

# Farm Bill Survey Accomplishment Report Template

## Farm Bill Survey Report

<b>Year:</b>	FY 2014 - 2015
<b>State:</b>	Louisiana
<b>Cooperative Agreement Name:</b>	Citrus Commodity Survey
<b>Cooperative Agreement Number:</b>	14-8422-0990-CA
<b>Project Funding Period:</b>	July 1, 2014 through September 30, 2015
<b>Project Report:</b>	Farm Bill Survey Report
<b>Project Document Date:</b>	December, 2015
<b>Cooperators Project Coordinator:</b>	J. Brett Laird
<b>Name:</b>	State Survey Coordinator
<b>Agency:</b>	Louisiana Department of Agriculture and Forestry
<b>Address:</b>	P.O. Box 3596
<b>City/ Address/ Zip:</b>	Baton Rouge, Louisiana 70821 - 3596
<b>Telephone:</b>	985 - 543 - 4024
<b>E-mail:</b>	brett_1@ldaf.state.la.us

Quarterly Report	<input type="checkbox"/>
Semi-Annual Accomplishment Report	<input type="checkbox"/>
Annual Accomplishment Report	<input checked="" type="checkbox"/>

- A. Write a brief narrative of work accomplished. Compare actual accomplishments to objectives established as indicated in the work plan. When the output can be quantified, a computation of cost per unit is required when useful.

The Louisiana Department of Agriculture and Forestry (LDAF) entered into a Cooperative Agreement with the United States Department of Agriculture (USDA), Animal Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ) in 2014 to conduct a visual survey for 15 Citrus Commodity Pests. LDAF is conducting this survey according to survey guidelines set forth by the USDA, APHIS, PPQ in 2014. This Farm Bill funded project executed by LDAF is strengthening its relationships with a state wide network of cooperators that are helping to identify exotic pest threats, determining and implementing the most effective means of preventing, detecting, and responding to new exotic pests. LDAF is also communicating risks and needs to land management personnel, relevant industries and the public.

The Citrus Commodity Survey was scheduled to start in July of 2014 when LDAF began securing vehicles, supplies and equipment needed to execute the work plan. Three rounds of interviews were conducted prior to finding 2 sound applicants to employ for conducting the survey. Consequently, survey initiation was delayed until October, 2014. LDAF submitted a program extension request in April, 2015, to extend the program into September, 2015.

Surveyors began the delimiting survey in the most southern portion of Plaquemines parish and began working northward. Once finished with Plaquemines parish, surveyors moved to St. Bernard, St Charles and portions of Jefferson, Orleans, Lafourche and Terrebonne. They went to every house and knocked on every door where residential or commercial citrus trees were deemed present, informing property owners of the targeted pests. Citrus trees were inspected if present and information on targeted pests was provided to each property owner. If the property owner was not available at time of inspection, surveyors would inspect visible citrus trees and leave a door hanger with targeted pests and contact information. Some property owners would make contact with surveyors in response to the door hangers and inspections would be re-scheduled for their property. On several occasions if Citrus Canker was found outside the current quarantine area, LDAF and PPQ personnel would team up and work together to perform a delimiting survey in those areas.

At the conclusion of this survey there have been 729 properties inspected by the 2 LDAF citrus surveyors. Sixty six properties were found positive for citrus canker and no other targeted pests have been identified. Total samples submitted as a result of the survey was 166. All samples are shipped to Dr. Raj Singh at Plant Diagnostic Center of the Louisiana State University (LSU) AgCenter (see Dr. Singh's report below). LSU received an additional 92 digital samples from county agents and citrus growers that produced 19 unconfirmed positives. Currently, the positive citrus canker (CC) finds resulting from this survey has enabled LDAF to establish quarantines in the entire parishes of Orleans and St. Bernard and portions of Plaquemines, Jefferson, St. Charles, and Lafourche (See quarantine map on citrus brochure).

Furthermore, the four commercial citrus nursery producers in central Plaquemines Parish have complied with all rules and regulations and upgraded their greenhouse structures to meet federal certification requirements, should a positive CC find occur near their growing facilities.

LDAF has hosted several logistical meetings and conference calls with USDA APHIS PPQ and LSU during this survey time period. LDAF, USDA APHIS PPQ and LSU jointly have hosted two meetings with citrus producers, packers, growers and any concerned stakeholders, informing them of the rules and regulations, quarantine boundaries, survey and outreach efforts.

This survey has been very beneficial to LDAF and the citrus community. It has allowed us to utilize these 2 new surveyors for citrus work only, which keeps the work load off of our current AES inspectors. This survey has allowed the 2 surveyors to gain much knowledge of citrus pests and the areas that contain citrus in our state and LDAF has been able to keep these two surveyors on full time as AES inspectors in the New Orleans District. LDAF has heard lots of positive feedback from concerned citrus stakeholders about this survey and the efforts being made to find citrus pests and protect this valuable industry.

Funding Amount	Total Number of Traps	Cost Per Unit
Proposed = \$759,376	Proposed = n/a	Proposed= n/a
Actual = \$174,595	Actual = n/a	Actual = n/a

1. Survey methodology (trapping protocol):

	Common Name	Scientific Name
<b>Pest:</b>	Asian Citrus Psyllid	<i>Diaphorina citri</i> , Kuwayama
	Brown Citrus Aphid	<i>Toxoptera citricida</i>
	Citrus Blackfly	<i>Aleurocanthus woglumi</i>
	Citrus Black Spot	<i>Guignardia citricarpa</i>
	Citrus Canker	<i>Xanthomonas axonopodis</i> pv. <i>Citri</i>
	Citrus Greening (African Strain)	<i>Liberibacter</i> spp.
	Citrus Greening (Asian Strain)	<i>Liberibacter</i> spp.
	Citrus Leprosis	(cl) <i>Rhaddovirus</i>
	Citrus Variegated Chlorosis Strain	<i>Xylella fastidiosa</i>
	Citrus Weevil	<i>Diaprepes abbreviatus</i>
	Chili Thrips	<i>Scirtothrips dorsalis</i>
	Fruit Piercing Moth	<i>Eudocima fullonia</i>
	Orange Spiny Whitefly	<i>Aleurocanthus spiniferus</i>
	Passion Vine Mealy Bug	<i>Planococcus minor</i>
	Sweet Orange Scab	<i>Elsinoe australis</i>

	<b>Proposed</b>	<b>Actual</b>
<b>Sites (Locations):</b>	n/a	729
<b>Traps:</b>	n/a	n/a

<b>Number of Counties:</b>	7
<b>Counties:</b>	Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Charles, Terrebonne

**2. Survey dates:**

	<b>Proposed</b>	<b>Actual</b>
<b>Survey Dates:</b>	January 1, 2015 through December 31, 2015	July 1, 2014 through September 30, 2015

**3. Benefits and results of survey:**

	<b>Positive</b>	<b>Negative</b>	<b>Total Number</b>
<b>Traps</b>	n/a	n/a	n/a

**4. Database submissions:**

**B. If appropriate, explain why objectives were not met.**

All objectives have been met or exceeded during this survey. Actual survey was started somewhat late due to restructuring of survey from proposed amount of funding to actual amount of funding. There was also a delay due to finding qualified applicants for the two positions. Although there were a few problems encountered during this survey, as with any survey, we were able to work through them and return a successful survey that will benefit this industry and equip LDAF with valuable information to aid in future surveys and important decisions regarding the citrus industry.

**C. Where appropriate, explain any cost overruns or unobligated funds in excess of \$1,000.**

LDAF encountered unobligated funds in the amount of \$6,813.00 at the conclusion of the Citrus Commodity Survey. The unobligated funds were due to one citrus surveyor not opting to receive health insurance benefits. LDAF had no foreseen way of knowing that this employee was not going to take out health insurance when planning for the survey.

\*\*\* Citrus brochure created during survey.



## LOUISIANA CITRUS UPDATE

Mike Strain DVM  
Commissioner

### LOUISIANA DEPARTMENT OF AGRICULTURE AND FORESTRY

Citrus Canker and Citrus Greening are serious bacterial diseases of citrus trees. Both of these diseases have been confirmed in Louisiana. Citrus Canker can be spread by wind-driven rain, contaminated landscape tools and infected citrus plants and fruit moved by people. Citrus Greening is spread by an insect called the citrus psyllid. This insect feeds on citrus leaves and while feeding infects the plant. The movement of infected citrus trees, canker-infected fruit or the insect that vectors Citrus Greening disease to areas that do not have these diseases can spread them prematurely.

Louisiana has quarantines in place to help stop the spread of these diseases. The quarantined areas for Citrus Greening are the entire parishes of Orleans and Washington. The parishes quarantined for Citrus Canker are the entire parishes of Orleans and St. Bernard, and portions of Plaquemines, Jefferson, St. Charles and Lafourche. See the map on the back of this brochure for quarantine boundaries.

- \* No citrus plants or citrus plant parts can be moved out of the quarantine area. No exceptions.
- \* Fruit can be moved, but it must meet washing and disinfection standards set forth by the USDA.
- \* If you prune or cut citrus trees, or perform yard work around citrus trees in the quarantined area, you must decontaminate the tools and equipment before leaving the quarantine area.

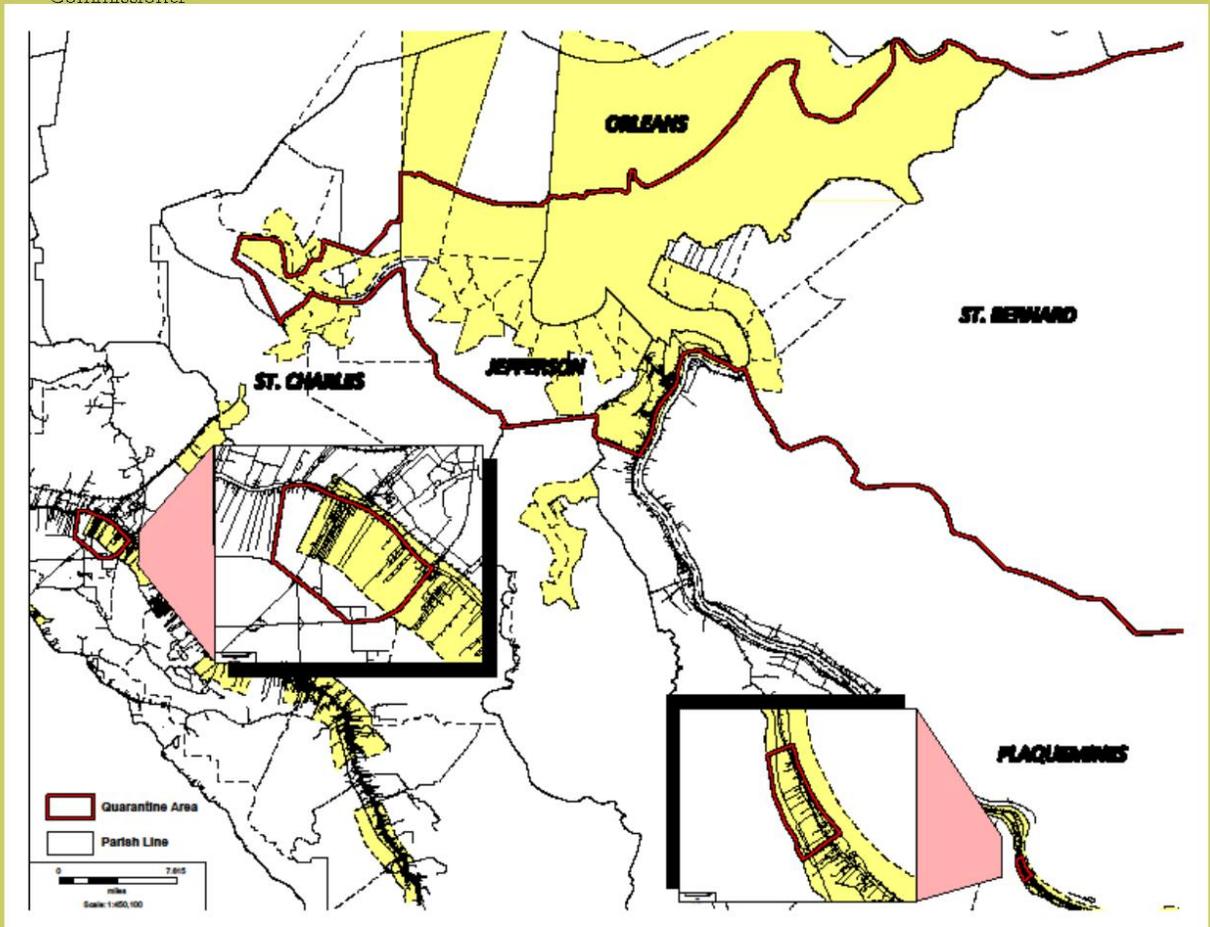




# CITRUS CANCKER QUARANTINE MAP

Mike Strain DVM

Commissioner



**For information or questions about citrus diseases please contact :**

Louisiana Department of Agriculture and Forestry

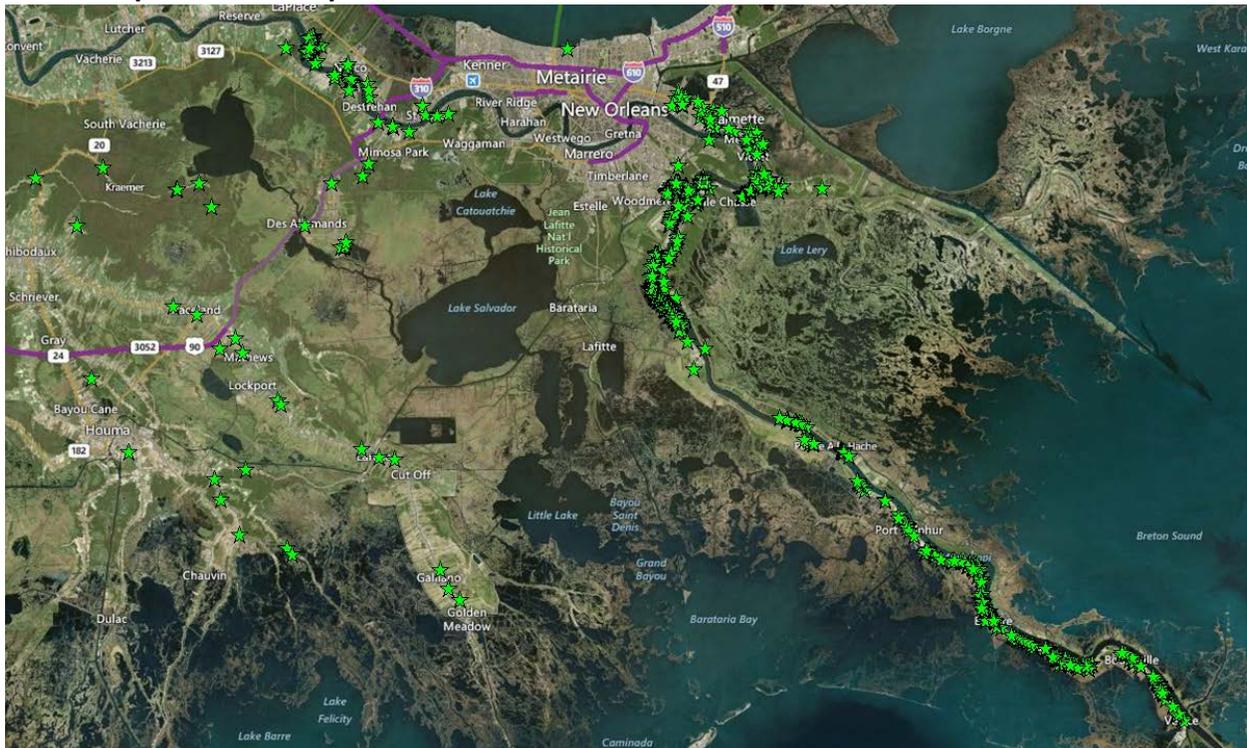
5825 Florida Blvd, Suite 3002

Baton Rouge, Louisiana 70806

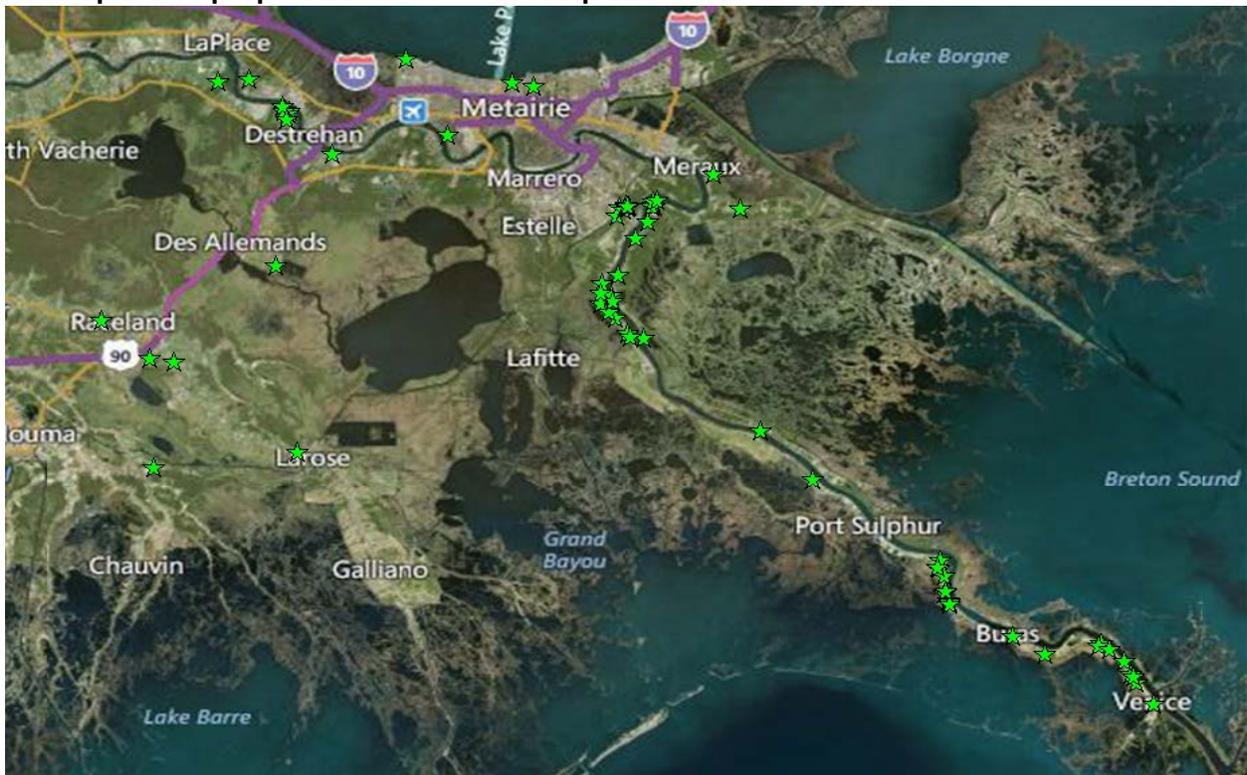
225-952-8100

[horticulture@ldaf.state.la.us](mailto:horticulture@ldaf.state.la.us)

\*\*\* Map of all 729 citrus inspections during survey. The green stars represent properties where inspections were performed.



\*\*\*Map of 166 properties where citrus samples were taken.



**\*\*\*Map of 66 positive citrus canker properties.**



## **2014 Citrus canker and greening survey Final Report**



**Prepared by: Dr. Raj Singh, Assistant Professor, Director Plant Diagnostic Center, LSU AgCenter**

During 2014 and 2015 Citrus Insect and Disease Survey, the LSU AgCenter's Plant Diagnostic Center received 166 physical samples. Samples were collected by

LDAF Inspectors. In addition to the physical samples, 92 digital samples were also received from clients and LSU AgCenter County Agents.

### Physical samples

Samples were comprised of citrus, grapefruit, lemons, kumquats, oranges (blood, navel, sweet) and satsumas (Figure 1). Majority of samples were navel oranges (52) followed by satsumas (36), Citrus sp. (26), grapefruits (22), Lemon (17), sweet oranges (8), blood orange (3) and kumquat (2). Samples consisted of both foliage and fruits.

### Citrus canker testing

An immunostrip assay was performed on all 166 samples. Two immunostrips were used per sample. The positive immunostrip samples were further subjected to a real time polymerase chain reaction to confirm citrus canker caused by *Xanthomonas citri* pv. *citri*. Two DNA samples were extracted from each immunostrip positive sample. Each sample was duplicated twice to confirm citrus canker. Out of 166 samples, 66 were positive for citrus canker.

Sweet oranges had the most canker positive (75%) samples followed by blood orange (66%), grapefruit (63%), navel orange (53%), lemons (29%), citrus sp. (26%). Satsumas and kumquats had zero canker positive samples.

### Citrus canker real time polymerase chain reaction results

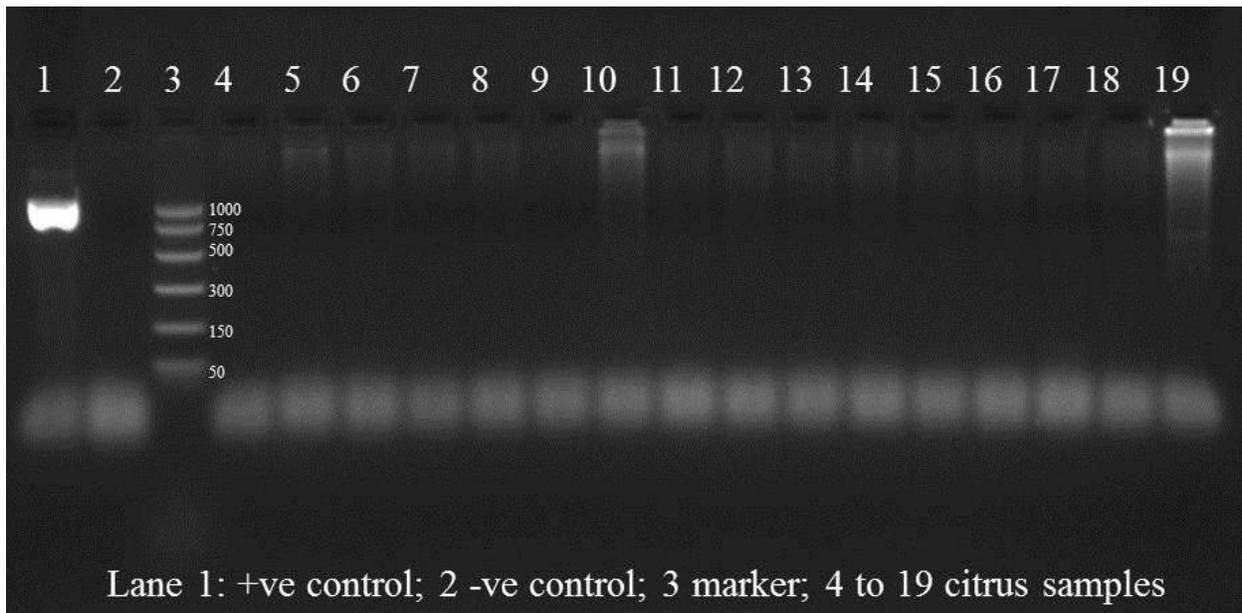
PDC Number	Host	LDAF Sample ID	Location	Canker +ve Ct Value
14473	Grapefruit	x	Tropical Bend, LA	24.68
14548	Citrus	Jl 12162014-2	Belle Chasse, LA	27.11
14550	Citrus	CT 12162014-1	Belle Chasse, LA	31.61
14551	Grapefruit	12162014-3	Belle Chasse, LA	20.65
15018	Navel Orange	Jl 01122015-2	Belle Chasse, LA	19.62
15019	Navel Orange	Jl 01122015-3	Belle Chasse, LA	17.55
15020	Blood Orange	Jl 01122015-4	Belle Chasse, LA	17.25
15021	Sweet Orange	Jl 01122015-5	Belle Chasse, LA	17.27
15022	Grapefruit	Jl 01122015-6	Belle Chasse, LA	24.89
15024	Grapefruit	Jl 01142015-4	Belle Chasse, LA	27.98
15036	Grapefruit	Jl 01202015-5	Belle Chasse, LA	28.22
15037	Sweet Orange	Jl 01202015-3	Belle Chasse, LA	25.65
15038	Navel Orange	Jl 01202015-4	Belle Chasse, LA	26.13
15040	Citrus	CT 012015-01	Belle Chasse, LA	17.59
15041	Citrus	CT 012015-02	Belle Chasse, LA	26.13

15042	Citrus	CT 01162015-1	Belle Chasse, LA	22.81
15043	Citrus	JI 01202015-2	Belle Chasse, LA	29.90
15045	Grapefruit	JI 01202015-6	Belle Chasse, LA	27.63
15046	Grapefruit	JI 01202015-1	Belle Chasse, LA	29.70
15048	Lemon	JI 01212015-1	Belle Chasse, LA	23.50
15049	Navel Orange	JI 01202015-6	Belle Chasse, LA	20.88
15050	Navel Orange	JI 01212015-3	Belle Chasse, LA	20.91
15051	Grapefruit	JI 01212015-2	Belle Chasse, LA	22.85
15052	Navel Orange	JI 0120215-12	Belle Chasse, LA	23.18
15053	Navel Orange	JI 0120215-13	Belle Chasse, LA	20.35
15054	Navel Orange	JI 0120215-14	Belle Chasse, LA	23.18
15055	Sweet Orange	JI 0120215-15	Belle Chasse, LA	20.91
15056	Sweet Orange	JI 0120215-16	Belle Chasse, LA	24.74
15057	Lemon	JI 0120215-17	Belle Chasse, LA	26.85
15059	Navel Orange	JI 01212015-5	Belle Chasse, LA	18.86
15060	Navel Orange	JI 01212015-6	Belle Chasse, LA	25.96
15061	Grapefruit	JI 01212015-7	Belle Chasse, LA	27.18
15062	Navel Orange	JI 01202015-7	Belle Chasse, LA	21.73
15063	Navel Orange	JI 01202015-8	Belle Chasse, LA	19.36
15064	Navel Orange	JI 01202015-9	Belle Chasse, LA	23.98
15065	Sweet Orange	JI 01202015-10	Belle Chasse, LA	22.42
15066	Lemon	JI 01202015-11	Belle Chasse, LA	27.48
15068	Navel Orange	JI 02022015-11	Belle Chasse, LA	23.95
15178	Citrus	Ctompson-1	Empire, LA	17.67
15184	Grapefruit	JI04242015-2	Empire, LA	22.36
15237	Lemon	MFCK51	New Orleans	17.39
15238	Blood Orange	MFCK52	New Orleans	18.50
15239	Navel Orange	MFCK53	New Orleans	17.46
15240	Grapefruit	MFCK54	New Orleans	19.38
15250	Grapefruit	JI 05192015-1	Hahnville, LA	19.75
15251	Lemon	JI 05192015-2	Hahnville, LA	16.96
15267	Grapefruit	JI 05222015-1	Hahnville, LA	21.37
15268	Navel Orange	JI 05222015-2	Hahnville, LA	21.80
15269	Navel Orange	JI 05222015-3	Hahnville, LA	21.53
15278	Navel Orange	JI 05272015-2	Hahnville, LA	20.82
15287	Navel Orange	JI 06032015-1	Taft, LA	21.27
15288	Navel Orange	JI 06032015-2	Taft, LA	19.28
15289	Navel Orange	JI 06032015-3	Taft, LA	20.90
15290	Navel Orange	JI 06032015-4	Taft, LA	20.86
15291	Navel Orange	JI 06032015-5	Taft, LA	20.89
15292	Navel Orange	JI 06032015-6	Taft, LA	21.14
15293	Navel Orange	JI 06032015-7	Taft, LA	20.70
15294	Navel Orange	JI 06032015-8	Taft, LA	21.35
15296	Navel Orange	JI 06032015-10	Taft, LA	21.59

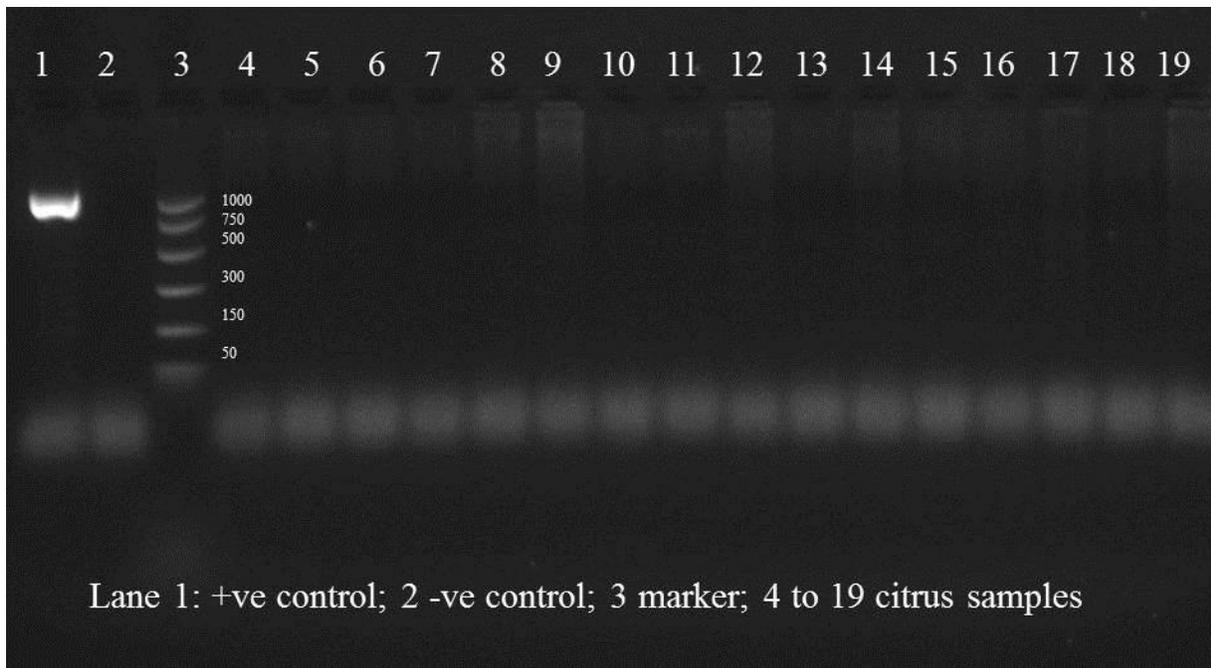
15297	Navel Orange	JI 06032015-11	Taft, LA	19.61
15298	Sweet Orange	JI 06032015-12	Taft, LA	21.41
155505	Grapefruit	JI 09052015-1	Metairie, LA	24.99

**Citrus greening testing**

All 166 samples were tested for both Asiatic and American strains of the citrus greening. DNA was extracted using DNeasy Plant mini kit according to manufacture guidelines. Conventional polymerase chain reaction was conducted with species specific primers and all samples were negative for both strains of citrus greening (Figures 2 and 3).



**Figure 2:** Gel picture showing negative results for Asiatic strain citrus greening.



**Figure 3:** Gel picture showing negative results for American strain citrus greening.

### **Digital samples**

During 2014-15, a total of 92 digital samples were submitted. Pictures of symptomatic fruit or foliage or whole tree was taken by homeowners or commercial growers and LSU AgCenter extension agents. Fifty eight samples were submitted by LSU AgCenter agents and 34 were submitted by citrus growers. Out of the 92 digital samples 19 were confirmed for citrus canker.

### **Biosafety cabinet**

The Biosafety Cabinet is required to open the samples to avoid any accidental escape of the pathogen. With the recent detections of citrus canker and citrus greening in Louisiana it has become extremely important to practice all the precautionary measures to avoid escape of the pathogen. A class II type A2 biosafety cabinet was purchased in 2015.

### **Outreach material**

Factsheets describing citrus greening epidemiology, symptoms with color pictures were produced to disseminate information about this disease. A total of 5,000 copies were produced and distributed to LDAF, LSU AgCenter Parish offices and research stations in Louisiana.

# LOUISIANA PLANT PATHOLOGY

DISEASE IDENTIFICATION AND MANAGEMENT SERIES



## Citrus Greening

(Huanglongbing)

Citrus greening, also known as yellow shoot disease or huanglongbing, is one of the most devastating diseases of citrus worldwide.

In the United States, citrus greening was positively identified first in south Florida in 2005. It appeared for the first time in Louisiana during 2008 in the Algiers neighborhood of New Orleans. Since that time, however, no new Louisiana cases were reported until recently. During March 2014, the disease was again confirmed from several citrus varieties at multiple properties in the Gentilly area of New Orleans.

Citrus greening is a bacterial disease, and the bacterium resides in the phloem (food conducting tissues) of the tree. There are three strains of citrus greening bacteria that can cause the disease. The Asiatic form (*Candidatus Liberibacter asiaticus*) is the most widespread, while the African form (*Candidatus Liberibacter africanus*) is present in Africa and the Middle East. The American form (*Candidatus Liberibacter americanus*) so far is found only in Brazil.

Citrus greening affects all citrus cultivars and hybrids. It also can cause disease in several other members of Rutaceae family, including *Murraya paniculata* (orange jasmine) and *Severinia buxifolia* (Chinese box orange). Sweet oranges and mandarin oranges are highly susceptible, while sour oranges, grapefruit and lemons are moderately susceptible to the disease.

Citrus greening is a systemic disease. Affected trees may not show symptoms for years. Depending on the citrus cultivar, the symptoms can vary greatly.

The pathogen causes blotchy mottling of leaves (Figure 1) that can resemble symptoms produced by nutrient deficiencies. Blotchy mottling caused by citrus greening is irregular, asymmetrical and crosses veins – in contrast to nutrient deficiency mottling, which is highly symmetrical and usually confined by the leaf veins. Affected leaves become thick, leathery and exhibit raised corky veins (Figure 2). Infected trees produce yellowing of one or more shoots randomly in the canopy. Fruit produced on infected trees is small, becomes lopsided (Figure 3) and tastes bitter. Fruit-set usually is poor, and seeds abort in affected fruit. Infected fruit does not



Figure 1. Blotchy mottling of leaves caused by citrus greening on a grapefruit tree.



Figure 2. Thick, leathery leaf exhibiting raised corky veins.



Figure 3. Lopsided fruit caused by citrus greening.

ripen uniformly, and some green color remains on the ripe fruit. Twig dieback also occurs, and infected trees eventually decline and die (Figure 4).

The disease is vectored effectively from infected to healthy trees by two species of psyllid insects – Asian citrus psyllid (*Diaphorina citri*) (Figure 5) and African citrus psyllid (*Trioza erytreae*) – but it also can be transmitted by grafting infected budwood. The Asian citrus psyllid can transmit both Asian and American strains, and the African citrus psyllid can transmit only the African form of the citrus greening bacterium. Both the adults and nymphs (immature) of Asian citrus psyllid can acquire and transmit the bacterium throughout their life spans. The adult female psyllid lays yellowish-orange eggs inside the whorls of new growth on citrus trees. The nymphs have yellow bodies with red eyes and produce white waxy secretions that can be spotted from a distance if there is a heavy infestation (Figure 6).

Once a tree is infected, it stays infected for rest of its life. There is no cure, and there is no chemical control available for citrus greening bacterium.

Commercial citrus producers must start with disease-free nursery stock. Growers should regularly scout for Asian citrus psyllids and inspect trees for suspicious symptoms. Nursery producers must follow all quarantine regulations and avoid movement of citrus trees out of quarantined zones. Infected trees should be promptly removed, but growers must get the trees checked for positive detection of the disease before tree removal. Homeowners must buy citrus trees from certified nurseries only.

Management of the Asian citrus psyllid is necessary to stop the spread of the disease. Check with your local LSU AgCenter county agent, or consult the LSU AgCenter's Insect Management Guide for up-to-date information on use and selection of insecticides to manage Asian citrus psyllids. If you suspect your citrus trees are infected with citrus greening, please consult the LSU AgCenter's "plant doctor" Raj Singh at 225-578-4562 or [rsingh@agcenter.lsu.edu](mailto:rsingh@agcenter.lsu.edu).



Figure 4. Infected citrus tree exhibiting twig dieback symptoms caused by citrus greening.



Figure 5. Adult Asian citrus psyllid.



Figure 6. Citrus shoot infested with adults and nymphs of Asian citrus psyllid. Notice the waxy secretions produced by nymphs.

Visit our website: [www.LSUAgCenter.com](http://www.LSUAgCenter.com)

**Author and Photo Credits**

Raj Singh, D.P.M.  
Department of Plant Pathology

William B. Richardson, LSU Vice President for Agriculture  
Louisiana State University Agricultural Center  
Louisiana Agricultural Experiment Station  
Louisiana Cooperative Extension Service  
LSU College of Agriculture

Pub. 3359

(online only)

08/14

The LSU AgCenter and LSU provide equal opportunities in programs and employment.

## **Appendix for work instructions**

**Citrus canker real time PCR work instructions:** Work instructions WI-B-T-1-4 Citrus canker detection using a real-time TaqMan PCR on a Cepheid SmartCycler, USDA, APHIS, PPQ, National Plant Germplasm and Quarantine, pages 1-6.

**Citrus greening conventional PCR work instructions:** Work instructions WI-B-T-C-2 Conventional and real-time PCR for confirmatort detection of citrus greening or HLB from plant samples, USDA, APHIS, PPQ, National Plant Germplasm and Quarantine, pages 1-14.

# CAPS Survey Accomplishment Report Template

Appendix P-2

Citrus Commodity Survey  
14-8422-0990-CA

Approved and signed by

  
\_\_\_\_\_  
Cooperator

Date: 12/21/15

\_\_\_\_\_  
ADODR

Date: \_\_\_\_\_