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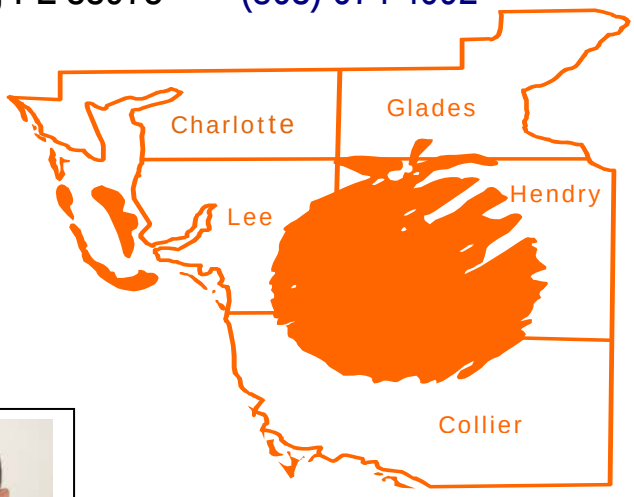
Flatwoods Citrus



Vol. 21, No. 4 **April 2018**

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

Table of Contents

TWENTY SEVENTH ANNUAL SAFETY DAY

Friday, 4 May 2018
Saturday, 5 May 2018

Location: University of Florida, IFAS, SWFREC
2685 State Rd. 29 North
Immokalee, FL 34142

SCHEDULE:

7:30-8:10	Check In, Coffee, Juice, Refreshments, Door Prizes
8:10-9:00	Session 1 (Begin sessions)
9:00-9:10	Break (change session, door prizes)
9:10-10:00	Session 2
10:00-10:10	Break (change session, door prizes)
10:10-11:00	Session 3
11:00-11:10	Break (change session, door prizes)
11:10-12:00	Session 4
12:00-1:30	Lunch and Adjourn

The 2018 FARM SAFETY DAY
REGISTRATION FORM

Please give us the names of those who will be attending our 27th Farm Safety Day on **Friday, 4 May or Saturday, 5 May 2018** at the Immokalee IFAS Center, 2685 State Rd. 29 North, Immokalee, FL 34142. The cost is **$25.00** per person, which will include educational sessions, handouts, refreshments, lunch, and a cap.

Make checks payable to:
Citrus Advisory Committee

Mail registration and checks to:
University of Florida, IFAS, SWFREC
Attention: Barbara Hyman
2685 State Rd. 29 North
Immokalee, FL 34142

Or fax registration to: 239 658 3403
Deadline is Friday, April 13, 2018

Company Name:
Administrative Contact Person:
E-mail address:
Mailing Address:
Telephone: _____ Fax:_____ County:_____

Please list the employees who will be attending our safety training and please check their language preference*****. If there is not enough space to fill in all attendants, please attach an additional sheet with the necessary information.

Name	Friday or Saturday	English	Spanish	Name	Friday or Saturday	English	Spanish

***Please Note: It is very important that we know the date (Friday, 4 May or Saturday, 5 May 2018) and the language capabilities for each attendee.**
Next to each attendee's name please mark in which language they are more fluent.
If there are any questions, please contact **Barbara Hyman (hymanb@ufl.edu) at 239 658 3400.**

Don't wait. The number of trainings offered and attendance at each training is LIMITED. Don't wait. For each day, class size is limited to the first 80 Spanish-speaking and 20 English-speaking people.

CITRUS WORKSHOP

Title: **Citrus Crop and Canopy Management for New Promising Varieties**

Location: Southwest Florida Research and Education Center, Immokalee
Date & time: Wednesday, 16 May 2018, 9:00 AM – 12:00 Noon
Speakers: Tripti Vashisth and Fernando Alferez, UF-IFAS
Program Coordinator: Mongi Zekri, UF-IFAS

2 CEUs for Certified Crop Advisors (CCAs)

You will learn techniques for canopy management and hand pruning of trees producing high value fresh fruit from new varieties such as Sugar Belle, Early Pride and Tango. We will focus on the Do's and Don'ts of hand pruning. We will talk about the When, the How and the What for. Then, we will discuss ways to optimize fruit production in these varieties, involving Crop Management Techniques.

Agenda	
9:00 – 9:15	**Check-in** **Refreshments**
9:15 – 9:30	Introduction and Session Overview by Dr. Mongi Zekri
9:30 – 9:50	Managing tree Canopy for Better Crop Returns Mechanical Pruning versus Hand Pruning by Dr. Fernando Alferez
9:50-10:00	**Break**
10:00 – 10:30	Pruning Trials Results by Dr. Tripti Vashisth
10:30 – 11:00	Hand Pruning in Depth. Adapting to Fresh Fruit Production with New Varieties by Dr. Fernando Alferez
11:00-11:10	**Break**
11:10 – 11:40	Crop Management and Thinning Trials Results by Dr. Tripti Vashisth
11:40– 12:00	Final Considerations by Dr. Fernando Alferez
12:00 pm	**Lunch**

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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Adrian Jahna
BASF Corporation
Cell: 863 443 2404
Adrian.jahna@basf.com

EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

issued by

CLIMATE PREDICTION CENTER/NCEP/NWS
and the International Research Institute for Climate and Society
8 March 2018

ENSO Alert System Status: La Niña Advisory

Synopsis: A transition from La Niña to ENSO-neutral is most likely (~55% chance) during the March-May season, with neutral conditions likely to continue into the second half of the year.

During February 2018, La Niña weakened, but was still reflected by below-average sea surface temperatures (SSTs) in the east-central equatorial Pacific Ocean (Fig. 1). The latest weekly index values were -0.8□C and -0.6□C in the Niño-3.4 and Niño-3 regions, respectively, and were near zero in the surrounding Niño.4 and Niño1+2 regions (Fig. 2). While negative anomalies were maintained near the surface, the sub-surface temperature anomalies (averaged across 180°-100°W) warmed to near zero (Fig. 3). This warming was due to the eastward propagation of above-average temperatures along the thermocline in association with a downwelling equatorial oceanic Kelvin wave (Fig. 4). The atmospheric anomalies typical of La Niña weakened considerably across the tropical Pacific. Convection was suppressed near Indonesia and was only weakly enhanced over the far western Pacific (Fig. 5). Also, low-level wind anomalies were westerly over the western and central Pacific, while upper-level winds remained anomalously westerly over the eastern Pacific. Overall, the ocean and atmosphere system suggests La Niña is weakening.

Most models in the IRI/CPC plume predict La Niña will decay and return to ENSO-neutral during the Northern Hemisphere spring 2018 (Fig. 6). The forecast consensus similarly favors a transition during the spring, with a continuation of ENSO-neutral conditions through the summer. In summary, a transition from La Niña to ENSO-neutral is most likely (~55% chance) during the March-May season, with neutral conditions likely to continue into the second half of the year (click CPC/IRI consensus forecast for the chance of each outcome for each 3-month period).

This discussion is a consolidated effort of the National Oceanic and Atmospheric Administration (NOAA), NOAA's National Weather Service, and their funded institutions. Oceanic and atmospheric conditions are updated weekly on the Climate Prediction Center web site (El Niño/La Niña Current Conditions and Expert Discussions). Forecasts are also updated monthly in the Forecast Forum of CPC's Climate Diagnostics Bulletin. Additional perspectives and analysis are also available in an ENSO blog. The next ENSO Diagnostics Discussion is scheduled for 12 April 2018. To receive an e-mail notification when the monthly ENSO Diagnostic Discussions are released, please send an e-mail message to: ncep.list.enso-update@noaa.gov.

Climate Prediction Center
National Centers for Environmental Prediction
NOAA/National Weather Service
College Park, MD 20740

EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

issued by

CLIMATE PREDICTION CENTER/NCEP/NWS
and the International Research Institute for Climate and Society
12 April 2018

ENSO Alert System Status: La Niña Advisory

Synopsis: La Niña is expected to transition to ENSO-neutral during April-May, with ENSO-neutral then likely (greater than 50% chance) to continue through the Northern Hemisphere summer 2018.

During March 2018, La Niña continued to weaken, but was still reflected by below-average sea surface temperatures (SSTs) across the east-central and eastern equatorial Pacific Ocean (Fig. 1). The latest weekly index values were -0.5°C and -0.3°C in the Niño-3.4 and Niño-3 regions, respectively, -1.1°C in the Niño1+2 region, and near zero in the Niño.4 region (Fig. 2). While negative anomalies were weakening near the surface, the sub-surface temperature anomalies (averaged across 180°-100°W) warmed (Fig. 3) due to the eastward propagation of a downwelling equatorial oceanic Kelvin wave (Fig. 4). Convection was suppressed near and east of the Date Line and enhanced over the far western tropical Pacific Ocean (Fig. 5). Low-level wind anomalies were easterly over the east-central Pacific, and westerly over the far western Pacific. At upper-levels, winds were anomalously westerly over the eastern Pacific. Overall, the ocean and atmosphere system remained consistent with a weak La Niña.

Most models in the IRI/CPC plume predict La Niña will decay and return to ENSO-neutral during the current March-May season (Fig. 6). The forecaster consensus similarly favors a transition to neutral, with a continuation of ENSO-neutral conditions through the summer 2018. Thereafter, there is considerable forecast uncertainty, in part due to the lower prediction skill for forecasts made at this time of year. In summary, La Niña is expected to transition to ENSO-neutral during April-May, with ENSO-neutral then likely (greater than 50% chance) to continue through the Northern Hemisphere summer 2018 (click CPC/IRI consensus forecast for the chance of each outcome for each 3-month period).

This discussion is a consolidated effort of the National Oceanic and Atmospheric Administration (NOAA), NOAA's National Weather Service, and their funded institutions. Oceanic and atmospheric conditions are updated weekly on the Climate Prediction Center web site (El Niño/La Niña Current Conditions and Expert Discussions). Forecasts are also updated monthly in the Forecast Forum of CPC's Climate Diagnostics Bulletin. Additional perspectives and analysis are also available in an ENSO blog. The next ENSO Diagnostics Discussion is scheduled for 10 May 2018. To receive an e-mail notification when the monthly ENSO Diagnostic Discussions are released, please send an e-mail message to: ncep.list.enso-update@noaa.gov.

Slightly above-average 2018 Atlantic hurricane season predicted by CSU team

https://source.colostate.edu/slightly-above-average-2018-atlantic-hurricane-season-predicted-by-csu-team/

Colorado State University hurricane researchers are predicting a slightly above-average Atlantic hurricane season in 2018, citing the relatively low likelihood of a significant El Niño as a primary factor.

Tropical Atlantic sea surface temperatures are currently near their long-term average values. Consequently, they are considered a neutral factor for 2018 Atlantic hurricane activity at the present time.

A weak La Niña this past winter has weakened slightly over the past few weeks. While there is the potential that a weak El Niño could develop by the peak of the Atlantic hurricane season, the odds of significant El Niño development appear relatively low. El Niño tends to increase upper-level westerly winds across the Caribbean into the tropical Atlantic, tearing apart hurricanes as they try to form.

The western tropical North Atlantic is currently slightly warmer than normal, while the eastern tropical Atlantic is slightly cooler than normal. Colder-than-normal sea surface temperatures provide less fuel for tropical cyclone formation and intensification. They are also associated with a more stable atmosphere as well as drier air, both of which suppress organized thunderstorm activity necessary for hurricane development.

14 named storms

The CSU Tropical Meteorology Project team is predicting 14 named storms during the Atlantic hurricane season, which runs from June 1 to Nov. 30. Of those, researchers expect seven to become hurricanes and three to reach major hurricane strength (Saffir/Simpson category 3-4-5) with sustained winds of 111 miles per hour or greater.

The team bases its forecasts on over 60 years of historical data that include Atlantic sea surface temperatures, sea level pressures, vertical wind shear levels (the change in wind direction and speed with height in the atmosphere), El Niño (warming of waters in the central and eastern tropical Pacific), and other factors.

So far, the 2018 hurricane season is exhibiting characteristics similar to 1960, 1967, 1996, 2006 and 2011.

“The years 1960, 1967 and 2006 had near-average Atlantic hurricane activity, while 1996 and 2011 were both above-normal hurricane seasons,” said Phil Klotzbach, research scientist in the Department of Atmospheric Science and lead author of the report.

The team predicts that 2018 hurricane activity will be about 135 percent of the average season. By comparison, 2017's hurricane activity was about 245 percent of the average season. The 2017 season was most notable for Hurricanes Harvey, Irma and Maria, which devastated the United States and portions of the Caribbean.

The CSU team will issue forecast updates on May 31, July 2 and Aug. 2.

This is the 35th year that the CSU hurricane research team has issued the Atlantic basin seasonal hurricane forecast. Recently, the Tropical Meteorology Project team has expanded to include Michael Bell, associate professor in the Department of Atmospheric Science. William Gray launched the report in 1984 and continued to be an author on them until his death in 2016.

The CSU forecast is intended to provide a best estimate of activity to be experienced during the upcoming season – not an exact measure.

Bell cautioned coastal residents to take proper precautions.

"It takes only one storm near you to make this an active season," Bell said.

Landfall probability

The report also includes the probability of major hurricanes making landfall:

63 percent for the entire U.S. coastline (average for the last century is 52 percent)

39 percent for the U.S. East Coast, including the Florida peninsula (average for the last century is 31 percent)

38 percent for the Gulf Coast from the Florida panhandle westward to Brownsville (average for the last century is 30 percent)

52 percent for the Caribbean (average for the last century is 42 percent)

The forecast team also tracks the likelihood of tropical storm-force, hurricane-force and major hurricane-force winds occurring at specific locations along the coastal United States, the Caribbean and Central America through its Landfall Probability website.

The site provides information for all coastal states as well as 11 regions and 205 individual counties along the U.S. coastline from Brownsville, Texas, to Eastport, Maine. Landfall probabilities for regions and counties are adjusted based on the current climate and its projected effects on the upcoming hurricane season.

Klotzbach and Bell update the site regularly with assistance from the GeoGraphics Laboratory at Bridgewater State University in Massachusetts.

Funding for this year's report has been provided by Interstate Restoration, Ironshore Insurance, the Insurance Information Institute, Weatherboy and a grant from the G. Unger Vetlesen Foundation.

EXTENDED RANGE ATLANTIC BASIN HURRICANE FORECAST FOR 2018:

Released April 5, 2018

Tropical Cyclone Parameters Extended Range (1981-2010 Climatological Median Forecast for 2018 in parentheses)	
Named Storms (12)*	14
Named Storm Days (60.1)	70
Hurricanes (6.5)	7
Hurricane Days (21.3)	30
Major Hurricanes (2.0)	3
Major Hurricane Days (3.9)	7
Accumulated Cyclone Energy (92)	130
Net Tropical Cyclone Activity (103%)	135

* Numbers in ( ) represent medians based on 1981-2010 data.

FOLIAR FEEDING

Foliar feeding is becoming very common on many horticultural crops including citrus. Economic and environmental considerations require the utilization of more efficient methods for nutrient applications.

It is usually assumed that foliar feeding refers to nutrient applications to the plants' leaves. In fact, it has been shown that all aboveground parts of a plant can absorb nutrients, including twigs, branches, buds, fruit, flowers, and stems. However, since leaves usually represent the largest surface area, they are the most important structures.

Foliar feeding is not intended to completely replace soil-applied fertilization of the macronutrients (nitrogen, potassium, and phosphorous). However, macronutrients can be foliarly applied in sufficient quantities to influence both fruit yield and quality. Some crops, such as citrus, can have a large part of the nitrogen, potassium, and phosphorous requirements met through foliar applications.

Foliar applications of other plant nutrients (calcium, magnesium, and sulfur) and micronutrients (zinc, manganese, copper, boron, and molybdenum) have proven for many crops to be an excellent means for supplying the plants' requirements.

Foliar feeding should be used as an integral part of the annual nutritional program. It can be used in other situations to help plants through short, but critical periods of nutrient demand, such as fruit set and bud differentiation. Foliar nutrition may also prove to be useful at times of soil or environmentally induced nutritional shortages. Foliar application of nutrients is of significant importance when the root system is unable to keep up with crop demand or when the soil has a history of problems that inhibit normal growth.

Foliar feeding is proven to be useful under prolonged spells of wet soil conditions, dry soil conditions, calcareous soil, cold weather, or any other condition that decreases the tree's ability to take up nutrients when there is a demand. Foliar feeding may be utilized effectively when a nutritional deficiency is diagnosed.

A foliar application is the quickest method of getting the most nutrients into plants. However, if the deficiency can be seen, the crop might have already lost some potential yield.

Foliar fertilization is also efficient since it increases the accuracy of fertilizer application. Applications made to the soil can be subject to leaching and volatilization losses and/or being tied up by soil particles in unavailable forms to citrus trees.

While foliar feeding has many advantages, it can burn plants at certain rates under certain environmental conditions. It is important, therefore, to foliar feed within the established guidelines. There are a number of conditions that can increase the chances of causing foliar burn. A plant under stress is more susceptible to damage. Stressful conditions include drying winds, disease infestations, and poor soil conditions. The environmental conditions at the time of application are also important factors. Applications when the weather is warm (above 80^0F) should be avoided. This means that during warm seasons, applications should be made in the morning or evening. Additionally, applications should not be at less than two-week intervals to give the plant sufficient time to metabolize the nutrients and deal with the added osmotic stress.

Another important factor when applying nutrient foliarly is to ensure that the pH of the material is in the proper range. The pH range of the spray solution should be between 6 and 7. Attention should be paid to the pH of the final spray solution. This is significant in areas where water quality is poor.

MICRONUTRIENTS IN CITRUS NUTRITION

Iron (Fe): One of the functions of Fe is to act as a catalyst in the production of chlorophyll. Iron deficiency has been of importance on calcareous soils in certain areas of Florida where the soil contains high amount of calcium carbonate and has a pH of 8.0. Iron deficiency is attributed to low Fe content in white sandy areas near lakes and places known locally as "sand soaked areas". Iron deficiency can be induced by high levels of P and accumulations of heavy metals, primarily Cu, in the soil. In Florida, Fe deficiency is commonly associated with Zn and Mn deficiencies.

The symptoms of Fe deficiency are also known as "iron chlorosis". They occur on new growing leaves which are very light in color and sometimes almost white but with the veins greener than the remainder of the leaf. In acute cases, the leaves are reduced in size, very thin, and shed early. The trees die back severely on the periphery and especially in the top. Fruit set, yield, and fruit size will be reduced.

Iron deficiency is usually associated with high soil alkalinity, but it is also associated with over irrigation, prolonged spells of wet soil conditions or poor drainage and low soil temperature. Several areas affected with Fe chlorosis in south Florida have been materially helped or completely cured by careful control of irrigation and drainage. Iron deficiency sometimes occurs where excess salts are present in the soil.

Iron deficiency has been found to be one of the most difficult deficiencies to correct especially on calcareous soils. Foliar applications of Fe are not recommended because of their lack of effectiveness and risk of leaf and fruit burn. At their best, foliar sprays of Fe produce a spotted greening of the leaves rather than an overall greening. The most reliable means of correcting Fe chlorosis in citrus is by soil application of iron chelates. Iron sulfate has not given satisfactory control on either acid or alkaline soils. Citrus rootstocks vary in their ability to absorb Fe. Trifoliate orange and its hybrids (Swingle citrumelo and Carrizo citrange) are the least able to do so.

Iron Chelates	Effective pH Range
Fe-EDTA	4 to 6.5
Fe-HEDTA	4 to 6.5
Fe-DTPA	4 to 7.5
Fe-EDDHA	4 to 9.0

Zinc (Zn): Zinc is essential for the formation of chlorophyll and function of normal photosynthesis. Zinc is also needed for the formation of auxins which are growth-promoting substances in plants.

Zinc deficiency symptoms are characterized by irregular green bands along the midrib and main veins on a background of light yellow to almost white. The relative amounts of green and yellow tissue vary from a condition of mild Zn deficiency in which there are only small yellow splotches between the larger lateral veins to a condition in which only a basal portion of the midrib is green and the remainder of the leaf is light yellow.

In less acute stages, the leaves are almost normal in size, while in very acute cases the leaves are pointed, abnormally narrow with the tendency to stand upright,

and extremely reduced in size. In mild cases, Zn deficiency symptoms appear on occasional weak twigs. Fruit formed on these weak twigs are drastically reduced in size and have an unusually smooth light-colored thin skin and very low juice content.
Zinc deficiency symptoms can be so severe that they may mask or noticeably alter the symptoms of other deficiencies or disorders. Deficiency in Zn can develop due to soil depletion or formation of insoluble compounds. Excessive P or N has also been found to induce or aggravate Zn deficiency.

A spray solution containing 2 to 4 lbs of elemental Zn per acre from Zn sulfate, oxide, nitrate, chelate, phosphite or other source can correct Zn deficiency. Under severe deficiency conditions however, application of Zn sprays may be necessary on each major flush of growth to keep the trees free of deficiency symptoms because Zn does not translocate readily to successive growth flushes. Foliage injury can be reduced by adding 2 to 3 lbs of hydrated lime to the spray. Maximum benefit is obtained if spray is applied to the young growth when it is two-thirds to nearly fully expanded and before it hardens off. Treatment on the spring flush is preferable. Soil application of Zn in the fertilizer is neither an economical nor an effective way to correct Zn deficiency. One of the early diagnostic symptoms of a disorder known as young tree decline or "blight" is a Zn deficiency pattern in the leaves. Correction of the symptoms will not alleviate the disorder, and trees will never recover form the disease.

Manganese (Mn): Manganese is involved in the production of amino acids and proteins. It plays a role in photosynthesis and in the formation of chlorophyll.

Manganese deficiency occurs commonly in Florida. It is particularly evident in the spring after a cold winter. Manganese deficiency leads to a chlorosis in the interveinal tissue of leaves but the veins remain dark green. Young leaves commonly show a fine pattern or network of green veins on a lighter green background but the pattern is not so distinct as in Zn or Fe deficiencies because the leaf is greener. By the time the leaves reach full size, the pattern becomes more distinct as a band of green along the midrib and principal lateral veins with light green areas between the veins.

In more severe cases, the color of the leaf becomes dull-green. Interveinal leaf areas may develop many whitish opaque spots which give the leaf a whitish or gray appearance. The leaves are not reduced in size or changed in shape by Mn deficiency, but affected leaves prematurely fall from the tree. No particular twig symptoms have been related to Mn deficiency. In cases of acute Mn deficiency, the growth is reduced giving the tree a weak appearance.

Manganese deficiency may greatly reduce the crop and the color of the fruit. Manganese deficiency is frequently associated with Zn deficiency. This combination of the two deficiency symptoms on leaves is characterized by dark green veins with dull whitish green areas between the veins. In such combinations, the Mn deficiency is acute and the Zn deficiency is relatively mild.

In Florida, Mn deficiency occurs on both acid and alkaline soils. It is probably due to leaching in the acid soils and to insolubility in the alkaline soils. For deficient trees on alkaline soils, treatments by sprays of Mn compounds are recommended. On acid soils, Mn can be included in the fertilizer. Foliar spray application quickly clears up the pattern on young leaves but older leaves respond less rapidly and less completely. When Mn sprays are given to Mn-deficient orange trees, fruit yield, total soluble solids in the juice and pounds solids per box of fruit increase. Foliar spray of a solution containing 2 to 3 lbs of elemental Mn on two-third to fully expanded spring or summer flush leaves is recommended. If N is needed, adding 7 to 10 lbs of low biuret urea will increase Mn uptake.

Boron (B): Boron is particularly necessary where active cell division is taking place. Boron plays an important role in flowering. Florida sandy soils are low in B, and a deficiency of this element in citrus occasionally occurs under field conditions. The deficiency may be aggravated by severe drought conditions, heavy lime applications, or irrigation with alkaline water. Boron is very mobile in the soil profile of sandy soils and readily leaches by rainfall or excess irrigation.

Boron deficiency is known as “hard fruit” because the fruit is hard and dry due to lumps in the rind caused by gum impregnation. The chief fruit symptoms include premature shedding of young fruits. Such fruit have brownish discoloration in the white portion of the rind (albedo), described as gum pockets or impregnations of the tissue with gum and unusually thick albedo. Older fruit are undersized, lumpy, mis-shapen with an unusually thick albedo containing gum deposits. Seed fails to develop and gum deposits are common around the axis of the fruit.

The first visual symptoms of B deficiency are generally the death of the terminal growing point of the main stem. Further symptoms are a slight thickening of the leaves, a tendency for the leaves to curl downward at right angles to the midrib, and sometimes chlorosis.

Young leaves show small water soaked spots or flecks becoming translucent as the leaves mature. Associated with this is a premature shedding of leaves starting in the tops of the trees and soon leaving the tops almost completely defoliated. Fruit symptoms appear to be the most constant and reliable tool for diagnostic purposes.

Borax and other B compounds are generally used in treating citrus affected with B deficiency. They can be applied either foliarly or in the fertilizer. As a maintenance program, apply B in the fertilizer at an annual rate equivalent to 1/300 of the N rate. In Florida, foliar spray applications have been found much safer and more efficient than soil application. Soil applications frequently fail to give satisfactory results during dry falls and springs and may result in toxicity problems if made during the summer rainy season. Boron solubility in the soil is reduced at soil pHs below 5 and above 7. Foliar spray may be applied during the dormant period through post bloom, but preferably during early flower development. Treating at this growth stage is important because boron does not move very readily from other parts of the tree to the buds. Applying boron at this time will assist in flower initiation and pollen production, satisfy the needs for pollen tube growth, and enhance fruit set. For maintenance spray application, 0.25 lb/acre of B (1.25 lbs of

soluble borate containing 20% B) may be used. Boron levels in the leaf tissue should not drop below 40 ppm or exceed 120 ppm (dry wt basis). Where deficiency symptoms are present, double the amount suggested. Use care not to apply more than the recommended amount because it is easy to go from deficiency to excess.

Copper (Cu): Copper also has a role in photosynthesis and chlorophyll formation. The functions of Cu in the mineral nutrition of plants are numerous. Heavy fertilization with N tends to increase the severity of Cu deficiency.

If Cu in citrus leaves falls below 4 ppm in dry matter, severe Cu deficiency will develop. In the range of 4 to 5 ppm, mild to moderate deficiency symptoms may occur. Copper deficiency rarely occurs when the Cu concentration in leaves is 6 ppm or above.

Excessive applications of nitrogenous fertilizers have been considered for years a contributing cause for this trouble giving rise to the term “ammoniation”. The cause might be an unbalanced N/Cu ratio.

The first symptom is the formation of unusually vigorous large dark green foliage with a “bowing up” of the midrib. The twigs are also unusually vigorous, long, soft, angular, frequently “S” shaped and more or less drooping.

Fruit symptoms are most pronounced on oranges. Brown stained areas of hardened gum on the rind of the fruit may precede the appearance of leaf and twig symptoms. In severe cases, dieback of young twigs will occur and the twigs will be covered by reddish brown droplets of gums.

Insufficient available Cu in the soil is believed to be the primary cause of the symptoms described. Copper deficiency is more of a problem on newly planted flatwoods land than the ridge. Prevention or cure of Cu deficiency is accomplished by either foliar sprays or soil applications of Cu compounds. A Cu spray of solution containing 2 to 3 lbs of elemental Cu applied during bloom time commonly causes an almost immediate recovery and results in a good setting of normal fruit. Copper deficiency can be a controlling factor in fruit production, and acute Cu deficiency may put trees entirely out of production. Foliage sprays are often valuable emergency treatments when symptoms of Cu deficiency are first observed.

CONCLUSION

Most micronutrient deficiencies may be recognized by visual symptoms. However, leaf analysis is helpful in verifying deficiencies particularly when non-typical symptoms or multiple nutrient deficiencies appear. Leaf analysis also provides information on low, but not yet deficient, amounts of an element so that treatment may be applied to prevent a deficiency.

For more details and more information on citrus nutrition, go to Nutrition of Florida Citrus Trees at:

http://edis.ifas.ufl.edu/pdffiles/SS/SS47800.pdf

CITRUS CANKER,

caused by the bacterium *Xanthomonas citri subsp. citri*, is a leaf, fruit, and stem blemishing disease that affects most citrus. Grapefruit, Mexican lime, and some early oranges are highly susceptible to canker. Navel, Pineapple, and Hamlin oranges, as well as, lemons and limes are moderately susceptible. Mid-season oranges, Valencias, tangors, tangelos, and other tangerine hybrids are less susceptible. Tangerines are tolerant.

Major citrus canker outbreaks generally occur when new shoots are emerging or when fruit are in the early stages of development, especially if a major rainfall event occurs during this critical time. Frequent rainfall in warm weather, especially storms, contributes to disease development. Citrus canker causes defoliation, shoot die-back and fruit drop.

With endemic canker, infection starts as early as April.

Leaf susceptibility is complicated by the Asian leafminer. The galleries caused by leafminer larvae do not heal quickly and increase leaf susceptibility. This results in leaves with highly susceptible wounds for long periods of time through which the bacterium can infect the leaf.

Almost all leaf and stem infections occur within the first 6 weeks after initiation of growth unless there is a leafminer infestation. The most critical period for fruit infection is when the fruit are between 0.5-1.5 inch in diameter for grapefruit and 0.25-1.25 inch in diameter for oranges. That is the stage when the stomates on the fruit surface are opening and fruit are particularly susceptible to bacterial penetration. After petal fall, fruit remain susceptible during the first 60 to 90 days for oranges or tangerines and 120 days for grapefruit.

Management

The Citrus Health Response Plan (CHRP) does not require removal of affected trees. Thus, growers should use their best judgment in management of citrus canker. The entire state of Florida is under quarantine, and fruit movement is subject to specific regulations depending on market destination.

Canker losses can be severe under Florida conditions, and can be difficult to control on grapefruit and the most susceptible early season orange varieties.

Endemic Canker. Where canker is already endemic, the primary means of control are: 1) planting of windbreaks, 2) protection of

fruit and leaves with copper sprays, and 3) control of leafminer.

Windbreaks. Windbreaks are highly effective for reducing the spread of canker, but more importantly, they reduce the severity of the infection in endemic situations. The vast majority of the infection occurs by wind-blown rains that push the bacteria into tissues. Winds of 18 to 20 mph are needed to force bacteria into stomates on leaves and fruit.
For more information on selection of plant species and design, see the CREC Web site (http://www.crec.ifas.ufl.edu/extension/windbreaks/).

No material has proven more effective than copper products. Copper products are quite effective for preventing fruit infection, but much less effective for reducing leaf infection. Application of copper to young leaves protects against infection, but it is soon lost due to rapid expansion of the surface area. Also, copper has limited value in reducing disease spread.

For oranges with endemic canker, most of the infection will occur from April to July. No more than five copper sprays applied at 21-day intervals are recommended for early processing oranges: one in early April (fruit at 0.25 to 0.5-inch stage); a second in late April, a third in mid-May, a fourth in early June and a fifth in late June to early July when the fruit is about 1.5-inch diameter. Three applications at a 21-day interval should be sufficient for Valencias and midseason varieties, in mid-April (fruit at 0.25 to 0.5-inch stage), in early/mid-May, and late May/early June. Varieties of early oranges grown for higher color score (Early Gold, Westin, Ruby, Itaborai) are more susceptible than Hamlin and may require additional sprays before April and beyond July.

The most critical period for fruit infection is when the fruit is between 0.5-1.5 inch in diameter

Navel oranges are susceptible to canker and will probably need to be sprayed every 21 days from early April to mid-July. Fallglo is relatively tolerant and probably three sprays in April, May and June should suffice. Newly planted trees in canker exposed settings are more susceptible because they produce leaf flushes more often and the flush tissue represents a high proportion of the canopy volume. The recommendation for the more susceptible varieties (grapefruit and early oranges) is that the trees be sprayed every 3 to 4 weeks to coincide with vegetative flush cycles from spring though the fall. Sprays should be applied with a hoop sprayer that thoroughly covers the foliage on all sides of the canopy.

Spray volumes for young and fruiting trees will have to be adjusted as more experience is gained. The rates of copper products depend on the length of protection expected and the weather. As little as 0.5 to 1.0 lb of metallic copper will protect spring flush growth or fruit during the dry spring season. However, in the rainy season, more than 1 lb of metallic copper may be required to protect fruit for 3-week periods.

TABLE 1. Recommended Chemical Controls for Citrus Canker

Pesticide	FRAC MOA1	Mature Trees Rate/Acre2
Actigard 50WG	21	See Table 2
copper fungicide	M1	Use label rate

1 Mode of action class for citrus pesticides from the Fungicide Resistance Action Committee (FRAC) 2016. Refer to ENY624, Pesticide Resistance and Resistance Management, in the 2017-18 Florida Citrus Production Guide for more details.
2 Lower rates can be used on smaller trees. Do not use less than the minimum label rate.

TABLE 2. Recommended Rates and Use Patterns for Actigard 50WG/100 Trees

Number of Applications /Year1	Tree Age and Rate2,4 (oz.)/Application			
	< 1 year3	1-2 years	2-3 years	>3 years
4 or less	0.125 - 0.25	0.25 - 0.50	0.50 – 0.75	0.75 – 1.5
5 or more	0.125	0.25	0.50	0.75 – 1

1 Minimum interval between applications is 30 days. If tree stunting, yellowing or other symptoms of possible phytotoxicity are observed reduce the use rates in subsequent applications to the low end of the recommended rate range and increase the application interval to 60 days.
2 Do not use more than 12.8 oz./A/year and no more than 3.2 oz./A/application.
3 For newly planted trees delay applications until trees become established & overcome transplant shock and initiate treatment at 0.125 oz./100 trees.
4 As tree size increases during the season dosages should be adjusted towards the upper end of the recommended rate range.

http://www.crec.ifas.ufl.edu/extension/pest/PDF/2017/Canker.pdf

PESTICIDE RECORDKEEPING BENEFITS & REQUIREMENTS

BENEFITS

Exemption from pesticide contamination liability. As provided by section 487.081(6), Florida Statutes, if you keep records of all your pesticide use (general and restricted use products), and you have used pesticides legally, you may be exempt from proceedings by the Florida Department of Environmental Protection to recover costs associated with damages, assessment, evaluation, or remediation of pesticide - contaminated property. Records must be kept indefinitely.

Evaluate effectiveness of controls. Use your records to analyze your pest management programs: what works and what doesn't. You can compare pesticides with other control tactics.

Resolve pesticide failures. If reduced pesticide product performance occurs, having record will help you determine the cause such as pest resistance or use of the wrong application rate.

Improve your ability to buy the right amount of pesticide. Records will help you buy the correct amount of pesticide the following year. You'll save money and eliminate excess pesticide disposal problems.

Provide buyers with required records of pesticide use. Nurserymen must document certain preventative applications before selling nursery stock. Other buyers may also require a report on pesticides used on crops or other commodities treated with pesticides.

Improve crop rotation decisions. With records, you know your crop rotation options. Some pesticides have restrictions on crops that can be planted within certain time frames after pesticide application.

Determine carryover injury. If your fields exhibit pesticide carryover injury, records will help evaluate the situation.

Document your legal use of pesticides. Records are your best defense if you are accused of an improper application that causes drift, personal injury, or other problems.

Provide necessary information in a medical emergency. If an accident or pesticide exposure occurs, records may be necessary for medical personnel to give treatment.

Support studies that identify critical pesticide registrations. Through surveys, your records can contribute data needed to preserve pesticide registrations.

Provide accurate data to respond to public concerns about pesticide use. Your records can be added to national databases that will accurately show pesticide use. Efforts to reduce pesticide use can be documented in the information.

Be prepared for requirements of lending institutions. Some lending institutions and buyers request field records to evaluate potential environmental liability when making land sales or loans.

Be in compliance with the law. The Florida Pesticide Law requires all licensed pesticide applicators to keep records of restricted use pesticides applied.

RECORDKEEPING REQUIREMENTS

The following information must be recorded for each application of a restricted use pesticide:

- Name and license number of licensed applicator
- Name of person who applied the pesticide (may be an unlicensed assistant)
- Date, start time, and end time of treatment
- Location of treatment site using one of the following methods:
    1. County, range, township and section
    2. Maps and/or written descriptions that accurately identify the treatment location and distinguish it from other sites
    3. USDA identification system found in 7 CFR 110 which uses maps and numbering systems
    4. Legal property description

5. Global Positioning Satellite (GPS) coordinates or longitude/latitude points that delineate the treatment site

- Crop, commodity or target site treated
- Total size of area treated
- Brand name and EPA Registration Number of product applied
- Total amount of product applied
- Application method
- Name of person authorizing the treatment, if the application was made to property not owned or leased by the licensed applicator

ADDITIONAL REQUIREMENTS

- The required pesticide application information must be recorded within 2 working days after application.
- Records may be kept in any format that includes all the required information and may be incorporated into other business records.
- It is not necessary to record repetitive information that applies to all records, as long as the information is recorded one time and there is a written record that this information applies to other applications as well.
- Records must be kept for 2 years from application date and must be made available to authorized FDACS representatives upon request.
- Commercial applicators must provide a copy of the application record to the person for whom the application was made within 30 days of application.
- Pesticide application records and any available label information must be provided to licensed health care professionals or their designated agents in the event of a medical emergency or if the health care professional determines the information is necessary to provide medical treatment to an individual who may have been exposed to a pesticide included in the record information.

VIOLATIONS

Licensed applicators who violate any of the above requirements are subject to a fine imposed by FDACS. Violators who are fined have the right to respond to the charges or request a hearing.

FORMS

A Suggested Pesticide Recordkeeping Form for Restricted Use Pesticides and WPS (Worker Protection Standard) is available from the FDACS Bureau of Compliance Monitoring or may be downloaded from **http://www.flaes.org**

CONTACT

For more information contact the FDACS Bureau of Compliance Monitoring, 3125 Conner Blvd., Bldg. 8 (L-29), Tallahassee, Florida 32399-1650, telephone (850) 488-3314.

WEB SITE

More information about Bureau pesticide programs and copies of various forms are available from the web site
http://www.flaes.org

Florida Department of Agriculture & Consumer Services
Division of Agricultural Environmental Services

Pesticide Recordkeeping Benefits and Requirements

Make wiser, more profitable decisions by keeping records of your pesticide use.

IMPORTANCE OF SPRAYER CALIBRATION

Sprayers must be checked to ensure all nozzles are applying pesticides uniformly and at the correct rate. Make sure your equipment is working properly and calibrated to ensure the correct amount of pesticide is delivered to the target area.

Pesticide application, greater than the label rate, is illegal and can result in needless risk to groundwater, increased production costs, and crop damage. Under-application might be costly by not properly controlling the target pest. Although you can sometimes repeat the application, doing so is time-consuming, costs more, increases the risk of applying too much and increases the risk in pesticide resistance.

Regular sprayer calibration includes measuring the output of each nozzle to ensure all nozzles are functioning properly. Specific calibration guides are available from a number of sources. Sprayer calibration should be done every time a different pesticide is applied or at least once each season.

The rate of application depends partly on the particle or droplet size, texture, and other properties of the pesticide being applied. Use only water during the test if the pesticide is a liquid. Contact the manufacturer to get reliable information regarding carrier material to perform the tests if the pesticide is a dust, granule, or fumigant, or a liquid diluted with a liquid other than water.

Follow calibration and mixing instructions carefully. Mixing, loading, and calibration methods must also conform to the speed of the application machinery. Moving too fast or too slow changes the rate of application.

Minimizing spray drift

Spray drift, movement of a pesticide through air during or after application to a site other than the intended site of application is a challenging issue facing pesticide applicators. Complete elimination of spray drift is impossible. However, drift can be minimized by following these control measures:

1. Read and follow the pesticide label.
2. Select low or nonvolatile pesticides.
3. Use spray additives following label guidelines.
4. Use large orifice sizes for spray nozzles.
5. Avoid high sprayer pressures, which create finer droplets.
6. Use drift reduction nozzles.
7. Use wide-angle nozzles, lower spray boom heights, and keep spray boom stable.
8. Do not spray when wind speeds exceed 10 mph and when wind direction is directed toward sensitive vegetation.
9. Use a shielded spray boom when wind conditions exceed preferred conditions.
10. Avoid spraying on extremely hot and dry days, especially if sensitive vegetation is nearby.
11. Keep good records and evaluate the results.

IMPORTANCE OF FERTILIZER SPREADER CALIBRATION AND MAINTENANCE

Properly calibrated and maintained equipment ensures a more uniform distribution of nutrients. This, combined with other conservation practices, reduces production costs, soil surface runoff, and nutrient movement to nearby surface waters. Spreaders that have not been properly maintained and calibrated will have problems delivering accurate rates and evenly distributed fertilizer amounts to the grown crop.

Calibration

Calibration is the process used to help ensure that the equipment applies proper rates of the selected product. Proper calibration is the key to successful fertilizer use efficiency. Failure to calibrate equipment can result in ineffective applications. Applying too much is costly, unlawful and may cause crop injury. Applying too little can result in poor crop growth and production. It is important to calibrate equipment on a regular basis to compensate for variations. The equipment will become worn or damaged with use and result in inaccurate output and spread pattern.

Two items must be considered when calibrating a spreader. The first is the distribution pattern of the spreader. The second is the product application rate, which is the amount of product applied per acre. There are many factors that affect the distribution pattern of a rotary spreader and some of them relate directly to the product. For this reason, it is recommended that the spreader be calibrated separately for every product to be applied. Spreader calibration should be checked more often when the spreader is used frequently.

Product & application

Choose a product according to the need of the crop. Before applying the product, read the spreader manual. The spreader manual will usually indicate proper settings for various application rates. However, calibration still needs to be performed to ensure the settings are accurate and to compensate for wear and variations in equipment. Be sure that the proper procedures and application rates are followed. Check the ‘spread pattern’ and amount being applied. The physical properties of dry fertilizer can vary widely. Since larger particles are thrown further than small particles, a product of uniform size should be used to achieve a consistent application pattern. It is essential to maintain a constant speed when using a rotary spreader to obtain uniform and accurate distribution.

Maintenance and Cleaning

Proper care and maintenance will help retain precise applications and prolong the life of spreaders. Manufacturer’s directions on cleaning and lubricating should be followed. With the shutter or gate wide open, remove all granules from the spreader at the end of each application. Then, the spreader should be thoroughly washed and allowed to dry. Hot water may help break lose fertilizer which is caked on. Finally, lubricate the spreader according to instructions. Spreaders should be stored in a clean, dry place out of direct sunlight.

PRECISION AGRICULTURE

Precision agriculture is an integrated crop management system that attempts to match the kind and amount of inputs with the actual crop needs for small areas within a grove. This goal is not new, but new technologies now available allow the concept of precision agriculture to be realized in a practical production setting.

Precision agriculture often has been defined by the technologies that enable it and is often referred to as GPS (Global Positioning System) agriculture or variable-rate farming. As important as the devices are, it only takes a little reflection to realize that information is the key ingredient for precision agriculture. Managers who effectively use information earn higher returns than those who don't.

Precision agriculture distinguishes itself from traditional agriculture by its level of management. Instead of managing whole grove as a single unit, management is customized for small areas within the grove. This increased level of management emphasizes the need for best management practices (BMPs). Before considering the jump to precision agriculture management, a good farm management system must already be in place.

The need for precision agriculture

Growers are aware that their fields have variable yields across the block. These variations can be traced to management practices, soil properties and/or environmental characteristics. Soil characteristics that affect yields include texture, structure, soil water content, organic matter, nutrient status, and landscape position. Environmental characteristics include weather, weeds, insects, and diseases.

Seeing this magnitude of variation prompts most growers to ask how the problem that is causing the low yields can be fixed. There may be no economically feasible method of "fixing" some problems. However, the management challenge is to optimally manage the areas within the grove that have different production capacities. This does not necessarily mean having the same yield level in all areas of the grove.

A grower's mental information database about how to treat different areas in a grove requires years of observation and implementation through trial-and-error. Precision agriculture offers the potential to automate and simplify the collection and analysis of information. It allows management decisions to be made and quickly implemented on small areas within larger blocks.

Tools of precision agriculture

In order to gather and use information effectively, it is important for anyone considering precision agriculture to be familiar with the technological tools available. These tools include hardware, software and recommended practices.

Global Positioning System (GPS) receivers. Global Positioning System receivers, either carried to the field or mounted on equipments allow users to return to specific locations to sample or treat those areas.

Yield monitoring and mapping. Yield monitors can provide data necessary for yield maps when linked with a GPS receiver. Yield measurements are essential for making sound management decisions. However, soil, landscape and other environmental factors should also be

weighed when interpreting a yield map. When used properly, yield information provides important feedback in determining the effects of managed inputs such as fertilizer, lime, pesticides and cultural practices including irrigation.

Yield measurements from a single year may be heavily influenced by weather. Examining yield information records from several years and including data from extreme weather years helps in determining if the observed yield level is due to management or is climate-induced.

Yield maps are only as accurate as the data collected to produce them and only demonstrate that yield variability exists. Monitors must be correctly installed and periodically checked to provide accurate data. Yield map data should be used with soil and plant tissue analysis data, scouting notes and other observations to learn why variability exists. The knowledge gained from site-specific crop management equips growers to make better management decisions that have positive environmental benefits and that result in improved productivity and profitability.

Grid soil sampling and variable-rate fertilizer (VRT) application

The recommended soil sampling procedure is to take samples from areas that are no more than 2 acres in size. Several soil cores should be taken at random locations from each 2-acre area, combined together, and sent to a laboratory for testing. Grid soil sampling uses the same principles of traditional soil sampling but increases the intensity of sampling. Soil samples collected in a systematic grid also have location information that allows the data to be mapped.

The goal of grid soil sampling is a map of nutrient needs, called an application map. Grid soil samples are analyzed in the laboratory, and an interpretation of crop nutrient needs is made for each soil sample. Then the fertilizer application map is plotted using the entire set of soil samples. The application map is loaded into a computer mounted on a variable-rate fertilizer spreader. The computer uses the application map and a GPS receiver to direct a product-delivery controller that changes the amount and/or kind of fertilizer product, according to the application map.

Site-specific management strategies

Site-specific strategies for improving productivity and profitability have common elements related to soil characteristics, topography and past management practices. These strategies often have at least some general relationship to yield maps.

Where the topsoil has varying physical properties, such as soil type or soil depth, the yield potential will vary considerably throughout the field. Past management practices of uniform nutrient applications may have created excess nutrient applications and accumulations in areas with low yield potential and nutrient deficits in areas with high yield potential. A variable rate application strategy will generally place higher rates of nutrients in areas with higher yield potential and lower rates of nutrients in areas with lower yield potential.

Where controllable factors such as weed pressure and drainage limit yield, modifications to management or renovations to the land should be used to improve productivity if the long-term benefits out-weigh the costs.

Geographic information systems (GIS)

Geographic information systems (GIS) are computer hardware and software that use feature attributes and location data to produce maps. An important function of an agricultural GIS is to store layers of information, such as yields, soil survey maps, remotely sensed data, crop scouting reports, tissue nutrient concentrations, and soil nutrient levels. Geographically referenced data can be displayed in the GIS, adding a visual perspective for interpretation.
In addition to data storage and display, the GIS can be used to evaluate present and alternative management by combining and manipulating data layers to produce an analysis of management scenarios.

Information management

The adoption of precision agriculture requires the joint development of management skills and pertinent information databases. Effectively using information requires a grower to have clear objectives and crucial information necessary to make decisions. Effective information management requires more than record-keeping analysis tools or a GIS. It requires an attitude toward education and experimentation.

Identifying a precision agriculture service provider

Growers should consider the availability of custom services when making decisions about adopting site-specific crop management. Agricultural service providers may offer a variety of precision agriculture services to growers. By distributing capital costs for specialized equipment over more land and by using the skills of precision agriculture specialists, custom services can decrease the cost and increase the efficiency of precision agriculture activities.

The most common custom services that precision agriculture service providers offer are intensive soil sampling, yield mapping and variable rate applications of lime, fertilizers and herbicides. Equipment required for these operations include a vehicle equipped with a GPS receiver and a field computer for soil sampling, a computer with mapping software and variable-rate applicators for fertilizers, lime, and herbicides. Purchasing the equipment and learning the necessary skills is a significant up-front cost that can be prohibitive for many growers. Agricultural service providers must identify a group of committed customers to justify purchasing the equipment and allocating human resources to offer these services.

Summary

Precision agriculture gives growers the ability to more effectively use crop inputs including fertilizers and pesticides. More effective use of inputs means greater crop yield and/or quality. Precision agriculture can address both economic and environmental issues that surround production agriculture today. It is clear that many growers are at a sufficient level of management that they can benefit from precision management.
Questions remain about cost-effectiveness and the most effective ways to use the technological tools we now have, but the concept of "doing the right thing in the right place at the right time" has a strong intuitive appeal. Ultimately, the success of precision agriculture depends largely on how well and how quickly these new technologies will be embraced.

Flatwoods Citrus

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Multi-County Citrus Agent
Hendry County Extension Office
P.O. Box 68
LaBelle, FL 33975

Subscriber's Name:_____

Company:_____

Address:_____

City:_____State:_____Zip:_____

Phone:_____

Fax:_____

E-mail:_____

Racial-Ethnic Background

__American Indian or native Alaskan
__Asian American
__Hispanic
__White, non-Hispanic
__Black, non-Hispanic

Gender

__Female __Male