave victoria-reginae

Sedum ‘Gold Glow’

**Rosettes**

*Painted Echeveria*

Sempervivums, Hens & Chicks

**Form**

Upright

- Senecio
- Cereus
- Kalanchoe
- Sansevieria

Senecio ‘Blue Chalk Sticks’

Aeonium ‘Zwartkop’ Green Aeonium

Aeonium ‘Kiwi’

Aloe ‘Pink Bush’

Upright

Cereus ‘Monsterosus’

Euphorbia lactea ‘Cristata’

Senecio mandraliscae – Blue Senecio

Euphorbia lactea ‘White Ghost’

Sansevieria trifasciata ‘Black Coral’

Sansevieria trifasciata ‘Moonshine’

Sansevieria trifasciata ‘Black Gold’

Sansevieria ‘Zulu’

Sansevieria trifasciata ‘Black Coral’

Sansevieria trifasciata ‘Moonshine’

Sansevieria trifasciata ‘Black Gold’

Sansevieria ‘Zulu’
Paddle-type- Opuntia

Form

Trailing and Groundcovers
- Portulaca
- Doreanthus
- Sedum
- String of Pearls

Climbing- Cereus vine

Companion Plants
- Foxtail fern
- Bulbine
- ZZ Plant
- Coontie
- Bromeliads

Paddle-type

Groundcovers & Trailing
- Portulaca 'Toucan Fuschia'
- String of Pearls
- Pepperomia 'Ginny'
- Sedum 'Sea Urchin'

Kalanchoe

Kalanchoe thrysifolia 'Fantastic'

Portulaca molikensis- Hawaiian Portulaca

Kalanchoe beharensis- Elephant Ear
Companion Plants

- Euphorbia millii - Crown of Thorns
- Bromeliads
- Zamia pumila - Coontie
- Bulbine

Companion Plants

- Zamioculas zamifolias - ZZ Plant
- Pedilanthus - Devil's Backbone
- Pedilanthus 'Silver Star'

Propagation

Propagation - division

Questions?

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Email kleymaster@ufl.edu
http://orange.ifas.ufl.edu
Yaupon Holly (*Ilex vomitoria*)  
Logan, Brightman -- All Native, LCC  
The Yaupon Holly is an upright, densely foliated, multi-stemmed, evergreen, round or vase shaped shrub or small tree that reaches a max height of 25 feet. It produces tiny, white flowers borne in dense clusters on grayish branches. Females produce shiny, red berries in fall and winter. Yaupon Holly is a very adaptable to a variety of conditions. It is suitable for shaped hedges and can be used as a screen, parking lot tree, or trained for an espalier. Yaupon Holly is found from coastal New Jersey south to Central Florida and west to Texas. Zones 7-10. Distribution is in wet to dry areas in woodlands, near the coast on dunes, and occasionally found on inland sandhills. These shrubs/trees prefer partial shade to sun and acidic to alkaline soils.

Simpson’s Stopper ‘Compacta’ (*Myrcianthes fragrans ‘Compacta’*)  
Simpson’s Stopper ‘Compacta’ is a more compact variety of the Simpson’s Stopper--with dense, evergreen foliage, and flaky red bark. A much slower growing variety, the ‘Compacta’ will grow to a height of 5-10’, and will produce small, fragrant, white flowers in spring followed by orange-red berries. Simpson’s Stopper is native to southern Florida but has adapted well to landscapes in northern Florida and along the Atlantic coast as far north as South Carolina. Zones 8-11. Works well as a border in mixed shrub beds or as a small background tree or shrub, and blooms best and maintains compact form in full sun.

Walter’s Viburnum ‘Withlacoochee’® (*Viburnum obovatum ‘Withlacoochee’®*)  
An upright natural selection exclusive to All Native, LLC that exhibits superior features for use in a variety of landscaping projects such as a specimen or seasonal accent plant, as a screen, along fence rows, or as a hedge. It is highly prized for its attractive, uniform growth habit, adaptability to various soil and light conditions, drought tolerance, disease resistance, and wildlife habitat value. The most striking feature that separates this selection from other Walter’s Viburnums is its unique, dark green foliage. This large shrub or small tree at maturity reaches 10-12’ in height with a spread of 6-10’. The ‘Withlacoochee’® performs best in full sun. This selection tends to hold more of its leaves in the winter, keeps a very full appearance, exhibits a showy white bloom in the spring, and maroon foliage during the winter months in response to cold weather.

Walter’s Viburnum ‘Riefler’s Densa’ (*Viburnum obovatum ‘Riefler’s Densa’*)  
This selection of Walter’s Viburnum is a small, neat, densely branched evergreen with both spring and fall blooms. It reaches an average height of 6-8 feet. This shrub is suitable for hedges or specimen shrubs in gardens. ‘Riefler’s Densa’ prefers moist to wet, sandy, acid, fertile soils with partial shade to sun. Walter’s Viburnum are commonly found growing in coastal and calcareous hammocks, floodplains, woodlands, and riverbanks through out the southeast. Zones 6-9. ‘Riefler’s Densa’ bloom most heavily in the spring, creating a very showy look for the landscape. This selection has been found to be less prone to fungus in comparison to other dense varieties.

Firebush ‘Calusa’ (*Hamelia patens ‘Calusa’™*)  
The Firebush ‘Calusa’™ is a natural selection exclusive to All Native, LLC. The ‘Calusa’™ is a multi-stemmed, spreading shrub or small tree with a rounded form, slender branches, and grows to a height of 3-10 feet and gains a spread of 3-6 feet. During the blooming season it produces bright, orange-red, tubular flowers filled with nectar, and purplish berries. The ‘Calusa’™ is an excellent shrub for borders along boardwalks, paths, and sidewalks, or for massing in mixed or single-species shrub beds. Firebush is found in Central and Southern Florida. Zones 8b-11. They grow best in dry, sandy, somewhat alkaline soils, but will adapt to a variety of conditions. They also prefer part shade to sun, however full sun is recommended for better blooms.

Gallberry (*Ilex glabra*)  
Gallberry is an erect, evergreen, mostly multi-stemmed, colony-forming shrub with an irregular, mostly informal form. Gallberry grow to a max height of 3-7 feet and spread of 2-4 feet. This shrub produces white, showy, small flowers and shiny, black berries. Typically used as a foundation or screening plant, it can also be used as a component in naturalistic landscapes, and can be pruned to maintain a compact form. Gallberry is usually found in swamps, flatwoods, bay heads, and wet areas ranging from Massachusetts, south nearly throughout Florida, and west to Mississippi. Gallberry is excellent for moist to wet, acidic soil with a pH 4.5-7.0, and prefers full sun to shade.
**Beautyberry (Callicarpa americana)**
Beautyberry is a loosely branched, irregular spreading, graceful shrub with arching branches that grows to about 4-8 feet in height with a spread of 3-6 feet. This shrub occurs in a wide variety of woodlands across much of eastern North America and throughout Florida. Beautyberry is often used in shrub beds, situated in naturalistic landscape settings, or along woodland edges. It is a very showy plant for roadside plantings, especially in such difficult situations as highway medians and the edges of road and powerline rights-of-ways. This shrub prefers rich soils, but is tolerant of a variety of slightly acid, well drained conditions, including poor and sandy soils. The showy purple clusters of berries attract wildlife.

**Pipe-stem (Agarista populifolia)**
Pipe-stem is an evergreen shrub with arching to leaning branches growing to be about 12 feet in height, often somewhat arborescent (treelike). In the spring it produces very showy, white, urn-shaped flowers. Pipe-stem is an outstanding ornamental shrub that does particularly well in moist, acid soils, especially in shaded sites and along ponds and streams. The bright, green, arching, weeping foliage is very attractive, and it’s very showy when in bloom. It is used mostly as an accent shrub, in hedges and screens, or at the back of a border. Pipe-stem is found natively growing in South Carolina through North and Central Florida. Zones 7-9.

**Fetterbush (Lyonia lucida)**
Fetterbush is an erect, multi-stemmed, evergreen shrub with arching branches, shiny leaves, and showy flowers. Flowers are pink to white, bell-shaped, aromatic, and borne in numerous clusters along the stem during the spring. Fetterbush work well as a hedge, along foundations, in mixed shrub beds, or in naturalistic landscapes. Distributed natively in flatwoods, bogs, edges of swamps and Cypress ponds extending from Virginia, south throughout Florida, and as far west as Louisiana. Zones 7-10. Fetterbush prefer well drained, acid soils high in organic content and full sun to part shade. Little irrigation is needed once the plant is established.

**Florida Privet (Forestiera segregata)**
The Florida Privet is a large, erect, densely foliated shrub or small multi-branched tree that grows with a varying height of 4-15 feet tall with a spread of 3-12 feet. In the spring it produces small, yellowish-green flowers and black, olive-like fruit that dangle from stalks along the branches. The Florida Privet is found in coastal woodlands in extreme southeastern Georgia, coastal South Carolina, south throughout much of coastal peninsular Florida and West Indies. Zones 8-11. This makes a great shrub for hedges and screening patios and outside sitting areas. It is an excellent plant for slope erosion control and shorelines. The Florida Privet prefers moist, sandy loams, but will adapt to a variety of soils.

**Dwarf Blueberry (Vaccinium mysinites)**
Dwarf Blueberry, also known as Shiny Blueberry, makes an excellent small shrub when used as a low hedge or border. It is an open habit grower that blooms heavily in the spring and produces large amounts of berries. This blueberry grows to a height of 3-3.5 feet and can spread from 2-3.5 feet. It can be found growing in flatwoods, sandhills, swamps, and hammocks in Virginia south throughout Florida and west to Texas. The Dwarf Blueberry can also be used in container for decks and patios. This blueberry prefers moist, high organic soils with a low pH.

**Wild Coffee (Psychotria nervosa)**
Wild Coffee is an erect, evergreen, woody branching shrub with smooth, sometimes hairy stems. Coffee is an excellent evergreen landscape shrub with attractive flowers and red berries. Coffee features distinctive shiny, green foliage with depressed veins. Found in North, Central, and southern peninsular of Florida, as far south as the Florida Keys. Zones 8b-11. Wild Coffee is useful as an understory shrub as it tolerates deep shade. Coffee can be used as a border, foundation, or hedge planting. Wild Coffee can help create a tropical look for the landscape. Prefers rich, acid to alkaline soils that are dry to moist. May tolerate full sun with supplemental irrigation.
**American Elm** *(Ulmus Americana var. floridana)*

The American Elm is a medium to large, stately, graceful, deciduous tree with thin, ascending to arching branches that form low on the tree and produce an attractive, upright, or vase shaped look. American Elms can be found in woodlands, bottomlands, lake and stream banks, or other damp locations. American Elms prefer rich, moist, acidic to alkaline soils, and part shade to full sun. The distribution of this tree is Southern Canada to Central Florida and West to the Rocky Mountains. Zones 3-10. This tree can reach a max height of 60-80’ and a max spread of 20-40’. The American Elm is known as the one of the fastest growing shade trees and typically used in suburban landscapes or near retention ponds.

**Winged Elm** *(Ulmus alata)*

The Winged Elm is a medium sized, deciduous, native tree with a rounded crown and spreading branches. This tree grows to about 60 feet in height with a spread of 30-60 feet. Winged Elm are generally found near floodplains, bluffs, slopes, and well drained upland woodlands. Prefers well drained, dry to moist soils, however they are adaptable to a variety of soil types. The distribution of this tree is Northwestern Florida to just west of the Atlantic coastal zone and south to Lake, Orange, and Pasco counties in Central Florida. Zones 6-9a. The Winged Elm is an excellent specimen, shade, or street tree. The delicate texture of the foliage and the characteristic corky wings along its twigs and branches make it an attractive alternative to many coarser shade trees.

**Loblolly Bay ‘Bilbrey’s Bay’™** *(Gordonia lasianthus ‘Bilbrey’s Bay’™)*

The ‘Bilbrey’s Bay™, exclusive to All Native, LLC, is a medium sized, evergreen, flowering, columnar tree that reaches heights of 50 feet tall. It has dark gray, roughened, interlacing bark with flat-topped ridges separated by rough, narrow furrows. The ‘Bilbrey’s Bay™ has been in propagation for nearly three and a half years while we have been noting its amazing show of profuse blooms, conical shape, and fuller, heavier branching. This tree produces showy, white flowers with yellow centers during an extended blooming season that lasts throughout the spring and summer. Loblolly Bay are commonly found in bay heads, swamps, bogs, and edges of flatwoods exhibiting long-term saturation. Zones 7-9. Frequently, soils of these areas consist of muck or muck sands, but will adapt to a variety of soils.

**Sweetbay Magnolia ‘Silver Mist’™** *(Magnolia virginiana ‘Silver Mist’™)*

The Sweetbay Magnolia ‘Silver Mist’™, exclusive to All Native, LLC, is an erect, evergreen tree with a narrow, conical crown, and leaves that are silvery below and shiny green above. Not only are the underside of the leaves of this variety more spectacular, but this tree features a much fuller growth habit and an absolute conical shape. The ‘Silver Mist™ is a profuse, showy, and highly fragrant bloomer from May until August. This tree reaches about 25-60 feet tall with a crown about half as wide as it is tall. Sweetbay Magnolias are found throughout Florida in moist to acid sites. Zones 5-10. The ‘Silver Mist™ can be used a specimen tree, street tree, or near a retention pond.

**Red Bay** *(Persea borbonia)*

The Red Bay is a small to medium evergreen, shrubby to erect tree that can attain heights up to 50 feet and a spread up to 20 feet. This tree produces dark blue to blackish, ellipsoid berries. The Red Bay occurs mostly in dry, sandy hammocks, and coastal dunes, but is occasionally found in mesic hammocks. This tree prefers best in well drained, xeric soils, with a pH of 5.0-7.0. The distribution of the Red Bay ranges from Delaware, southward to southern peninsular Florida, and west to eastern Texas. Zones 7-10. The Red Bay works well as a background shrub or tree in naturalistic settings. It also serves to conceal retention ponds, drainage swales, and canal banks.

**Hornbeam** *(Carpinus caroliniana)*

The Hornbeam is a small to medium sized, deciduous, oval shaped tree that grows to 30 feet tall and reaches a spread of 15-25 feet. This is an excellent tree if used as a small shade, specimen, or street parking tree for large suburban landscapes or useful near retention ponds. Red tips are present on emergent leaves. Great for use under power lines. The Hornbeam is native from North Florida throughout the south to about Orlando. Zones 3-9a. Hornbeams prefer acidic to slightly alkaline soils, and perform best in partial shade to partial sun. Hornbeams grow best in moist sites, however they have a moderate drought tolerance.
Silverbell (*Halesia diptera*)
The Silverbell is a small, understory tree that is often used as a specimen planting. The height of the Silverbell ranges from 15-30 feet with a 15-25 foot spread. In the spring, it is highly noticeable as it is covered with thousands of 1” white to pale pink, bell-shaped flowers. Silverbells are deciduous with leaves that turn yellow in fall. Silverbells have a southern distribution, occurring on the Coastal Plain from South Carolina to northern Florida and west to eastern Texas. Zones 6-9. Prefers slightly acidic, well-drained, but moist soil. Silverbells are tolerant of considerable shade and occasional flooding.

Pond Cypress (*Taxodium ascendens*)
The Pond Cypress is a medium to large, deciduous, columnar or upright shaped tree that grows 50-75 feet in height. It is characterized by leaves that are nearly needlelike and extend upward from the branches, creating a distinctive appearance from the Bald Cypress. The Pond Cypress is smaller in stature than the Bald Cypress, but tends to be much wider at the base. Found throughout Florida and west to Texas in wet areas such as ponds, wet depressions and lakeshores, and still water locations. Zones 5b-9. Pond Cypress prefer full sun in wet sites, however it does have a moderate to high drought tolerance.

Bald Cypress (*Taxodium distichum*)
The Bald Cypress is a medium to large, deciduous, pyramidal shaped, conifer tree that gets about 50-75 feet tall. The distribution for this tree is Delaware, throughout Florida, and west to Texas. Zones 4-10. Bald Cypress prefer permanently wet swamps, bottomlands, along stream banks and ponds, with full sun. They are drought tolerant once established. Bald Cypress are often used as a screen by group planting, planted as a street or parking lot tree, and are extensively used on retention ponds and in mitigation projects.

Densa Pine (*Pinus elliottii var. Densa*)
The Densa Pine, also known as South Florida Slash Pine, is distinguished by its wood, which is heavier than the typical Slash Pine and a thicker, longer taproot. Perhaps an adaptation to avoiding high winds during hurricanes. In comparison to the typical Slash Pine, it has longer needles that are more dense on the stems and smaller cones. Found in flatwoods, mostly over limestone with occurrences from Central Florida through South Florida and the Florida Keys, mainly along the coast. Zones 7a-11. Densa passes through a “grass stage” that is similar to the Longleaf Pine, eventually reaching a mature height of 50-60 feet. The Densa Pine prefers partial shade to full sun and moist soil, however the tree will grow well in poorly drained soils. The denser growth habit makes it a more attractive landscape pine.

Flatwoods Plum (*Prunus umbellata*)
The Flatwoods Plum is a deciduous, small tree or shrub with a height range of 18 to 20 feet and a spread of 8 to 12 feet. White, showy flowers emerge in spring typically appearing before leaves. Flatwoods Plums are found throughout North Florida, southward to about Highlands County. Zones 5-9. These trees grow in woodland edges, dry hammocks, disturbed roadsides, fencerows, and open fields. They prefer full sun and dry to moist soil with a pH of 5.0-7.5, and perform best in well-drained soil and full sun. Flatwoods Plum have a single trunk and do not sucker like the Chickasaw Plum. The Flatwoods plum can be used in naturalistic settings or where large, dense shrubbery is required; good for stabilization and for roadside beautification.

Redbud (*Cercis canadensis*)
The Redbud is a small, deciduous tree with a short trunk and arching branches with a horizontally spreading, full, rounded crown. Mature height is 15-35 feet with a spread of 10-35 feet. Native to rich, moist, shaded hammocks of northern and central Florida. Well adapted to a broad range of conditions from moist bottomlands to dry upland forests. Generally an understory tree, however Redbud will flower heaviest in full sun. Does well along stream banks. Redbuds are native to most of the eastern half of the U.S. Zones 5-9. Redbuds are outstanding ornamental accent tree.

Some portions of plant profiles have been used with permission from Gil Nelson and can be found in his book *Florida’s Best Native Landscapes*.
Blanket Flower *(Gaillardia pulchella)*

Blazing Star *(Liatris tenufolia)*
Slender herbs with narrow leaves and erect stems. The upper third of the stem produces a showy, elongated spike of lavender flowers. Grows 2-7’ tall. It will grow best in sandy, moist to dry, slightly acid to neutral soils, with full sun. Flowers are attractive to a host of butterflies.

Cardinal Flower *(Lobelia cardinalis)*
An erect, perennial, potentially thick-stemmed wildflower topped with a conspicuous, showy raceme of numerous, bright red flowers. Prefers rich, acid, poorly drained soils and full sun to part shade. Excellent in moist wildflowers gardens, along small streams, and for beautifying the edges of retention ponds, canal banks, and drainage swales.

Dune Sunflower *(Helianthus debilis)*
Wildflower that produces a bright, yellow, daisylike bloom with dark purplish centers. Well suited for wildflower beds, as a border along walkways. Grows to a height of 2-6’ and spread through underground stems. Blooms attract butterflies. Naturally found in flatwoods, marshes, and coastal dunes. Prefers well drained soils and full sun.

Greeneyes *(Berlandiera subacaulis)*
Rosette forming perennial wildflower with single green-yellow flower with prominent green seed heads 2” in diameter thick tuberous taproot; can grow to 20” tall. Prefers sandy or rocky, well drained soils in light shade to full sun.

Scarlet Hibiscus *(Hibiscus coccineus)*
Upright to sprawling, stout, somewhat open, perennial sub-shrub. Has large, bright, red flowers with five well separated petal that bloom all summer long. Grows to a height of 4-6 feet and a spread of 2-5 feet. Prefers best in moist to wet, fertile soil, but will adapt to most well-drained soils if kept moist. Grows best in full sun to part shade.

Lantana *(Lantana depressa)*
This variety of Lantana is a hybrid or cross between two of the native varieties found in Florida. Its creamy, yellowish-white flowers create a showy look when in full bloom. Lantana prefer dry conditions and well drained, sandy soils, as they are typically found growing in pine-land areas. Lantana works well in full sun as a ground-cover or used to fill in areas of garden beds as they have a tendency to sprawl. Great for butterfly gardens.

Porterweed *(Stachytarpheta jamaicensis)*
A small perennial shrub that produces blue flowers on long, stringy spikes at the end of the stems. Stems become woody toward the base when plant reaches maturity at about 4’. Great as a hedge, border, mass planting, and excellent for butterfly gardens. Grows well in part shade/part sun and sandy, well-drained soils.

Rosinweed *(Silphium compositum)*
Stout, erect, perennial wildflower with yellow disk florets 2-3” in size. Rough, coarse stems. Grows to a height of 3-4 feet tall. Bears large, highly attractive yellow daises with a distinctive green disk. Prefers well drained soil in full sun to part shade.

Golden Asters *(Pityopsis graminifolia)* & *(Chrysopsis spp.)*
Clump-forming perennial. Stems are woody towards the base and non-woody above. Flower heads are grouped in clusters of 1-25 heads at the top of the stem. *Pityopsis* has silky, silvery green foliage due to the abundance of tiny grayish hairs on the underside of the linear leaves. Attractive foliage throughout the year, blooms both spring and autumn, variable height 6-36”. Prefers dry to moist sites with full sun.
**Skyflower (Hydrolea corymbosa)**
Perennial wildflower with deep blue flowers appearing in summer and fall. Small, glossy, deep green foliage. Grows to a height of 2 feet. Grows best in moist soils with a pH of 5.5-6.5. Prefers full sun to part shade.

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**Wild Petunia (Ruellia caroliniensis)**
A mostly erect, perennial wildflower with tubular lavender flowers and dark green leaves. Height reaches 1-2 feet. A hardy addition to mixed wildflower gardens. A good replacement for impatients along the edges of walkways and patios. Tolerant of a wide range of soil conditions. Flowers best in full sun, but will tolerate light shade.

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**Dotted Horsemint (Monarda punctata)**
Erect annual or short-lived perennial that reaches 1.5-3’ at maturity. Blooms late spring to early autumn and prefers well-drained soil in light shade to full sun. The white flowers are marked with dark purple spots. Attracting the most attention are the large, leafy bracts with shades of white, pink, and rose that provide color for several weeks while in bloom. Leaves have an oregano-like scent, perfect as an herb garden plant.

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**Climbing Aster (Symphotrichum carolinianum)**
Sprawling or climbing, vine-like, many branched native shrub with woody, buff colored stems and herbaceous branches. Grows to height of 12’. Prefers wet, organic soil, but is highly adaptable to drier locations once established, full sun to partial shade.

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**Tickseed (Coreopsis leavenworthii)**
Herbaceous wildflower with showy, daisy like heads of bright yellow flowers, 2” in diameter heads. Prefers moist, acid soils in full sun. Often used components of mixed wildflower and butterfly gardens and are excellent for sunny roadsides, highway medians, and powerline easements.

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**Tropical Sage (Salvia coccinea)**
An erect wildflower, sometimes reaching 6’ in height, with toothed leaves and a showy spike of bright red, 2-lipped flowers. Blooms year round in the south. Poor, neutral to slightly alkaline soils in full sun to dappled shade. May be used as a specimen plant, but sought after mostly butterfly, hummingbird, and wildflower gardens.

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**Twinflower (Dyschoriste oblongifolia)**
Erect to sprawling perennial, forms a small groundcover when established, pale lavender 1” flowers from late spring through early winter or all year southward, semi-dormant in winter. Grows to a height of 8-12”. Grows best in moist conditions in part shade to full sunlight.

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**Cross Vine (Bignonia capreolata)**
Native perennial with tubular, reddish-orange flowers borne in a showy cluster. Evergreen, woody, high climbing vine that can climb up to 50’. Prefers acid-rich soils in full sun to part shade. Hummingbirds visit flowers as they migrate north in the spring.

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**Sunshine Mimosa (Mimosa strigillosa)**
Native, evergreen, perennial low-growing groundcover. Has woody stems below with herbaceous, hairy, non-prickly stems above. Produces pinkish to lavender, inch diameter, globular heads that bloom spring through fall. Usual height: 3-9 inches with a mat covering spread. Prostrate habit will cover many square feet. Prefers well drained or moist-wet, wide pH range, sandy to organic soils. Grows best in full sun to partial shade.
Fawn Weather Resources For Master Gardeners

Rick Lusher
University of Florida

**URBAN IRRIGATION SCHEDULER**
Recommends an irrigation system ON/OFF setting
Uses real-time rainfall and ET data from each FAWN site
User submits ZIP Code and selects a sprinkler type & FAWN site

**INTERACTIVE IRRIGATION TOOL**
Weekly lawn water usage evaluation
Uses real-time FAWN data and user-submitted lawn information
User can “test” various systems in a virtual environment

**FACT SHEETS**
Handouts on various irrigation topics
Non-technical information for homeowners
Topics: time clock, maintenance, rain sensors, application rate

**HOME IRRIGATION PRESENTATION**
Narrated slide show titled “The Basics of Home Irrigation”
Easy-to-understand visuals on various irrigation topics
Includes application rate worksheet
Florida-Friendly Butterfly Scaping

Kathy Malone
Florida Friendly Landscaping

Community Butterfly Scaping:
How to have a large-scale butterfly habitat

by
Kathy Malone
Wendy Wilber
Dr. Gail Hansen
Dr. Jaret Daniels
Claudia Larsen
Dr. Esum Momol
University of Florida,
Florida-Friendly Landscaping™ Program,
Gainesville
http://edis.ifas.ufl.edu/ep420

Butterfly Scaping expands the concept of butterfly gardening through the community-wide preservation and planting of butterfly host vegetation, including street trees, small trees, shrubs, grasses, and groundcovers. Common grounds, medians, sidewalks, natural areas, dry retention areas, stormwater ponds, undeveloped areas, easements and residential yards in new and existing communities are components of Butterfly Scapes.

Butterfly Bouquets

EXAMPLE HOST PLANT COMBINATIONS

Blue Plumbago (Cassius Blue), Coontie (Atala Hairstreak), Partridge Pea (Cloudless Sulphur, Gray Hairstreak, Ceraurus Blue) (blue, yellow and white)

Carolina Wild Petunia (Common Buckeye), Passionflower (Gulf Fritillary, Zebra Heliconian, Variegated Fritillary), Fogfruit (Phaon Crescent, Common Buckeye, White Peacock) (all purple flowers at three different heights)

Twinflower (Common Buckeye), Carolina Wild Petunia and Sunshine Mimosa (Little Yellow) (two purples and a pink)

Bay Cedar (Martial Scrub-Hairstreak; Mallow Scrub-Hairstreak), Blue Plumbago, Passion Flower (Bay Cedar for warmer coastal areas)

Town centers can transform their sidewalk container gardens into beautiful and dynamic butterfly magnets by focusing on host plants and adding some nectar.
Example Planted Pond Cross-section

Consider turning your stormwater drainage pond into a community amenity. Florida Friendly Landscaping recommends a 10-foot vegetative buffer pond-side to help cleanse pollution. While a variety of the plants are available at some nurseries, a number of the plants may already exist by your community pond. One of the concepts of ButterflyScaping is to preserve existing, non-invasive host vegetation, then plan around it.

**EXAMPLE POND HOST VEGETATION AND BUTTERFLIES**

### GROUNDCOVER OR SOD
- Fogfruit—Phaen Crescent, Common Buckeye
- White Peacock
- Passionflower (vine)—Cull Fritillary, Zebra Heliconian
- Pellitory (peninsular Florida)—Red Admiral
- Native grasses—Skippers

### TREES
- Bastard Indigobush—Silver-spotted Skipper; Southern Dogface
- Cabbage Palm—Monk Skipper
- Dahoon Holly—Henry’s Elfin (north)
- Elm—Question Mark (north)
- Green Ash—Tiger Swallowtail (north)
- Sugarberry—American Snout, Tawny Emperor, Hackberry Emperor, Question Mark
- Sweetbay—Tiger Swallowtail (south)
- Willow—Viceroy

### PLANT BUFFER
- False Nettle—Red Admiral
- Partridge Pea—Cloudless Sulphur, Ceraunus Blue, Gray Hairstreak
- Swamp Milkweed—Monarch, Queen
- Switchcane—Southern Pearly-eye and several Skippers
- Wax Myrtle—Red-banded Hairstreak

### POND
- Pond edge
- Alligator Flag (south)—Brazilian Skipper
- Mock Bishop’s Weed—Black Swallowtail
- Sedges and Sawgrass-various skippers
- Waterhyssop—White Peacock (south)
- Yellow Canna—Brazilian Skipper
Plants to Attract Beneficial Insects and Trap Crops

Russ Mizell
University of Florida

Ecosystem Services are processes that take place in the natural world that benefit mankind. Ecosystem services are provided by the complex functional interactions that occur between the ecological components of natural resources. These services contribute to the stability, productivity and sustainability of landscapes.

This factsheet should stimulate your thinking about enhancing these important valuable and free functions in habitats such as yards, gardens, small farms, etc. This is not a recipe book! The plants suggested are primarily for the coastal plain area of the southern U.S. Many other plants are available to augment specific services and we have not included any large tree species. We focus on augmentation of pollinators, beneficial insects (parasites and predators), butterflies, and wild life as well as trap crops for stink bugs.

Notice that the list contains native, exotic and cultivated species. Key factors are resource availability (usually flowers with pollen or nectar) and quality (seeds) in relation to time of year. It is important to have resources available either continuously or at least during key periods when targeted organisms are present. Many plants provide more than one resource (e.g., pollen, nectar, prey, seeds) or service. Plantings should also be tailored to the type of habitat (ex. uplands vs. wetlands) or unusual function (rain gardens) and to avoid choosing species that may have undesirable characteristics (e.g. invasiveness) in specific habitats.

Much supporting literature is available on the web if you search using key category words. Relevant terms would include dooryards, home gardens, windbreaks, shelterbelts, hedgerows, and agroforestry.

Email: rfmizell@ufl.edu; http://nfrec.ifas.ufl.edu/contact/index_faculty.shtml

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<thead>
<tr>
<th>Plant Species</th>
<th>Common Name</th>
<th>Season of Service</th>
<th>Ecological Service</th>
<th>Trapping Stink and Leaffooted Bugs</th>
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1. Includes flowers, nectar, pollen, fruit and seeds
2. Includes butterflies, beneficial insects and wildlife
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</table>

¹ Flowers: attract bees, butterflies, and other pollinators.
² Beneficial Insects: benefit from nectar and pollen.
³ Butterflies: provide food and habitat.
⁴ Wildlife: provide habitat and food for birds and other wildlife.
⁵ Stink and Leaffooted Bugs: attract certain insects and animals.
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1Extrafloral nectaries; 2Arthropod parasites and predators; 3Needs to be near water; 4Hummingbirds; 5Suppresses soil nematodes; 6Especially for Monarch butterflies.

Comments on recommended plants:

1. *Lonicera* spp. bloomed throughout Jan.-Feb. 2010 which was a very cold period with nighttime temperatures consistently in the low-mid 20’s F for over six weeks. *Mahonia* is one of the few truly winter-blooming plants present in north Florida. Honey bees work it during warm days.

2. *Camellia* spp. are late winter-early spring bloomers and the species with open blooms containing pollen are one of the few blooming plants available during the colder months.

3. *Brassica* spp. such as rapeseed (*B. napus*) collards, broccolis and related “greens” are usually planted in fall or winter for food. When warm weather arrives these species flower “bolt” and the seed heads provide nectar, pollen and seeds as well as serve as hosts for whiteflies, aphids and other herbivores that may be alternate foods for beneficial insects.

4. The genera *Hyssops, Hyptis and Agastache* in the mint family are very confusing because the common names are often used interchangeably for species and cultivars of each. For example, blue giant hyssop is *Agastache foeniculum*.

5. Land owners are encouraged to evaluate and inventory the vegetation in their growing areas such as yards, gardens and other managed habitats such as hedgerows, shelterbelts, etc. “Homegardens” have been important to human beings for millennia and now are recognized
in many parts of the world as critical areas with high biodiversity and as repositories of vanishing native plant species. A simple table of the plant species annotated by a number of variables such as the following will be helpful in any effort to use or improve the ecological services provided. Possible variables to record by species: tree, shrub, annual, perennial, habitat type, native, exotic, phenology (budding, bloom, fruiting dates, etc.), special characteristics such as fruit/seeds, medical properties, extrafloral nectaries, arthropod and wildlife associates (butterflies, hummingbirds, pests, beneficials).

6. Crape myrtles are very important ornamental plants in the landscape in the Southeast due to their horticultural characteristics. They are also very important in augmentation of beneficial insects and pollinators. The flowers do not produce nectar but have two types of pollen. Crape myrtles are attacked by crapemyrtle aphids, *Tinocallis kahawaluokalani*, which along with their honeydew serve as food for beneficial insects. The aphids are more prevalent on some cultivars of crape myrtle than others (Mizell and Knox 1993) and some newer cultivars such as ‘Cherry Dazzle’ and ‘Raspberry Dazzle’ have high populations of aphids every year without special treatment. Other crape myrtle cultivars will need to be managed to promote new growth by heavy pruning, fertilizer and sometimes irrigation. We recommend considering the following cultivars if one is trying to promote pollinators (Acoma, Osage, Apalachee, Miami, Natchez) or beneficials (Biloxi, Comanche, Apalachee, Tuscarora, Tonto, Cherry Dazzle, Raspberry Dazzle).

7. *Ecological bottlenecks* are extreme events that often severely affect organism survival on a local or larger level. Examples would be severe weather such as hurricanes or climatic conditions such as severe and prolonged droughts. Prolonged droughts can be devastating to insects because of the impact on their host plants. When such events occur, plants that are more tolerant of the imposed conditions become extremely important to sustain local insect populations. Crape myrtle is an example of such a plant and it is very important in sustaining both natural enemies and pollinators during droughts.

8. *Lobularia* “Snow Princess” grows year round in north Florida

**General comments:** According to the Millennium Ecosystem Assessment ([http://www.maweb.org/en/index.aspx](http://www.maweb.org/en/index.aspx), MA), “ecosystem services are the benefits people obtain from ecosystems.” The MA classifies ecosystem services as follows:

- **Cultural:** nonmaterial benefits people derive from ecosystems, such as recreation, cultural and religious values, artistic and scientific inspiration, etc.
- **Provisioning:** products that come directly from ecosystems, such as food, fiber, fuel, pharmaceuticals, etc.
- **Regulating:** benefits accrued from regulating ecosystem processes, such as climate regulation, water purification, flood control, crop pollination, biological control, etc. (discussed in this publication).
- **Supporting:** services necessary for all other ecosystem services, such as soil formation, nutrient cycling, primary production, etc.

**Further Reading:**
Florida-Friendly Landscaping™ Legislative Definition

Esen Momol
University of Florida

The definition of Florida-Friendly Landscaping™ in Florida Statutes section 373.185 (adopted in 2009 in Senate Bill 2080) addresses "quality landscapes that conserve water, protect the environment, are adaptable to local conditions, and are drought tolerant. The principles of such landscaping include planting the right plant in the right place, efficient watering, appropriate fertilization, mulching, attraction of wildlife, responsible management of yard pests, recycling yard waste, reduction of stormwater runoff, and waterfront protection. Additional components include practices such as landscape planning and design, soil analysis, the appropriate use of solid waste compost, minimizing the use of irrigation, and proper maintenance."

Questions & Answers about the FFL Legislature

Q. Does the new law allow homeowners to retrofit their yards by removing turfgrass and installing Florida-Friendly plants without HOA permission?

A. The amendments to Florida Statutes section 373.185, et seq., have not changed the review approval process for HOAs. If deed restrictions or covenants require HOA approval for landscape modifications, then homeowners still need approval from HOAs.

Q. Does the bill address common property owned by the HOA?

A. No, but the Florida-Friendly Landscaping™ Program recommends that the HOA set an example for homeowners by following Florida-Friendly Landscaping™ principles in common areas.

Q. What does the new law specifically require of homeowners and landscape maintenance companies?

A. **Homeowners:** Homeowners are encouraged but not required to landscape in accordance with Florida-Friendly Landscaping™ principles but they are required to get an approval from their HOA Review Board.


B. **Landscape maintenance companies:** Florida Statute Landscape maintenance professionals who apply fertilizer commercially are required to obtain a Limited Certification for Urban Landscape Commercial Fertilizer Application from the Florida Department of Agriculture and Consumer Services by 2014. To get this certificate, each green industry professional must be trained and must have received a Certificate of Completion from UF/IFAS and the Florida Department of Environmental Protection in the Florida-Friendly Best Management Practices for Protection of Water Resources by the Green Industries (GI-BMP). The training program teaches...

**Q.** Do HOA review boards have the authority to tell homeowners what they can and cannot plant?

**A.** Yes, if the review board is permitted to do so through their covenants or deed restrictions.

**Q.** If a homeowner submits a landscape plan to his or her HOA that the HOA does not consider to be Florida-Friendly, what recourse does the homeowner have?

**A.** The Florida-Friendly Landscaping™ Program recommends homeowners and HOAs work cooperatively to find mutually acceptable solutions. UF/IFAS and the Department of Environmental Protection can offer technical assistance and education but they cannot provide a legal advice.

**Q.** Is turfgrass Florida-Friendly?

**A.** Yes, as long as it matches site conditions and is not maintained with excessive irrigation, pesticides, and fertilizer.

**Q.** What types of turfgrass are Florida-Friendly?

**A.** Five types of turfgrass (two classifications of St. Augustinegrass and several cultivars) are considered Florida-Friendly as long as the choices match the site conditions.

**Q.** Can HOAs require St. Augustinegrass for lawn turfgrass?

**A.** Yes, it can be required just like any other Florida-Friendly Landscaping™ turfgrass if it is the right plant for the right place.

**Q.** Does Florida-Friendly Landscaping™ achieve any cost savings?

**A.** A condominium community in St. Augustine Beach converted to Florida-Friendly Landscaping™ and reduced outdoor water use by 10 million gallons between 2006 and 2010. The community also saved $6,500 in one year on landscape maintenance. Reduced irrigation resulted in fewer pest problems and substantial savings in electricity costs to run the well pumps.

Please feel free to contact me at [eam@ufl.edu](mailto:eam@ufl.edu) if you have further questions.
Florida has greater biodiversity than nearly all other states in the U.S.

Your Decisions Impact Wildlife

- Large conservation areas are essential to wildlife
- Large conservation areas make up <30% of Florida
- That means across >70% of Florida, the decisions you make influence wildlife!
- You can provide the resources wildlife need to survive

Resources Required by Wildlife

1. Food
2. Water
3. Shelter (cover)

Plants provide food and cover. They determine the value of an area to wildlife.

What Should You Plant?

- Native wildlife are adapted to native plants
- Native plants are suited to the local climate
- Native plants require less fertilization & water
- Wildlife thrive in areas with native vegetation

Providing Food for Wildlife

- Grasses
- Flowers
- Fruits
- Nuts
- Seeds
- Other wildlife
Grasses / Ground Cover
Limit your lawn!
- turf provides little food or cover
Allow portions of yard to remain unmowed
Substitute plant native flowers or grasses for turf
- consider Coreopsis or perennial peanut
Advantages: reduced chores!
- less fertilizing
- less watering
- less weeding

Flowers
Some wildlife consume them directly
- Deer, gopher tortoises
Others feed on their nectar & pollen
- Hummingbirds, bees, butterflies, moths

Flowers as Food for Wildlife
Most pollinators have preferences
- hummingbirds: red, pink, orange — tubular shape
- bees: yellow, purple, blue
- butterflies: any bright color
- moths: white

Food for Hummingbirds
Natural vegetation
- Red, orange, or pink flowers
- Tubular (cone-shaped) flowers
- Variety of species that bloom throughout the year
- Placed in several distinct groups

Food for Hummingbirds
artificial feeders
- mix 4 parts water with 1 part sugar
- replace sugar water 1-2 times/week (when cloudy)
- clean with hot water and vinegar (not bleach)
- place in shade to limit fermentation
- place >10 ft apart
Real nectar is better: sugar + water is not very nourishing
Food for hummingbirds

- Cardinal flower (*Lobelia cardinalis*) Su, Fa
- Catch pink (*Silene virginica*) Sp, Su
- Four o’clock (*Mirabilis jalapa*) Su, Fa
- Red buckeye (*Aesculus pavia*) Su, Fa
- Red morning glory (*Ipomoea hederifolia*) Su
- Royal catchfly (*Silene regia*) Sp
- Scarlet sage (*Salvia coccinea*) Fa, Wi
- Trumpet creeper (*Campsis radicans*) Su
- Trumpet/coral honeysuckle (*Lonicera sempervirens*) Sp, Su

Fruits & Nuts

Fruiting shrubs and trees - "soft mast"
- important during spring and summer
Trees with nuts and acorns - "hard mast"
- important during fall and winter

Fruits & Nuts

Food for Granivores

Bird feeders
- >10 ft from vegetation to limit squirrel access
- <20 ft from vegetation to provide escape cover
- Either <3 or >30 ft from windows to prevent collisions

Wash feeders every month
- Rotting seeds can sicken birds
- Use soap and water
- Use bleach periodically if not wooden

Providing Water for Wildlife

- drinking
- bathing
- reproduction

Forms of water:
- bird baths
- ponds
- swamps
- marshes
- streams

Bird Baths

- Empty 1-2 times per week
- prevents mosquito breeding
- prevents algae build-up
- Place >15 ft from shrubs
- Place >3 ft off ground
- Water level should be low <3 inches
**Ponds for Wildlife**

- Habitat for turtles, frogs, salamanders, snakes, raccoons, birds, fish, invertebrates
- Irregular shapes, peninsulas, and islands are desirable
- Aquatic plants provide food and cover
- Gently sloping bottom is best
- Regular maintenance is required to limit cattails and hydrilla

**Artificial Pools for Wildlife**

Manufactured pools good for fish: too deep for birds
Add rocks
- some submerged
- some above the surface
Locate pool near overhanging tree branches
- Shade
- Perch sites

**Providing Cover for Wildlife**

Plants are the key to providing cover
- shade from the sun
- protection from precipitation
- hiding from predators and people
- structural diversity

Think about “layering”
Strive to create ≥3 layers

**Structural Diversity**

**Seasonality of Cover Options**

**Deciduous species**
- Leaves used as nest material
- Leaf litter used by amphibians, small mammals, and invertebrates
- Hard and soft mast
- Nesting and foraging sites

**Evergreen species**
- Shelter during fall and winter
- Nest and perch sites
Provide Cover Options Year-round

Dead Wood Provides Cover
Snags = dead standing wood
Logs = fallen dead wood

Dead Wood as Cover
Snags and cavity trees
- 40 bird species in FL use tree cavities
- bats, squirrels, raccoons, opossums, bears

Logs
- shelter, humidity, basking location, navigational aid, food source
- amphibians, reptiles, mammals

What if No Dead Wood is Present?
Nest boxes
- owls, nuthatches, bluebirds, purple martins
- bats, flying squirrels, gray squirrels

Different species have different preferences
- size
- opening shape, dimensions, and positioning
- height
- consider territoriality and predation

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### Tips for nest boxes

- Make a hinged door for cleaning
- Want it watertight but not airtight
  - Overhanging roof
  - Holes in bottom for drainage
  - Ventilation holes just beneath roofline
- Don’t add a perch
  - Perches encourage English sparrows & European starlings
- Use untreated, durable wood
  - Cedar, redwood, plywood
- Use galvanized nails

### Bluebirds

- Feed on insects during the summer and berries during the winter
- Lack of natural tree cavities in open areas limits their numbers
- By installing a nest box, you can create new bluebird habitat
  - 4 x 4 x 9 in or 5 x 5 x 9 in
  - Round entrance hole 1.5 in

### Attracting Bluebirds

- Mount ~5 ft above the ground
- Mount on a pole
  - Raccoons can access boxes on fences/trees
  - Coat the pole with grease
  - Add a predator guard
- Space houses >100 yards apart
- Face away from prevailing wind

See North American Bluebird Society website for blueprints

### Attracting bats

- Insect control provided by bats
  - 13 species of bats live in FL year-round
  - Nearly all FL bats feed on insects
  - Bats have high metabolism – they eat a lot!
  - Research has shown bats feed on crop pests
  - Attract bats by providing shelter

### Pests Eaten by Bats

- Spotted cucumber beetle
- Green stinkbugs
- Leafhoppers
- Fall armyworm
- Cabbage looper
- Tobacco budworm
- Corn earworm/cotton bollworm
- Pecan pests
- Mosquitos

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Spotted cucumber beetle
Fall armyworm
Tobacco budworm
Corn earworm
Fall webworm
Cabbage looper
Leafhoppers
Spotted cucumber beetle
Fall armyworm
Tobacco budworm
Corn earworm
Fall webworm
Cabbage looper
Leafhoppers
Bats Also Produce Free Fertilizer

- Slow release (2-6 weeks)
- 5-10% nitrogen
- 3% phosphorous
- 1% potassium

Bat Species You Can Attract

Bat Houses

- Size matters – bigger is better
- External color will influence internal temperatures
- The more chambers the better
- Create a landing pad
- Exterior-grade plywood
  - > 1/2 in thick
- ¾ in. spacing between baffles
- Watertight but not airtight

Bat House Mounting
Bat House Locations

On a building or a pole, not on a tree
The higher above ground the better (>12 ft)
Not near a perch site for predators (trees, wires)
Not near a road or a street light
Near open water
Consider permanency

Providing Bat Habitat

Don’t be surprised if bats don’t move in immediately
Best to erect a new house over the winter so it’s available for bats to move in during the spring
Consider other, natural options for providing bat habitat
- Leave trees with cavities in your yard
- Leave trees with peeling bark in your yard
- Leave dead fronds on palm trees in your yard

Developing a Management Plan

1. Describe what you want to do for wildlife
2. Describe how you will do it
3. Describe where (map)
4. Describe when (timeline)

What Will You Do?

Take an inventory of what you currently have
- Vegetation types
- Habitat features
- Soil types
- Exotic species
- Mast-producing species
- Pesticide use
- Adjacent land use
Draw a map to show the layout

Setting Goals and Objectives

Are there specific species you want to attract?
Do you know the needs of these animals?
- Food
- Water
- Cover
What conditions need to be changed?

Consider Your Constraints

What factors are limiting?
Can you provide them?
Florida’s climate allows homeowners to grow their own delicious vegetables nearly year-round. Basic vegetable gardening information, planting dates, reliable varieties, and much more can be found in the Florida Vegetable Gardening Guide available from your county Extension office or online at http://edis.ifas.ufl.edu/vh021.

This publication on organic techniques is meant to be a companion document to the Florida Vegetable Gardening Guide. Organic Vegetable Gardening in Florida is intended for the home gardener who prefers to use natural and organic materials as well as methods that are compatible with the philosophy of organic gardening. Commercial organic producers should refer to Organic Vegetable Production (http://edis.ifas.ufl.edu/CV118).

The Legal Definition of Organic
The National Organic Program (NOP) was created in response to the need for uniform production standards among commercial organic farms. The NOP is managed by the United States Department of Agriculture and is a federally-regulated consumer protection label for agricultural products. Commercial producers who want to advertise crops as organic must be certified if they gross more than $5,000 a year. Part-time market gardeners who gross less than $5,000 a year from “organic” products are not required to be certified, but are required to comply with all regulations established by the NOP if they advertise their products as “organic”. Home gardeners who consume or freely share the bounty with friends and family are not required to be certified and, in fact, are not allowed to use any NOP labels or organic logos. For more information, visit the NOP website (see Additional Resources at the end of this document).

Be careful when buying products with the term “organic” on the label. The term “organic does not necessarily mean the product is approved for use in organic production, but rather that the product contains organic material, or material that is high in carbon. The term “certified organic” is used only for commercial agricultural “outputs” - namely food, fiber, and seed, but not on “inputs” such as compost, manure, or soil. For products approved for use in commercial organic production (such as pesticides and fertilizers), look for the NOP seal or the OMRI seal. The OMRI seal can also be found on numerous garden products sold at nurseries and home supply stores. For more information, see “Understanding the USDA’s Organic Label in EDIS at: http://edis.ifas.ufl.edu/hs397.
Seeds and Transplants
Organically produced seeds are now available from many on-line or mail order catalogs as well as local garden centers. Organically produced transplants are not as widely available, but may occasionally be purchased at farmer’s markets or from a certified organic producer. Currently, the demand for organic seeds and transplants exceeds supply so these organic products can be more expensive than non-organic products.

If you intend to grow your own transplants, pay special attention to the quality of the planting medium. Sterilized soil-less mixes are readily available and minimize the risk of soil-borne diseases and weeds. However, many commercially available mixes have synthetic wetting agents and starter fertilizers that are prohibited in commercial organic production. Therefore, purist organic gardeners should look for mixes approved for use in organic production or make their own by buying bulk ingredients and mixing by hand. A large aluminum or plastic trash can with a secure lid is an inexpensive container for mixing and storing the media. Galvanized containers can impart zinc to the media.

There are several reliable recipes for organic media, but trial and error is the only way to know which blend will work best for the crops you grow. For vegetable transplants, one simple media recipe is 2 parts compost, 6 parts peat moss or small sized pine bark chips, and 2 parts perlite or vermiculite. For best results, transplant media should have a pH between 5.5 and 6.5; otherwise some nutrients may not be accessible to the plant. If perlite is used, adjust the pH with dolomitic limestone (dolomite) that provides magnesium as well as calcium. Since magnesium is already present in vermiculite, regular agricultural limestone is sufficient to raise the pH if necessary. Add the liming material at a rate of 5 pounds to every cubic yard of mix. Be sure to mix your media in a well-ventilated area and wear gloves and a dust mask to avoid inhalation of potentially harmful dusts. If using the trash can approach, simply alternate the addition of ingredients until the can is no more than ¾ of the way full, secure the lid and roll until mixed. For a list of suppliers of organic potting media and more media recipe ideas, see Additional Resources: “Potting Mixes for Certified Organic Production” on the National Sustainable Agriculture Information Service (ATTRA) website.

Fertilize transplants 10-14 days after germination. Purist organic gardeners should use a soluble fertilizer such as liquid fish emulsion or liquid kelp; otherwise most soluble fertilizer can be used. Mix and apply according to product directions. Gardeners with an interest in using compost tea should refer to that section below. Transplants grown indoors need to be prepared for the more stressful conditions outdoors. Move the transplants outside for about a week before planting them in the garden. Transplant stems should be firm but not woody - woody stems are a sign that growth has slowed, and these plants may have difficulty resuming active growth. Transplants should also be free from flowers to ensure rapid growth and establishment.

Soil Preparation
One key tenet of organic gardening is to increase the soil’s organic matter content. Organic matter is central to many beneficial ecological processes. With time, organic matter is slowly transformed by soil microbes into soluble nutrients that plants use for growth and development. Organic matter also provides these additional benefits:
• Improves soil structure.
• Improves the ability of soil to hold water, nutrients, and air.
• Improves the “buffering” capacity of soil, i.e., improves the soil’s resistance to sudden changes in pH.
• Provides a source of carbon to sustain the biological life in the soil.
• Acids from decomposing organic matter and natural microbial processes help convert insoluble natural additives such as ground phosphate rock into plant-usable forms.
• Suppresses nematode populations.
• Recycles organic waste products.

Organic gardening relies on regular additions of organic material applied to the soil usually in the form of animal manures, plant manures (cover crops), compost, or mixed organic fertilizer. Before adding any nutrients or amendments to the soil, all gardeners should submit a soil sample for analysis to a licensed soil laboratory. The University of Florida offers a soil test for home gardeners for a nominal fee. Visit the Extension Soil Testing Laboratory’s (ESTL) website http://soilslab.ifas.ufl.edu/ESTL%20Home.asp for more information on how to collect and submit a soil sample. Soil test results will include a recommendation for fertilizer application based on the planned crops.

Soil Organic Matter. Soil contains minerals (sand, silt, and clay), water, air, and soil organic matter. Soil organic matter (SOM) consists of living microorganisms plus plant and animal organic residues that are fresh, partially, or fully decomposed. Florida soils typically contain from 0 to 5% organic matter although the muck soils found near Lake Okeechobee contain up to 100% organic matter. Organic matter is decomposed by micro-organisms such as fungi, algae, bacteria, beneficial nematodes and earthworms. It is possible to increase the SOM in our subtropical environment but it takes regular additions of organic amendments for several years before an increase can be documented. The UF ESTL can determine the percentage of soil organic matter for an extra fee.

Lime. Reducing the acidity of the soil is the primary purpose for using lime in the garden. Lime should be applied only when the need for it has been established by a soil test that measures both the pH and buffer capacity. (See soil testing information above). Natural deposits of lime that an organic gardener might use are limestone, dolomite, shell, and marl. All these forms must be finely ground to provide maximum benefit to the soil and plants. When a soil test reveals that a pH adjustment is needed, apply lime well in advance of the planting date, preferably 2 to 3 months before the garden is planted. In most Florida soil conditions, applications of 2 to 5 pounds of finely ground dolomitic limestone per 100 square feet will increase the soil pH by one unit. Mix well with the soil and keep moist for best results. Application of lime closer to planting time is permissible, but its benefits will be delayed. Most water from wells in Florida is high in calcium and magnesium. If you plan to irrigate from well water, be careful not to add too much lime to the soil. Irrigating with well water high in these nutrients can increase the pH of your soil.

Animal Manures
When animal manures are available, they are a very good source of nutrients and organic matter. When obtained from a local source, transportation costs are minimized, a waste product is
recycled, and the gardener learns first-hand about animal diets and litter materials. The disadvantages of using raw manure include its strong odor, plant damage from its high salt and nitrogen concentration, and risks to human health due to the *E. coli*, Salmonella, and Listeria. Composting removes most of these problems and improves the quality of the organic matter being added to the garden. (see *Compost* section below).

The National Organic Standards has strict rules on manure use. In certified organic systems, raw manure must be applied 90 days before harvesting a crop where the edible portion is not in contact with the soil (Ex: sweet corn) and 120 days before harvesting a crop where the edible portion does touch the soil (Ex: watermelons, potatoes). This practice, commonly referred to as the “90/120 day rule,” is highly recommended for home gardeners as well. Manure from pigs, dogs, and cats should never be used in gardens due to the risk of contamination by parasites such as roundworm or tapeworm. Manure generally releases nutrients slowly and should be mixed into the soil before planting. Soil incorporation also reduces the potential for nutrient losses due to run-off in heavy rains or volatilization of certain nutrients such as nitrogen.

Because phosphorus, copper, and zinc are frequently added to poultry feed, repeated applications of poultry litter on the same location should be avoided. This practice prevents accumulation of heavy metals at concentrations toxic to plants and reduces the chance of phosphorus contaminating surface water like lakes and rivers. A number of private labs offer waste analysis for a nominal fee. Gardeners who plan to use the same manure source for several years should consider having the source analyzed.

Manures vary greatly in their nutrient content according to the type, age, and condition of the animal; the kind of feed used; the age of the manure; the moisture content of the manure; and the kind and amount of litter or bedding mixed in the manure. Table 1 shows nutrient concentrations of N, P, and K as well as recommended application rates of raw manures based on their wet weights. Animal manures also provide most of the micro-nutrients needed by plants. Keep in mind that manure is not always a well-balanced fertilizer. It is advantageous to broadcast a complete fertilizer or ground rock phosphate and potash in addition to the manures.

Before planting, broadcast the manure evenly over the plot and till or spade it into the topsoil. Break up clumps of partially decomposed organic matter that may interfere with planting and may result in nutrient deficiencies and possible soil-borne disease problems such as "damping-off" of young seedlings. Use the “90/120 day rule” described above for human and plant safety.

**Cover Crops**

Cover crops, also called green manure, are short-term plantings that are turned into the soil rather than harvested. They are grown to cover and protect bare soil from erosion during heavy rains and winds, improve soil physical structure, provide habitat for beneficial insects, and supply nutrients to subsequent crops. Planting and plowing-in cover crops during the off-season is another way to increase the content of organic matter in the soil and give the garden a rest. The following crops are recommended: cowpea, velvet bean, soybean, and sunflower in summer (June through September), and cereal rye (FL 401), crimson clover, and Austrian winter pea in winter (November through February). Some cover crops also help to reduce nematode
populations. For more information, see *Managing Nematodes for the Non-Commercial Vegetable Garden* and the additional references at the end of this publication.

*Compost*

Simply put, compost is produced by alternating layers of “green” organic materials, such as yard trimmings and kitchen table wastes with “brown” organic materials such as fallen leaves, animal or plant manure, or even unbleached paper. Mixing these materials with water and air encourages microbial decomposition. Some gardeners add organic fertilizers, topsoil, lime, or minerals to enhance the nutrient concentration of compost. There are many recipes and several methods of composting from which to choose. A list of materials and what each might contribute to the compost is given in Table 2. For more information regarding home composting methods see “Compost Tips for the Home Gardener” http://edis.ifas.ufl.edu/ep323 and visit the UF-IFAS Composting Center http://sarasota.ifas.ufl.edu/compost-info/.

Compost for the garden should be ready from 2 months to 1 year, depending on the time of year, type of materials added, and how intensely the compost is managed. When the compost is broken down into a somewhat homogenous mixture, smells sweet, and is not hot, it is ready for use as a mulch or soil amendment. Broadcast over the entire garden and incorporate into the soil to a depth of six inches two to three weeks before planting. If you have only a small quantity of compost, it may be mixed into the soil along each planting furrow or at each hill site.

Special consideration should be given to compost and other inputs used in school gardens, gardens for the elderly, and other “at-risk” populations. To minimize risk of illness, look for commercial compost that meets the standards established by US EPA (Chapter 40 Code of Federal Regulation (CFR) section 503) or the USDA’s National Organic Program (7 CFR 207.203) for unrestricted use and distribution. These regulations have specific time/temperature requirements to insure pathogen destruction. The US Composting Council (USCC) offers a Seal of Testing Assurance (STA) for commercial compost producers. The USCC’s STA is a compost testing, labeling and information disclosure program to assure consumers that the compost was made according to EPA standards and is of the highest quality. STA compost is considered certified pathogen-free for fecal coliform bacteria or Salmonella. The STA label is voluntary, thus there may be other compost suppliers offering properly composted manures with minimum risk due to fecal coliform bacteria. These companies keep composting records and most will provide certificates of analysis, if requested. Most states require commercial facilities to obtain permits to sell compost. In Florida, permits are obtained from the Department of Environmental Protection. For more information on compost use in commercial organic systems, refer to http://edis.ifas.ufl.edu/CV118.

Apply compost at the rate of about 25 pounds per 100 square feet, or ¼ pound per square foot. This rate was calculated using the assumption that compost has a typical nitrogen content of 3%, and that one half of the total nitrogen will be available during the growing season. This rate will provide approximately 200 pounds nitrogen during the season. If the compost was made without animal manures or biosolids, it will likely have a lower nitrogen concentration. In that instance, larger amounts may be more beneficial, up to 100 pounds per 100 square feet (1 lb/sq ft.). IFAS recommends splitting the higher application into at least two smaller applications during the season to avoid water pollution due to nutrients present in leachate and runoff.
Compost Tea
Compost tea is made by soaking compost in water and, in the process, extracting beneficial microbes and nutrients. Compost tea is claimed to provide some protection against plant diseases. However, because results depend on a complex of environmental and biological conditions, compost tea does not consistently suppress pathogens. Generally, there are many other cultural practices that can be used with a greater likelihood of reducing disease problems (rotation, selecting resistant cultivars, etc.). Compost tea does not provide a measurable amount of nutrition to plants. Tea from raw manures is prohibited in organic production because this practice does not follow the “90-120 Day Rule.” More information on compost tea can be found in the Additional Resources section at the end of this publication.

Fertilization
A number of new products are available to gardeners that contain pre-formulated balanced blends of nutrients and have been approved for organic production. These products are made from plants or animal by-products of the livestock industry and include both the organic materials derived from plants and animals, plus natural deposits of rocks and minerals. These mixtures have a guaranteed analysis and it is easy to calculate application rates (Box 2). Home gardeners who may wish to create their own organic fertilizers. The nutrient content of various materials is listed in Table 3.

Vegetables need a number of nutrients. A primary nutrient refers to nitrogen (N), phosphorus (P) and potassium (K), which are used in considerable quantities by plants. Secondary nutrients refer to calcium (Ca), magnesium (Mg), and sulfur (S), that plants use in moderate quantities. Sometimes, primary and secondary nutrients are grouped together and called macronutrients. Micronutrients are essential plant nutrients used in relatively small quantities. These micronutrients include boron (B), copper (Cu), iron (Fe), chloride (Cl), manganese (Mn), molybdenum (Mo) and zinc (Zn).

Nitrogen (N). Nitrogen is frequently the limiting nutrient in vegetable growing success. N from organic sources is typically sufficient to support plant growth, but its management can be challenging in organic gardening due to the variability of N concentrations in these sources. Furthermore, because the rate of N release depends on many environmental factors such as temperature, soil moisture and microorganisms, even the best estimate may not always reflect the actual release rate.

The application of N nitrogen depends largely on the crop’s requirements and the form that is being applied. Soluble, mineral forms of N (often present in synthetic fertilizers) are avoided by some organic gardeners due to the philosophical opposition of using synthetic products as well as the scientific observations that highly soluble nutrients contribute little to the soil biology. However, keep in mind that misapplication of N in any form poses a risk to ground and surface water quality.

Phosphorus (P). Phosphorus is plentiful in many Florida soils. A soil test will reveal whether additional phosphorus is needed. If so, and an organic approach is preferred, apply rock or colloidal phosphate. Rock phosphates are natural deposits of phosphate in combination with calcium. The material is hard and yields phosphorus slowly (months to years). When finely
ground and purified, the powdery material is only slightly soluble in water and is not immediately available to plants. Eventually, the phosphate rock reacts with acids from decaying organic matter in the soil and becomes absorbable by plants. Colloidal phosphate is also available and widely used.

The application rate for rock or colloidal phosphates is 2-5 pounds per 100 square feet of garden soil. Or, when applying compost, mix at the rate of 2½ pounds per 25 pounds compost. Broadcast the material over the soil surface and work into the topsoil before planting. Since phosphate materials are so slowly decomposed, side-dressings are seldom beneficial. Only the minimum amount of phosphorus should be used due to its negative impact on water quality.

Potassium (K). Potassium is widely distributed in nature, occurring in rocks, soils, tissues of plants and animals, and in water of seas and lakes. In organic gardening practice, materials such as wood ashes, seaweed, potash salts, greensand, and ground rock potash are used alone or in combinations with other materials such as manure or compost. Since potash-bearing materials vary so much in composition and rate of decomposition, application rates must be determined for each. In general, ground rock potash at 5 pounds per 100 square feet may be broadcast over the soil surface three weeks before planting and incorporated into the soil. Langbeinite (Brand name: Sul-Po-Mag) is used at 1 lb/100 sq ft.

Secondary Nutrients and Micronutrients. An advantage of using organic materials as fertilizers is that these organic sources often contain many additional elements that plants need in addition to N, P, and K. For example, manganese is typically present in manure. Other nutrients are found in naturally occurring materials such as marl (calcium), dolomite (calcium and magnesium), limestone (calcium), and gypsum (calcium and sulfur). Gypsum is used where calcium is needed but a pH adjustment is not.

Remember, micronutrients are needed by plants in very small quantities; too much is toxic. Avoid problems by applying micronutrients only when indicated by a soil or plant tissue test. Boron (B) it is commonly sold as Solubor. However, approved organic products containing other micronutrients (such as the metals zinc, copper, iron) can be difficult to locate. Try to find formulations that are chelated (or coated) with natural agents. Never apply foliar nutrients during the hottest time of day.

Lime. Reducing the acidity of the soil is the primary purpose for using lime in the garden. Lime should be applied only when the need for it has been established by a soil test that measures both the pH and buffer capacity. (See soil testing information under Soil Preparation section above). Liming materials also contain plant nutrients. Gypsum is used where calcium is needed but a pH adjustment is not. Natural deposits of lime that an organic gardener might use are limestone, dolomite, shell, and marl. All these forms must be finely ground to provide maximum benefit to the soil and plants. When a soil test reveals that a pH adjustment is needed, apply lime well in advance of the planting date, preferably 2 to 3 months before the garden is planted. In most Florida soil conditions, applications of 2 to 5 pounds of finely ground dolomitic limestone per 100 square feet will increase the soil pH by one unit. Mix well with the soil and keep moist for best results. Application of lime closer to planting time is permissible, but its benefits will be delayed.
**Water Management**

Frequent, light applications of water are necessary for seed germination and transplant establishment. After that period, it is advisable to ensure soil is moistened throughout the root zone weekly, either by rainfall or by irrigation. Light sprinklings every day merely tend to wet the surface and encourage shallow root growth. Drip or trickle irrigation is encouraged as a method for conserving water. Drip irrigation uses water more efficiently than overhead sprinklers because the water is applied through drip emitters or tubing placed directly over the root zone where it is needed.

**Mulch**

Mulch is any material placed on the soil surface around plants. Mulch provides the following benefits: (a) conserves soil moisture, (b) conserves nutrients, (c) reduces soil erosion, (d) reduces crop loss due to nematodes, (e) reduces weed growth, (f) provides a barrier between fruit and soil, thus reducing rotting of fruit, and (g) moderates soil temperature. Organic mulch can attract many insects, including beneficial spiders and ground beetles, but may also attract insects that can damage crops. Organic materials most commonly used for mulching are oak leaves, grass clippings, Bahia hay, pine straw, and mature cover crops that have been cut and returned to the garden as mulch. Apply mulch before or after seeding or transplanting. Generally, 3 to 4 inches of moderately packed mulch is recommended to prevent weeds. Hardwood or pine mulch chips are best used in walkways and border areas around the garden. These mulches are slow to breakdown, provide a surface to walk on when the garden soil is wet, and can reduce weeds. Adding a weed barrier under the mulch chips reduces weed growth even further. The most affordable way to purchase mulch is in volume. Mulch is typically sold by the cubic yard. One cubic yard (yd³) will cover 100 square feet spread 2-3 inches deep.

At the end of the garden season, organic mulch may be removed and composted, or incorporated into the garden soil. If the mulch consists mainly of dry and woody plant stems (which have a high concentration of carbon), add manure or other nitrogen-rich organic fertilizer to promote their decomposition.

Synthetic mulch materials including plastic are allowed and used frequently by commercial organic producers in combination with drip irrigation. These mulches can be reused for several seasons before needing replacement. Black mulch and Infra Red Transmitting (IRT) mulch increase soil temperature – an advantage in the winter season. Gardeners relying on compost and other solid materials to fertilize their crops will need to apply those materials before laying down synthetic mulch.

**Pest Management**

The main objective of many organic gardeners is to produce food that has not been exposed to synthetic pesticides. Pests include weeds, insects, diseases, nematodes, and even animals such as raccoons and birds. The first step to effective pest management is good cultural practices such as observing planting dates, appropriate fertilizer and water use, crop rotation and controlling weeds that harbor pests.

Selecting vegetable varieties that are resistant or tolerant of pests is another approach that should be integrated into a home gardener’s pest management plan. Seed catalogs, seed packets, and
Transplant labels often indicate if a variety has resistance to certain pests either as statements or with letter designations. For example, a tomato variety name may be followed with _VFNTA_ indicating that it is resistant (in this case) to _Verticillium_ (V) and _Fusarium_ (F) wilt diseases, Nematodes (N), Tobacco Mosaic Virus (T), and _Alternaria_ fungus (A). Table 5 provides a list of pesticides considered as organic. The Florida Vegetable Gardening Guide (http://edis.ifas.ufl.edu/vh021) provides an extensive list of “no-pesticide” approaches to pests. Another excellent reference for identifying and managing insects is Insect Management in the Home Garden (http://edis.ifas.ufl.edu/vh036). Table 4 provides a list of pesticides considered to be organic.

_Crop Rotation._ Changing the location of crops within the garden is called rotation. Rotation is an essential component to pest management because it disrupts pest life cycles. Many pests prefer vegetables that belong to the same plant family. For example, bell pepper, tomato, and eggplant are in the same Solanaceae family. Avoid consecutively using crops from the same family in the same section of the garden. Some insects and diseases can persist in the soil for years, so it may be necessary to allow several planting seasons to pass before repeating a crop in a problematic section of the garden.

Many gardeners find it helpful to draw a sketch of the garden and the succession of crops to be planted. Try to plan at least 2 years in advance, 3-5 years is even better. Refer to the Florida Vegetable Gardening Guide (http://edis.ifas.ufl.edu/VH019) for planting dates and plant families to help plan a crop rotation strategy.

_Weed Management._ A few herbicides are labeled for use in organic systems, but they are expensive and not very effective. When it comes to controlling weeds, prevention is best. Select a garden site that is as free of weeds as possible. But fair warning, even when weed plants are not present, weed seeds are “banked” in the soil surface just waiting to germinate. Weed seeds are naturally managed to some extent by diseases that kill them and insects, microbes and small rodents that consume them. Weed seeds may be introduced into the garden in transplants, improperly prepared compost, plant mulches, and animal manures.

After the initial soil preparation for the garden is complete, it is beneficial to disturb the soil surface as little as possible so as to not expose new weeds seeds to the surface. Weeds are best controlled when they are small and have not begun to consume soil nutrients. Pull weeds or use hand tools for weed control. Only shallow cultivation and hoeing are advised so as not to damage the crop root system. If weeds are too large to cultivate with hand tools, then cut them off at the soil with pruning shears. Never allow weeds to flower and produce seeds; otherwise they will re-seed themselves and reappear in the future.

_Nematode Management._ Nematodes are microscopic worms that can seriously reduce growth and yield of most vegetables by feeding in or on their roots. There are many kinds of nematodes that can cause damage to plants. Sting nematodes cause roots to appear stunted or “stung”. Root knot nematodes form galls - swollen areas in the root that contain female nematodes and their young. Do not confuse these galls with another type of swollen growth called nodules. Nodules are formed by _Rhizobium_, a beneficial bacterium that inhabits root systems and provides nitrogen.
to leguminous plants. Nodules are easily distinguished from galls because they turn pink when sliced open and are easily removed from the root.

Nematode damage is less likely in soils with high levels of organic matter and where crops are rotated so that members of the same crop family are not planted repeatedly in the same soil. Excessive nematode populations may be reduced temporarily by "soil solarization" (Box 1) and other techniques described in Managing Nematodes for the Non-Commercial Vegetable Garden (http://edis.ifas.ufl.edu/ng005). See Additional Resources for more information.

Insect/Mite Management. Florida is home to many insects – including a host of beneficial organisms that naturally suppress pests. Certain cover crops attract beneficial insects that, in turn, reduce pest populations. Another approach is to plant a border of flowering plants known to attract natural enemies. Examples of such plants include Sunflower (Helianthus spp.), Mustards (Brassica spp.), Alfalfa (Medicago sativa), and Queen Ann’s Lace (Daucus carota). Buying and introducing beneficial insects into the home garden is expensive and seldom necessary.

A number of research studies have shown that excess nitrogen increases insect and mite populations. This finding creates a balancing act for gardeners who must provide enough nitrogen to grow a good crop without attracting pests. Weather patterns can also influence insects and mites. For example, hot, dry conditions tend to be associated with spider mites. It is a good idea to scout the garden weekly. Many insects are small even as adults, and prefer to remain out of direct sunlight. Check undersides of leaves, inside whirls of new growth including flower buds, and at the soil surface near the base of plants.

Disease Management. Diseases must be prevented as there are few curative controls available. Sanitation, resistant varieties, crop rotation, biological controls, and other cultural practices are common approaches to disease prevention. Sanitation practices include avoiding introducing diseased transplants into the garden and disinfecting tools following use. A number of materials including hydrogen peroxide, chlorine, and sodium hypochlorite (plain bleach) are generally allowed for use in organic production systems for sanitation purposes. Prevent crop-to-soil contact by staking plants or mulching. Avoid keeping the plants and soil too wet by using raised beds and drip irrigation. Avoid spreading disease by allowing vegetable foliage to dry before moving through the garden.

In organic gardens, pest management relies primarily on cultural practices, and pesticides should be used only as a last resort. For more information on pest management in the home garden, refer to http://edis.ifas.ufl.edu/topic_vegetable_garden_pests and the Florida Vegetable Gardening Guide (http://edis.ifas.ufl.edu/vh021).

When problems persist, it may be wise to submit a plant and/or soil sample for diagnosis to your local county Extension office. Contact information for county offices is located at: http://solutionsforyourlife.ufl.edu/map/. Your county Extension Agent may refer you to one of UF’s diagnostic labs listed in Additional Resources.
**Additional Resources**

**Internet**
- ATTRA (National Sustainable Agriculture Information Service) [http://www.attra.org](http://www.attra.org)
- FOG (Florida Organic Growers and Consumers) [http://www.foginfo.org](http://www.foginfo.org)
- OMRI (Organic Materials Review Institute)
  - List of Allowed Materials: [http://www.omri.org/OMRI_brand_name_list.html](http://www.omri.org/OMRI_brand_name_list.html)
  - Organic Seed Database: [http://www.omri.org/OMRI_SEED_list.html](http://www.omri.org/OMRI_SEED_list.html)
- Purdue University Extension
- SARE (Sustainable Agriculture Research and Education)
  - Home: [http://www.sare.org](http://www.sare.org)

**UF-IFAS EDIS Publications of Interest to Organic Gardeners**

- Florida Vegetable Gardening: [http://edis.ifas.ufl.edu/VH021](http://edis.ifas.ufl.edu/VH021)
- Seed Production and Seed Sources of Organic Vegetables: [http://edis.ifas.ufl.edu/HS227](http://edis.ifas.ufl.edu/HS227)
- Minigardening (Growing Vegetables in Containers): [http://edis.ifas.ufl.edu/VH032](http://edis.ifas.ufl.edu/VH032)
- Growing Potatoes in the Florida Home Garden: [http://edis.ifas.ufl.edu/HS183](http://edis.ifas.ufl.edu/HS183)
- Index for specific vegetable guidelines: [http://edis.ifas.ufl.edu/TOPICh8](http://edis.ifas.ufl.edu/TOPICh8)
- Growing Heirloom Tomato Varieties in Southwest Florida: [http://edis.ifas.ufl.edu/HS174](http://edis.ifas.ufl.edu/HS174)
- Producing Peanuts for Home Use: [http://edis.ifas.ufl.edu/AA182](http://edis.ifas.ufl.edu/AA182)

**Compost and Soil Amendments**
- Florida’s Online Composting Center- [http://www.compostinfo.com/Construction of Home Compost Units](http://www.compostinfo.com/Construction of Home Compost Units)
- Producing Garden Vegetables with Organic Soil Amendments: [http://edis.ifas.ufl.edu/MG323](http://edis.ifas.ufl.edu/MG323)
- Composting Horse Manure: [http://edis.ifas.ufl.edu/AN040](http://edis.ifas.ufl.edu/AN040)

**Cover Crops**
- Cover Crop Benefits for South Florida: [http://edis.ifas.ufl.edu/SS461](http://edis.ifas.ufl.edu/SS461)
- Cover Crops: [http://edis.ifas.ufl.edu/AA217](http://edis.ifas.ufl.edu/AA217)
- Management of Nematodes with Cowpea Cover Crops: [http://edis.ifas.ufl.edu/IN516](http://edis.ifas.ufl.edu/IN516)
- Managing Nematodes for the Non-Commercial Vegetable Garden: [http://edis.ifas.ufl.edu/NG005](http://edis.ifas.ufl.edu/NG005)
Pest Management
Beneficial Insects #1: http://edis.ifas.ufl.edu/IN002
Beneficial Insects #2: http://edis.ifas.ufl.edu/IN003
Beneficial Insects #3: http://edis.ifas.ufl.edu/IN012
Beneficial Insects #4: http://edis.ifas.ufl.edu/IN013
Beneficial Insects and Mites: http://edis.ifas.ufl.edu/IN078
Biological Control for Insect Management in Strawberries: http://edis.ifas.ufl.edu/HS180
Coping with Deer Damage in Florida: http://edis.ifas.ufl.edu/UW128
Diseases in Florida Vegetable Garden: Beans: http://edis.ifas.ufl.edu/PP132
Diseases in Florida Vegetable Garden: Pepper: http://edis.ifas.ufl.edu/PP122
Diseases in Florida Vegetable Garden: Tomato: http://edis.ifas.ufl.edu/PP121
Insect Management in the Home Garden: http://edis.ifas.ufl.edu/VH036
Management of Nematodes with Cowpea Cover Crops: http://edis.ifas.ufl.edu/IN516
Managing Nematodes for the Non-Commercial Vegetable Garden: http://edis.ifas.ufl.edu/NG005
Natural Enemies and Biological Control: http://edis.ifas.ufl.edu/IN120
Nematode Management Using Sorghum and Its Relatives: http://edis.ifas.ufl.edu/IN531
Plant Pathology’s Index of Extension Publications on Diseases:
http://plantpath.ifas.ufl.edu/takextpub/
Vegetable Garden Insects #1: http://edis.ifas.ufl.edu/IN006
Vegetable Garden Insects #2: http://edis.ifas.ufl.edu/IN007

Diagnostic Labs and Clinics of the University of Florida/IFAS
Plant Disease Clinic http://plantpath.ifas.ufl.edu/pdc/Default.htm
Insect Identification Service http://edis.ifas.ufl.edu/sr010
Nematode Assay Laboratory http://edis.ifas.ufl.edu/SR011
The Florida Plant Diagnostic Network http://edis.ifas.ufl.edu/PP151
Soil Testing Laboratory http://soilslab.ifas.ufl.edu/
Landscape and Vegetable Garden Test Information Sheet: http://edis.ifas.ufl.edu/SS187

Books
Free online version: http://www.sare.org/publications/insect/insect.pdf


More for-sale resources on Florida Vegetable Gardening and Pest Management are available through the University of Florida/IFAS Extension Bookstore: 800-226-1764 or http://ifasbooks.ifas.ufl.edu/

Footnotes

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The use of specific trade names in this publication does not constitute endorsement of these products in preference to others containing the same active ingredients. Mention of a proprietary product does not constitute a guarantee or warranty of the product by the authors or the publisher.
Box 1. Soil sterilization methods for the home gardener.

Soil Solarization for garden beds
In Florida, summer (July-August) is the best time to “solarize” soil in the garden. Clear plastic (low density polyethylene mulch) does the best job of transferring heat to the greatest soil depths. Black plastic becomes hot on the surface, but does not transfer heat as well as clear plastic. Using thick plastic (> 4 mil) or doubling thinner plastic will help retain moisture in the bed, which then increases and retains soil at high temperatures. Moisten soil, cover with plastic, pull the plastic tight, and seal the edges with surrounding garden soil. Keep the plastic in place for at least 6 weeks. Soil temperature should reach 100-120°F to a depth of 6 to 8 inches below the soil surface to provide the best results. Results will vary by soil type. Sandy soils that are low in organic matter and water holding capacity may not achieve target temperatures at sufficient levels. In this instance, it may be necessary to add organic matter to the soil before solarizing, or keep the plastic on longer than 6 weeks. This technique can suppress densities of plant disease causal organisms including root-knot nematodes, *Pythium* spp. and *Rhizoctonia solani*.

For transplant media
Place moistened soil in heat-proof container, and bake at 180-200 F for 30-60 minutes. Cool thoroughly before use. If soil is high in clay content, mix with an equal portion of vermiculite or peat moss to avoid hardening (turning the soil into a brick!). A meat thermometer can be used to verify the temperature. This procedure can be very smelly and is probably best done on an outdoor grill rather than a home oven.

Table 1. Raw Manure Nutrient Concentration (Wet Weight Basis) and Recommended Application Rates on Vegetable Gardens

<table>
<thead>
<tr>
<th>Manure Source</th>
<th>% Water</th>
<th>% N †</th>
<th>% P</th>
<th>% K</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow</td>
<td>86</td>
<td>0.55</td>
<td>0.15</td>
<td>0.50</td>
<td>Mix 25 pounds + 2-3 pounds rock phosphate per 100 square feet (this rate is roughly equivalent to 5 tons per acre). Sidedress with up to 5 pounds per 100 feet.</td>
</tr>
<tr>
<td>Horse</td>
<td>80</td>
<td>0.65</td>
<td>0.25</td>
<td>0.50</td>
<td>12 pounds per 100 square feet (about 3 tons per acre). Can apply as much as 20 tons per acre, which equates to 3-4 inches of material on the soil surface. Sidedress up to 3 pounds per 100 feet.</td>
</tr>
<tr>
<td>Sheep</td>
<td>68</td>
<td>1.0</td>
<td>0.75</td>
<td>0.40</td>
<td></td>
</tr>
<tr>
<td>Duck</td>
<td>61</td>
<td>1.10</td>
<td>1.45</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>Goose</td>
<td>67</td>
<td>1.10</td>
<td>0.55</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>Hen</td>
<td>73</td>
<td>1.10</td>
<td>0.90</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>74</td>
<td>1.30</td>
<td>0.70</td>
<td>0.50</td>
<td></td>
</tr>
</tbody>
</table>

† N = Nitrogen, P = phosphorus, K = Potassium.
Box 2. Units of measure and conversions for garden fertilizer.

What do the numbers on the fertilizer bag mean?
The numbers stand for the grade or analysis of nutrients in the bag. Grade or analysis means the minimum guarantee of the percentage of total nitrogen (N), phosphorus (P) measured in the oxide form (P$_2$O$_5$), and potassium (K) measured in the oxide form (K$_2$O) in the fertilizer. The numbers are always presented in the same order: N-P-K.

Common conversions between elemental and oxide forms of N-P-K:

<table>
<thead>
<tr>
<th>Conversion</th>
<th>Equality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 lb N</td>
<td>= 1 lb N</td>
</tr>
<tr>
<td>1 lb P$_2$O$_5$</td>
<td>= 0.44 pounds P</td>
</tr>
<tr>
<td>1 lb P</td>
<td>= 2.29 pounds P$_2$O$_5$</td>
</tr>
<tr>
<td>1 lb K$_2$O</td>
<td>= 0.83 pounds K</td>
</tr>
<tr>
<td>1 lb K</td>
<td>= 1.20 pounds K$_2$O</td>
</tr>
</tbody>
</table>

How do I convert percent of nutrient to pounds?

1. How many pounds of N are in a 50 lb bag of 10-10-5?
Divide the percent N by 100 to get a fraction. Multiply that fraction of N by the number of pounds of material in the container to get pounds of N in a 50 bag.

   Example: A 50 lb bag contains 10% N.
   
   \[
   \frac{10\%}{100} = 0.10 \\
   0.10 \times 50 \text{ lbs fertilizer} = 5 \text{ pounds of N in the 50-lb bag.}
   \]

2. How many pounds of P and K are in a 50 lb bag of 10-10-5?
Divide the percent of nutrient by 100 to get a fraction. Because P and K are reported as oxides on the label you must first determine the amount of element present in the oxide. To get P from P$_2$O$_5$ multiplying by 0.44. To get K from K$_2$O, multiply by 0.83.

   Example: A 50 lb bag contains 10% P$_2$O$_5$.
   
   \[
   \frac{10\%}{100} = 0.10 \\
   0.10 \times 0.44 \times 50 \text{ lbs fertilizer} = 2.2 \text{ pounds of P in the 50-lb bag.}
   \]

   Example: A 50 lb bag contains 5% K$_2$O.
   
   \[
   \frac{5\%}{100} = 0.05 \\
   0.05 \times 0.83 \times 50 \text{ pounds fertilizer} = 2 \text{ pounds of K in the 50-lb bag.}
   \]

In a 50 lb. bag of 10-10-5 fertilizer, there are 5 pounds of N, 2.2 pounds of P and 2 pounds of K.

For more information on calculating the amount of fertilizer needed in garden beds, please see the EDIS publication “Soil fertility and fertilizers: A Five-Session Short Course for Florida Producers” at: http://edis.ifas.ufl.edu/SS171
Table 2. Average Nutrient Content of Plant and Animal Materials Suitable as Organic Fertilizer (Percentage based on Dry-Weight)¹

<table>
<thead>
<tr>
<th>MEALS and COMPOST MATERIALS</th>
<th>%N</th>
<th>%P₂O₅</th>
<th>%K₂O</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa Meal</td>
<td>2.5</td>
<td>0.5</td>
<td>2.0</td>
<td>Commonly used as animal feed</td>
</tr>
<tr>
<td>Blood Meal</td>
<td>12.0-15.0</td>
<td>2.0</td>
<td>0.8</td>
<td>High in ammonia, can burn. Expensive.</td>
</tr>
<tr>
<td>Bone Meal, Raw</td>
<td>4.0</td>
<td>21.0</td>
<td>0.2</td>
<td>22% Ca, 0.3% Mg</td>
</tr>
<tr>
<td>Citrus Pomace</td>
<td>1.0</td>
<td>0.1</td>
<td>1.0</td>
<td>Heavy and wet. Best composted prior to use.</td>
</tr>
<tr>
<td>Cottonseed Meal</td>
<td>7.0</td>
<td>3.0</td>
<td>1.5</td>
<td>Most certifiers restrict or prohibit use due to pesticide residues in the seeds.</td>
</tr>
<tr>
<td>Crab Meal</td>
<td>2.0-10.0</td>
<td>0.2-3.5</td>
<td>0.2</td>
<td>Slow release. Also used for nematode suppression.</td>
</tr>
<tr>
<td>Egg Shells</td>
<td>1.2</td>
<td>0.4</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Feather Meal</td>
<td>15.0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Fish Meal</td>
<td>10.0-13.0</td>
<td>4.0</td>
<td>0.0</td>
<td>Available in wettable powder. Also a source of sulfur.</td>
</tr>
<tr>
<td>Fish Emulsion</td>
<td>4.0</td>
<td>1.0-4.0</td>
<td>1.0</td>
<td>Acid digest (4-1-1), Enzyme digest (4-1-1).</td>
</tr>
<tr>
<td>Kelp Meal</td>
<td>1.0</td>
<td>0.5</td>
<td>2.0 – 10.0</td>
<td>Provides up to 60 trace elements. May have high salt concentration.</td>
</tr>
<tr>
<td>Mushroom Compost (Spent)</td>
<td>2.0</td>
<td>0.74</td>
<td>1.46</td>
<td></td>
</tr>
<tr>
<td>Oak Leaves</td>
<td>0.8</td>
<td>0.4</td>
<td>0.2</td>
<td>Readily available, but may be contaminated with unwanted trash.</td>
</tr>
<tr>
<td>Oyster Shell Siftings</td>
<td>0.4</td>
<td>10.4</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Peanut Hull Meal</td>
<td>1.2</td>
<td>0.5</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Peanut Meal</td>
<td>7.0</td>
<td>1.5</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Pine Needles</td>
<td>0.5</td>
<td>0.1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Sawdust</td>
<td>0.2</td>
<td>0</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Seaweed, Dried</td>
<td>0.7</td>
<td>0.8</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Shrimp Heads</td>
<td>7.8</td>
<td>4.2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Shrimp Waste</td>
<td>2.9</td>
<td>10.0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Soybean Meal</td>
<td>7.0</td>
<td>1.2</td>
<td>1.5</td>
<td>Protein supplement for animals. Can be expensive.</td>
</tr>
<tr>
<td>Spanish Moss</td>
<td>0.6</td>
<td>0.1</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Worm Castings</td>
<td>1.5</td>
<td>2.5</td>
<td>1.3</td>
<td></td>
</tr>
</tbody>
</table>
Table 3. Average Nutrient Content of Mined or Natural Amendments Used in Organic Production (Percentage on a Dry-Weight Basis)\textsuperscript{1}

<table>
<thead>
<tr>
<th>MINERALS</th>
<th>%N</th>
<th>%P\textsubscript{2}O\textsubscript{5}</th>
<th>%K\textsubscript{2}O</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nitrogen Materials</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium Nitrate NaNO\textsubscript{3} (Restricted use in certified organic production)</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>Maximum allowable use is 20% of total crop N requirements. Will be prohibited from certified systems in 2014 due to concerns of sodium accumulation in soil.</td>
</tr>
<tr>
<td><strong>Phosphorous Materials</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colloidal Phosphate</td>
<td>0</td>
<td>16.0</td>
<td>0</td>
<td>Availability moderately faster than phosphate rock.</td>
</tr>
<tr>
<td>Phosphate Rock</td>
<td>0</td>
<td>2-35</td>
<td>0</td>
<td>Slow availability</td>
</tr>
<tr>
<td>Granite – Ground.</td>
<td>0</td>
<td>0</td>
<td>4.5</td>
<td>Mostly feldspar. Slow availability.</td>
</tr>
<tr>
<td>Greensand (Glauconite)</td>
<td>0.0</td>
<td>1.5</td>
<td>5.0-7.0</td>
<td>Used as a soil conditioner, rich in iron, magnesium, silica and trace minerals. Slowly available. Expensive.</td>
</tr>
<tr>
<td><strong>Potassium Materials</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium Chloride (Muriate of Potash) KCl</td>
<td>0</td>
<td>0</td>
<td>60-62</td>
<td></td>
</tr>
<tr>
<td>Potassium Magnesium Sulfate (Sulfate of potash magnesia, or Langbeinite) (K\textsubscript{2}SO\textsubscript{4}·2MgSO\textsubscript{4}/MgSO\textsubscript{4} K\textsubscript{2}SO\textsubscript{4}·6H\textsubscript{2}O)</td>
<td>0</td>
<td>0</td>
<td>22</td>
<td>11% Mg, 23% S</td>
</tr>
<tr>
<td>Potassium Sulfate (K\textsubscript{2}SO\textsubscript{4})</td>
<td>0</td>
<td>0</td>
<td>50</td>
<td>18% S</td>
</tr>
<tr>
<td><strong>Calcium Materials</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcitic Limestone (CaCO\textsubscript{3})</td>
<td>0</td>
<td>0</td>
<td>0.3</td>
<td>32% Ca, 3% Mg.</td>
</tr>
<tr>
<td>Dolomitic Limestone (CaCO\textsubscript{3}+MgCO\textsubscript{3})</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>21-30% Ca, 6-12% Mg</td>
</tr>
<tr>
<td>Gypsum (CaSO\textsubscript{4}·H\textsubscript{2}O)</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>22% Ca, 17% S</td>
</tr>
<tr>
<td><strong>Magnesium Materials</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnesium Sulfate (Epsom Salt) (MgSO\textsubscript{4}·7H\textsubscript{2}O)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10% Ca, 14% S</td>
</tr>
<tr>
<td>Magnesium Sulfate (Kieserite) (MgSO\textsubscript{4}·H\textsubscript{2}O).</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>17% Ca, 23% S</td>
</tr>
<tr>
<td><strong>Boron Materials</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solubor (Na\textsubscript{2}B\textsubscript{8}O\textsubscript{13}·4H\textsubscript{2}O)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20.5% B</td>
</tr>
</tbody>
</table>

Table 4. Pest Management Products for Organically-Managed Home Gardens

<table>
<thead>
<tr>
<th>Insects</th>
<th>Active Ingredient</th>
<th>Function/Advantages</th>
<th>Disadvantages</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insects</td>
<td>Bacillus thuringenesis (Bt)</td>
<td>Targeted for soft-bodied insect larvae (caterpillars and moths). Larvae must ingest product. Can apply same day as harvest.</td>
<td>Degrades quickly in sun, washes away with rain.</td>
<td>Liquid and dust formulations. Must get the correct formulation for the pest you have. Safe for beneficials.</td>
</tr>
<tr>
<td>Insects</td>
<td>Spinosad</td>
<td>This fermentation product from a soil fungus kills insects after ingestion.</td>
<td>Degrades quickly in sun, washes away with rain.</td>
<td>Safe for beneficials. Formulations for garden vegetables and fire ants.</td>
</tr>
<tr>
<td>Insects</td>
<td>Pyrethrum</td>
<td>Made from extracts of chrysanthemum flowers.</td>
<td>Broad spectrum insecticide; harmful to beneficials.</td>
<td>Liquid and Dust formulations.</td>
</tr>
<tr>
<td>Insects</td>
<td>Rotenone</td>
<td>Works as a contact and stomach poison, not toxic to honeybees.</td>
<td>Broad spectrum insecticide, so harmful to beneficials.</td>
<td>Sometimes mixed with Pyrethrum.</td>
</tr>
<tr>
<td>Insects</td>
<td>Oil, horticultural</td>
<td>Kills soft bodied adults and some insect eggs. Works on mites, aphids and scale.</td>
<td>Degrades quickly. Coverage under leaves is critical.</td>
<td>May injure sensitive plants.</td>
</tr>
<tr>
<td>Insects</td>
<td>Soap, insecticidal</td>
<td>Most effective against soft-bodied pest, such as aphids, mites, whiteflies, thrips, caterpillars, mealybugs, ect.</td>
<td>Degrades quickly. Less effective on heavier cuticle such as beetles and grasshoppers.</td>
<td>Must come in contact with pest. Only active when wet and may burn sensitive plants.</td>
</tr>
<tr>
<td>Insects</td>
<td>Neem Neem oil Neem oil soap Azadirachtin</td>
<td>Kills aphids, whiteflies, thrips, leafminers, caterpillars, scales, beetles, mealybugs and adelgids. Some effectiveness on mites and snails has been reported.</td>
<td>Broad spectrum insecticide; harmful to beneficials. For best results, apply frequently on immature insects when population density is low to moderate. Neem is more effective in warm temperatures.</td>
<td>Azadiractin is a compound made from seeds of the neem tree (Latin name for this tree is Azadirachta indica). Formulations are approved for use in organic production. Frequently sold as the active ingredient in horticultural soaps.</td>
</tr>
<tr>
<td>Insects</td>
<td>Diatomaceous earth (silicon dioxide)</td>
<td>Made from fossils of diatoms. Deters slugs and beetles, and many structural pests. This material tears epidermis or exoskeleton of insects and kills by dehydrating the insect.</td>
<td>Possible effects on beneficials. Nuisance value of the dust and does not adhere well to the foliage.</td>
<td>To minimize destroying beneficials, should be applied late evening or at night.</td>
</tr>
<tr>
<td>Insects</td>
<td>Boric acid</td>
<td>Acts as a stomach poison and causes insects to die from starvation.</td>
<td>Has to be consumed by the insect and sometime mixed with a sweetener.</td>
<td>Available in paste, powder, aerosol, tablet and liquid forms.</td>
</tr>
<tr>
<td>Insects</td>
<td>Copper (Cu)</td>
<td>Copper is very effective.</td>
<td>As a metal, copper can accumulate in the soil and reach toxic levels</td>
<td></td>
</tr>
</tbody>
</table>
with overuse. Some insects are resistant due to poor copper management.

Baking soda (Potassium bicarbonate) Non-toxic, effective, readily available and very inexpensive. Controls powdery mildew on various plants and early blight on tomato. Must be applied weekly to control powdery mildew and a surfactant or liquid detergent must be used to spread it evenly on the leaf. Timing and application rates are important due to high levels of sodium bicarbonate will burn plants.

| Diseases |
|------------------------|-----------------|-----------------|-----------------|
| **Active Ingredient**  | **Function/Advantages** | **Disadvantages** | **Comment** |
| Bacillus subtilis       | B. subtilis is a soil bacteria used to manage plant diseases caused by Sclerotinia fruticola, Verticillium, Rhizoctonia and Fusarium. It is sometimes mixed with another beneficial, Streptomyces gramicifaciens. | Degrades quickly in sun, washes away with rain. | Several strains are listed below, so be sure to get the proper strain for the application: Foliage – QST713; Soil – GB03, MBI 600, FZB 24; Seeds – GB03, MBI 600. For foliar diseases, it is often used in rotation with copper products. |
| Sulfur (S)              | Prevents various blights, spots, certain rots, downy and powdery mildew, leaf blister, anthracnose, scab, stem canker, Septoria spp. and Stemphylium spp. leaf molds. | Toxic to mammals, so observe recommended precautions on the label. Do not apply when air temperatures exceed 80 °F, or when oil has been recently applied. | It has no insecticidal qualities and will not burn plants. Safest on the good-bugs. Sold as sulfur, line-sulfur, and Bordeaux mixture. |
| Streptomyces            | Contains active cultures of streptomycyes that grow around plant roots and prevent infection from other diseases, including fusarium. | May cause sensitization by inhalation and skin contact. Wear all protective equipment including a dust mask. | Do not allow re-entry for 4 hours after applied. |

| Weeds |
|------------------------|-----------------|-----------------|-----------------|
| **Active Ingredient**  | **Function/Advantages** | **Disadvantages** | **Comment** |
| Corn gluten meal       | A by-product of corn processing, this herbicide also has nitrogen. Some formulations have added potassium and phosphorus. | Is not effective on emerged or established weeds. Expensive. | Effective on some broad leaf annual weeds when applied prior to weed emergence in the spring. |

Creating a Bee Friendly Garden

Michelle Peterson
Florida Advanced Beekeeper and Master Gardener

Plants produce pollen and nectar as a means of attracting insects, birds and other potential pollinators. One of the greatest benefits of gardening with pollen- and nectar-producing plants is being able to provide an attractive habitat for a plethora of wildlife, particularly honey bees, native bees, butterflies and other pollinators.

A standard bee garden includes a mix of annuals, perennials, herbs, shrubs and trees. Most plants that attract pollinators require full sun (at least 5 to 6 hours of light a day), so it may be more of a challenge to attract bees to your shade garden, though not impossible. And, although there are many commonalities, each garden has unique requirements when attracting specific pollinators.

**Bee Gardening Do’s:**

- Do plant your garden near a pond, stream, lake, canal OR provide an ample water source. Most pollinators like to drink from shallow mud puddles where they get their source of water and minerals.
- Do provide good plant diversity with plants of many different flower shapes, heights and sizes.
- Do have a staggered bloom schedule, include early, mid, & late summer varieties, as well as early and late fall.
- Do plant flower boxes next to vegetable plots to bring more pollinators to your garden and provide a greater fruit set.
- Do add native bee condos to your garden to encourage solitary “stingless” bees to stay.

**Bee Gardening Don’ts:**

- Don’t add too much organic matter to your nectar garden. It may change the soil composition and discourage the presence of native bees.
- Don’t cover every part of your landscape with mulch. Bare patches of native earth will be the siren’s call to wonderful native pollinators who like to nest in the soil.
- Don’t have a garden that’s too pristine. Solitary native bees like to nest in hollow reeds and stems. A garden that’s a bit messy creates great cover for native bees to rest.
- Don’t overuse pesticides. You’ll keep those pesky bugs away, but also the ones that you’re trying to attract. Be very cautious in your applications, and ALWAYS choose spot treatments over systemic.
- Don’t add toxic plants to your landscape like Yellow Jessamine aka Carolina Jasmine (*Gelsemium sempervirens*) and White Ti Ti (*Cyrilla racemiflora*) which are poisonous to bees.
Honey Bees vs. Native Bees

<table>
<thead>
<tr>
<th>Honey Bees</th>
<th>Native Bees</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Generalists” – forage on any plant that provides the nectar and pollen</td>
<td>“Picky eaters” and prefer specific plants and trees – usually natives and</td>
</tr>
<tr>
<td>needed to feed the hive</td>
<td>seed-bearing plants</td>
</tr>
<tr>
<td>Prefer yellow, white, blue and purple flowers – they cannot see the color</td>
<td>Have short life spans, and, with the exception of bumble bees, are solitary</td>
</tr>
<tr>
<td>red</td>
<td>nesters</td>
</tr>
<tr>
<td>Like daisy-like flowers and other blossoms with broad petals that offer</td>
<td>Mostly ground-dwellers, and prefer native soil free from pesticides and</td>
</tr>
<tr>
<td>a large landing pad</td>
<td>fertilizers</td>
</tr>
<tr>
<td>Have a short proboscis and can’t get nectar from long, slim, tubular</td>
<td>Some are cavity-dwellers and enjoy hollow stems and twigs in the garden</td>
</tr>
<tr>
<td>blossoms</td>
<td></td>
</tr>
<tr>
<td>Prefer to forage in sunny, warm weather</td>
<td>Often early morning and cool-weather foragers</td>
</tr>
</tbody>
</table>

Bee Gardening  Quick Reference:

Native Florida species:
- Coral vine (*Antigonon leptopus*)
- Lemon beebalm (*Monarda citriodora*)
- Blue mistflower (*Conoclinium coelestinum*)
- Prairie nymph (*Herbertia lahue*)
- Narrow-leaf sunflower (*Helianthus angustifolius*)
- Beach or Dune sunflower (*Helianthus debilis*)
- Partridge pea (*Chamaecrista fasciculata*)
- Blanketflower (*Gaillardia pulchella*)
- Coreopsis or Tickseed (*Coreopsis basilis, Coreopsis lanceolata, Coreopsis leavensworthii*, etc.)
- Black eyed Susan (*Rudbeckia hirta, Rudbeckia mollis*)
- Blue curls (*Trichostema dichotomum*)
- Buffalo clover (*Trifolium reflexum*)
- Giant ironweed (*Vernonia gigantea*)
- Twinflower (*Dyschoriste oblongifolia*)
- Yellowtop (*Flaveria linearis*)
- Goldenrod (*Solidago spp.*)
- Butterfly milkweed (*Asclepia tuberosa*)
- Blazing star (*Liatris spp.*)
- Dotted horsemint (*Monarda punctata*)

Vegetables that are pollinator attractants:
- Cucurbits: cucumbers, watermelons, squash, zucchinis, pumpkins, cantaloupes.
- Legumes: beans (green, soy, garbanzo, fava), peas (sugar, snap, snow), peanuts
- Nightshades: tomatoes, bell peppers, eggplant, okra
- Herbs: basil, celery, mint, sage, dill, chives, thyme, oregano, lavender
- Rose family: apples, raspberry, blackberries, strawberries, apples, plums, peaches, nectarines
- Other fruit: blueberries, citrus, avocado, peaches, etc.
## More Options for Pollinator Gardening

<table>
<thead>
<tr>
<th>Botanical Name(s)</th>
<th>Common Name(s)</th>
<th>Be</th>
<th>Bu</th>
<th>Description &amp; Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Acer rubrum</em></td>
<td>Red Maple</td>
<td>X</td>
<td></td>
<td>Blossoms herald the start of nectar flow for beekeepers in north and central Florida</td>
</tr>
<tr>
<td><em>Achillea millefolium</em></td>
<td>Yarrow</td>
<td>X</td>
<td>X</td>
<td>Nectar source and larval food for Painted Lady butterflies</td>
</tr>
<tr>
<td><em>Aesculus pavia</em></td>
<td>Red Buckeye; Firecracker Plant</td>
<td>X</td>
<td></td>
<td>Small native tree with springtime display of attractive red flowers; shade tolerant and resistant to pests and diseases</td>
</tr>
<tr>
<td><em>Agapantus africanus</em></td>
<td>African Blue Lily</td>
<td>X</td>
<td>X</td>
<td>Dark green strappy leaves; spikes of purplish-blue and white heads of trumpet blossoms; bloom from mid to late summer</td>
</tr>
<tr>
<td><em>Agastache</em></td>
<td>Hyssop</td>
<td>X</td>
<td></td>
<td>Perennial herbs; brightly colored flowers and aromatic foliage</td>
</tr>
<tr>
<td><em>Allium tuberosum</em></td>
<td>Chives, Garlic Chives, Chinese Leeks</td>
<td>X</td>
<td>X</td>
<td>fast growing and spreading perennial; flower clusters on stalks smell like violets, and are great attractors; tolerate light shade</td>
</tr>
<tr>
<td><em>Aloysia citrodora</em></td>
<td>Lemon Verbena; Lemon Beebrush</td>
<td>X</td>
<td>X</td>
<td>South American native; lemon scent; cold-sensitive deciduous perennial with white and mauve flowers (zone 9 or warmer)</td>
</tr>
<tr>
<td><em>Amalanchier</em></td>
<td>Juneberry, Serviceberry</td>
<td>X</td>
<td></td>
<td>Florida native grown as small deciduous tree or shrub; clusters of white flowers; berries used for jelly and jam.</td>
</tr>
<tr>
<td><em>Anethum graveolens</em></td>
<td>Dill</td>
<td>X</td>
<td>X</td>
<td>Annual herb with lacy, blue-green foliage and yellow, umbrella-like flowers; Dill (and other members of the carrot family) are the sole food plants for the caterpillars of the beautiful Black Swallowtail butterfly</td>
</tr>
<tr>
<td><em>Asclepias spp.</em></td>
<td>Milkweed; Butterfly weed</td>
<td>X</td>
<td>X</td>
<td>Evergreen perennial shrub, often grown as an annual; Butterflies and other nectar-sipping insects are attracted to the blossoms; both Monarch and Queen butterflies lay their eggs on milkweed; most varieties will tolerate light shade</td>
</tr>
<tr>
<td><em>Asimina spp.</em></td>
<td>Pawpaw; Prairie Banana; Indiana Banana; Hoosier Banana</td>
<td>X</td>
<td>X</td>
<td>Small clustered trees with large leaves and banana-mango-flavored fruit; host plant for the Zebra Swallowtail butterfly; will tolerate part shade</td>
</tr>
<tr>
<td><em>Aster spp.</em></td>
<td>Aster</td>
<td>X</td>
<td>X</td>
<td>Daisy-like flowers that produce large clusters of blossoms in white, purple, lavender, pink or red; bloom mid to late summer and fall; perennial in South Florida</td>
</tr>
<tr>
<td><em>Brassica capestris</em></td>
<td>Mustard</td>
<td>X</td>
<td>X</td>
<td>Cool weather, annual plant with yellow flowers that produces a great deal of pollen.</td>
</tr>
<tr>
<td>Botanical Name(s)</td>
<td>Common Name(s)</td>
<td>Be</td>
<td>Bu</td>
<td>Description &amp; Comments</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------</td>
<td>----</td>
<td>----</td>
<td>------------------------</td>
</tr>
<tr>
<td><em>Buddleia</em> ssp.</td>
<td>Butterfly Bush; Summer Lilac</td>
<td>X</td>
<td>X</td>
<td>Semi-evergreen shrub that produces cone-shaped flower clusters in purple, pink, white or red; pinching off spent flowers prolong blooming period; Perfect foundation plant for nectar garden; full to part sun</td>
</tr>
<tr>
<td><em>Bulbine frutescens</em></td>
<td>Yellow bulbine, Snake flower, Cat’s tail</td>
<td>X</td>
<td>X</td>
<td>Clump forming evergreen succulent with tall tubular stems, similar to chives that forms spikes of small yellow to orange blossoms</td>
</tr>
<tr>
<td><em>Callicarpa americana</em></td>
<td>American Beautyberry</td>
<td>X</td>
<td></td>
<td>Florida native with white to pinkish/purple flowers; fall berries enjoyed by birds; part shade; filtered shade</td>
</tr>
<tr>
<td><em>Callistemon citrinus</em></td>
<td>Red Bottlebrush</td>
<td>X</td>
<td></td>
<td>Evergreen shrub or small tree with drooping branches that produce bright red flowers that look like the bristles of a bottlebrush; highly attractive to native bees</td>
</tr>
<tr>
<td><em>Canna</em></td>
<td>Canna Lily</td>
<td>X</td>
<td></td>
<td>Tropical plant with large leaves and thick stems that support brightly colored flowers; some varieties are more cold tolerant than others; rhizome is rich in starch and used as food in many areas of the world</td>
</tr>
<tr>
<td><em>Cassia fasciculate</em></td>
<td>Partridge Pea</td>
<td>X</td>
<td>X</td>
<td>Native plant in legume family, often considered a weed; showy yellow flowers that are pollinated by bumblebees, but produces nectar on its stems, which attracts butterflies and other pollinators</td>
</tr>
<tr>
<td><em>Clitoria ternatea</em></td>
<td>Blue Pea Vine; Butterfly Pea</td>
<td>X</td>
<td>X</td>
<td>Tender annual climbing vine with blue flowers; perennial in zones 9b or warmer</td>
</tr>
<tr>
<td><em>Cocoloba uvifera</em></td>
<td>Sea Grape</td>
<td>X</td>
<td>X</td>
<td>South Florida native that can be kept as a shrub or a tree; produces thick, shiny round leaves with red veins, and clusters of white flowers that produce edible fruit; will tolerate part shade and salty conditions.</td>
</tr>
<tr>
<td><em>Coriandrum sativum</em></td>
<td>Coriander, Cilantro, Chinese Parsley</td>
<td>X</td>
<td>X</td>
<td>Parsley-like aromatic herb with lacy green foliage and white flowers; Cilantro (and other members of the carrot family) are the sole food plants for Black Swallowtail caterpillars; will tolerate partial sun</td>
</tr>
<tr>
<td><em>Echinacea purpurea</em></td>
<td>Purple Coneflower</td>
<td>X</td>
<td>X</td>
<td>Fast growing daisy-like perennial and a great attractor that may not grow well south of zone 9</td>
</tr>
<tr>
<td><em>Foeniculum vulgare</em></td>
<td>Fennel, Anise</td>
<td>X</td>
<td>X</td>
<td>Aromatic biennial with soft, feathery foliage and a starburst of tiny golden flowers; Fennel (and other members of the carrot family) are the sole food plants for the caterpillars of the Black Swallowtail butterfly</td>
</tr>
<tr>
<td>Botanical Name(s)</td>
<td>Common Name(s)</td>
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<td>Bu</td>
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</tr>
<tr>
<td>Forestiera segregata</td>
<td>Florida Privet; Inkberry; Wild Olive</td>
<td>X</td>
<td>X</td>
<td>Florida native evergreen shrub; tiny pale yellow flowers in spring and late fall followed by dark purple berries that native birds enjoy; will tolerate part shade</td>
</tr>
<tr>
<td>Helianthus spp.</td>
<td>Sunflowers</td>
<td>X</td>
<td>X</td>
<td>Any brightly colored sunflower, whether annual or perennial, a great attractor, though few perennials grow well in South Florida (anything warmer than zone 9).</td>
</tr>
<tr>
<td>Hypericum spp.</td>
<td>St. John’s Wort</td>
<td>X</td>
<td></td>
<td>Florida native shrub used for medicinal purposes; yellow flowers; summer bloomer; great bee plant; sun to part shade</td>
</tr>
<tr>
<td>Impatiens wallerana</td>
<td>Impatiens, Touch-Me-Nots, Jewel Weed</td>
<td>X</td>
<td>X</td>
<td>Popular cold-sensitive annual flowering plants; prolific bloomers that come in a variety of colors; create a carpet of red to attract native bees</td>
</tr>
<tr>
<td>Lantana montevidensis</td>
<td>trailing lantana, weeping lantana</td>
<td>X</td>
<td>X</td>
<td>Trailing shrubby tropical perennial with clusters of pale purple flowers – continuous bloomer in warm climates. Non-native, but not as invasive as L. camara. WARNING: Unripe berries are toxic. Livestock and pets have become ill after eating the foliage.</td>
</tr>
<tr>
<td>Lathyrus latifolius</td>
<td>Perennial Pea; Pea Vine</td>
<td>X</td>
<td>X</td>
<td>Good fall, winter bloomer in Florida; fuschia to pale pink flowers; prefers zones 5-9; can become invasive</td>
</tr>
<tr>
<td>Licania Michauxii</td>
<td>Gopher Apple; Ground Oak</td>
<td>X</td>
<td>X</td>
<td>Florida native evergreen shrub seen often in sandy pinelands and coastal scrub habitats; small white cluster blossoms produce fruit enjoyed by gopher tortoises.</td>
</tr>
<tr>
<td>Lonicera sempervirens</td>
<td>Coral/Trumpet Honeysuckle</td>
<td>X</td>
<td>X</td>
<td>Native perennial climbing vine with clusters of orange colored tubular flowers; produces throughout spring and summer.</td>
</tr>
<tr>
<td>Melissa officinalis</td>
<td>Lemon Balm</td>
<td>X</td>
<td>X</td>
<td>Any plants in the mint family (Lamiaeae) attract pollinators; Lemon balm produces tiny flowers from pale yellow to pale lavender all summer long; larval food for the White Peacock butterfly</td>
</tr>
<tr>
<td>Melochia tomentosa</td>
<td>Pyramid Bush, Teabush</td>
<td>X</td>
<td>X</td>
<td>Native shrub with modest purple blossoms; hardy and drought tolerant</td>
</tr>
<tr>
<td>Mentha spp.</td>
<td>Mints</td>
<td>X</td>
<td>X</td>
<td>Mints are good attractors; ID’d by the square stem as well as herbaceous aroma; generally serves as larval food for Painted Lady and White Peacock butterflies.</td>
</tr>
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<td>Botanical Name(s)</td>
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<tr>
<td><em>Monarda didyma</em></td>
<td>Bee Balm, Bergamot, Oswego Tea</td>
<td>X</td>
<td>X</td>
<td>Mint family; good attractor, though difficult to grown south of zone 9; does best in dry conditions; will tolerate some light shade; deadheading increases bloom.</td>
</tr>
<tr>
<td><em>Ocimum basilicum</em></td>
<td>Basil, Sweet Basil</td>
<td>X</td>
<td></td>
<td>Annual herb with a distinct aroma and pungent sweet flavor; blooms like salvia and spreads through seeds; white, yellow, silver or purple blossoms; many varieties available</td>
</tr>
<tr>
<td><em>Odontonema strictum</em></td>
<td>Firespike</td>
<td></td>
<td>X</td>
<td>Herbaceous perennial that produces abundant 1-inch tubular, bright red, waxy flowers on 12-inch spikes; blooms in fall and winter; tender to the cold.</td>
</tr>
<tr>
<td><em>Origanum majorana</em></td>
<td>Marjoram</td>
<td>X</td>
<td>X</td>
<td>Fragrant perennial herb that is a bit cold sensitive, but a great nectar source and well worth planting</td>
</tr>
<tr>
<td><em>Passiflora caerulea</em></td>
<td>Blue Passionflower; Blue Passion Vine</td>
<td>X</td>
<td>X</td>
<td>Beautiful blue blossoms on this vine are favorites of bees and butterflies; serves as host plant for the Zebra Longwings (state butterfly) and the orange Julia Butterfly; can become invasive in warmer zones – plant in large pots to contain roots</td>
</tr>
<tr>
<td><em>Passiflora suberosa</em></td>
<td>Corkystem Passionflower</td>
<td>X</td>
<td>X</td>
<td>host plant for the Zebra Longwing butterfly caterpillars; can be invasive, though not as aggressive as P. incarnate; so named due to &quot;corky&quot; older stems</td>
</tr>
<tr>
<td><em>Pentas lanceolata</em></td>
<td>Pentas, Star Flower, Star Cluster</td>
<td>X</td>
<td>X</td>
<td>Tender perennial with clusters of five-petal star-shaped flowers in red, fuchsia, pink, purple, and white on dark green leaves; blooms best in sun, tolerates some shade.</td>
</tr>
<tr>
<td><em>Petroselinum crispum</em></td>
<td>Parsley, Italian Parsley, Hamburg Parsley</td>
<td>X</td>
<td></td>
<td>Perennial herb; good container or border plant; Parsley and other members of the Umbelliferae, are favorites of Black Swallowtail caterpillars; attracts Anise Swallowtail butterflies; tolerates light shade</td>
</tr>
<tr>
<td><em>Petunia hybrida</em></td>
<td>Petunia</td>
<td></td>
<td>X</td>
<td>Annuals throughout the country; tender perennials in zones 9-11; fast-growing and repeat bloomers; plant a carpet of bright red or pink to attract hummingbirds.</td>
</tr>
<tr>
<td><em>Prunus caroliniana</em></td>
<td>Carolina Cherry Laurel; Laurel Cherry</td>
<td>X</td>
<td></td>
<td>Evergreen tree that can be pruned as a shrub; fragrant white and pink blossoms followed by black fruit that birds love; sun to light shade; NOTE: Leaves and branches have high amounts of cyanide; should not be used where animals graze or children play</td>
</tr>
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<tr>
<td><em>Psychotria nervosa</em></td>
<td>Wild Coffee</td>
<td>X</td>
<td>X</td>
<td>Tender evergreen perennial that blooms in late spring to early summer; tiny white flowers attract bees and butterflies; native birds enjoy autumn berries; prefers partial or filtered shade and regular watering</td>
</tr>
<tr>
<td><em>andia aculeata</em></td>
<td>White Indigo Berry</td>
<td>X</td>
<td></td>
<td>Tender evergreen shrub; attractive small flowers are white and star-shaped; hardier once established; will tolerate part shade</td>
</tr>
<tr>
<td><em>Richardia spp</em></td>
<td>Mexican Clover; Florida Pusley</td>
<td></td>
<td></td>
<td>Flowering ground cover with white star blossoms that bloom in winter. Considered a turfgrass weed. R. scabra is a native; NOT the forage plant used for Clover honey</td>
</tr>
<tr>
<td><em>Rondeletia leucophylla</em></td>
<td>Panama Rose; Bush Pentas</td>
<td>X</td>
<td>X</td>
<td>Tropical perennial shrub with tight rounded clusters of pink, red or orange flowers</td>
</tr>
<tr>
<td><em>Rosa spp</em></td>
<td>Roses</td>
<td>X</td>
<td></td>
<td>Choose roses grafted to Florida-hardy rootstock – hybrid tea roses and Floribunda varieties do best; attract honey bees, leafcutter bees, mason bees</td>
</tr>
<tr>
<td><em>Ruellia caroliniensis</em></td>
<td>Wild Petunia; Carolina Wild Petunia</td>
<td>X</td>
<td>X</td>
<td>Native alternative to invasive Mexican Petunia; Large trumpet-shaped lavender colored blossoms from early spring to late fall; part sun to part shade</td>
</tr>
<tr>
<td><em>Russelia equisetiformis</em></td>
<td>Firecracker Plant; Coral Plant</td>
<td></td>
<td>X</td>
<td>Cascading shrub with hanging clusters of scarlet tubular flowers; full sun to part shade</td>
</tr>
<tr>
<td><em>Sabal palmetto</em></td>
<td>Sabal Palm, Cabbagepalm</td>
<td>X</td>
<td></td>
<td>Native palm tree with creamy white flowers on a long branched inflorescence from late summer through early winter; salt and drought tolerant; hardy zones 8 - 11</td>
</tr>
<tr>
<td><em>Salvia spp.</em></td>
<td>Salvia; Sage</td>
<td>X</td>
<td>X</td>
<td>Salvia is the largest genus of the mint family, and most are excellent attractors featuring many showy red, pink, white or blue blooms on an upright stem; they are perennial in warmer climates; most varieties will tolerate some shade</td>
</tr>
<tr>
<td><em>Sedum spp.</em></td>
<td>Stonecrop</td>
<td>X</td>
<td></td>
<td>Perennial succulent that blooms in fall and early winter; varieties from groundcovers to over 2’</td>
</tr>
<tr>
<td><em>Senna ligustrina</em></td>
<td>Privet Cassia</td>
<td></td>
<td>X</td>
<td>A native shrub with short-lived yellow flowers that bloom from late summer to winter. Attracts sulphur butterflies.</td>
</tr>
<tr>
<td><em>Serenoa repens</em></td>
<td>Saw Palmetto; Saw-Tooth Palm; Scrub palmetto</td>
<td>X</td>
<td>X</td>
<td>Fragrant white blossoms; hardy drought and salt tolerant Florida native attract honeybees and butterflies. May be difficult to weed around the saw tooth frond stems, requiring long sleeves and thick gloves</td>
</tr>
<tr>
<td>Botanical Name(s)</td>
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</tr>
<tr>
<td><em>Stachytarpheta</em> spp.</td>
<td>Porterweed</td>
<td>X</td>
<td>X</td>
<td>Perennial with spiky blooms of tiny blue, red, coral or white flowers. The native variety is low growing and hardy.</td>
</tr>
<tr>
<td><em>Tagetes</em> spp.</td>
<td>Marigold</td>
<td>X</td>
<td>X</td>
<td>Nectar-producing annual with the ability to stave off some root-damaging nematodes</td>
</tr>
<tr>
<td><em>Taraxacum officinale</em></td>
<td>Dandelion</td>
<td>X</td>
<td>X</td>
<td>For some this is a troublesome lawn weed; for other it is a source of garden greens; all-year bloomer and great nectar source</td>
</tr>
<tr>
<td><em>Thymus</em> spp.</td>
<td>Thyme, Common Thyme, Garden Thyme</td>
<td>X</td>
<td>X</td>
<td>A common garden herb know for its aromatic flavor; produces pale lavender to purple blossoms; place in part shade south of zone 9 or grow in containers.</td>
</tr>
<tr>
<td><em>Trifolium repens</em></td>
<td>White Clover</td>
<td>X</td>
<td></td>
<td>Prefers cool weather and most soil, and grows best in N. Florida, but certain cultivars will do well in zones 9 &amp; 10.</td>
</tr>
<tr>
<td><em>Tropaeolum majus</em></td>
<td>Nasturtium</td>
<td>X</td>
<td>X</td>
<td>Flowering plant used as an ornamental as well as an edible. Both leaves and flowers can be eaten; peppery taste when added to salads; leaves are large and circular and flowers are yellow to orange and shaped like a small hibiscus blossom; Serves as larval food for Cabbage White butterflies</td>
</tr>
<tr>
<td><em>Verbena</em> spp.</td>
<td>Verbena, Vervain</td>
<td>X</td>
<td>X</td>
<td>Many cultivars are used in landscaping, although the most known is the Purpletop (V. bonariensis).</td>
</tr>
<tr>
<td><em>Viburnum obovatum</em></td>
<td>Walter’s Viburnum; Small Viburnum</td>
<td>X</td>
<td>X</td>
<td>Native shrub; member of honeysuckle family; dense and showy once established. Does well in South Florida through zones 10a. Honeybees and butterflies enjoy nectar from the white spring flowers and birds and other critters eat the fall’s fleshy fruit</td>
</tr>
<tr>
<td><em>Viola odorata</em></td>
<td>Sweet violets</td>
<td>X</td>
<td>X</td>
<td>Fragrant tiny purple blossoms; self-seeding; plant in containers to avoid unwanted spread; Larval host plant for Fritillaries</td>
</tr>
<tr>
<td><em>Viola sororia</em></td>
<td>Florida Violet; Common Blue Violet</td>
<td>X</td>
<td></td>
<td>Native woodland groundcover often considered a turfgrass weed; white to blue flowers on long stems with large, heart-shaped leaves; attracts osmia (mason) and halictid (metallic sweat) bees</td>
</tr>
<tr>
<td><em>Zamia floridana</em></td>
<td>Coontie; Seminole Bread</td>
<td>X</td>
<td></td>
<td>Primitive Florida native a cycad – can be either male or female; sole host plant for larvae of the rare Atala butterfly (<em>Eumaeus atala</em>), once thought to be extinct in Florida</td>
</tr>
</tbody>
</table>

**Be:** attracts native and/or honey bees; **Bu:** attracts butterflies
Instructions for a DIY Bee Condo

Not yet ready for hives of honey bees? You can still have pollinators in your garden by making a home for solitary native bees. There are over 300 species of native bees in Florida – and most are stingless. If you build it, they will come!

1. Find or cut an untreated piece of wood – pieces of 4x4 to 6x6 work well. Cutting one end at an angle (for rainwater run-off) works best.

2. Drill into it – but not all the way through – with wood drill bits from 1/8 to 3/8 inch (a range of sizes will attract various species of bees); leave about 1/2 inch between holes. To attract mason bees, drill all holes 3/8 inch.

3. If you want to decorate your new bee house, use artist’s acrylic paint (water-based), or latex house paint, as long as it doesn’t have anti-fungus additives. Also, stick to water-based glues.

4. Create a simple roof by nailing or screwing on a piece of plywood, PVC, re-used plastic corrugated signs, etc.

5. You can choose to insert paper straws or rolled paper into each hole. Parasites and fungi commonly cause problems over time, and replacing the straws or swabbing out the holes with a little 50-50 hydrogen peroxide and water solution (allow the wood to dry out well) will help.

6. Attach a hanger to the back of your bee house and suspend from a tree, garden shed, or the side of your house. Or affix to a poll for inserting into the ground (minimum 16 inches up to avoid ants, etc.; max probably no more than 4 ft high to avoid strong winds). Or place on a small table or platform outside. Placing the base of the pole or table legs in containers of water or vegetable oil creates a moat to keep out unwanted ants, spiders and other crawling insects.
Online Resources:

Atlas of Florida Vascular Plants
http://www.florida.plantatlas.usf.edu (plant look up)

BeeSpotter: Creating A Bee Friendly Garden (written for Midwest, but good info)
http://beespotter.mste.illinois.edu/topics/beegarden

Enhancing Nest Sites for Native Bee Crop Pollinators (USDA)
http://plants.usda.gov/pollinators/Enhancing_Nest_Sites_For_Native_Bee_Crop_Pollinators.pdf

Florida Bee College
http://entnemdept.ufl.edu/honeybee/extension/bee_college.shtml

The Florida Friendly Landscaping Guide to Plant Selection and Landscaping Design

Florida Gardening: Information resource for gardening
http://www.floridagardening.org

Florida Native Plant Society

Florida Native Wildflowers
http://flawildflowers.org/ (seeds for sale and growing advice)

Floridata: Encyclopedia of Florida Plants and Nature
http://www.floridata.com

Florida State Beekeepers Association
http://floridabeekeepers.org

Lady Bird Johnson Wildflower Center
http://www.wildflower.org/explore/ (species information)

Landscaping for Wildlife: Attracting Native Bee Pollinators to Your Backyard
http://sarasota.ifas.ufl.edu/AG/Landscaping_for_NativeBee%20pollinators.pdf

Native Buzz – a forum for creating native pollinator habitats
http://www.ufnativebuzz.com

Nests for Native Bees

Northeast Florida’s Native Bees
http://www.floridasnativebees.com

Pollinator Conservation
http://www.fws.gov/pollinators/PollinatorPages/YourHelp.html#bee

Urban Bee Gardens (for California, but good overall info)
http://nature.berkeley.edu/urbanbeegardens

Xerces Society – Pollinator Conservation Resources
http://www.xerces.org
<table>
<thead>
<tr>
<th>2012 Hot New Plants</th>
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<tbody>
<tr>
<td><strong>Simply Scentsational®</strong></td>
</tr>
<tr>
<td><strong>Black Velvet Petunia</strong></td>
</tr>
<tr>
<td><strong>Colocasia Black Magic, Coleus ColorBlaze® LifeLime, Cuphea David Verity</strong></td>
</tr>
<tr>
<td><strong>Cuphea species</strong></td>
</tr>
<tr>
<td><strong>Alstroemeria Rock’n Roll</strong></td>
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<tr>
<td><strong>Queen Kalanchoe Paris</strong></td>
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<tr>
<td><strong>Superbells® Lemon Slice</strong></td>
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<tr>
<td><strong>Superbells® Pomegranate Punch</strong></td>
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<td><strong>Fireworks Gomphrena</strong></td>
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<tr>
<td><strong>Dragonwing Begonia</strong></td>
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<tr>
<td><strong>Charmed® Oxalis</strong></td>
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<tr>
<td><strong>Golden Delicious Salvia</strong></td>
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<td><strong>Plectranthus</strong></td>
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<tr>
<td><strong>Asclepias</strong></td>
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<tr>
<td><strong>Bouvardia</strong></td>
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<tr>
<td><strong>Señorita Rosalita® Cleome</strong></td>
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<tr>
<td><strong>Senorita Blanca™ Cleome</strong></td>
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<tr>
<td><strong>Firespike Odontonema</strong></td>
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<tr>
<td><strong>Sweet Caroline Sweet Potato</strong></td>
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<tr>
<td><strong>Illusion® Sweet Potato</strong></td>
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<tr>
<td><strong>Snow Princess® Lobularia</strong></td>
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<tr>
<td><strong>Frosty Knight™ Lobularia</strong></td>
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<tr>
<td><strong>Blushing Princess™ Lobularia</strong></td>
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<tr>
<td><strong>Flambé™ Chrysocephalum</strong></td>
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<tr>
<td><strong>Double Take™ Quince Orange, Pink, &amp; Scarlet Storm’</strong></td>
</tr>
<tr>
<td><strong>Amaranthus caudatus &amp; Plectrathus argentatus</strong></td>
</tr>
<tr>
<td><strong>Fuchsia Tassel™ Salmon Pink &amp; Dark Salmon</strong></td>
</tr>
<tr>
<td><strong>Ipomoea Sweet Caroline Bewitched</strong></td>
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<tr>
<td><strong>Solcito Zinnia (Z. maritima)</strong></td>
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<tr>
<td><strong>Diamond Frost® Euphorbia</strong></td>
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<tr>
<td>Plant Name</td>
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<tr>
<td>Supertunia® VISTA Bubblegum</td>
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<tr>
<td>Color Blaze® Solenostemon</td>
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<tr>
<td>Colorblaze® Marooned</td>
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<tr>
<td>Intensia® Phlox</td>
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<tr>
<td>Color Spires® Agastache</td>
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<tr>
<td>Rhodochiton</td>
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<td>Supertunia® Raspberry Blast</td>
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Thank you for all you do in the name of gardening!
Florida-Friendly Groundcovers

**David Shibles**
Urban Horticulturist, Polk County Extension Service

This PowerPoint presentation will detail a series of Florida-Friendly groundcovers including perennial peanut, yellow jasmine, St. Bernard’s lily, bugleweed, cast iron plant, sweet potato vine, holly fern, autumn fern, twin flower, blue daze, Tampa vervain, Algerian ivy, English ivy, shore juniper, creeping juniper, trailing lantana, liriope, powderpuff, giant sword fern, sword fern, mondo grass, leather leaf fern, southern shield fern, Asiatic jasmine, Confederate jasmine, periwinkle, coontie, cardboard plant, beach sunflower, aloe, blue-eyed grass, mid-summer aster, spider plant and Pineland heliotrope. Various characteristics of each species will be discussed including origin, recommended planting zones, speed of growth, preferred pH, soil texture, drought tolerance, light requirements, salt tolerance, flower color, flowering season, and other important cultural characteristics.

A color copy of this PowerPoint presentation will be available at the rear of the room. It will also be available on my web site [www.polkhort.com](http://www.polkhort.com) on the Power Point presentation page.
Online Training Resources Developed for Master Gardeners

Stephanie D. Stocks

Description: There have been several online training resources developed recently for Master Gardeners on topics such as identifying plant pests and diseases, submitting digital and physical samples for identification when needed, invasive species of concern, Entomology 101, etc. Each comes with a certification of completion (if you take the accompanying quiz) and all of these training resources are available at no cost to you!

Outline of material covered:

- Online training available for Master Gardeners:
  - National Plant Diagnostic Network First Detectors
  - Protect U.S., the community invasive species network
  - Sentinel Plant Network
  - UF Online Training

- Some special topics workshops that will be available during 2013
  - Stink Bugs of Florida
  - European Pepper Moth
  - Invasive Species of Concern to Florida
Youth Gardening Activities

Wendy Wilber
University of Florida

Hands on activities bring much to the gardening student’s learning experience. Anytime you can incorporate an experiential learning opportunity for your young gardeners they will gain knowledge and confidence around the project.

The metamorphosis bracelet is an easy beading project for little hands and it teaches the life cycle of the butterfly. Students will keep this piece of art for years and use it to teach others about the wonders of insect metamorphosis.

Plant people is an activity that teaches the concept of germination and shoot growth. This activity uses simple materials such as a plastic cup, nylons and soil and plenty of rye seed to create a unique take home plant.

Container gardening is a skill that many master gardeners use. Sharing this skill with children and gardening students is a great way to get them set up for success with keeping plants close to the classroom or home. Use different styles of containers for interest or use usual plants such as ivy or spider plants to create fun container garden creations.

Plant faces is an activity that uses dried plant parts such as seeds, leaves, flower petals, stems to create a unique self portrait. This self reflective artistic project helps children to really look at the different plant parts and to think about how they portray themselves to others.
Climate Variability and Change in Florida

David F. Zierden
Florida State Climatologist
Center for Ocean Atmospheric Prediction Studies
The Florida State University

What is a State Climatologist?
- Originally a NOAA program until 1973
- States urged to appoint their own SC
- Most states made it a faculty appointment at the land grant university
- Title transferred to FSU after a number of years
- Appointed by the department Chair
- MOU with partners at NOAA NWS and NCDC
- Office certified by the American Association of State Climatologists

“Climate Change” versus “Global Warming”
Climate change is ongoing and has many causes, both natural and man-made.

Natural causes:
• Changes in solar intensity
• Eccentricity in the earth’s orbit and “wobbles”
• Vegetation, albedo changes
• Volcanic eruptions
• Coupled ocean/atmospheric cycles

Man-made causes:
• Urbanization
• Land use changes
• Aerosols
• Greenhouse gases

“Global warming” specifically refers to a general warming of the planet due to the anthropogenic increase in greenhouse gases.

Unfortunately, “climate change” is now misconstrued as the same as “global warming.”

IPCC 4 Conclusions
“Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.”

“Global atmospheric concentrations of CO2, methane (CH4) and nitrous oxide (N2O) have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years.”

“Most of the observed increase in globally-averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations.”
- IPCC 4 Summary for Policy Makers

Historical Greenhouse Gas Concentrations
Scientist extract ice cores from up to two miles beneath the surface at Vostok, Antarctica.
"the Holocene, which has already lasted 11,000 years, is, by far, the longest stable warm period recorded in Antarctica during the past 420,000 years."
- Petit, et. al., 1999

The famous “hockey stick” graph of reconstructed temperatures from Mann, et al.
- Source: Intergovernmental Panel on Climate Change 2001

Southeast Temperature Trends

Global Warming in South Florida?

Climate Division 6 Weather Stations

Rural Weather Station
Small Town

Small Town surrounded by pastures, citrus groves, pine stands, and lowlands. Station located at the water treatment plant inside the city limits. Arcadia has grown very little in the last 40 years and only has a population of around 10,000. USCHN station (unadjusted data)

Other Land Use Changes

Sugar Cane Fields

Belle Glade Temperatures

Land cover maps of Florida from the pre-1900's and from 1993 show the area south of Okeechobee now surrounded by irrigated sugar cane fields. Mesoscale modeling has shown large summertime temperature differences in the area from differences in land use (Marshall, et al., 2004).

USDA Cold Hardiness Zones

- Base on yearly minimum temperature averaged over a period of 10-15 years

Endpoints are important!
**Climate Change and Hurricanes**

Emanuel (Nature, 2005) – Hurricane power has increased in recent decades due to warmer sea surface temperatures part to global warming.

Webster, et al. (Science, 2005) – The number of category 4 and 5 hurricanes have doubled in the last 30 years, due to global warming.

**Climate Change and Hurricanes**

Updated WMO Consensus (Feb., 2010):
- Cannot conclusively identify anthropogenic signals in past cyclone data
- Frequency likely to remain unchanged or lower, intensity likely to increase a modest amount

"Over the long term the effects of changes in society dwarf the effects of any projected changes in tropical cyclones…”
- Pielke, et al., 2005

**Southeast Precipitation Trends**

**Southwest Georgia**

**Sea Level Rise – Who is Right?**

Some well-known predictions:
- James Hansen (NASA) – 20 ft. or more, past the “tipping point”
- Harold Wanless (Miami) – 3.3 to 5.0 ft
- Harrington and Walton (FSU) – 0.83 to 1.13 ft by 2080
- IPCC 4 – 10 to 23 inches

Recent Studies:
- Mitrovica, et al., University of Toronto – uneven effects of melting Antarctica
- Skaarup, et al., University of Copenhagen – correlation of proxy data with past sea level measurements

**Causes of Sea Level Rise**

Global sea level can rise from two primary causes:
1. Warming of the oceans (thermal expansion)
2. Melting of ice caps and glaciers
**PaleoAucilla Settlements in the Gulf**

Artifact encounters in Apalachee Bay  
- Faught, 2004

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**Local sea level measurements**

- Key West, FL: 22 cm by 2090
- Pensacola, FL: 10 cm by 2090

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**New Report on Sea Level Rise**

- Red Lines – possible future scenarios
- Blue Line – Current rate from satellite measurements

Best estimate for this area is 80 cm by 2100.

More likely to be too low than too high.
  - Gary Mitchum 2011, USF

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**Climate and Florida Citrus**

Adapted from: John Attaway, "A History of Florida Citrus Freezes"

**Impact Freezes:**
- February 7-9, 1835
- December 29, 1894
- February 8, 1895
- February 13-14, 1899
- December 12-13, 1934
- January 27-9, 1940
- December 12-13, 1962
- January 18-20, 1977
- January 12-14, 1981
- December 24-25, 1983
- January 20-22, 1985
- December 24-25, 1989
- January 19, 1997

Freeze damaged orange trees in 1895

---

**“The Warm Century” – prior to 1835**

Citrus was introduced with success at colonial Charleston, Savannah, and St. Augustine. Accounts are written of groves producing for "generations".

The freeze of 1835 killed trees to the roots in South Carolina, Georgia, and northeast Florida with temperatures reaching as low as 1 degree F in Charleston and 8 degrees in Jacksonville.

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**Orange Industry takes hold in North-Central Florida**

Mature orange grove outside of St. Augustine, FL in the early 1890’s. Trees have obviously grown for decades without major freeze damage.
  - from Buell, 1893

Following the 1835 freeze, a thriving orange industry sprung up in Alachua, Marion and Putnam counties surrounding Orange Lake.
The winter of 1894/1895 experienced two severe freezes (mid-Dec. and mid-Feb.) separated by an unusually warm spell. Groves damaged by the Dec. freeze had produced tender new vegetation prior to the Feb. event, leaving them especially vulnerable. Damage by these freezes and another in 1899 put many north-central and northeast Florida producers out of business.

Beginning in 1977 and lasting through 1989, Florida saw a succession of severe freezes that damaged trees further south than ever before. The center of production moved further south to its present position in west-central and southwest Florida. The more tropical climate of south Florida brings increased disease threats such as citrus canker and greening along with greater risk of hurricane damage.

Thanks!
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Lynn Barber

Lynn Barber, Florida-Friendly Landscaping™ (FFL) Agent, Hillsborough County and UF/IFAS Extension, is a Master Gardener and Master Composter. She has given back hundreds of hours in environmental horticulture education to the community. Lynn co-created the 2005 University of Florida award winning Educational Materials Preparation, Hassle Free Houseplants, and completed two co-created presentations, The Lazy Gardener and Recycling Your Garden. Her yard has been on tour and featured in several newspapers, and she won the 2005 Hillsborough County Community Water-Wise Award. She writes two weekly articles for the Tampa Tribune, monthly for Florida Community Association Journal and Osprey Observer and bi-monthly for In The Field Magazine and Fish Hawk Trails Homeowner Association Newsletter. Lynn is a graduate of the College of St. Catherine, St. Paul, Minnesota, with a Bachelor of Arts in Business Administration - Management Major, and is currently working on a Masters in Environmental Horticulture at UF. In a former life, Lynn was AVP of an insurance company workers compensation claim operation. She is ‘owned’ by two cats that she would like to compost on occasion!

Michael Dukes

Michael D. Dukes is a UF Research Foundation Professor and Irrigation Specialist at the University of Florida in the Agricultural and Biological Engineering Department. He is currently Interim Director Center for Landscape Conservation & Ecology. Michael obtained a B.S. in Agricultural Engineering and an M.C.E. in Civil and Environmental Engineering from the University of Delaware. He obtained a Ph.D. in Biological and Agricultural Engineering from North Carolina State University. He joined the University of Florida in Gainesville in 2001. His interests are in the area of irrigation and water management, particularly in the area of efficient irrigation design and management, water conservation, and minimizing negative impacts of irrigated systems. Research areas include nutrient and water management under vegetable production, residential irrigation efficiency, and evaluation of “smart” irrigation control systems such as soil moisture sensor controllers or evapotranspiration based controllers. Extension efforts concentrate on implementation of irrigation control technologies to reduce over-irrigation and loss of nutrients. He is a licensed professional engineer in Florida and a residential Certified Irrigation Designer.

Stephen Futch

Steve Futch, Ph.D. has been the Multi-County Citrus Agent since 1990 located at the UF Citrus Research & Education Center in Lake Alfred. His Extension position is responsible for conducting educational programs and providing citrus grower assistance in the 4-county area of Hardee, DeSoto, Manatee and Sarasota. These counties represent about 24% of the states total citrus production and acreage. In addition to citrus program, activities are also directed toward conducting classes related to pesticide license training, agricultural safety programs and Worker Protection Standards trainings.

Steve grew up in a citrus family located in Dade City (Pasco County). He operated a citrus production and caretaking company after college graduation from 1975 to 1985. After the severe
freezes of 1983 and 1985, he moved to Vero Beach where he was the Extension Agent and later the County Extension Director for Indian River County from 1985-1990.

During his extension career he has authored or co-authored more than 360 articles or research findings. These articles appear in trade magazines, professional proceedings and numerous University of Florida publications. He has observed citrus in many regions around the world (Argentina, Australia, Brazil, Costa Rica, Cuba, Egypt, Guatemala, Honduras, India, Jamaica, Mexico, South Africa, and Uruguay).

Aparna Gazula

Aparna Gazula is the Commercial Horticulture Agent in Alachua County. She completed her Bachelor of Science degree in Agricultural Sciences from the Acharya N.G. Ranga Agricultural University, India, in 2000. In 2004, she received a Master of Science degree in Horticultural and Crop Sciences from The Ohio State University. Her thesis was on the effects temperature and light on anthocyanin pigment levels in different leaf lettuce varieties. She began work towards a doctor of philosophy in the Horticultural Sciences department at University of Florida, and received her PhD degree in Horticultural Sciences in 2009. Her PhD dissertation was on the impact of irrigation and nutrient management programs on fruit yields, nitrogen load, and crop value of fresh market tomatoes grown with plasticulture. Her programming focus includes commercial horticulture including fruit and vegetable production, landscape maintenance, ornamental nurseries, and 4-H.

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 third 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 75 scientific peer reviewed journal articles in his 30 years in academia and industry.

Janice Hamlin

Janice Hamlin has lived in Florida since early childhood and has always loved plants, flowers, birds, bees, and all things natural. She lives in Bradenton and is a Manatee County Master Gardener. After taking her first floral design classes at Manatee River Garden Club, she joined the club and continued her studies to become an Accredited Master Judge and Flower Shows Schools Design Instructor for National Garden Clubs, Inc. She teaches and demonstrates floral design at many garden clubs and recently received the Best in Show Award at the Florida Federation of Garden Clubs’ State Flower Show. Many of her designs feature common plant materials that she has manipulated through braiding and weaving to create new forms. Photographs of her designs have been published in The National Gardener, The Florida Gardener, Design Dimensions, and Flower Arranging-The American Way.
**Gail Hansen**

Gail Hansen, MS, MLA, PhD, is an assistant professor in the Environmental Horticulture Department at the University of Florida. Her teaching and extension focus is sustainable landscapes and her program addresses best design practices and quality of life in residential and urban landscapes. She is also a faculty member in the Center for Landscape Conservation and Ecology (CLCE), a faculty advisor for the Florida-Friendly Landscaping™ Program, and the Statewide Extension Specialist in Landscape Design. Dr. Hansen has an MLA and PhD in landscape architecture. She worked for a private landscape architecture firm in Gainesville, Florida for eight years and as an adjunct faculty for seven years in the landscape architecture department at UF before joining the environmental horticulture department where she teaches the residential landscape design courses.

**Doris Heitzmann**

Doris Heitzmann is the Community Association Outreach Coordinator of the Florida-Friendly Landscaping™ Program with the UF IFAS Extension in Pinellas County. This valuable outreach program provides Ms. Heitzmann the opportunity to visit communities, evaluate their landscaping needs and share her expertise with community association members and property managers. Communities benefit from her knowledge and practical experience by adopting water conservation techniques and protecting the area's precious water resources as well as enhance property value while creating attractive, low maintenance and desirable landscapes.

Before joining the Florida-Friendly Landscaping™ team Ms. Heitzmann designed, implemented and maintained Florida-Friendly landscapes for homeowners in the Tampa Bay region. Ms. Heitzmann is a horticulturist, an ISA Certified Arborist and a Florida Master Gardener. Her passion is preservation and Doris enjoys visiting Florida State Parks to learn about the diverse eco systems with their magnificent fauna and flora.

**Mary Keith**

Dr. Mary Keith grew up gardening, canning, raising hogs and goats, and working on neighbor’s farms in central Pennsylvania. After a BS she spent 6 years in South America. There in the Peace Corps she worked with the Paraguayan Ministry of Agriculture organizing 4-C (4-H) clubs and supporting the Home Economics programs. She then earned her MS and PhD in Food Science from Penn State University, and went on to Univ. of Illinois as Assistant Professor of Food Safety and Preservation for 6 years. She is also a licensed dietitian. She worked as a nutritionist in Kenya, East Africa for several years. She managed a residence hall in Gainesville, and worked as a Public Health Nutritionist with WIC in Tampa before returning to Extension in 2000 as the Hillsborough County Foods, Nutrition and Health Agent. She is an active member of the Institute of Food Technologists, International Home Economic Services and Florida Extension Assoc. of Family and Consumer Sciences. She has most recently won 2 regional awards from the National Extension Assoc. of FCS for her work with the swelling interest in home canning. In 2011 she taught 47 home canning classes to almost 900 people.
George Kish

George R. Kish is a project manager for the USA-National Phenology Network working to establish long-term phenology research partners and study sites in the Southeast. He collaborates with Florida Extension, other state and federal agencies, botanical gardens, universities, nature centers and middle schools to engage citizen scientist participation in phenology observations.

George earned his B.S. degree in Biology from Drexel University and his M.S. degree in Environmental Science from Rutgers University. George is a hydrologist with the U.S. Geological Survey in Tampa, Florida and co-author of the gardening book, “The Right Native Plants for Dry Places” with a second gardening book about to be published, “The Right Plants for Dry Coastal Places: Native Plant Landscaping with Salt Tolerant Plants in Peninsular Florida” by Richard Wunderlin and George Kish.

Kenneth Langeland

Professor and Extension Specialist, Weed Science, University of Florida, IFAS, Agronomy Department and Center for Aquatic and Invasive Plants, where he specializes in weedy plants 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 (Plant Pathology and Physiology) in 1978, Ph.D. from the University of Florida (Agronomy) in 1982. He was Assistant Professor at North Carolina State University from 1982 to 1986. He joined the Agronomy Department of the University of Florida in 1986, reaching the rank of Professor in 1994. Research emphasis is on applied research to solve practical problems related to aquatic and natural area weeds. Extension activities are focused on providing information on management of aquatic and upland invasive plant species to land managers and the general public, including certification of restricted use pesticide applicators in these areas. 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. In 1989, Ken received the Florida Aquatic Plant Management Society Presidential Award. He was Florida Weed Science Society Weed Scientist of the Year in 1993, presented the Florida Lake Management Society Paper of the Year in 1994, and in 1998 received the Florida Native Plant Society Green Palmetto Award and the Florida Exotic Pest Plant Council President’s Award. He is the author of “Identification and Biology of Non-Native Plants in Natural areas of Florida” and has published over 150 scientific articles and extension fact sheets.

Richard Lindberg

Richard has been growing bamboo for fourteen years in north Florida. Since then he has increased the collection to over 50 species. He is active in the cultivation and propagation of bamboo. Richard has also been hybridizing and testing many species for cold hardiness. Recent projects include consultation on the Asian exhibit at the Jacksonville Zoo and Gardens and the bamboo garden at the University of North Florida. Mr. Lindberg is a member of the American Bamboo Society.
**Brightman Logan**

Has owned All Native, L.L.C. for 31 years, growing only natives. Brightman worked on restoration and landscape projects throughout Florida. He is a founding member of the Florida Native Plant Society, Founding member, past President of the Florida Assoc. of Native Nurseries, current member of University of Florida Environmental Horticulture Curriculum Advisory Panel, Past vice chair of the Florida Wildflower Foundation, and current chair of the research committee.

**Rick Lusher**

Rick is the Director of the Florida Automated Weather Network (FAWN). Rick was born and raised in Ocala. He received an M.S. in Meteorology from Florida State University (FSU) in 1999. He worked as the Coordinator of Educational Outreach for the FSU Department of Meteorology until 2004, taught Earth-Space Science in Leon County for 2 years, then worked as a Contract Weather Observer at the Tallahassee Regional Airport before moving to the University of Florida to become the Director of FAWN in 2007.

**Kathy Malone**

Kathy Malone is a butterfly photographer, conservationist and enthusiast, having retired from the University of Florida in 2011 as the state builder and developer coordinator for Florida-Friendly Landscaping™. While there, she and others developed the concept of Community ButterflyScaping. Kathy co-authored a national 4-H butterfly monitoring curriculum while at the Florida Museum of Natural History before joining the FFL team. She has a master's in education from Palm Beach Atlantic University and a bachelor's in journalism and minor in environmental science from UF. She authored the first recreational guide to public lands at the South Florida Water Management District, is active in the North American Butterfly Association, and has placed in the Association for Tropical Lepidoptera's photography contest for several years. Kathy says, "Keep on the lookout for butterflies and if they are not there, ask why, then find out what you can do to change that."

**Russell Mizell**

Dr. Mizell is a Professor of Entomology with the University of Florida’s Institute of Food and Agricultural Sciences and is located at NFREC-Quincy. Dr. Mizell has research and extension responsibilities for deciduous fruits, pecan, and woody landscape plants with focus on the development of Integrated Pest Management systems. He has authored or coauthored ~350 publications concerned with IPM programs including pest biology, biological and chemical control, host plant resistance, population dynamics and insect-plant-disease interactions. His current research focuses on methods of evaluating and enhancing biological control agents (predators and nematodes), monitoring methods for deer flies, weevils (fruit, citrus, and forestry), the ecology, behavior and suppression of stink bugs, plant stress and insect interactions, and the development of regulatory ecosystem services. Some of his past and current contributions can be viewed at the websites: //ufinsect.ifas.ufl.edu and //nfrec.ifas.ufl.edu.
Esen Momol

Dr. Esen Momol is the Director for the Florida-Friendly Landscaping™ (FFL) Program that is located in the Environmental Horticulture Department of UF/IFAS and part of the Center for Landscape Conservation & Ecology. She is also an affiliated faculty member with the Center for Landscape Conservation & Ecology and the Water Institute.

FFL is an educational outreach program of UF/IFAS and Florida Department of Environmental Protection. It is implemented through the UF/IFAS County Extension Service offices in each county. The program collaborates with the water management districts and other state, local, and county agencies. FFL program has three sub programs: FYN Home Owner, FYN Builder & Developer and Green Industries Best Management Practices.

The mission of FFL is to provide science-based interdisciplinary educational resources that result in the adoption of environmentally friendly landscape practices to reduce water use & non point source pollution, protect water bodies and natural resources and enhance the lives of Floridians.

Holly Ober

Holly Ober is an Assistant Professor and Extension Specialist in the Department of Wildlife Ecology and Conservation at the University of Florida. She holds a 60% extension and 40% research appointment, and is stationed at the North Florida Research and Education Center in Quincy. Her research and extension programs encompass a wide variety of topics including the influence of forest management activities on wildlife, restoration of forest biodiversity and ecosystem functions, management of threatened and endangered species, and development of tactics to moderate wildlife damage issues. She currently serves as director of the Natural Areas Training Academy and as a co-director of CFEOR (Conserved Forest Ecosystems: Outreach and Research). She received a B.S. in biology from Duke University, M.S. in Wildlife Ecology from the University of Arizona, and dual Ph.D. in Forest Science and Wildlife Science from Oregon State University.

Sydney Park Brown

Sydney is a native Floridian who has devoted her entire professional career to the University of Florida. A former UF graduate, Sydney was the Extension Horticulture Agent and Master Gardener Coordinator in Hillsborough County before transferring to UF’s distance campus in Plant City. There she teaches courses in Plant ID, Plant Propagation, Annuals and Perennials and others. She is also the state Extension Specialist in Consumer Horticulture for UF and, in that position, creates numerous educational resources and opportunities for gardeners, homeowners, and Master Gardeners.
Michelle Peterson

An avid gardener, Michelle Peterson started beekeeping four years ago after noticing a scarcity of honey bees pollinating her flowers and later learning about Colony Collapse Disorder. She became an active member of the nearest beekeeper club, the Palm Beach County Beekeepers Association, and, in 2011, founded the Treasure Coast Beekeepers Association to support beekeepers and bee advocates in St. Lucie, Martin and Indian River Counties. Michelle currently serves as President of the Treasure Coast Beekeepers Association and as a Board of Director of the Port St. Lucie Botanical Gardens. She is a Florida Master Gardener in St. Lucie County, an Advanced Beekeeper in the UF IFAS Master Beekeeper Program, and is working to become a Master Beekeeper with a specialization in Native Bee Apiculture. Michelle has a strong interest in supporting backyard beekeepers, promoting and encouraging native bee pollinators in residential gardens and landscapes, and discouraging the use of pesticides, particularly clothianidin and other neonicotinoids, that are harmful to bees and other pollinators. Michelle lives and works in Port St. Lucie, Florida.

Carolyn Saft

Family owned and operated an orchid nursery in West Palm Beach, FL. BS in Ornamental Horticulture, MS in Ag Education and Communication both degrees from the University of Florida. Member of the American Orchid Society, Florida Native Plant Society, Florida State Horticulture Society, National Association of County Agriculture Agents & Association of Natural Resources Extension Professionals. Hobbies include gardening, kayaking, golf and collecting Snoopy collectables.

David Shibles

David is originally from Maine and attended the University of Maine in Orono where he earned a B.S. degree in Education and a M.S. degree in Entomology. He later earned a Ph.D. degree in Entomology from Rutgers University in New Brunswick, New Jersey.

David has spent most of his career working in agricultural research with insects and plants. He worked with Sandoz Crop Protection Company for 15 years in Homestead, FL and for the Polk County Mined Lands Research Demonstration Project for 9 years in Bartow, FL. He has also worked in agricultural research in Mexico, Central and South America. David has been with the Polk County Cooperative Extension Service since April 2000.

Rick Schoellhorn

Dr. Rick Schoellhorn joined the Proven Winners team in 2005 as Director of New Products. Rick coordinates the US trials of Proven Winners and works with PW global on global trialing issues. He is responsible for finding new plants and testing them via Proven Winners exhaustive trialing program and working with plant breeders around the world to help them make headway in developing new crops. From March through October Rick is in the air and on the road around the globe looking for the truly best breeding from Proven Winners.

Over the past twenty years he has worked extensively in the horticulture industry in a variety of occupations. His experience includes: seven years as a college professor at the University of
Florida, five years in retail nursery sales, three years of golf course maintenance in California, three years retail nursery production and sales in Alaska and 12 years as sole proprietor of a landscape and interiorscape installation and design company in Colorado. He has toured Indonesia, Holland, Germany, Spain, Madeira Island Portugal, Costa Rica, Japan, and Mexico collecting plants and consulting with growers.


Rick is the co-author of “Your Florida Guide to Perennials” (ISBN: 0-8130-2927-9) with Dr. Sydney Park-Brown and has a CD of original music floating around out there somewhere called “Under a Midnight Sky” and if you’re lucky you’ll never hear it…

**Stephanie Stocks**

Stephanie Stocks works for the Department of Entomology and Nematology at the University of Florida (Gainesville) where she develops educational material on invasive species topics of concern to natural ecosystems and agricultural systems for various organizations such as Protect U.S. and the National Plant Diagnostic Network First Detector Training Program. This material is delivered in three forms: scripted presentations for educators, online training modules (e-learning) for industry, small farm producers, master gardeners, and the general public, and K-12 lesson plans that are correlated to the National Science Education Standards as well as the Sunshine State Standards. She is also the outreach coordinator for the department.

**Laurie Trenholm**

Laurie Trenholm received both her B.S. and M.S. degrees from the Environmental Horticulture Department at the University of Florida, majoring in Turfgrass Science. Her Ph.D. is from the University of Georgia’s Crop and Soil Science Department in Turfgrass Physiology. She is currently a Professor of Environmental Horticulture at the University of Florida in Gainesville. She has been active in development of the Green Industries Best Management Practices and leads the statewide research program on nutrient leaching from turfgrass for BMP quantification. Other research interests’ focus on turfgrass stress physiology and cultural practices.

**Wendy Wilber**

Wendy Wilber has been the Environmental Horticulture Agent at the UF/IFAS Alachua County Extension Office since 2000. Wendy’s main focus is teaching Alachua County residents how to create and maintain environmentally friendly landscapes. These Florida friendly landscapes minimize water use, reduce storm water runoff, and decrease the potential pollutants of pesticides, and nitrates.

Wendy also provides leadership for programming in residential horticulture. In this role, she teaches and coordinates the Master Gardener volunteer program. These volunteers participate in an intensive course to learn about gardening, horticulture and landscaping. In turn, these volunteers advise and teach people of Alachua County in areas of plants, landscape, and insects and diseases of plants. Youth education through 4-H is another component of her extension work. She instructs the 4-H
Junior Master Gardener program for 3rd and 4th graders. These children learn not only about gardening, but about environmental stewardship as well.

She grew up on a tropical fruit farm in Miami Dade County, and has worked in the landscape industry. She is a graduate of Stetson University in De Land Florida, and the University of Florida in Gainesville.

**David Zierden**

David Zierden earned his Bachelor of Science degree in Meteorology in 1996 at Florida State University. He followed that with a Master of Science in Meteorology under the direction of Dr. James J. O’Brien, then director of FSU’s Center for Ocean-Atmospheric Prediction Studies. Following graduation, David served under Dr. O’Brien, a recognized world leader in ocean modeling and climate application studies, as the Assistant State Climatologist from 1998 through 2005. In 2006, Mr. Zierden was appointed State Climatologist following the retirement of James O’Brien.

David is a full member of the American Association of State Climatologist and the American Meteorological Society, and the Florida Climate Institute. He has published journal articles on satellite meteorology, climate variability and wildfire threat, and applications to agriculture in the Southeast U.S. and presented these findings at many professional conferences. He is well known among growers, producers, and Extension in the Southeast for providing seasonal climate forecasts and presents this information at many workshops, trade shows, and commodity meetings throughout the year. Mr. Zierden is an avid outdoorsman, enjoying running as well as surfing, fishing, and other water sports.
Map of Florida Counties