

CURRENT SITUATION, MANAGEMENT AND ECONOMIC IMPACT OF CITRUS CANKER IN FLORIDA

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Abstract

After citrus canker, *Xanthomonas citri* subsp. *citri*, was detected in an orange tree on a residential property in Miami-Dade County in October 1995, the United States Department of Agriculture (USDA) and the Florida Department of Agriculture and Consumer Services (FDACS) began a ten-year effort to eradicate the disease from Florida. Between 1999 and 2004, however, the eradication program was stymied by various legal challenges that prevented the removal of exposed trees and hampered the removal of infected trees. This period was followed by two extremely active hurricane seasons in 2004 and 2005 that helped to spread the disease throughout Florida's major citrus production areas. In January 2006, USDA determined that canker had become so widespread in Florida that eradication was no longer feasible. Following the eradication effort, despite grove management practices, citrus canker has continued to spread throughout most of Florida's major citrus growing regions. Although complicated by the more recent arrival and spread of Huanglongbing (HLB) in Florida, the impact of citrus canker on Florida's citrus industry, by many measures, has been severe.

Introduction

Historically, Florida has suffered three outbreaks of citrus canker, *Xanthomonas citri* subsp. *citri*. The most recent outbreak began in 1995 when citrus canker was detected on a residential property in Miami. The initial delimiting survey determined that the disease was confined to a fourteen square mile area (Figure 1). In the ten years following that first detection in 1995, the United States Department of Agriculture (USDA) and the Florida Department of Agriculture and Consumer Services (FDACS) cooperated on an eradication program. In the early years, from 1995 to 1999, the strategy involved surveying for the disease, removing infected trees, and either removing or buck horning exposed citrus trees within a 125-foot radius. Despite those efforts, citrus canker continued to spread, and it became clear that the 125-foot radius strategy was not working. In response to new scientific information made available to USDA in 1998 about the distance canker can spread during normal weather events, later published in 2002 (3), USDA and FDACS changed the eradication strategy to removal of all citrus trees within 1900 feet of an infected tree. Because this change in strategy dramatically increased, by a factor of approximately 230, the number of homeowners affected by the removal of exposed trees, opposition to the eradication program increased and resulted in legal challenges to the program. The ongoing legal actions against the program between 2000 and 2004 essentially prevented the removal of exposed trees for a period of five years, setting the stage in 2004 and 2005, when six hurricanes crisscrossed the state, for citrus canker to be spread far and wide in Florida. After FDACS and USDA extensively surveyed for the spread of citrus canker in commercial groves throughout the state as a result of the hurricanes, the USDA determined in January 2006 that eradication was no longer economically feasible. It was determined that by then, 75% of the commercial groves were within five miles of a known canker infection. (5) (Figure 2). At that point, since eradication involved removing all citrus trees within a 1900-foot radius, or as much as 260 acres surrounding a single infected tree in a commercial setting, for many citrus producers, the cure (eradication) became worse than the disease. As a result, USDA abandoned its strategy of eradication, and to protect the other citrus producing states, promulgated regulations that placed the entire State of Florida under quarantine for citrus canker (8).

Current Situation and Citrus Canker Management

To date, citrus canker has been detected in twenty-nine counties in Florida. Of the twenty-three counties with over 1000 acres of commercial citrus (2), only two remain free of any canker detections: Pasco and Marion Counties. In fact, over 98% of the commercial citrus production in Florida occurs in counties where canker is known to be present. Since January 2006, when the eradication effort ceased, citrus canker has been detected in some 966 new square-mile sections in both residential and commercial production areas (Figure 3).

With the spread of canker and HLB in Florida, some growers are leaving the citrus production business, and in many cases, leaving behind abandoned acreage. FDACS has confirmed some 65,000 acres of abandoned citrus groves in Florida. This of course provides a potential reservoir of both citrus canker and HLB innocula. FDACS has been working on an initiative that seeks to reduce the abandoned acreage that involves a legislative remedy that would include tax incentives for growers to remove any abandoned citrus groves, coupled with tax penalties for leaving abandoned citrus groves standing.

In 2006, mitigation and management replaced eradication as a strategy for dealing with citrus canker in Florida, as outlined in the Citrus Health Response Plan (CHRP), a document developed by USDA/APHIS and FDACS/DPI, with participation from various stakeholders (6). The responsibility for some of the functions that were formerly either required by or directly performed by USDA and/or FDACS officials during the eradication effort have been largely transferred to the growers themselves. These include grove surveys, removal of infected trees, and decontamination of equipment and personnel entering a grove. Likewise, the University of Florida, Institute of Food and Agricultural Sciences (IFAS) developed a set of best management practices that include grower self surveys, voluntary removal of infected trees in areas where citrus canker is not widespread, copper spray applications, control of citrus leaf miner, and planting of windbreaks (1).

The USDA's regulation that imposed a citrus canker quarantine on the entire State of Florida also contained a regulatory framework to allow fresh fruit to move interstate from Florida, based on surveys to establish grove freedom from the disease. That framework was replaced in 2007 with the current regulations that require treatment of fruit with an APHIS-approved decontaminant, APHIS inspection of each commercial lot of fruit for freedom from canker, and limited distribution to those states that do not produce citrus. Grove freedom was eliminated as a requirement. The 2007 regulations were based on an evaluation of scientific evidence available at that time that concluded that asymptomatic fruit that is treated with disinfectant dips is an extremely unlikely pathway for spreading citrus canker (7). More recent scientific studies go further and conclude that even symptomatic fruit is not an epidemiologically significant pathway for the disease to spread. (4) Based on this very recent science, USDA has initiated rule-making that, if successful, will provide further relief to Florida's fresh fruit industry by eliminating the requirement for APHIS inspection in the packinghouses and expanding the interstate market.

Economic Impacts

With the emergence of HLB in Florida in August 2005, it has become difficult to separate the economic impacts of citrus canker on the Florida citrus industry from those of HLB. However, prior to that time, the economic impacts of citrus canker in Florida are clearer and include the direct costs of the eradication program, an overall decrease in citrus production acreage in Florida, the elimination of several commercial citrus nurseries, the loss of markets for fresh fruit production, the total elimination of the fresh lime industry that had flourished in Miami-Dade County, added grower costs of performing grove surveys, added costs of implementing the recommended best management practices for mitigating the effects of citrus canker in groves,

and the added costs borne by both the citrus industry and the State and Federal Government as a result of the quarantine regulations.

The direct Government costs of the eradication effort from 1995 to 2006 exceeded \$1.3 billion, including over \$600 million to conduct program operations and over \$700 million for commercial compensation for groves destroyed as part of the eradication effort. In the ensuing years from 2006 through 2009, it is difficult to parse out expenditures for citrus canker versus HLB, however, the federal government spent an additional \$90 million on the Citrus Health Response Program. A sizeable portion of that paid for packinghouse inspections of fruit and pre-harvest surveys required in the regulatory framework for citrus fruit to be shipped from Florida to other states and countries.

Another measure of the impact of citrus canker on production of citrus in the Florida is the decrease in commercial acres of citrus present in the Florida. Citrus production acreage in Florida reached a twenty-year peak in 1996, with 857,687 acres (2). After that, acreage has declined steadily through the last census in 2008 to 576,577 acres, representing a decline of 281,110 acres or 32.8% (2). How much of this decline is directly attributable to citrus canker is unclear, but what is clear is that approximately 87,000 acres were destroyed in the citrus canker eradication effort alone. Other factors affecting the decline in the number of acres include hurricane damage, Real Estate development, citrus tristeza virus, and more recently, Huanglongbing (HLB). Along with citrus canker, these factors and others have undoubtedly contributed to the decline in commercial citrus acreage in Florida.

On a county-by-county basis, St. Lucie County has suffered the largest decrease in the total acres of citrus production, with a loss of 59,151 acres between 1996 and 2008, representing an over 55% decline in acreage (2). In terms of citrus variety impact, the lime industry in Miami-Dade County, even though small to begin with at 2,800 acres, was completely destroyed in the eradication effort. Grapefruit has been also hit hard with a total decline from a 1994 peak of 146,915 acres to 56,881 acres in 2008 (2). This may be due in part to its relatively high susceptibility compared to other varieties.

Another economic impact of citrus canker on the citrus industry has been the loss of the other citrus producing states as fresh fruit markets due to the quarantine imposed on the State of Florida. Beginning in 2006, Florida citrus could not be sent to Arizona, California, Hawaii, Louisiana, Texas, Puerto Rico, Guam, the U.S. Virgin Islands and the U.S. Marianna Islands. The loss of tangerine sales to California has probably had the most impact. Likewise, beginning with the 2007-08 packing season, the Florida fresh fruit industry has borne additional costs associated with the required USDA inspections of fruit in their packinghouses. These inspections are required for fruit to be shipped to the interstate market. In some cases, packinghouses have had to slow down their packing lines to accommodate the inspection process. In other cases, they've chosen to run shorter lots to minimize their risk of having a large lot rejected based on a citrus canker detection. Many packers have added fruit graders, at an additional cost, in an attempt to grade out any fruit with citrus canker lesions, and as a whole, the fresh fruit packing industry has been largely successful in this endeavor. During the 2007-08 shipping season the number of lots rejected for a citrus canker find was 247, or 0.65% of the total lots. Likewise, during the 2008-09 season, that number was 326 or 0.87% of the total lots inspected. Although these numbers represent a very small portion of the total lots shipped, these 573 lots over the two-year period had to be redirected to either a less restrictive market or to be processed for juice, resulting in a negative economic impact for the grower and/or packer.

Conclusion

The impact of citrus canker on the citrus industry in Florida has been dramatic. The Federal and State Governments have spent over \$1.4 billion in the eradication effort and to support the

regulatory framework established after the eradication program. Management of the disease after the eradication effort has been challenging. While the management practices recommended to the fruit production industry come with higher production costs, on a statewide basis, citrus canker has continued to spread. Likewise, the fresh fruit packing industry has not escaped the impacts of citrus canker. The regulatory framework that mandates APHIS inspection of fruit for interstate market eligibility means both higher fruit packing costs and the loss of some markets. Some relief in this area may come if new regulations successfully implemented. Finally, while not totally attributable to citrus canker, citrus fruit production acreage in Florida has declined approximately 33%, to a 40-year low, during Florida's fourteen year battle with citrus canker. Citrus production territories and countries that are canker-free only need to look at Florida's experience to conclude that vigilant surveillance, early detection and eradication are the best response to citrus canker.

References

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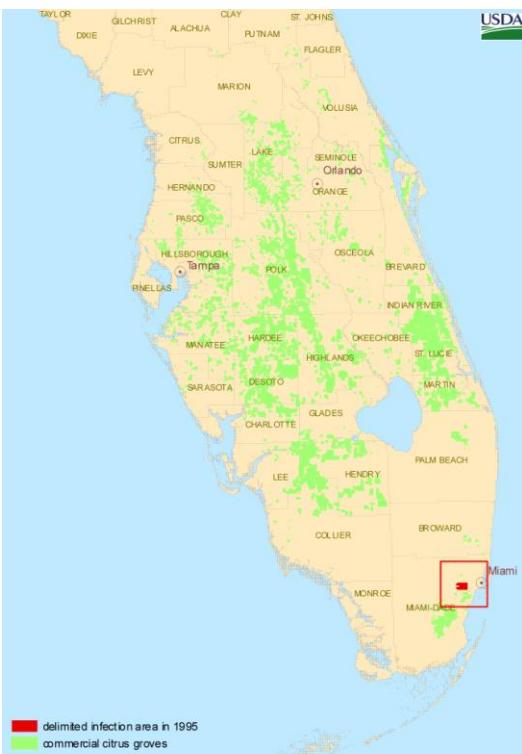


Figure 1. Map of Original 14-Square Mile Area After 1995 Delimiting Survey

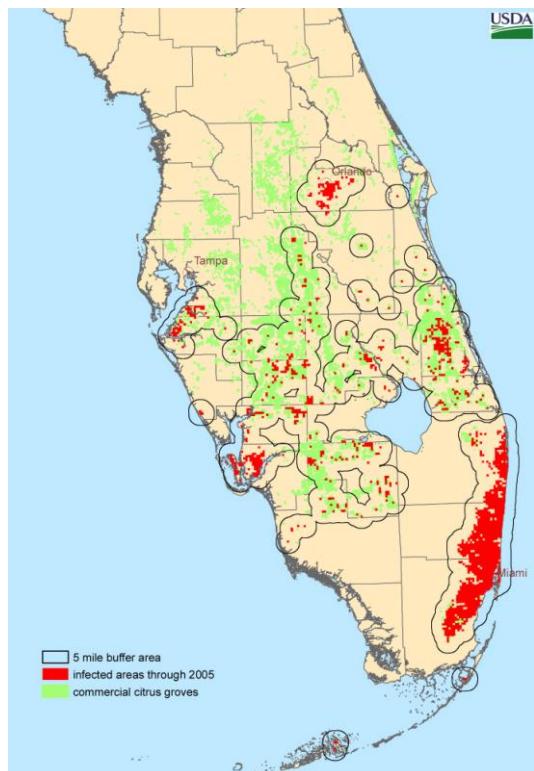


Figure 2. Map of Positive Sections through 2005 with 5-Mile Buffers

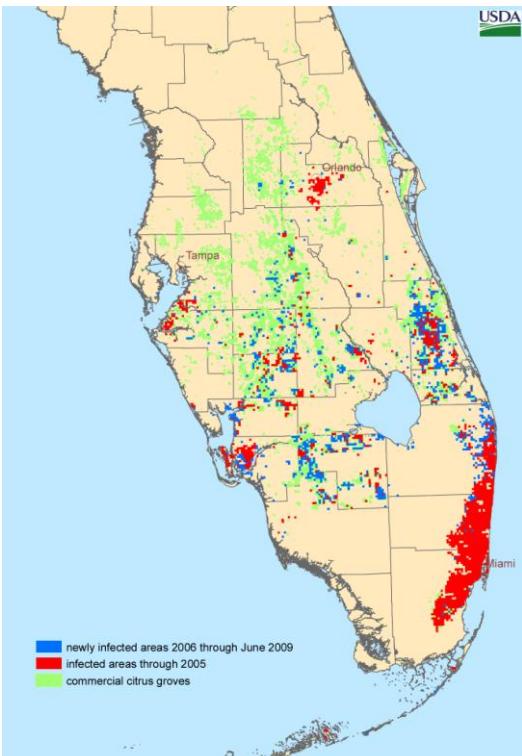


Figure 3. Map of Positive Sections through June 2009

