

Hendry County Extension, P.O. Box 68, LaBelle, FL 33975 (863) 674 4092

Flatwoods Citrus



Vol. 15, No. 9

September 2012

Dr. Mongi Zekri
Multi-County Citrus Agent, SW Florida



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Previous issues of the Flatwoods Citrus newsletter can be found at:

<http://citrusagents.ifas.ufl.edu/agents/zekri/index.htm>

<http://irrec.ifas.ufl.edu/flcitrus/>

IMPORTANT EVENTS

September Seminar

Date: Thursday, September 20, 2012, Time: 10:00 AM – 12:00 Noon

Location: Southwest Florida REC (Immokalee)

1. Spray program calendar for all citrus pests – **Dr. Phil Stansly**, Immokalee IFAS Center
2. Growing young citrus trees in the greening era – **Dr. Tim Spann**, Lake Alfred CREC, UF-IFAS
3. Breeding disease tolerant citrus rootstocks – **Dr. Kim Bowman**, USDA, Fort Pierce
4. Ridomil Gold Best Use Guidelines – **Mr. Cody Hoffman**, Syngenta, Fort Myers

2 CEUs for Certified Crop Advisors (CCAs)

2 CEUs for pesticide license renewal

Pre-registration is required. No registration fee and lunch is free Thanks to Cody Hoffman with **Syngenta**. To reserve a seat, call 863 674 4092, or send an e-mail to: maz@ufl.edu

CITRUS SPOT BURNER WORKSHOP

Date & Time: October 8, 2012 starting at 9:00 AM

Location: Hendry County Extension Office, LaBelle

The workshop will explain requirements for burning.

There is no need for pre-registration and attendance is free.

Citrus spot burners who have been previously involved in the citrus spot burner program are required to attend and submit an updated map to the Florida Forest Service every year.

Certified Crop Adviser Educational Seminar and CEU Session

Wednesday, October 10, 2012

7:30 AM to 6:00 PM

Soil and Water Management (5 CEUs)

Crop Management (5 CEUs)

At the Immokalee IFAS Center and other locations

For more information and registration, see pages 8-10.

Special Thanks to sponsors of the "Flatwoods Citrus" newsletter for their generous contribution and support. If you would like to be among them, please contact me at 863 674 4092 or maz@ufl.edu



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South Florida Farmers Set Standard For Water Quality

Implementation of BMPs leads to historic achievement in runoff reduction goals.



For the 17th consecutive year, water flowing from farmlands in the Everglades Agricultural Area (EAA) achieved phosphorus reductions that exceeded those required by law. Implementation of best management practices (BMPs) produced a 71% phosphorus reduction in the 470,000-acre EAA farming region south of Lake Okeechobee for the 2012 monitoring period. An approved model is used to compute the reductions and makes adjustments to account for the influences of rainfall.

Just west of the EAA, the C-139 Basin also met its goal of reducing phosphorus discharges to historic levels. The 170,000-acre C-139 farming region consists primarily of pasture land, row crops, citrus and sugarcane. Results show 15 metric tons flowed from the basin during the 2012 monitoring period, less than half the target load of 32 metric tons.

“Year after year, science-based best management practices deliver reductions in nutrients that are greater than required by state law, helping to significantly improve Everglades water quality,” said Joe Collins, chairman of the South Florida Water Management District Governing Board. “Together with treatment wetlands, BMPs provide a solid foundation for our collective efforts to achieve the ultra-low water quality standards in the River of Grass.”

In the EAA, the most commonly used BMPs are more precise fertilizer application methods, refined stormwater pumping practices, and erosion controls to reduce the amount of phosphorus transported in stormwater runoff to the Everglades and connected water bodies. In the C-139 Basin, the District recently worked with landowners to develop more comprehensive and stringent BMP plans for each farm that better address the unique nutrient challenges in this basin. These plans are anticipated to result in greater phosphorus reduction results.

[Source: South Florida Water Management District](#)

**Certified Crop Adviser
Educational Seminar and CEU Session**

October 10, 2012
7:30 AM to 6:00 PM

Soil & Water Management (5 CEUs) and **Crop Management** (5 CEUs)
On-site host: **UF/IFAS Citrus Research and Education Center in Lake Alfred**, and offered by
videoconference at:

- Gulf Coast REC in Balm
- Southwest Florida REC in Immokalee
 - Indian River REC in Ft. Pierce
- University of Florida main campus in Gainesville
 - Lake County Extension Office in Tavares

Regular registration is \$100. Lunch will be provided at all sites.
Please send the attached registration form to the Citrus Research and
Education Center, Lake Alfred.

Visit the CCA Seminar website at

http://www.crec.ifas.ufl.edu/crec_websites/cca/registration.shtml
for the specific program as it becomes available.

Future UF/IFAS CCA Seminars: **Wednesday, April 10, 2013**

CERTIFIED CROP ADVISER CEU SESSION

SOIL & WATER MANAGEMENT (5 CEUs) – CROP MANAGEMENT (5 CEUs)

Wednesday, October 10, 2012

http://www.crec.ifas.ufl.edu/crec_websites/cca/registration.shtml

Registration by mail is \$100; Registration at the door is \$120.

Registration host: UF/IFAS Citrus Research and Education Center in Lake Alfred. Please register by October 3 for the videoconferences at Immokalee, Balm, Ft. Pierce, Gainesville, and the Lake County Extension

Office in Tavares. We need the advance notice to make additional arrangements at these sites.

I. LOCATION - Speakers will deliver their presentation from the site in their respective area.

Lunch and refreshments provided at all locations.

Check one:

Lake Alfred (host site)

UF/IFAS Citrus Research and Education Center, 700 Experiment Station Road,
Lake Alfred, FL 33850; Contact is Jane Wilson at (863) 956-8643

Immokalee (videoconference)

UF/IFAS Southwest Florida Research and Education Center, 2686 SR 29 N,
Immokalee, FL 34142; Contact is Julie Carson at (239) 658-3400

Balm (videoconference)

UF/IFAS Gulf Coast Research and Education Center, 14625 County Road 672,
Wimauma, FL 33598; Contact is Christine Cooley at (813) 634-0000

Ft. Pierce (videoconference)

UF/IFAS Indian River Research and Education Center, 2199 S. Rock Road,
Ft. Pierce, FL 34945; Contact is Velma Spencer at (772) 468-3922

Gainesville (videoconference)

University of Florida campus in Gainesville (McCarty Hall, Room 1066)
Contact is Greg Means at (352) 392-1951, ext. 253

Tavares (videoconference)

Lake County Extension Office in Tavares (1951 Woodlea Road, Tavares, FL 32778)
Contact is Gary England at (352) 343-4101

Registration Form

II. CONTACT INFORMATION (Please print or attach a business card)

To register, complete this form and mail with payment.

Name(s): _____

Affiliation: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone: _____ FAX: _____

E-Mail: _____

Dietary restrictions or special accommodations: _____

III. PAYMENT

Registration: Includes admission to the 1-day workshop, handouts, lunch, coffee breaks.

By mail (\$100) \$100.00 × (No.) _____ = \$_____ (Total) At the door (\$120)

Please make payment by **check** payable to **CRE FOUNDATION**, or **CREF**.

Mail this form and payment to: **Citrus Research and Education Foundation**
Attn: Jane Wilson
700 Experiment Station Road
Lake Alfred, FL 33850-2299

For questions about the CCA Seminar Program, contact one of the Program Coordinators:

Ed Hanlon, UF/IFAS Southwest Florida Research and Education Center, 2686 SR 29 North, Immokalee, FL 34142-9515; Tel. (239) 658-3400; e-mail: eahanlon@ufl.edu.

Rao Mylavarapu, UF/IFAS Soil & Water Science Department, PO Box 110510, Gainesville, FL 32611; Tel. (352) 392-1951, ext. 202; e-mail: raom@ufl.edu.

Yoanna Newman, UF/IFAS Agronomy Department, PO Box 110500, Gainesville, FL 32611; Tel. (352) 392-1811, ext. 212; e-mail: ycnew@ufl.edu.

For questions about registration, please contact **Ms. Jane Wilson** at the CREC; Tel. (863) 956-1151, ext. 1309; e-mail: wilsonmj@ufl.edu.

Quick Overview of the Federal Worker Protection Standard (WPS)



Key Definitions Relating to WPS

Agricultural establishment --- any farm, forest nursery or greenhouse.

Agricultural employer --- any person who hires or contracts for services of workers/handlers, for any type of compensation, to perform activities related to the production of agricultural plants, or any person who is an owner

or responsible for the management or condition of an agricultural establishment that uses workers/handlers.

Agricultural plant --- any plant grown or maintained for commercial or research purposes and includes, but is not limited to, food, feed, and fiber plants; trees; turf grass; flowers; shrubs; ornamentals; and seedlings.

Handler --- any person, including a self employed person, who mixes, loads, transfers, applies, disposes pesticides or pesticide containers, cleans, adjusts, handles or repairs application equipment, acts as a flagger, etc.

Restricted entry interval (REI)--- the time after the completion of a pesticide application during which entry into the treated area is restricted.

Worker --- any person, including a self employed individual, who performs hand labor tasks, including weeding, harvesting, topping, sucker removal, packing produce in the field, thinning, etc.

What Employers Must Do for Both Workers and Handlers

Information at a central location

Information must be made available to workers and handlers at a central location where it can be easily accessed during normal business hours and must include the following information:

- EPA WPS Safety Poster
- Name, address and telephone number of the nearest medical facility
- Facts about each pesticide application (from before each application begins to 30 days after the REI)
 - Application list which includes the location and description of the area to be treated.
 - Product name, EPA registration number, and active ingredient(s) of the pesticide.
 - Time and date the pesticide is scheduled to be applied.
 - Restricted entry interval for the pesticide.

Pesticide Safety Training

Agricultural workers must be trained within the first 5 days of employment. Handlers must be trained before any handling activity is performed. Workers and handlers must each be trained at least once every 5 years. Trainers must:

- Use written and/or audiovisual materials,
- Use EPA approved materials for training,
- Conduct the training orally and/or audiovisually in a manner the employees can understand with an opportunity to answer questions and
- Meet one of the following criteria to perform training:
 - Currently be a certified applicator of Restricted Use Pesticides (RUPs) or
 - Currently be designated by a State, Federal or Tribal agency having jurisdiction, as a trainer of pesticide applicators or
 - Have completed a pesticide safety Train the Trainer program conducted by a State, Federal or Tribal agency having jurisdiction.

Decontamination Supplies

Employers must establish a decontamination site within 1/4 mile of where workers and handlers are performing their duties. Handlers mixing pesticides must have a decontamination site at the mixing area.

The decontamination site must include:

- Enough water for routine washing and for eyeflushing,
- An adequate supply of soap and single use towels,
- Enough water to wash the entire body (for handlers only) and
- A clean change of clothes such as coveralls (for handlers only).



Employer/Commercial Applicator Information Exchange

Before any application, commercial handler employers must make sure the operator of the agricultural establishment where a pesticide will be applied is aware of:

- Specific location and description of area (s) to be treated,
- Time and date of application,
- Product name, EPA registration number, and active ingredient,
- Restricted entry interval for the pesticide,
- Notification requirements; oral/posting and
- Any other specific requirements for the protection of workers and other persons during or after the application.

Operators of agricultural establishments must make sure any commercial pesticide establishment operator they hire is aware of:

- Specific location and description of all areas on the establishment where pesticides will be applied or where an REI will be in effect while the commercial handler is on the establishment and
- Restrictions on entering those areas.

Emergency Assistance

Agricultural employers must make emergency transportation available for workers and handlers to an emergency medical facility. In the event of a suspected poisoning, they must also provide information to the victim and medical personnel about the pesticide including:

- product name, EPA registration number and active ingredients,
- all first aid and medical information from the label,
- description of how the pesticide was used and
- information about the victim's exposure.

Get your 140-page book of the **Worker Protection Standard for Agricultural Pesticides - How to Comply, What Employers Need To Know** from my office. \$3.00 each.

Additional Duties for Handler Employers

- Do not allow handlers to apply a pesticide so that it contacts, either directly or through drift, anyone other than trained and PPE equipped handlers.
- Make sight or voice contact at least every 2 hours with anyone handling pesticides with a skull and crossbones on the label.
- Make sure a trained handler equipped with labeling-specific PPE maintains constant voice or visual contact with any handler in a greenhouse who is doing fumigant-related tasks, such as application or air-level monitoring.
- Before any handling task, inform handlers, in a manner they can understand, of all pesticide labeling instructions for safe use.
- Keep pesticide labeling accessible to each handler during entire handling task.
- Before handlers use any assigned handling equipment, tell them how to use it safely.

Additional Duties for Worker Employers

- During any REI, do not allow workers to enter a treated area and contact anything treated with the pesticide to which an REI applies.

below
the
surface
an in-depth
look at...



Water Reuse:

A safe and effective way to save water

ON THE INSIDE

- Reclaimed water and reuse explained
- Reuse success stories
- Reuse on a regional level
- How water is reclaimed

The demand for water by urban populations, agricultural operations and the environment is projected to increase over the long term in South Florida. Fresh ground water and surface water will not be sufficient to satisfy all future demands. Meeting this growing thirst hinges on our efforts to develop alternative water sources. This brochure looks at one of the ways to conserve our water resources — reclaiming water for reuse.

Consider what happens to the water we use inside the home. Once down the drain, this water is piped to the local wastewater treatment plant where it undergoes treatment to meet state standards for disposal. Historically, most of the water was disposed by injecting the water deep underground or by discharging to surrounding waters or to the ocean. This is a wasteful way to treat such a valuable resource.

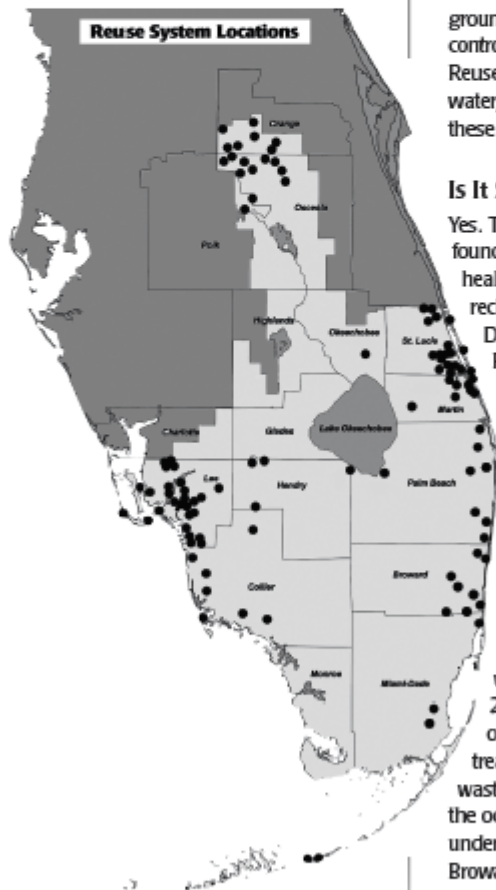
More and more communities are finding that wastewater need not be wasted at all. They are reclaiming this water for Irrigation of residential lots, golf courses, sports fields and orange groves; Industrial cooling; car washing; fire protection and groundwater recharge.



Reclaimed water sign in Collier County.



The color purple is used to identify pumps, tanks and pipes carrying reclaimed water for reuse. The photo above and on the cover shows a reuse facility in Pompano Beach.



Reuse is also beneficial to the environment. During times of drought, reclaimed water is a dependable source of water because its availability is not dependent on rainfall. The use of reclaimed water is currently exempt from year-round landscape irrigation conservation measures and emergency water shortage restrictions.

What Is Reclaimed Water and Water Reuse?

Water use with reclaimed water is the use of highly treated domestic wastewater for beneficial purposes, such as: irrigation of yards, agriculture, golf courses, parks and other green space; industrial purposes such as cooling water and process water; groundwater recharge; toilet flushing; dust control; and environmental restoration. Reuse reduces the reliance on ground water, surface water and potable water for these uses.

Is It Safe to Use Reclaimed Water?

Yes. The Florida Department of Health has found that reuse poses no threat to public health. Continuous monitoring of reclaimed water, required by the Florida Department of Environmental Protection, ensures excellent water quality for protection of the public and the environment.

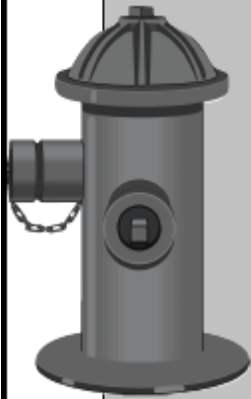
Reuse System Locations

The map to the left shows locations where reclaimed water is being utilized within the 16-county area of the South Florida Water Management District. The dots represent more than 100 wastewater facilities that are reusing 235+ million gallons per day (mgd), or 29 percent of the total wastewater treated. For now, the rest of the wastewater (586 mgd) is being sent to the ocean or injected 3,000 feet underground, primarily in Palm Beach, Broward and Miami-Dade counties. This is water that could be reclaimed for reuse.

Success Stories

- **Pompano Beach** – The city takes wastewater being piped to the ocean, treats it to a higher standard and reuses it locally for irrigating residential lawns, parks and golf courses.
- **Cape Coral** – Reclaimed water irrigation system serves more than 41,000 residences as part of the city's Water Independence for Cape Coral (WICC) campaign. Canal water is used to supplement reclaimed water to meet the 23 mgd system demand.
- **Collier County** – More than 12 mgd of reclaimed water is provided by two facilities. The water is reused at almost 4,000 residences, 19 golf courses and several parks and schools.
- **Orlando and Orange County** – The Conserv I and Conserv II reuse systems provide reclaimed water to about 7,000 residences, 80 parks, 10 schools, 13 golf courses and 5,600 acres of agriculture – in addition to recharging the aquifer through rapid infiltration basins.
- **Loxahatchee River District** – This award-winning system in Jupiter reuses more than 6 mgd of reclaimed water to irrigate 14 golf courses, 14 parks and 4,400 residential lawns.
- **Palm Beach County** – The Southern Region Water Reclamation facility is reusing approximately 14 mgd of reclaimed water to irrigate 6,000 residential lawns, 9 golf courses and 2 parks, and for environmental enhancement at the Wakodahatchee and Green Cay wetlands.
- **Reedy Creek Improvement District** – This utility provides reclaimed water for irrigation of the landscaped areas in the Walt Disney World Resort Complex. Five golf courses, hotels, highway medians and parks are irrigated with reclaimed water. A network of rapid infiltration basins is used for groundwater

OTHER SUCCESSFUL REUSE UTILITIES IN OUR DISTRICT



Ave Maria	Miramar
Boca Raton	Naples
Bonita Springs	North Fort Myers
Broward County	Okeechobee
Clewiston	Port LaBelle
East Central Regional (West Palm Beach)	Port St. Lucie
Everglades City	St. Cloud
Fort Myers	St. Lucie County
Hollywood	St. Lucie West
Homestead	Sanibel
Indiantown	Seacoast
LaBelle	South Central Regional (Boynton Beach/Delray Beach)
Lee County	South Martin Regional (Hobe Sound/Jupiter Island)
Lehigh Acres	Toho Water Authority
Marco Island	Wellington
Martin County	
Miami-Dade County	

recharge. More than 6 mgd of reclaimed water is used for groundwater recharge and another 6 mgd is used for irrigation.

Does the SFWMD Help Fund Reuse Projects?

The District has provided financial assistance through the Alternative Water Supply (AWS) grant program to local entities in developing local reuse initiatives. The District has contributed more than \$94 million to 245 reclaimed water projects through its annual grants program.

Reuse on a Regional Level

The District is working with local utilities on regional applications of reclaimed water pursuant to its regional water supply plans to meet future water needs:

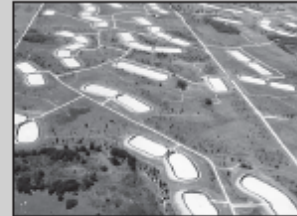
Kissimmee/Orlando Area - This area has historically had a high percentage of water reuse. The District is working with utilities in Orange, Osceola and Polk counties to optimize the use of reclaimed water to offset withdrawals from the Floridan aquifer and avoid potential harm to the groundwater resources.

Collier, Lee, Martin Counties/ Northern Palm Beach County

These areas have a high percentage of reuse. The demand, especially for irrigation, has grown beyond what can reasonably be supplied by traditional groundwater sources and reclaimed water sources. There is a waiting list of users for reclaimed water. Utilities and the District are working together to maximize the use of reclaimed water. This includes interconnecting reclaimed water systems, developing supplemental sources of water and storage.

Miami-Dade, Broward, Palm Beach Counties

Miami-Dade, Broward and Palm Beach counties make up the Lower East Coast urban corridor. During the dry season, these counties traditionally depend on water from the Everglades and Lake Okeechobee system. Since 2007, any increase in future water supply needs cannot increase reliance on this system and will primarily be met through alternative sources. These counties have large requirements for water reuse due to the Ocean Outfall Act that could offset these regional demands. This would reduce the demand on the regional system and improve Everglades/Lake Okeechobee restoration efforts.



Groundwater recharge basins in Orlando.



Fort Myers city nursery using reclaimed water.



Wetland created with reclaimed water in south Palm Beach County.

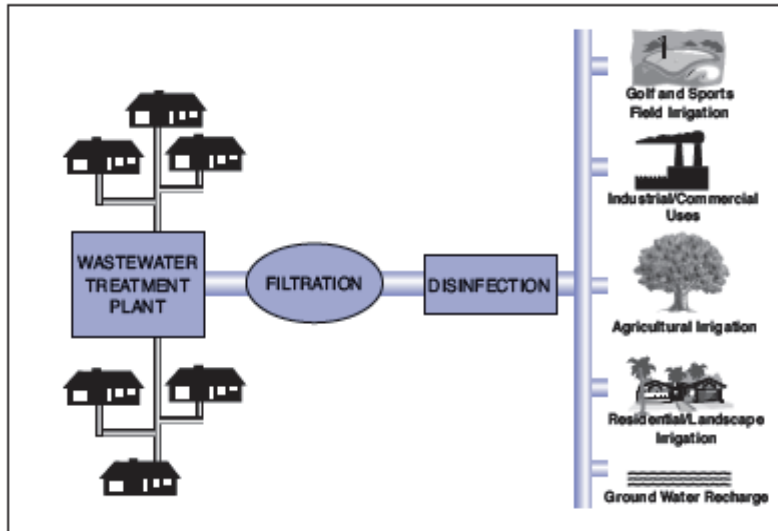


Freeze-proofing plants with reclaimed water in Orlando.



Reclaimed water for golf course irrigation in Palm Beach Gardens.

Palm Beach County has taken great strides the last 10 years to 42 mgd in 2010, or with water reuse, doubling its reuse over 34 percent of its wastewater flow.



This diagram follows the process of turning residential wastewater into reclaimed water for reuse. Separate pipes carry wastewater to the treatment plant where it undergoes treatment, including filtration and disinfection, before it can be distributed. Reuse eliminates the dependence on potable water, surface water or ground water for these uses.

– FOR MORE INFORMATION ON WATER REUSE –
Rick Nevulis (561) 682-6242 or rnevil@sfwmd.gov

– FOR MORE INFORMATION ON WATER CONSERVATION –
www.savewaterfl.com

The South Florida Water Management District is a regional, governmental agency that oversees the water resources in the southern half of the state. It is the oldest and largest of the state's five water management districts.

Our Mission is to manage and protect water resources of the region by balancing and improving water quality, flood control, natural systems and water supply.

This "Below the Surface" publication on Water Reuse directly supports our mission of water supply.



sfwmd.gov

South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33406
561-686-8800 • 800-432-2045
www.sfwmd.gov

MAILING ADDRESS: P.O. Box 24680
West Palm Beach, FL 33416-4680

DID YOU KNOW?

- More than 100,000 residences, 189 golf courses, 210 parks and 70 schools are using reclaimed water for irrigation within the boundaries of the South Florida Water Management District.
- Reclaimed water doesn't smell or stain sidewalks and driveways like well water or canal water.
- Nature is the ultimate reuser of water. Through what is called the "hydrologic cycle," today's rainfall is the same water recycled over millions and millions of years.
- An average of 658 mgd of reclaimed water is reused every day in Florida. About 235 mgd of this reuse occurs within the 16-county area of the South Florida Water Management District.
- Most of the reclaimed water (63%) is used for irrigation of public areas like residences, parks, schools, medians, golf courses, etc.
- Users of reclaimed water are currently exempt from year-round irrigation measures and restrictions imposed during water shortages.
- Wastewater flows within the District's boundaries are projected to increase to more than one billion gallons a day by 2020.
- Sixty-two percent of wastewater treated in the District is in Broward and Miami-Dade counties. Of that, only about 6 percent is reused.
- Putting reclaimed water to beneficial use is "Recycling at its Best."
- mgd = million gallons per day

SOIL ACIDITY & LIMING

The optimum soil pH range for citrus trees is 6.0 to 7.0. Trifoliolate hybrid rootstocks such as citrumelos and citranges do better at the low end of this pH range. For sandy soils, one ton of liming material such as dolomite will raise the soil pH by about one unit. Liming acidic soils is economically sound and essential for profitable crop production. Soil pH must be monitored every year through soil testing because development of soil acidity is a continuous process that requires repeated applications of liming materials. Always test your soil before liming. Do not assume that lime is needed.



Problems in very acid soils

- *Aluminum (Al) toxicity to plant roots
- *Copper toxicity in soils that have received repeated Cu fungicide applications
- *Manganese toxicity to plants in continuously wet soils
- *Calcium & magnesium deficiencies
- *Molybdenum deficiency
- *Phosphorus tied up by iron (Fe) & Al
- *Poor bacterial growth
- *Reduced conversion of ammonium to nitrate

Problems in alkaline (high pH) soils

- *Iron deficiency
- *Manganese deficiency

- *Zinc deficiency
- *Excess salts (in some soils)
- *Phosphorus tied up by calcium (Ca) and magnesium (Mg)
- *Bacterial diseases and disorders

Fertilizers. Both organic and non-organic fertilizers may eventually make the soil more acid. For example, transformations of ammonium- (NH_4^+) and urea-based fertilizers into nitrate (NO_3^-) release H^+ that increases soil acidity. Therefore, fertilization with materials containing ammonium or even adding large quantities of organic matter to a soil will ultimately increase the soil acidity and lower the pH.

Raising soil pH (liming acid soils).

Soils are limed to reduce the harmful effects of low pH and to add calcium and magnesium to the soil. Lime reduces soil acidity (increases pH) by reducing the H^+ concentration through neutralization with carbonate (CO_3^{2-}) or hydroxide (OH^-). A Ca^{++} ion from the lime replaces two H^+ ions on the cation exchange complex. The hydrogen ions (H^+) are then reduced and changed into water (H_2O). An acid soil can become more acid as basic cations such as Ca^{2+} , Mg^{2+} , and K^+ are removed, usually by crop uptake or leaching, and replaced by H^+ .

Benefits of liming to correct soil acidity

- *Increased nutrient availability
- *Improved fertilizer use efficiency
- *Increased soil microbial activity
- *Higher nitrogen fixation by legumes
- *Reduced toxicity of copper
- *Solving molybdenum deficiency
- *Provision of additional amounts of calcium and magnesium

- *Improved soil physical conditions
- *Increased cation exchange capacity
- *Improved herbicide activity
- *Increased growth and crop yield

Lime placement. Since ground limestone is relatively insoluble in water, maximum contact with the soil is necessary to neutralize the soil acidity. Lime will not quickly move into the soil like water-soluble fertilizers. Even though it is usually recommended to thoroughly mix lime with the topsoil, it is not practical to incorporate it in a citrus grove. Therefore, it will take lime longer to raise soil pH in a grove compared with a field where it is incorporated. As soon as moisture is present, the lime will begin to react. Coarse lime particles react more slowly than very fine particles. Therefore, using very finely ground limestone is necessary to achieve the desired soil pH change within 4 to 6 months after application.

Overliming. While a correct liming program is beneficial for plant growth, excessive liming can be detrimental because deficiencies and imbalances of certain plant nutrients may result. The practice of estimating lime requirement without a soil test is risky because it can lead to overliming.

Liming materials. The most common liming materials are calcitic or dolomitic agricultural limestone. Calcitic limestone is mostly calcium carbonate (CaCO_3). Dolomitic limestone is made from rocks containing a mixture of calcium and magnesium carbonates. Dolomitic limestone also provides magnesium. Not all materials containing calcium and magnesium are capable of reducing soil acidity. Gypsum (CaSO_4) does not reduce soil acidity.

Lime may be applied at any time during the year to Florida citrus groves.

Calcium sources

Source	Chemical formula	Calcium carbonate equiv. (pure form)
Burned lime (Quicklime)	CaO	179
Hydrated lime (Builder's lime)	Ca(OH)_2	135
Dolomitic lime	$\text{CaCO}_3 \bullet \text{MgCO}_3$	109
Calcitic lime	CaCO_3	100
Basic slag (by-product)	CaSiO_3	80
Marl (soft carbonates)	CaCO_3	70 to 90
Gypsum	CaSO_4	0
Calcium nitrate	$\text{Ca(NO}_3)_2$	20
Ordinary superphosphate	$\text{Ca(H}_2\text{PO}_4)_2 + \text{CaSO}_4$	0
Concentrated superphosphate	$\text{Ca(H}_2\text{PO}_4)_2$	0

Suggested Facility Security Practices



Awareness

- Conduct a security assessment of your facility.
- Use opening and closing security check lists; note any discrepancies or irregularities.
- Initiate or join your local “crime watchers” program.

Access

- Escort all customers or visitors in storage yards or near loading docks.
- Establish a uniform or ID badge system to distinguish employees.

Alarms

- Install alarms and use a security alarm monitoring service.
- Ensure that phone lines are protected or have a service interruption alarm.
- Locate exterior strobe lights with alarms where neighbors and law enforcement can see them.

Barriers

- Construct structural barriers, including steel doors and barred windows.
- Install fencing as a deterrent where appropriate; fencing should be such that law enforcement and passers-by can view the property.
- Install access gates where fencing is not appropriate.
- Install bollards and chains across driveways or block with trucks and other equipment during off-hours.

Community

- Establish a process for including neighbors and the community as part of facility security and emergency response planning.

Inventory Control

- Know your inventory.
- Establish an ongoing process for inventory control of materials stored at the facility.
- Do not allow unattended, loaded trailers on site.
- Record stored nurse tanks by identification number and weight of remaining product.
- Inspect tanks visually each morning.
- Keep bills of lading, blank forms and all shipping/receiving paperwork secured.

Law Enforcement

- Establish and maintain relationships with local law enforcement and emergency responders. Provide them with your emergency plans and keys to locked gates.
- Provide law enforcement dispatchers with current emergency contact information for the facility. Keep this information current.
- Immediately report unusual or suspicious persons, vehicles or activity to local law enforcement.

Lighting

- Contact your local power company for a lighting assessment and information on leasing lights for your property.
- Install sufficient exterior lighting for law enforcement and passers-by to see your property.
- Discuss your lighting plan with local law enforcement.

Locks

- Establish a procedure and responsibility for locking up at close of business.
- Use high-security locks for doors, enclosures and gates, following local fire code requirements. Keep padlocks locked on hasps while not in use to prevent your lock from being replaced by someone else's.
- Use deadbolt locks on doors with a minimum of 1.5-inch throw.
- Implement key control for locked containers, equipment, hoppers, vehicles and vessels.

Signage

- Post alarm monitoring service signs in highly visible locations. Include signage for:
 - No trespassing
 - Private property
 - Closed circuit TV surveillance
 - Patrolled
 - No vehicles beyond this point
 - All visitors must check-in with front office
 - All visitors must be escorted

Surveillance

- Install CCTV surveillance cameras to monitor less visible or high-risk areas.

Training

- Involve employees in security planning.
- Train employees to spot suspicious individuals and behavior.
- Conduct periodic emergency drills, e.g. fire, evacuation and security, with employees.

Vendors

- Know vendors that service your facility.
- Require all vendors to check in.
- Escort vendors.

Visibility

- Assure an open area around the facility, unlimited by shrubs, trees, large signs or other barriers to open sight.

SUGGESTED CUSTOMER TRANSACTION PRACTICES

Awareness

- Heighten employee awareness of what constitutes an unusual customer and sales transaction.
- Heighten customer awareness of potential for criminal misuse of agricultural chemicals.
- Advise customers to contact law enforcement immediately with any concerns about unusual persons, vehicles or activities in the vicinity of your facility or theirs.

Sales Transaction

- Know your customer.
- Follow all requirements for verification when selling restricted use pesticides.
- For all sales, record customer's name, address, telephone number. If in doubt ask for a driver's license.
- Make deliveries only when the customer or agent is available to take custody and sign for the material.
- Do not deliver tanks or other products to empty fields or other unattended locations.
- Make follow-up calls to verify receipt of materials by customer in quantity ordered.
- Be alert to those who:
 - ♂ Pay in cash;
 - ♂ Won't take delivery;
 - ♂ Behave in an unusual manner;
 - ♂ Hesitate when asked for ID to complete the sale;
 - ♂ Don't know the product;
 - ♂ Insist on certain products, such as ammonium nitrate, and will not consider other suggestions;
 - ♂ Ask questions about product manufacturing;
 - ♂ Aren't familiar with farming, pesticides or fertilizer products.
- If in doubt:
 - ♂ Write down vehicle color, make, license number and state and a physical description of the individual;
 - ♂ Retain papers the customer may have touched for fingerprints;
 - ♂ Save this information in the event that it needs to be provided to law enforcement.

Certain agricultural inputs stored at your facility may warrant special security measures, such as anhydrous ammonia, ammonium nitrate, bulk urea and insecticides.

Alarms

- Install alarms near tanks.
- Install explosion-proof alarm systems near combustible material.

Awareness

- Be alert to those attempting to buy ammonia if they cannot state a legitimate, agronomic need for the product.
- Inspect tank and bulk storage areas daily.
- Check for fresh tracks in mud or snow or disturbed ground around tanks and bulk storage areas;
- Check to see if tank valves are closed tightly;
- Look for suspicious items near tanks such as duct tape, garden hose, bicycle inner tubes, buckets and coolers;
- Check for broken or missing wire ties or seals that you may have placed on valve wheels as markers.
- Make customers aware of the potential for theft or tampering with tanks and bulk ag chemicals.
- Remove hoses between tool bars and nurse tanks; relieve pressure with the bleed valves when left overnight. Encourage end-users to do the same.

Law Enforcement

- Work with local law enforcement to encourage frequent nighttime patrols.
- Contact local law enforcement immediately if you suspect tampering or theft at your facility or the presence of unusual persons, vehicles or activities.
- Do not disturb a potential crime scene.

Locks for Tanks

- Use brightly colored plastic ties or wire seals between the valve wheel and the roll cage to ease visual checks and to identify tampering.
- Use tamper resistant seals and locks.
- Use high-security locks.
- Use specialized tank locks for nurse tanks containing anhydrous ammonia.
- Paint tank locks red so law enforcement can identify anhydrous ammonia tanks.

Visibility

- Store tanks in well-lit areas with a clear line-of-sight.

- Store tanks with flow valves facing outward to speed visual inspections.

- Do not leave tanks in remote areas.

SUGGESTIONS FOR PARTNERING WITH YOUR CUSTOMERS ON SECURITY AND SAFETY

- Take delivery of tanks as close to time of application as possible.
- Position tanks in open, visible areas.
- Don't take delivery of tanks to unattended locations.
- Don't store tanks and tool bars inside buildings, near the farmhouse or livestock confinement houses.
- Remove hoses between tool bars and nurse tanks and relieve pressure with the bleed valves if tanks are left overnight. Store hoses and tool bars away from tanks.
- Don't leave tanks unattended for long periods of time.
- Inspect tanks every day, especially after a weekend when most thefts occur.
- Return tanks immediately after use.
- Inspect and record the condition of each nurse tank upon delivery and return.
- Store all agricultural chemicals, e.g. bulk, bagged, in a secured area.
- Where appropriate, use alarm systems to protect secured storage areas and chemicals.
- Be aware of and maintain inventory control.
- Lock any containers, equipment, hoppers, tanks and vessels containing product whenever possible.
- Be aware of signs of theft of anhydrous ammonia, ammonium nitrate or bulk urea.

Law Enforcement

- Urge customers to contact local law enforcement immediately if tampering or theft is suspected or suspicious persons or vehicles are seen.
- Do not approach or confront suspicious individuals.
- Do not disturb the area around a possible crime scene.

FERTILIZER FORMULATIONS AND APPLICATIONS

Fertilizers have many different formulations, analyses and grades available for purchase. Among the many choices, formulation—fluid or granular—is one of the most important. How do you decide which is the right product for your needs?

A fluid fertilizer is formulated and packaged as a liquid. This includes fertilizers that are clear liquids (solutions) or liquids that contain suspended solids (suspension fertilizers). Growers and production managers frequently use more solids (granules) than fluid fertilizers.

Solid fertilizers are dry particles that manufacturers size between an upper and lower limit of screen sizes. They may be finely crushed, granular, crystalline, powder or processed into uniform prills. These fertilizers by themselves usually are water-soluble for quick release but sometimes are coated as controlled-release products.



Water-soluble fertilizers are rapidly available for crops. Examples of common water-soluble products include ammonium nitrate (33-0-0) and urea (46-0-0). Some water-soluble fertilizers are homogeneous products (every particle has the same composition). These homogeneous products have a uniform appearance and

are made from blends of raw fertilizer materials such as superphosphate, urea, and potassium chloride. Fertilizer bags always list which raw materials the manufacturer used in the fertilizer bag.

Other solid fertilizers are non-homogeneous blends (you can see the individual granules of different fertilizer materials), where the manufacturer simply has mixed particles together to produce a desired overall composition. Non-homogeneous products may not spread as uniformly as homogeneous products, especially if the particles are different in size and in weight.



Water-soluble fertilizers produce a rapid response, have a low cost per unit of nutrient, are easy to apply, and do not take expensive equipment or intensive training to ensure correct application.

Foliar feeding uses a small amount of fertilizer sprayed directly to the foliage, providing rapid uptake of nutrients and quick correction of a nutrient deficiency. Typically, applicators use foliar feeding to supply a small amount of a deficient nutrient or as part of a pesticide application. Sometimes, a nitrogen-phosphorous-potassium mix is used.

Benefits from using soluble solids as liquid fertilizers include the ability to apply nutrients through irrigation (fertigation), possible use as a carrier for post-emergence herbicides and flexibility of application as a foliar feed. Liquid application of a soluble-solid fertilizer through fertigation can reduce the risk of foliar burn, provide even coverage and allow simultaneous application of water and fertilizers. Liquid fertilizers can be

applied at low rates on a frequent basis to spoon-feed the crop, promoting consistent and uniform growth. Application of small amounts of fertilizer on a regular basis can increase fertilizer efficiency and reduce environmental risk. Disadvantages of liquid fertilizer may include the extra cost of new application equipment and the issues of handling a heavy, bulky, liquid material.



New technologies have led to the development of resin or polymer-coated fertilizers. Nutrient-release rates depend on factors such as moisture and temperature (depending on the product) and vary with the composition and the thickness of the coating. These fertilizers tend to be uniform in granule size and provide controlled release nutrients. They are an excellent choice in high-value crops or when frequent application of soluble N is not an easy and a cheap option.



On the positive side, use of controlled release fertilizers creates a long-term, consistent growth. Because of the low application frequency, labor cost is low. These products also have a low

burn potential. On the negative side, they do not tend to provide a rapid response, and their cost per unit of nutrient is much higher than that of soluble sources.



All fertilizers have both advantages and disadvantages. The appropriate type for each operation depends on several factors. Consider the following in making your choice of fluid or solid fertilizers. Do you have the labor and/or the equipment to make the frequent applications that soluble liquid or solid products require? Consider controlled release products for some blocks.

Do you need a quick fix of a visual manganese, zinc, boron, copper, or magnesium deficiency? Foliar liquid application may be the best solution. Controlled release fertilizers and properly timed, frequent applications of soluble fertilizer sources can help protect the water supplies and the environment, especially in areas prone to heavy rains near environmentally sensitive areas. Test your crop and soil to determine what nutrients you need to apply and which application methods you should use.

IRRIGATION, NUTRITION AND FRUIT QUALITY

Florida has the highest citrus fruit quality standards in the world. Fruit quality factors include juice content, soluble solids and acid concentrations, soluble solids-acid ratio, fruit size, and color. Florida citrus growers know that quality factors differ for the fresh and processing markets. For example, fruit size, shape, color, and maturity date are most important for fresh fruit, but high juice content and soluble solids are desired for processing fruit. Fruit quality is affected by several factors including cultivar, rootstock, climate, soil, pests, irrigation, and nutrition.



The effects of irrigation and nutrition on fruit quality are very important and should be understood and taken into consideration by citrus growers and production managers to increase their profitability and enhance their sustainability and competitiveness on a worldwide basis. In general, excessive irrigation and nutrition reduce fruit quality. Therefore, balanced nutrition with sound irrigation scheduling based on **IFAS** recommendations should be a high priority management practice for every grower. Citrus trees require a properly designed, operated, and maintained water management system and a balanced nutrition program formulated to provide specific needs for maintenance and for

expected yield and fruit quality performance. Irrigation contributes to the efficiency of fertilizer programs. Adequately watered and nourished trees grow stronger, have better tolerance to pests and stresses, yield more consistently, and produce good quality fruit. On the other hand, excessive or deficient levels of watering or fertilization will result in poor fruit quality. The most important management practices influencing fruit quality are irrigation and nitrogen, phosphorus, potassium, and magnesium nutrition. However, when any nutrient element is severely deficient, fruit yield and fruit quality will be negatively altered. Trends in fruit quality response to high nutrition and irrigation are described and summarized below.

Nitrogen (N)

- ❑ Increases juice content and color, total soluble solids (TSS), and acid content.
- ❑ Increases soluble solids per box and per acre. However, excessive N, particularly with inadequate irrigation, can result in lower yields with lower TSS per acre.
- ❑ Decreases fruit size and weight.
- ❑ Increases peel thickness and green fruit at harvest.
- ❑ Increases incidence of creasing and scab but decreases incidence of peel blemishes such as wind scar, mite russeting, and rind plugging.
- ❑ Reduces stem-end rot incidence and green mold of fruit in storage.

Phosphorus (P)

- ❑ Reduces acid content, which increases soluble solids-acid ratio. Phosphorus rates have no effect on soluble solids per box but may increase soluble solids per acre due to increase in fruit production in soils that are low in P.

- Increases number of green fruit but reduces peel thickness.
- Increases expression of wind scar but reduces that of russeted fruit.

Potassium (K)

- Potassium produces mostly negative effects on juice quality except soluble solids per acre. Potassium increases fruit production therefore producing more soluble solids per acre.
- Decreases juice content, soluble solids, ratio, and juice color.
- Increases acid content.
- Increases fruit size, weight, green fruit and peel thickness.
- Reduces incidence of creasing and fruit plugging. In storage, reduces stem-end rot.

Magnesium (Mg)

- Slightly increases soluble solids, soluble solids-acid ratio, soluble solids per box and soluble solids per acre.
- Slightly increases fruit size and weight but decreases rind thickness.

Irrigation

- Increases juice content and soluble solids-acid ratio.
- Reduces soluble solids and acid contents. Soluble solids per box will decrease, but soluble solids per acre may increase due to yield increase.
- Increases fruit size and weight, increases green fruit at harvest, but decreases rind thickness.
- Increases incidence of blemish from wind scar, scab and *Alternaria* brown spot, but reduces rind plugging.
- Reduces stem-end rot incidence but increases incidence of green mold in storage.

Specific effects on juice and external fruit qualities are summarized in the Table below. This summary is based on numerous field experiments conducted over many years. Most of these effects were consistently observed, but some of them appear to depend on local conditions and growing regions.

EFFECTS OF MINERAL NUTRITION AND IRRIGATION ON FRUIT QUALITY

Variable	N	P	K	Mg	Irrigation
<u>Juice Quality</u>					
juice content	+	0	-	0	+
soluble solids (SS)	+	0	-	+	-
acid (A)	+	-	+	0	-
SS/A ratio	-	+	-	+	+
juice color	+	0	-	?	0
solids/box	+	0	-	+	-
solids/acre	+	+	+	+	+
<u>External Fruit Quality</u>					
size	-	0	+	+	+
weight	-	0	+	+	+
green fruit	+	+	+	0	+
peel thickness	+	-	+	-	-

Increase (+), Decrease (-), No change (0), No information (?).

Flatwoods Citrus

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Racial-Ethnic Background

__ American Indian or native Alaskan

__ Asian American

__ Hispanic

__ White, non-Hispanic

__ Black, non-Hispanic

Gender

__ Female

__ Male