UF UNIVERSITY of FLORIDA
IFAS Extension

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Institute of Food and Agricultural Sciences

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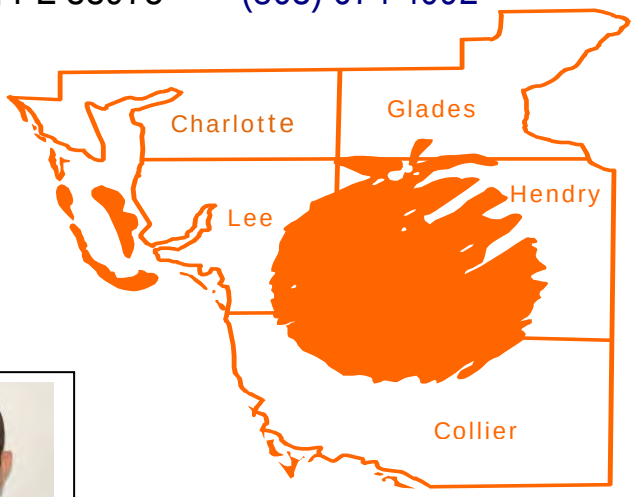
# Flatwoods Citrus




**Vol. 25, No. 6** **June 2022**

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

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Please mark your calendar and plan to attend

# June 2022 Citrus Seminar **in-person (at the Immokalee IFAS center and via Zoom**

**Pre-registration is required**. No registration fee and lunch is free Thanks to **Gio with Tropicana Brands Group**

Please do 1 **or** 2, not both

1. To reserve an in-person seat and have lunch, send an e-mail to Dr. Mongi Zekri at maz@ufl.edu
2. To attend via Zoom, click on this link: https://ufl.zoom.us/j/98533965072?pwd=Q21yZU10WGxoNmRBMFkrUkNjZTQ0dz09 After registering, you will receive a confirmation email containing information about joining the Zoom meeting.

Date & Time: **Thursday, June 23**, 2022, 10:00 AM – 12:00 Noon
Title: "Cover crops in citrus: results from a 3-year project."

10:00 AM-10:30 AM: "Overview: practical considerations and impact on soil microbes" (Dr. Sarah Strauss)
10:30 AM-11:00AM "Improvements to nutrient availability, tree growth, and root distribution" (Dr. Davie Kadyampakeni)
11:00AM-11:30 AM: "Increased weed suppression" (Dr. Ramdas Kanissery)
11:30 AM – Noon: "Cost benefit analysis" (Dr. Shourish Chakravarty and Dr. Tara Wade)

**Cover crops can improve water and nutrient retention, promote microbial activity, reduce weed growth and insect pests, and improve plant growth. As citrus greening (Huanglongbing or HLB) can significantly impact root growth and nutrient and water uptake, the benefits from cover crops may be an additional strategy to improve Florida citrus production and reduce fertilizer and water inputs.**

Coordinator: Dr. Mongi Zekri, Multi-County Citrus Extension Agent, UF-IFAS

2 CEUs for pesticide license renewal
2 CEUs for certified crop advisors



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Please mark your calendar and plan to attend

# July 2022 Citrus Seminar **via Zoom only**

The Zoom link will be provided next month

**Pre-registration is required**. No registration fee

Date & Time: **Wednesday, July 20**, 2022, **9:00 AM** – 10:00 AM
Title: **Citrus Huanglongbing is an immune-mediated plant disease and its implications in HLB management**
Speaker: **Dr. Nian Wang**, Professor in microbiology and cell science, UF/IFAS Citrus Research & Education Center, Lake Alfred

Our recent study demonstrate that Citrus Huanglongbing is a pathogen-triggered immune disease. We discovered that CLas infection of citrus stimulates systemic and chronic immune response in phloem tissues including reactive oxygen species (ROS) production. Systemic cell death of phloem tissues is caused by excessive and chronic ROS production triggered by CLas. Consequently, cell death of phloem tissues causes HLB symptoms. The finding of citrus HLB as an immune-mediated plant disease helps guide the battle against this notorious disease. It seems likely that horticultural and genetic approaches that suppress ROS damages can manage HLB. I will talk about the shove-ready approaches including inducing the activities of antioxidant enzymes via application of micronutrients (B, Fe, Mo, Ni, and Zn), promoting plant growth using plant growth hormones, such as gibberellin, and suppressing reactive oxygen species (ROS) damages using antioxidants, such as uric acid which is yet to be labeled on citrus. I will talk about our current progress on generating HLB resistant/tolerant citrus varieties. I will also talk about other experiments that we have conducted that might be interested to citrus industry including trunk injection with antimicrobials.

Coordinator: Dr. Mongi Zekri, Multi-County Citrus Extension Agent, UF-IFAS

1 CEU for pesticide license renewal
1 CEU for certified crop advisors



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# CEUs for pesticide license renewal

## Earn CEU Credits NOW online through Southeast AgNet & Citrus Industry magazine

http://citrusindustry.net/ceu/

The following series of articles and quizzes are available with their expiration dates noted:

- **#2** How Weather Affects Pesticide Applications (4/30/23)
- **#1:** Increasing Pesticide Effectiveness With Adjuvants (1/31/23)
- **#4:** Protecting People From Pesticide Exposure (10/31/22)
- **#3:** Before You Spray (7/31/22)

***Each article grants one General Standards (Core) CEU when submitted and approved toward the renewal of a Florida Department of Agriculture and Consumer Services restricted-use pesticide license.***

FYI, there are also CORE CEU available at Growing Produce
http://www.growingproduce.com/crop-protection/ceu-series/

http://www.growingproduce.com/crop-protection/ceu-series/

Online Pesticide CEUs
https://pested.ifas.ufl.edu/ceu/

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# EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

**issued by**

## CLIMATE PREDICTION CENTER/NCEP/NWS
## and the International Research Institute for Climate and Society

12 May 2022

ENSO Alert System Status: La Niña Advisory

Synopsis: Though La Niña is favored to continue, the odds for La Niña decrease into the late Northern Hemisphere summer (58% chance in August-October 2022) before slightly increasing through the Northern Hemisphere fall and early winter 2022 (61% chance).

Below-average sea surface temperatures (SSTs) persisted during April across most of the central and eastern equatorial Pacific Ocean [Fig. 1]. Over the past month, the Niño index values decreased, with the latest weekly values ranging from -1.1°C to -1.5°C [Fig. 2], which are quite negative for this time of year. Subsurface temperatures anomalies (averaged between 180°-100°W and 0-300m depth) remained negative [Fig. 3], reflecting an extensive area of below-average temperatures from the surface to ~100m depth across the central and eastern equatorial Pacific Ocean [Fig. 4]. For the monthly average, low-level easterly and upper-level westerly wind anomalies dominated the equatorial Pacific. Convection remained significantly suppressed around the Date Line and was enhanced over the Philippines [Fig. 5]. Overall, the coupled ocean-atmosphere system reflected the continuation of La Niña.

The most recent IRI/CPC plume average for the Niño-3.4 SST index forecasts borderline La Niña conditions during the Northern Hemisphere summer, with increasing odds for La Niña into the fall [Fig. 6]. Similar to last month, the forecaster consensus predicts Niño-3.4 index values to weaken into the summer, but remaining below the threshold of La Niña (Niño-3.4 values equal to or less than -0.5°C). In the near-term, westerly wind anomalies are predicted for mid-late May which supports the weakening of below-average surface and subsurface oceanic temperatures in the coming months. However, much of the model guidance is also hinting at a re-strengthening of La Niña conditions again in the fall and upcoming winter. In summary, though La Niña is favored to continue, the odds for La Niña decrease into the late Northern Hemisphere summer (58% chance in August-October 2022) before slightly increasing through the Northern Hemisphere fall and early winter 2022 (61% chance; click CPC/IRI consensus forecast for the chances in 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). Additional perspectives and analysis are also available in an ENSO blog. A probabilistic strength forecast is available here. The next ENSO Diagnostics Discussion is scheduled for 9 June 2022.

**Climate Prediction Center**
**National Centers for Environmental Prediction**
**NOAA/National Weather Service**

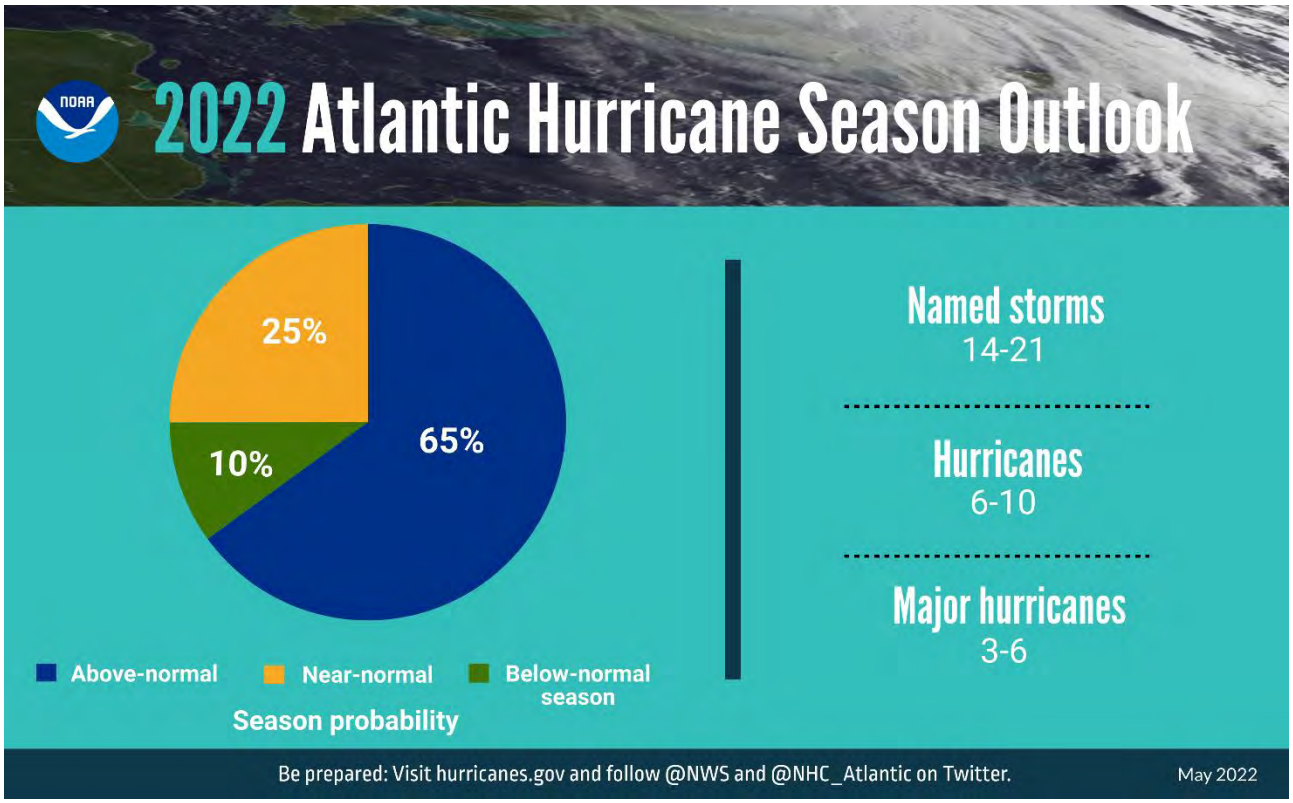
# NOAA predicts above-normal 2022 Atlantic Hurricane Season

## Ongoing La Niña, above-average Atlantic temperatures set the stage for busy season ahead

**https://www.noaa.gov/news-release/noaa-predicts-above-normal-2022-atlantic-hurricane-season#:~:text=For%20the%202022%20hurricane%20season,of%20111%20mph%20or%20higher).**

Forecasters at NOAA's Climate Prediction Center, a division of the National Weather Service, are predicting above-average hurricane activity this year — which would make it the seventh consecutive above-average hurricane season. NOAA's outlook for the 2022 Atlantic hurricane season, which extends from June 1 to November 30, predicts a 65% chance of an above-normal season, a 25% chance of a near-normal season and a 10% chance of a below-normal season.

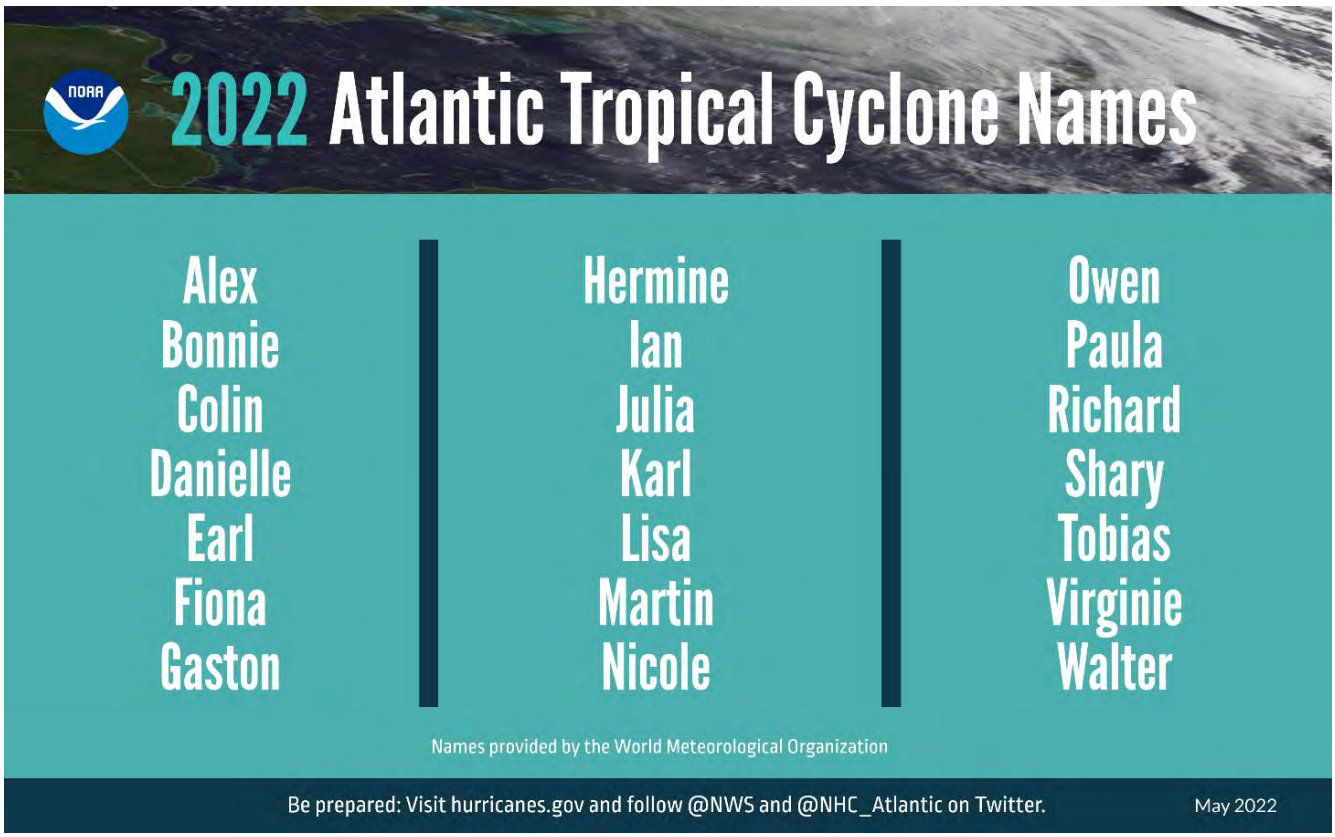
For the 2022 hurricane season, NOAA is forecasting a likely range of 14 to 21 named storms (winds of 39 mph or higher), of which 6 to 10 could become hurricanes (winds of 74 mph or higher), including 3 to 6 major hurricanes (category 3, 4 or 5; with winds of 111 mph or higher). NOAA provides these ranges with a 70% confidence.



A summary infographic showing hurricane season probability and numbers of named storms predicted from NOAA's 2022 Atlantic Hurricane Season Outlook. (NOAA)
Download Image

“Early preparation and understanding your risk is key to being hurricane resilient and climate-ready,” said Secretary of Commerce Gina M. Raimondo. “Throughout the hurricane season, NOAA experts will work around-the-clock to provide early and accurate forecasts and warnings that communities in the path of storms can depend on to stay informed.”

The increased activity anticipated this hurricane season is attributed to several climate factors, including the ongoing La Niña that is likely to persist throughout the hurricane season, warmer-than-average sea surface temperatures in the Atlantic Ocean and Caribbean Sea, weaker tropical Atlantic trade winds and an enhanced west African monsoon. An enhanced west African monsoon supports stronger African Easterly Waves, which seed many of the strongest and longest lived hurricanes during most seasons. The way in which climate change impacts the strength and frequency of tropical cyclones is a continuous area of study for NOAA scientists.



A summary graphic showing an alphabetical list of the 2022 Atlantic tropical cyclone names as selected by the World Meteorological Organization. The official start of the Atlantic hurricane season is June 1 and runs through November 30. (NOAA)

"As we reflect on another potentially busy hurricane season, past storms — such as Superstorm Sandy, which devastated the New York metro area ten years ago — remind us that the impact of one storm can be felt for years," said NOAA Administrator Rick Spinrad, Ph.D. "Since Sandy, NOAA's forecasting accuracy has continued to improve, allowing us to better predict the impacts of major hurricanes to lives and livelihoods."

Additionally, NOAA has enhanced the following products and services this hurricane season:

- To improve the understanding and prediction of how hurricanes intensify, NOAA's Atlantic Oceanographic and Meteorological Lab and Pacific Marine Environmental Lab will operate five Saildrone uncrewed surface vehicles during the peak of the 2022 hurricane season and coordinate for the first time with uncrewed ocean gliders, small aircraft drone systems, and NOAA Hurricane Hunter aircraft to measure the ocean, atmosphere and areas where they meet.
- The Hurricane Weather Research and Forecast Modeling System and Hurricanes in a Multi-scale Ocean-coupled Non-hydrostatic model, which have shown significant skill improvements in terms of storm track and intensity forecasts, have been successfully transitioned to the newest version of the Weather and Climate Operational Supercomputing System, allowing for uninterrupted operational forecasts.
- The Excessive Rainfall Outlook (ERO) has been experimentally extended from three to five days of lead time, giving more notice of rainfall-related flash flooding risks from tropical storms and hurricanes. The ERO forecasts and maps the probability of intense rainfall that could lead to flash flooding within 25 miles of a given point.
- In June, NOAA will enhance an experimental graphic that depicts the Peak Storm Surge Forecast when storm surge watches or warnings are in effect. Upgrades include an updated disclaimer and color coding that illustrates the peak storm surge inundation forecast at the coast. This tool is currently only available in the Atlantic basin.

"Hurricane Ida spanned nine states, demonstrating that anyone can be in the direct path of a hurricane and in danger from the remnants of a storm system," said FEMA Administrator Deanne Criswell. "It's important for everyone to understand their risk and take proactive steps to get ready now by visiting Ready.gov and Listo.gov for preparedness tips, and by downloading the FEMA App to make sure you are receiving emergency alerts in real-time."

NOAA's outlook is for overall seasonal activity and is not a landfall forecast. In addition to the Atlantic seasonal outlook, NOAA has also issued seasonal hurricane outlooks for the eastern Pacific and central Pacific hurricane basins. NOAA's Climate Prediction Center will update the 2022 Atlantic seasonal outlook in early August, just prior to the historical peak of the season.

# HURRICANE PREPAREDNESS FOR CITRUS GROVES

Mongi Zekri, Robert E. Rouse, and Jonathan H. Crane

## INTRODUCTION

Each year, growers look forward to the rainy season because it helps their young trees grow fast and their mature trees produce good crops. Growers hope for good distribution of rains following the usual dry spring season. However, along with the anticipation of the rainy season, there is also the reality that tropical storms or hurricanes may bring too much rain and wind, causing devastations to citrus groves (Figure 1). The hurricane season is June 1 through November 30. Any hurricane or severe tropical storm poses a threat to all of Florida with additional issues for south Florida shallow-rooted citrus trees. Strong winds blow fruit off trees. Tree damage resulting from wind and 10–20 inches of rain could be the most severe and lasting injury. In addition to rain, high tides caused by wind blowing toward land may cause saltwater flooding several miles inland. Grove flooding may also be caused by the damaging effect of high tides, which raise the level of water in bays, estuaries, and rivers and prevent excess water from running off groves. While a hurricane has the potential to inflict heavy damage on any grove, growers who have developed hurricane plans prior to the event have the best chance of minimizing losses. They will be the ones most likely to save groves by quickly replanting uprooted and blown-over trees and by removing excess water within 72 hours to avoid root damage caused by suffocation from lack of oxygen.

# PLAN AND PREPARE

It is best to devise a hurricane plan and use it to make preparations far before June, the start of the hurricane season. Although hurricanes can strike at any time during the June–November period, they are most likely to occur in August and September, at the end of the rainy season when the soil and water retention areas are least able to accommodate more water. The hurricane plan should provide for both protection from a storm and recovery after the storm. Little can be done to protect trees and fruit from wind; but growers can take steps to protect the people, equipment, and supplies that will be needed in the recovery process to include adequate insurance for groves, buildings, and equipment. Additional information can be obtained from local county offices of Emergency Management, Sheriff, Chamber of Commerce, and Economic Development. Following are some things to consider in a pre-storm preparation plan and a post-storm recovery plan.

# PRE-STORM PREPARATION

**Personnel assignments**—A major part of the hurricane plan is ensuring that all managers know their responsibilities prior to, during, and after a hurricane. Make a list of all tasks that will need to be performed so there are no last-minute, unanticipated gaps to plug. Identify and maintain an updated list of the members of a damage inspection team, which will determine where storm damage occurred and how extensive it is. Make sure each team member knows his or her responsibilities. Specific workers should be assigned to fix ditches, prop up trees, fix roadways, and perform other tasks after the storm. Make sure you know how to contact workers at their place of safety, and that they have a way to call in after the storm.

**Safety training**—Workers should be trained in the safe operation of unfamiliar equipment that they may have to use if a hurricane hits. For instance, drivers may wind up using chain saws to remove a downed tree that is blocking a road.

**Liquid tanks**—Tanks containing fuel, fertilizer, and other materials should be kept full so they do not move in the wind and rain, and to ensure that sufficient fuel is available for machinery used in recovery efforts after the storm.

**Ditches**—Ditches should be kept clean and pumped down to help maximize water removal efforts after the storm.

**Cultural Practices**—Trees should be pruned regularly to reduce broken limbs and minimize toppled or uprooted trees. Windbreaks can also reduce tree damage and the spread of citrus canker bacterium.

**Emergency equipment**—Make sure that all emergency equipment—including generators, chain saws, torches, and air compressors— is on hand and in good repair. Emergency generators should be available for use in headquarters and equipment maintenance shops. Large diesel powered generators with 25 to 60 kilowatt capacity can be rented or leased by the month during the hurricane season.

**Communications equipment**—Ensure that radios are in good working order. Have hand-held portable radios with extra charged battery packs available for workers who will need them in the field after the storm. Direct truck-to-truck radio communication is most reliable when phone lines are down, but cellular phones with radio capabilities and standard cellular phones can help workers save valuable time during the recovery process, as opposed to communication systems that require messages to be relayed through a base unit.

**Hazardous materials**—Hazardous materials should be secured prior to a storm, and gasoline pumps should be shut down.

**Emergency contacts**—Have a list of phone numbers you might need in an emergency, including numbers for the phone and electric companies, sheriff, and medical facilities.

# POST-STORM RECOVERY

**Activity check list—**An activity check list will help ensure that all essential damage assessment and recovery operations are carried out. Additionally, a plan that prioritizes the importance of individual blocks makes grove recovery efficient. With a priority plan, managers can quickly determine where to begin recovery operations.

**Employee call-in**—Maintain a current list of employee locations and phone numbers. As soon as it is safe to do so, call in those who will be needed for damage inspection and grove recovery work.

**Damage inspection**—If roads are passable, inspection of tree and equipment damage may be conducted from trucks. Since flooding, downed trees, and electrical poles may have blocked roads, large growers should consider making prior arrangements for a helicopter or flying service to transport the grove manager to survey grove damage. Aerial surveillance can also determine routes of passage through the grove.

**Clear road access**—Have crews clear all roads leading to parts of the grove where trees must be reset or other recovery activities must be conducted. Having a clear path for workers will speed the recovery effort.

**Water removal**—Remove excess water from tree root zones as soon as possible. It is essential to accomplish this task within 72 hours to avoid feeder root damage due to insufficient oxygen.

**Tree rehabilitation** (Figure 2)—Resetting of trees to an upright position should be accomplished as soon as possible after the storm. Ensure that employees know how to properly upright toppled trees and that appropriate equipment is available. Such equipment might include pruning saws, chain saws, front-end loaders, backhoes, and shovels. Toppled trees should be pruned back to sound wood. Painting exposed trunks and branches with white latex paint helps prevent sunburn.

Figure 2. Pruning and resetting a tree to an upright position.

# TROPICAL DEPRESSIONS, TROPICAL STORMS, AND HURRICANES

Florida experiences an average of two tropical cyclones each year. "Tropical cyclone" is a term that includes tropical depressions, tropical storms, and hurricanes. The difference between each of these is determined by the strength of its maximum winds.

**Tropical depression**—The sustained winds for a tropical depression are less than 39 miles per hour (mph). Wind damage to trees usually begins when the winds exceed 40 mph; only tropical storms and hurricanes will pose a wind damage threat to citrus groves. However, because tropical depressions frequently bring more rainfall than storms and hurricanes, they pose a flooding risk to citrus trees.

**Tropical storms**—Tropical storm winds are sustained between 39 and 73 mph. At these velocities, light damage to groves will occur in the form of twigs and branches broken off trees, fruit knocked off, and the first and/or second row of trees on the windward side may have an occasional tree pushed over.

**Hurricanes**—Hurricane winds are sustained at greater than 73 mph velocities and are further categorized from 1 through 5 according to the speed of maximum sustained winds (Table 1). For categories 1 and 2 (sustained wind speeds of 74 to 110 mph), moderate damage to groves will occur. The first five rows of trees to windward may have trees snapped or broken, or blown over. Mobile homes may be overturned and outbuildings demolished. For categories 3 and 4 (sustained wind speeds of 111 to 155 mph), considerable damage to groves will occur. The first 10 rows of trees to windward may be snapped or uprooted. Roofs may be torn off of frame houses, outlying buildings may be lifted and moved, and mobile homes demolished. For category 5 (sustained winds in excess of 155 mph), catastrophic damage to groves will occur. Whole groves may be uprooted and trees carried some distances. Well-constructed houses likely will be destroyed, heavy vehicles lifted and thrown, and pavement pulled from roads.

**Wind gusts and tornadoes**—Wind gusts are generally 30% stronger than the sustained winds in storms and hurricanes and greatly increase the potential for damage. There is an increased threat of tornadoes during hurricanes.

**How much rain?**—The amount of rainfall from a tropical depression, tropical storm, or hurricane is dependent on the cyclone's speed of movement. A rule of thumb to determine how much rainfall is possible is to divide 100 by the forward movement speed of the cyclone (in mph). For example, the maximum amount of rainfall from a 10 mph moving storm would be 10 inches, and for a 5 mph moving storm, 20 inches. Because tropical depressions move relatively slowly, they frequently bring more rainfall than tropical storms and hurricanes.

# CONCLUSION

Planning for a hurricane will help reduce damage to citrus trees and enhance recovery of the grove operation. The most important pre-hurricane practice is the maintenance of a regular pruning program to limit tree size. After a hurricane, being prepared for clearing debris, repairing the irrigation system, resetting toppled trees, protecting trees from sunburn when significant portion of the canopy has been removed, and irrigating and fertilizing trees frequently will increase chances of tree recovery.

## TABLE 1

## Saffir-Simpson hurricane storm rating scale.

| Category | Wind (mph) | Expected Damage to Citrus Trees and Fruit |
|---|---|---|
| 1 | 74–95 | Some loss of leaves and fruit, heaviest in exposed areas |
| 2 | 96–110 | Considerable loss of leaves and fruit with some trees blown over |
| 3 | 111–130 | Heavy loss of foliage and fruit, many trees blown over |
| 4 | 131–155 | Trees stripped of all foliage and fruit, many trees blown over |
| 5 | over 155 | Groves and orchards completely destroyed |

## HOW TO REDUCE DRIFT?

■ Avoid high spray pressure, which create finer droplets. Use as coarse a spray as possible and still obtain good coverage and control.
■ Don't apply pesticides under windy or gusty conditions; don't apply at wind speeds over 10 mph. Read the label for specific instructions.
■ Maintain adequate buffer zones to insure that drift does not occur off the target area.
■ Be careful with all pesticides. Insecticides and fungicides usually require smaller droplet sizes for good coverage and control than herbicides; however, herbicides have a greater potential for nontarget crop damage.
■ Choose an application method and a formulation that is less likely to cause drift.
■ Use drift reduction nozzles.
■ Use wide-angle nozzles, lower spray boom heights, and keep spray boom stable.
■ Use drift control/drift reduction agents. These materials are designed to minimize the formation of droplets smaller than 150 microns. They help produce a more consistent spray pattern and aid in deposition. Drift control additives do not eliminate drift. Therefore, common sense is still required.
■ Apply pesticides early in the morning or late in the evening; the air is often more still than during the rest of the day.
■ Don't spray during thermal inversions, when air closest to the ground is warmer than the air above it. When possible, avoid spraying at temperatures above 90° F.
■ Know your surroundings! You must determine the location of sensitive areas near the application site. Some crops are particularly sensitive to herbicides, which move off-site.
■ Be sure you are getting the spray deposition pattern you think you are; service and calibrate your equipment regularly.
■ Whenever possible, cut off the spray for missing trees in the row. Spray that does not enter the tree canopy is wasted and contributes significantly to drift problems.
■ Keep good records and evaluate pesticide spray results.

**Remember,**
**ALWAYS read and follow label directions.**

# WEED MANAGEMENT

Weeds can reduce the growth, health and survival of young trees, or the time to come into bearing and ultimately fruit production. The more competitive the weeds, the more adversely they alter tree physiology, growth, fruit yield and quality. The attainment of early crop production requires controlling the growth of weeds. Weeds alter economic status by competing with trees, particularly young trees, for water, nutrients and even light in the case of climbing vines, which can easily cover trees if left uncontrolled.

Weeds also have various effects on tree performance including reduced efficacy of low volume irrigation systems, and interception of soil-applied pesticides.

Management Methods

*Cultural & mechanical*

Cultural methods include off-target irrigation and fertilizer applications. Mechanical methods include cultivation in row middles. However, **constant cultivation results in the destruction of citrus fibrous roots, which normally would grow in the undisturbed portion of the soil.**

Mowing is practiced between the tree rows and away from the trees in combination with herbicide applications in the tree row over the major root zone of trees. It is appropriate where a cover crop is desired in bedded groves to prevent soil erosion. Weeds can also be spread by seed and vegetatively during mowing operations, reinfesting tree rows where herbicides have been applied. **Mowing before seedhead formation is necessary to reduce seed dissemination and reinfestation.**

*Chemical mowing*

Chemical mowing, utilizing Low Rate Technology (LRT) postemergence herbicide spray applications and wiping in combination with mechanical mowing, is used for the suppression of vegetation in row middles. With the high frequency and cost of mechanical mowing required to maintain vegetation control in row middles, chemical mowing and wiping with low rates of glyphosate has increased. Weed management in Middles by chemical applications results in the elimination of tall growing species and establishment of more manageable sod type species such as Bermuda and Bahia grasses.

*Chemical*

Generally speaking, all weed species listed as susceptible on the herbicide product label will be controlled by that herbicide at the appropriate rate, time of application and stage of growth. Environmental and plant conditions before, during and following the application are also important including moisture in the form of rainfall and/or irrigation.

**Poor control can sometimes be expected from postemergence applications to weeds under stress conditions due to poor uptake and translocation of applied herbicides**. Assuming that the appropriate herbicide or herbicide mixtures are selected for the weed species present, failures in the program will usually be due to one of the above factors or to the actual application including calibration and/or equipment design and operation.

Herbicides may be classified as foliar or soil-applied. Foliar applied materials may have systemic or contact activity. Soil applied preemergence herbicides are absorbed

through weed root systems, being most effective during germination and early seedling growth stages. Systemic herbicides are those that are absorbed by either roots or aboveground plant parts and are translocated throughout the plant. Contact herbicides act as desiccants, damaging or killing all plant parts actually sprayed with little if any translocation.

**For the control of well-established perennial weeds, a postemergence herbicide with systemic metabolic activity should be used with preemergence soil residual products**.

Timing and frequency of application are the keys to good vegetation management. **Increased application frequency of lower rates of soil residual herbicides is more effective in young groves where vegetation presence is greater due to more exposure of the grove floor to sunlight and where a greater herbicide safety factor is required**.

***Application Technology***

Rapid advances in herbicide application technology have resulted in the development of sophisticated equipment. Application equipment is now capable of selective delivery of multiple herbicide products, each directly injected into booms. In a single application, tree rows and row middles may be treated with soil residual and postemergence products with selectivity for tree age, soil type and vegetation species.

Well-maintained, accurately calibrated equipment with good filtration and agitation systems capable of uniform distribution of prescribed spray volumes and droplet size is essential for efficiency, cost-effective vegetation management. Worn nozzle tips result in increased spray delivery rates and distortion of distribution patterns and should be checked regularly. Improved herbicide boom design to reduce tree skirt contact, spray drift and interference of heavy weed cover with nozzle output will reduce tree damage and fruit drop while improving control of target vegetation. Tree skirt pruning and timing of postemergence applications will also reduce boom and spray contact with low hanging limbs and fruit.

**Environmental Considerations**

In determining management options, herbicide selection should be based not only on species and stage of vegetation development, but product solubility and leaching potential, soil type and rainfall distribution. Objectives are to reduce weed competition and interference through measured vegetation control/suppression with inputs having reduced potential for leaching through over-irrigation, runoff and erosion, chemical drift, or other off-target impacts. CAUTION: Herbicides may move through the soil to groundwater. Several factors influence the rate of this movement. Lower rates applied more frequently combined with sound irrigation management practices will reduce herbicide movement. **The use of bromacil-containing herbicides is prohibited on deep, sandy Ridge-type soils**. For more information and for the list of herbicides registered for citrus in Florida, go to:

https://edis.ifas.ufl.edu/pdf/CG/CG013/CG013-Dlb1o3qu7o.pdf

# Citrus Spray Programs

Dr. Jawwad Qureshi and Dr. Phil Stansly, UF IFAS- Immokalee

Asian citrus psyllid (ACP) control has been the main objective of Florida citrus growers for more than 10 years. While some may question the value of controlling ACP in trees with high HLB incidence, replicated field studies have shown the economic benefit of maintaining young flush pathogen free. Good ACP control starts with effective dormant sprays that will control ACP when populations are low, reducing ACP infestation and thus HLB infection of the all-important spring flush. Pyrethroids (Danitol, Baythroid or Mustang) and organophosphates (dimethoate, chlorpyrifos,or Imidan) provide great winter season control of ACP. Best not to use pyrethroids or OPs again during the year except for border sprays which will reduce the need for whole block applications. Follow up with bloom sprays of labeled products to clean up stragglers. Subsequent whole block sprays should target ACP as well as other pests like rust mites and leafminers that may be problematic.

The table below offers alternative products for different months, depending on which pests are of major concern at the time. Neonicotinoids like imidacloprid, thiamethoxam or clothianidin have not been included as spray options due to their importance for controlling ACP in young trees. Superscripts after the pesticide name are now in sequential order to facilitate use and correspond to superscripts after pests controlled. Make choices based on: (1) effectiveness against ACP and other pests that may be problematic, (2) avoiding repetition of any insecticide mode of action in the interest of resistance management, and (3) rebuilding and maintaining an effective natural enemy complex in the grove. Confining the broad-spectrum insecticides (pyrethroids and organo-phosphates) to the winter season and border sprays during growing season will help conserve these products as well as populations of beneficial insects and mites.

## Spray Options for Citrus Pest Management

**Dormant Season** ← → **Growing Season**

| Months | Nov-Dec | Jan | Feb-Mar | Apr | May - June | July - Aug | Sep-Oct |
|---|---|---|---|---|---|---|---|
| **Products**<br><br>*** Labeled for bloom** | OP[1] (e.g. Imidan, Dimethoate, chlorpyrifos) | Pyrethroid[2] (Mustang Danitol Baythroid) | *Sivanto[3]<br>*Movento[4]<br>*Portal[5]<br>*Micromite[6]<br>Intrepid[7]<br>Exirel[8] | Portal[5]<br>Micromite[6]<br>Exirel[8]<br>Apta[9]<br>Sivanto[3]<br>Oil[13] | Movento[4]<br>Delegate[11]<br>Abamectin[12]<br>Knack[14]<br>Exirel[8]<br>Apta[9]<br>Sivanto[3]<br>Oil[13]<br>MinectoPro[10] | Sivanto[3]<br>Apta[9]<br>OP[1]<br>MinectoPro[10]<br>Oil[13] | Movento[4]<br>Delegate[11]<br>Apta[9]<br>Sivanto[3]<br>Oil[13] |
| **Pests** | ACP<br>Weevils | ACP<br>Weevils | ACP<br>Mites<br>Leafminer<br>Weevils<br>Scales<br>Aphids | ACP<br>Mites<br>Leafminer<br>Weevils<br>Aphids | ACP<br>Rustmite<br>Leafminer<br>Scales | ACP | ACP<br>Rustmite<br>Leafminer |

**ACP[+++ 1,2,3,4,8,9,10] ACP[++ 5,11] ACP[+ 6,12] Leafminer[6,7,8, 9,11, 12] Rustmite[4, 12]**
**Scales[4,13] Aphids[3,4] Mealybugs[3,4] (+++ excellent, ++ good,+ fair)**

**Flatwoods Citrus newsletter** by regular mail will stop this year. You will receive your copy only through e-mail or through

**https://citrusagents.ifas.ufl.edu/newsletters/**

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Please send: Dr. Mongi Zekri
Multi-County Citrus Agent
Hendry County Extension Office
P.O. Box 68
LaBelle, FL 33975
or E-mail: maz@ufl.edu

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Subscriber's Name:_____

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E-mail:_____

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## ***Racial-Ethnic Background***

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

## ***Gender***

__Female
__Male