



Quality and Secure Plant & Insect Sample Submission

Training Guide



SART Training Media



Quality and Secure Plant & Insect Sample Submission Training Guide

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Published February 2007

SART Training Media are available for download from the Florida SART Web site <www.flsart.org>.

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About Florida SART

- SART is a multi-agency coordination group.
- SART is made up of over 25 partner agencies (state, federal and non-governmental organizations).
- SART provides preparedness and response resources for Emergency Support Function 17 [(ESF 17) Animal and Agricultural Issues].
- SART statutory authority
 - State Emergency Management Act (Section 252.3569, Florida Statutes)

SART Mission

Empower Floridians through training and resource coordination to enhance all-hazard disaster planning and response for animal and agricultural issues.

SART Goals

- Support the county, regional and state emergency management efforts and incident management teams.
- Identify county resources available for animal and/or agricultural issues.
- Promote the cooperation and exchange of information of interested state, county and civic agencies.

Specific Learning Objectives

At the end of this training module, participants will be able to:

- Explain why security is an issue with plant and insect submission
- Identify issues in handling and shipping samples
- Clarify some of the most common packaging errors and explain proper shipment techniques for plants and for insects
- Discuss the NPDN, National Plant Diagnostic Network, and its role in identifying and evaluating plant and insect submissions
- Identify key resources that participants can easily access for additional information and assistance

Resources

The following are sources of additional information about the subjects mentioned in this introduction.

United States Department of Agriculture (USDA)

www.usda.gov

USDA, Animal and Plant Health Inspection Service, National Center for Import and Export

<https://www.aphis.usda.gov/aphis/ourfocus/importexport>

Florida Department of Agriculture and Consumer Services (FDACS)

<https://www.freshfromflorida.com/>

Division of Plant Industry

<https://www.freshfromflorida.com/Divisions-Offices/Plant-Industry>

Division of Animal Industry

<https://www.freshfromflorida.com/Divisions-Offices/Animal-Industry>

Florida State Agricultural Response Team

<https://flsart.org/>

Southern Region Center for Integrated Pest Management

<http://www.sripmc.org/>

Extension Disaster Education Network

<https://eden.lsu.edu/>

Centers for Disease Control and Prevention

<https://www.cdc.gov/>

Resources, continued

National Plant Diagnostic Network:

National

<https://www.npdn.org/>

Southern

<https://www.npdn.org/spdn>

Southern Regional Laboratory

<https://plantpath.ifas.ufl.edu/extension/plant-diagnostic-center/>

Florida

<http://fpdn.ifas.ufl.edu/>

University of Florida

IFAS Extension Service

<http://sfyl.ifas.ufl.edu/>

Nematode Assay Laboratory

<http://nematology.ifas.ufl.edu/assaylab/>

Insect Identification Laboratory

<http://entnemdept.ufl.edu/insectid/>

Center for Aquatic and Invasive Plants

<http://plants.ifas.ufl.edu/plant-directory/>

Integrated Pest Management

<http://ipm.ifas.ufl.edu/>

Florida First Detector

<http://www.flfirstdetector.org/>

Florida Extension Plant Diagnostic Clinics, UF

Quincy

<https://nfrec.ifas.ufl.edu/plant-disease-diagnostic-clinic/#>

Wimauma

<https://gcrec.ifas.ufl.edu/plant-clinic/>

Homestead

<https://trec.ifas.ufl.edu/plantdiagnosticclinic/>

Florida Exotic Pest Plant Council

<https://www.fleppc.org/>

Florida Fish & Wildlife Conservation Commission

<http://myfwc.com/>



Quality and Secure Plant & Insect Sample Submission

Appendix A - Training Slides



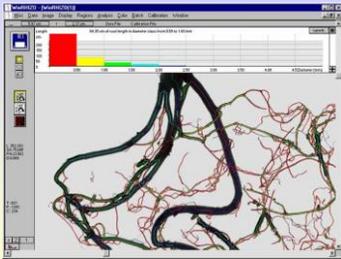
SART Training Media



Quality and Secure Plant & Insect Sample Submission



Glassy winged sharpshooter



Quality and Secure Plant & Insect Sample Submission

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Acknowledgements

- University of Florida, Institute of Food & Agricultural Sciences (IFAS)
- At the University of Florida: Carrie Harmon, Lyle Buss, Richard Cullen (retired) and Eileen Buss (retired)
- At FDACS-DPI: Susan Halbert
- Various partners affiliated with the National Plant Diagnostic Network (NPDN), Southern Plant Diagnostic Network (SPDN), and Florida First Detector
- Washington Dept. of Agriculture; University of California, Agriculture & Natural Resources; Mississippi State University Extension Service
- Tom Chester, Jane Strong - http://tchester.org/plants/site/happy_botanist.html
- Additional photo credits: Mark Garland (DOACS-DPI), Ray Carruthers, Scott Bauer and Gail Wisler (USDA-ARS), Case Medlin, Glenn Nice
- Florida Fish & Wildlife Conservation Commission
- US Dept. of Interior, US Geological Survey



Learning Objectives

1. Explain why security is an issue with plant and insect submission
2. Identify issues in handling and shipping samples
3. Clarify some of the most common packaging errors and explain proper shipment techniques for plants and for insects
4. Discuss the NPDN, National Plant Diagnostic Network, and its role in identifying and evaluating plant and insect submissions
5. Identify key resources that participants can easily access for additional information and assistance



Florida SART

- Multi-agency coordination
 - Governmental and private
 - All-hazard preparation, response and recovery
 - Animal and agricultural



Security Issues

1. Prevent spread of exotic or disease pathogen
2. Identify source to aid quick and positive response
3. Prevent contamination of sample



Citrus greening

Mediterranean fruit fly

Passionvine mealybug



Plant Sample Submission

So, you woke up and found this bizarre plant growing in your pasture or on the patio. Now what?

- A. Call the police
- B. Make sure the pets are safe
- C. Blame the pesky neighbor
- D. Submit a sample for diagnosis ... but how do I package it?



Plant Sample Submission

The Four Basics

- The accuracy of a disease diagnosis or insect ID can only be as good as the sample and information provided
- Sample must be representative of symptoms and severity in the field and must contain the right material
- Samples must be fresh and in good condition
- Rapid delivery may be critical



Plant Sample Submission

A Few Considerations

- Communication: early contact with diagnostic laboratories and regulatory officials
- Confidentiality
- Accuracy of source data/information
- Maintaining accountability: an unbroken "chain of custody"
- Delivery details: where, how, when



Plant Sample Submission

Sample Collection

- Look for patterns in the field
- Record site conditions (soil type, drainage, recent weather)
- Time and date of occurrence
- Incidence vs. Severity



Soybean rust



Plant Sample Submission



Pepper: *Phytophthora* root/stem rot

How do you know? Is it chemical injury, nematodes, root disease....



Corn: Stubby root nematode



Plant Sample Submission

Incidence

A percentage of the crop affected



Severity

A measure of impact on plants or crops



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Plant Sample Submission

What to send?

An entire plant, or multiple plants, if practical, ought to be included. Diseases may show up on any part of the plant.



Foliage diseases

Check for injuries or disease on the main stem and trunk

Keep most roots and soil intact if possible



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Plant Sample Submission

Dead plants tell no tales!

Avoid plants that are obviously dead.

Select plants that exhibit a range of symptoms, from mild to severe.



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Weed Sample Submission

- A weed is:
 - Any plant that crowds out a cultivated plant
 - The generic term for a plant that is growing where it is not wanted
 - An uninvited and usually unattractive plant that surfaces in a garden
 - Any plant that interferes with management objectives
 - There are about 1,400 weeds in Florida



Weed Sample Submission

- Collect intact specimens
- Preserve and package sample properly
- Send suspected exotics by Next Day delivery



Invasive alligator weed threatens waterways in Florida and throughout the South



Weed Sample Submission

Make sure to include all parts of the plant, including stems, roots if possible, whole leaves attached to the stem, and any flowers, fruits, or seeds.



Weed Sample Submission

Collect multiple samples of all plant parts, if possible. Not all plant may be at the same stage of growth or reproduction.

Identify leaf blade, sheath, node, collar, and ligule characteristics of grasses... and leaf type, margin, shape, attachment, and arrangement for broadleaves.



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Weed Sample Submission

- Digital photos can be extremely useful if they are close-ups and very clear.
- Be specific about collection information. The more accurate information you give, the better. Correct and timely information results in faster, more precise diagnosis.
- Where was the sample found, for instance: greenhouse, residence, nursery, parkland, woodland, pasture, row crop or other site?



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Sample Quality Packing and Shipping

- Select a strong crush-proof box and tape all seams
- Keep soil on the roots
- Do not add extra water
- Wrap in dry paper then double bag in plastic
- Disinfect the exterior of the bags



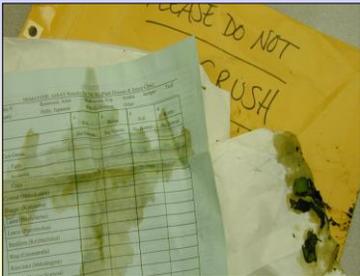
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Sample Quality Packing and Shipping



Sample Quality Packing and Shipping



Sample Quality Packing and Shipping



Real-life packaging and shipping blunders



Sample Quality Packing and Shipping

Additional real-life
packaging and
shipping blunders.



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Sample Quality Packing and Shipping

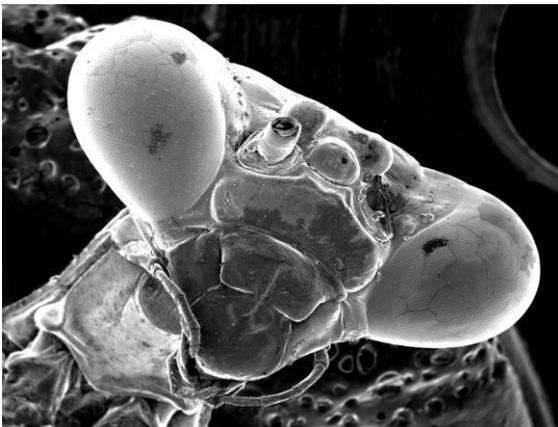


Examples of good packaging



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Insect Sample Submission

The Wrong Way



Insect Sample Submission

The Right Way

Properly packaged mailing tubes protect samples!



Insect Sample Submission

Most insects can be preserved in a vial with 70% Isopropyl or ethyl alcohol.



Insect Sample Submission

Caterpillars should be placed in boiling water for one minute prior to preservation. Live caterpillars may be taken to the local county extension office for digital diagnosis or shipment from that office. Any caterpillar collected live should be shipped in a crush-proof container.



Warning

Do Not Microwave Your Samples!



Insect Sample Submission

Scale insects, mealybugs and other tiny arthropods may be submitted in plastic bags. Wrap specimen in dry paper towel before placing in bag. Double-bag suspected exotics!



Insect Sample Submission

Collect multiple samples of all available life stages, because biologists may need a specific life stage for positive identification. Sometimes, both male and female specimen are required for positive identification. If it is a new or rare arthropod, more samples (more than one) may be needed.



Insect Sample Submission

If the insect pest infestation is totally unknown, collect plant samples to aid identification. Include flowers, fruits, leaves and roots. The same method can be used to identify weed specimens.



Insect Sample Submission



Plant samples can be preserved indefinitely by drying and pressing in newspapers.



Insect Sample Submission

Digital photos of infestation and damage assist rapid identification. You can help further by describing the extent of the infestation, the specific location(s) and what appears to be the cause.



Insect Sample Submission



Piercing/Sucking



Skeletonizing



Leaf-mining



Stem-boring



Insect Sample Submission Essential Guidelines

- Be specific about your collection information
- Study and then state the location on the host plant: roots, stems, buds, leaves, flowers, etc.
- Note where the insect was found: field crops, in a greenhouse, residence, general landscape, etc.
- Give an educated estimate of the degree of infestation
- Don't forget to give the name and contact information for the person who collected the sample



Insect Sample Submission More ... Essential Guidelines

- Collect multiple samples of all life stages, if possible
- Collect intact specimens, not just body parts
- Collect portions of the infested plant and briefly describe the damage and the extent of damage exhibited
- Submit quality digital photos of damage if possible
- Preserve and ship appropriately for the type specimen
- For suspected exotics, notify the specialists and ship by *Next Day* delivery
- Include complete and accurate collection data
- **Double bag specimens containing suspected exotic species**



Insect Sample Submission Things **NOT** To Do

- Do not crush specimens in tissue or plastic wrap, or tape them to paper
- Do not overcrowd them (whether they are dead or alive)
- Do not send them without complete and accurate information



Where to Submit Your Samples




Where to Submit Samples For Plant Pathology

Southern Plant Diagnostic Network Regional Laboratory
C/O Florida Extension Plant Diagnostic Center, UF
2570 Hull Rd, Building 1291
Gainesville, FL 32611-0830
Phone: (352) 392-1795 Fax: (352) 392-3438
Email: pdco@ifas.ufl.edu
Sample submission forms are available at
<https://plantpath.ifas.ufl.edu/extension/plant-diagnostic-center/>



Air potato

Note: The Florida Extension Plant Disease Clinic is a service provided to any Florida resident by IFAS, UF, in conjunction with the Cooperative Extension Service. The Clinic is open from 8 am to 5 pm Monday-Friday except for state holidays. The cost to submit a sample is \$40 for standard submissions.



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Where to Submit Samples For Plant Pathology

Florida Extension Plant Diagnostic Clinic
University of Florida, IFAS/NFREC
155 Research Rd.
Quincy, FL 32351
Phone: (850) 875-7100
Sample submission forms are available at
https://nfrec.ifas.ufl.edu/media/nfrecifasufiedu/docs/pdf/PDDC_form-FI04-18-2017.pdf



Brazilian pepper / Florida holly

Note: The Clinic is a facility of NFREC and the Dept. of Plant Pathology, UF, designed to provide plant disease and insect diagnostic services to Florida residents. It promotes an "Identify the problem before taking any control action" attitude and is open from 8 am to 5 pm Monday-Friday except for state holidays. The cost to submit a sample is \$30 to \$50.



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Where to Submit Sample For Plant Pathology

Tropical Research and Education Center
18905 SW 280th St.
Homestead, FL 33031-3314
Phone: (786) 217-9274
Email: trec-pdc@ifas.ufl.edu
Sample submission forms are available at
<https://trec.ifas.ufl.edu/plantdiagnosticclinic/submissions-and-contact/>



The Center provides plant disease diagnostics for plant diseases. Services include analysis of plant material for bacterial, fungal, viral and nematode pathogens as well as suggesting appropriate control measures when available. The cost is \$40 per sample.



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Where to Submit Sample For Plant Pathology

Florida Extension Plant Diagnostic Clinic
UF, IFAS/GCREC
14625 C.R. 672
Wimauma, FL 33598
Phone: (813) 633-4131
Sample submission forms are available at
<https://gcrec.ifas.ufl.edu/plant-clinic/>

FEPCD is a service provided by the Plant Pathology Department of IFAS, UF in conjunction with the Cooperative Extension Service. The goal is to determine if the plant dysfunction involves an infectious causal agent, by associating causal agents with symptomatic plant tissue.

Hours are 8 am to 5 pm Monday-Friday (except state holidays) and the charge is \$40.



Melaleuca quinquenervia



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Where to Submit Insect Samples

Insect Identification Laboratory
UF/IFAS, Entomology & Nematology Department
Bldg. 970 Natural Area Dr. / P.O. Box 110620
Gainesville, FL 32611-0620
Phone: (352) 273-3933 Fax: (352) 392-5660
Sample submission forms are available at
<http://edis.ifas.ufl.edu/pdf/files/SR/SR02200.pdf>

A service to Florida residents provided by UF's Institute of Food & Agricultural Sciences.

Hours are 8 am to 5 pm Monday-Friday. The fee for insect identification is \$8.



Pheromone-baited flight trap for the Southern Pine Beetle

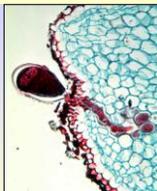


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Where to Submit Nematode Samples

Nematode Assay Laboratory
UF/IFAS, Entomology and Nematology Department
1881 Natural Area Drive, Bldg. 970
Gainesville, FL 32611-0820
Phone: (352) 392-1994 Fax: (352) 392-0190
E-mail: nemalab@ifas.ufl.edu
Sample submission forms are available at
<http://nematology.ifas.ufl.edu/assaylab/Forms.html>



Juvenile citrus nematode

Note: The Nematode Assay Laboratory determines the types and numbers of plant-parasitic nematodes in soil and plant samples. Based on this information a diagnosis will be made. Hours are 8 am to 5 pm Monday-Friday. The charge is \$25 per sample.



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Where to Submit Sample Plants and Insects

Florida Department of Agriculture & Consumer Services
Division of Plant Industry
1911 SW 34th St.
Gainesville, FL 32608-7100
Phone: (352) 395-4600
Sample forms: <http://forms.freshfromflorida.com/08400.pdf>



Kudzu



Tomato Leafminer



Hydrilla



Brazilian Pepper Tree

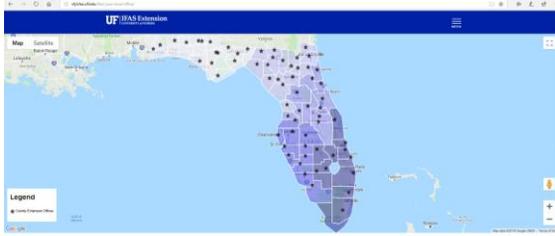


Additional Plant and Insect Laboratories

- **UF Herbarium, (FLAS)**
Department of Plant Pathology, 2527 Fifield Hall/PO Box 110180,
Gainesville, FL 32611-0180 (352) 273-2837
<https://www.floridamuseum.ufl.edu/herbarium/flasfung.htm>
- **UF Citrus Research and Education Center** (specializing in citrus),
700 Experiment Station Rd. Lake Alfred, FL 33850 (863) 956-1151
<https://crec.ifas.ufl.edu/>
- **UF Southwest Florida Research & Education Center**
2685 State Rd 29 North, Immokalee, Florida 34142 (239) 658-3400
<https://swfrec.ifas.ufl.edu/>



Where to find County Extension Offices

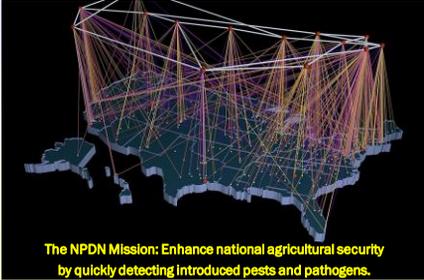


DISTRICTS, DIRECTORS AND COUNTY OFFICES

Here is an Interactive Map to our Extension County Offices by District, or view an alphabetical list with addresses and phone numbers. You can also access a grid-friendly version of the map.



NPDN: National Plant Diagnostic Network

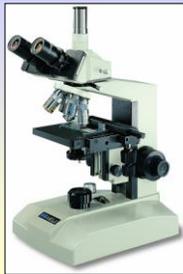


The NPDN Mission: Enhance national agricultural security by quickly detecting introduced pests and pathogens.

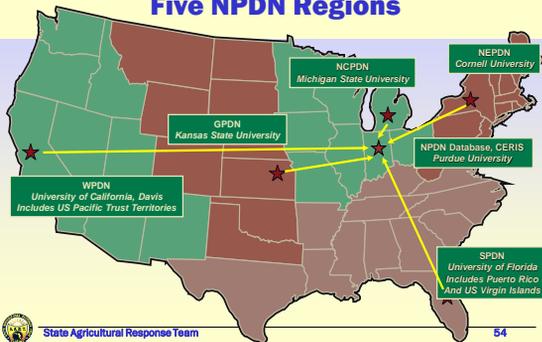


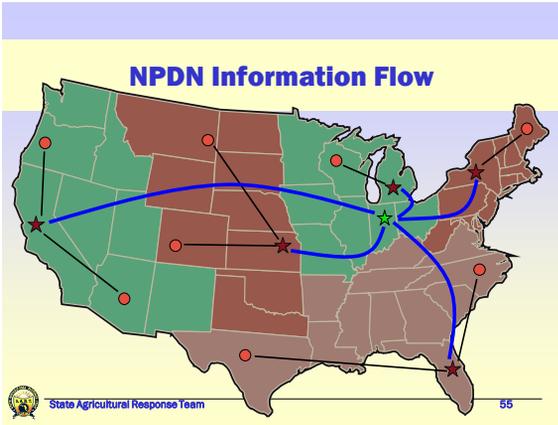
The NPDN Role

- Enhanced security of America's agricultural sector from a biosecurity event or unintentional introduction.
- How is this accomplished?
 - Coordinated national diagnostic laboratories
 - Rapid communication and response system
 - Database analysis for event detection
 - Education and training of "first detectors"



Five NPDN Regions





What is a “First Detector?”

- What is a First Detector?
 - Anyone likely to encounter an act or suspected act of bio- or agroterrorism
 - Producer: farmer or rancher
 - Agricultural consultant
 - County Extension Agent or Forester
 - Agents of the State Department of Agriculture & Consumer Services
 - Florida Master Gardeners



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What does a “First Detector” do?

- Training, certificate of completion and national registry
- Surveillance
 - Be alert to the odd or different
 - Change in attitude from business as usual to potentially important
 - May be contacted if an incident in their area



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“First Detectors” – Natural Multi-Taskers



4-H

Training

Field Days

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Key Resources

- United States Department of Agriculture (USDA) www.usda.gov
- USDA, Animal and Plant Health Inspection Service, National Center for Import and Export <https://www.aphis.usda.gov/aphis/ourfocus/importhexport>
- Florida Department of Agriculture and Consumer Services (FDACS) <https://www.freshfromflorida.com/>
 - Division of Plant Industry <https://www.freshfromflorida.com/Divisions-Offices/Plant-Industry>
 - Division of Animal Industry <https://www.freshfromflorida.com/Divisions-Offices/Animal-Industry>
 - Florida State Agricultural Response Team <https://fsart.org/>
- Southern Region Center for Integrated Pest Management <http://www.sripmc.org/>
- Extension Disaster Education Network <https://eden.lsu.edu/>
- Centers for Disease Control and Prevention <https://www.cdc.gov/>

Key Resources

- National Plant Diagnostic Network
 - National <https://www.npdn.org/>
 - Southern <https://www.npdn.org/spdn>
 - Southern Regional Laboratory <https://plantpath.ifas.ufl.edu/extension/plant-diagnostic-center/>
 - Florida <http://fpdn.ifas.ufl.edu/>
- University of Florida
 - IFAS Extension Service <http://sfyl.ifas.ufl.edu/>
 - Nematode Assay Laboratory <http://nematology.ifas.ufl.edu/assaylab/>
 - Insect Identification Laboratory <http://entnemdept.ufl.edu/insectid/>
 - Center for Aquatic and Invasive Plants <http://plants.ifas.ufl.edu/plant-directory/>
 - Integrated Pest Management <http://ipm.ifas.ufl.edu/>
 - Florida First Detector <http://www.flfirstdetector.org/>

Key Resources

- Florida Extension Plant Diagnostic Clinics, UF
 - Quincy <https://nfrec.ifas.ufl.edu/plant-disease-diagnostic-clinic/#>
 - Wimauma <https://grec.ifas.ufl.edu/plant-clinic/>
 - Homestead <https://trec.ifas.ufl.edu/plantdiagnosticclinic/>
- Florida Exotic Pest Plant Council <https://www.fleppc.org/>
- Florida Fish & Wildlife Conservation Commission <http://myfwc.com/>



Working Together To Protect Florida's Agriculture & Way of Life



Now, Test Your Knowledge and Awareness (1 of 3)

1. (True/False) The best way to prepare a caterpillar sample for diagnosis is to immerse it in water and then microwave it on a light setting for 60 seconds.
2. (Fill in the blank) Always wrap a plant sample in a _____ (wet or dry) paper towel before bagging it for mailing or shipment.
3. (True/False) The role of the NPDN is to facilitate enhanced security of America's agricultural sector from a biosecurity event and, if possible, the unintentional introduction of a harmful plant, animal or insect species.
4. (Fill in the blank) A plant sample to be sent to a laboratory for diagnosis first requires _____. A. your county agent's approval, B. call for an authorization number before sending, C. nothing more than attention to packaging, the correct address and payment, or D. a certified check for \$50, please.



Pre/Post Test (2 of 3)

5. The following information will help plant and/or insect scientists make a proper identification or analysis:
 - A. the date and address where collected
 - B. your evaluation of the extent and seriousness of infestation
 - C. details about parts of the plant affected and the symptoms
 - D. all of the above.
6. (True/False) Because of variations within a population, submit only one sample as more than one can become confusing.
7. Name two towns in Florida where samples can be submitted for testing and diagnosis.
8. (Select the best answer) For samples to arrive in a timely manner, samples should be mailed:
 - A. early in the week to avoid weekend layovers at the post office
 - B. late in the week is fine - the post office expedites samples



Pre/Post Test (3 of 3)

9. (True/False) Samples arriving from sites in Florida that are two days or less mailing time from their destination can be sealed in plastic bags for shipping.
10. Security is an issue with plant and insect submissions for:
 - A. preventing the spread of dangerous and invasive species
 - B. identifying the source for new and possibly dangerous diseases and/or insects
 - C. preventing contamination of samples (and thus increase the chance of a correct diagnosis)
 - D. all of the above.
11. **BONUS:** Unusual nematodes should only be handled with latex gloves and driven live to the prestigious Frog/Toad Identification Center at Florida State University in this north Florida city: _____.



Test Answer Key (1 of 2)

1. False. Never put creatures, live or dead, in a microwave oven.
2. Wrap plant samples in dry paper before shipping. Adding water or wrapping them in wet papers will cause the sample to degrade and allow the growth of molds.
3. True. The Southern Region is headquartered at the University of Florida in Gainesville.
4. The correct answer is C. nothing more than attention to packaging, the correct address and payment, which is \$40 for most diagnostic work, although may be more.
5. The correct answer is D. all of the above.
6. False. Carefully submit several sample specimen if possible.
7. Two of - Quincy, Gainesville, Wimauma, and Homestead.
8. For samples to arrive at a laboratory without remaining in an envelope over the weekend mail early in the week.



Test Answer Key

- 9. True
- 10. Security is an issue with plant and insect sample submission for all of the above reasons.

Bonus: Nematode samples should be submitted to the Nematode Assay Laboratory at the University of Florida in Gainesville.



Glossary

- National Plant Diagnostic Network (NPDN): A national organization whose mission is to enhance national agricultural security by quickly detecting introduced pests and pathogens.
- Nematode: Any of several worms of the phylum Nematoda, having unsegmented, cylindrical bodies, often narrowing at each end, and including parasitic forms such as the hookworm and pinworm. Also called *roundworm*.
- SART: The Florida State Agricultural Response Team. A multi-agency coordinating group consisting of governmental and private entities dedicated to all-hazard disaster preparedness, planning, response and recovery for the animal and agriculture sectors in Florida.
- Weed: Generic term for a plant that is growing where it is not wanted.



Reporting Suspicious Plants and Insects/Diseases Cases



Protect Florida Agriculture.
Report suspicious animal disease cases to the Office of the State Veterinarian.
All calls are confidential and toll free.
Daytime (8 am – 5 pm) 1-877-815-0034
(1-850-410-0900)
Or to Office of Bio & Food Security Preparedness
1-850-410-6757
Or 24/7 to Agriculture Law Enforcement
1-800-342-5869
Or SPDN Hub Laboratory (Gainesville)
1-352-392-1795



**Quality and Secure
Plant & Insect Sample Submission**

This concludes our presentation on "Quality and Secure
Plant and Insect Sample Submission."
Thank you for attending and participating.