

# The Federal Agriculture Quarantine on Hawaii: Regulatory History, Impacts, and Opportunities for Change

Author(s): Cameron S. Deptula[1, 2, 3], Jake Vuillemin[4], and Jae Yun Ham[5, 6].

## October 2026

**Hawaii Institute for Public Affairs, Economic Series (October 2026)**
**Research Topics: Agriculture, Federal Regulations, Economy, Biosecurity.**

HIPA
HAWAII INSTITUTE FOR PUBLIC AFFAIRS




HAWAII INSTITUTE FOR PUBLIC AFFAIRS

*Hawaii Institute for Public Affairs (HIPA)*
*P.O. Box 1851*
*Honolulu, Hawai'i 96805*
*info@hipa.org*



*Layout and design by Terry Nii Design.*



Author(s): Cameron S. Deptula[1, 2, 3], Jake Vuillemin[4], and Jae Yun Ham[5, 6].



Preferred Citation: Deptula, C. S., J. Vuillemin, & J. Y. Ham, "The Federal Agriculture Quarantine on Hawaii: Regulatory History, Impacts, and Opportunities for Change." HIPA Economic Series (2026). Hawaii Institute for Public Affairs.



*© 2026 Hawaii Institute for Public Affairs. All rights reserved. Permission is granted to reproduce any portion of this document so long as credit is given to the Hawaii Institute for Public Affairs. This report is available digitally at www.hipa.org.*



[1] **Office of the Governor, State of Hawaii**
[2] **Center for Public Policy Analysis, Hawaii Institute for Public Affairs**
[3] **Haas School of Business, University of California, Berkeley**
[4] **Center for Public Policy Analysis, Hawaii Institute for Public Affairs**
[5] **Office of the Governor, State of Hawaii**
[6] **Harvard Law School, Harvard University**



# Executive Summary

Hawaii has been subject to a federal agricultural quarantine that may cost as much as $800M annually in impacts to the state. The quarantine is codified in a stand-alone section of the Code of Federal Regulations, 7 CFR 318. Key features of the quarantine include a ban on the movement of fresh fruits and vegetables, and mandatory inspection requirement for all travelers, baggage, and airplanes/ships. The quarantine began in 1911 by the State of California due to the establishment of Mediterranean fruit flies *(Ceratitis capitata)* in Hawaii, and was subsequently adopted by the federal government in 1912. Its main components have largely remained in place since then. Comparative regulatory analysis shows that Hawaii's quarantine is unique among US states and administratively similar to the quarantine treatment of foreign countries, however the regulatory outcomes would likely be comparable if Hawaii were governed under alternative existing domestic quarantine frameworks. There are areas for significant improvement to reduce regulatory burdens, primarily by reducing the length of time it takes for a new commodity to be approved for export, which can take 5+ years. Further, federal and state resources need to be dedicated to addressing the invasive quarantine species in Hawaii, which can address quarantine status as a whole, while reducing the risk of introducing future invasive species of concern, among other important opportunities. Given the extent of likely impact on Hawaii, the federal quarantine should be prioritized as a fundamental economic issue of statewide concern by both local and national stakeholders.

# Introduction

Today zoned agricultural land makes up 47% of Hawaii's landmass.[7,8] However, the economic value of agriculture in Hawaii both from primary agricultural production and secondary value-added activity totaled just .4% of the state's total economic activity as of 2022.[9]

An underappreciated reason for Hawaii agriculture's small size, in spite of a large societal commitment to the industry, is the ongoing impact of the federal regulatory environment on Hawaii agriculture– specifically Hawaii's ongoing federal quarantine authorized in the Code of Federal Regulations (7 CFR 318).

These regulations limit Hawaii growers' access to the very large US market and are in place due to the presence of highly damaging invasive species and high risk of future invasive species entrants to the state.

---

**[7]DBEDT Research and Economic Analysis Division, "Hawaii State Databook: Table 6.03-- ESTIMATED ACREAGE OF LAND USE DISTRICTS: 1993 TO 2023."**

**[8]Not all land zoned for agriculture is suitable for agricultural practices. Zoned agricultural land in active agricultural use: 919,004 acres (158,053 acres total cropland and 760,951 acres pastureland, all types - from 2022 Census of Agriculture - County Data Table 8, pages 232-233). Zoned agricultural land not in agricultural use: 1,007,679 acres (State Agricultural District minus Census of Agriculture - County Data)**

**[9]Li and Roos, "Hawaii Economic Structure Analysis Using the Industry Level Gross Domestic Product Data."**



# Key Points in this Brief

Since 1912, Hawaii has been subject to a federal agricultural quarantine that impacts Hawaii-based farms and US agriculture upwards of $800M annually.[10] The quarantine is codified in a stand-alone section of the Code of Federal Regulations, titled, "state of Hawaii and territories quarantine notices" (7 CFR 318). This federal quarantine includes several key enforcement features. The quarantine is expansive in breadth. It is applicable to any number of current and future pests, regulates the movement of all fresh fruit and vegetables, and imposes mandatory inspection requirements for all travelers, baggage, and means of conveyance (i.e. airplanes and ocean-going vessels).

The regulatory history of the quarantine began in 1911, prompted by the discovery of invasive Mediterranean fruit flies (Ceratitis capitata) in Hawaii. California, at the urging of its agricultural industry, began enforcing the first quarantine on Hawaii agricultural products and steamship passengers, which was put in place with the cooperation of steamship companies such as Matson. The federal government subsequently adopted a similar, full quarantine against Hawaii the following year with the support of California. Hawaii's quarantine is now broader, applicable to any pest of concern, but structurally similar to these first quarantines in their scope, scale, and inclusion of passenger searches.

The continued presence of major pests of concern such as tephritid fruit flies and high risk profile for future pest introductions has led to Hawaii's ongoing regulatory impacts. A comparative analysis of Hawaii's current quarantine to domestic quarantine regulations (7 CFR 301) and foreign quarantine regulations (7 CFR 319) show that Hawaii's quarantine is administratively similar to foreign nations in its treatment due to Hawaii's unique pest risk profile. Accessing US markets for Hawaii-based growers requires receiving regulatory evaluation and a pest risk assessment for a specific geographic region and commodity pair from USDA APHIS and involves competing administrative and research capacity at the federal level with foreign commodity approvals. For new commodities, this process can take upwards of 5+ years. Were Hawaii to be governed under existing domestic quarantine regulations, benefits and tradeoffs would be mixed and likely result in a similarly restrictive quarantine treatment.

Currently, Hawaii receives a small amount of federal assistance relative to other states such as California, Texas, and even foreign nations for the eradication of economically significant invasive pests. While the state has done significant work for the control of certain important pests such as tephritid fruit flies through the use of biocontrol agents, this is not the same as eradication which would adequately address impacts related to being under quarantine status. Greater government resources both from state and federal sources will be needed to tackle the inherent problem of invasive species.

Given the large impact the quarantine has on Hawaii-based growers, addressing the quarantine's impacts should be a high priority for both state and federal officials. Importantly, this will likely not come from simply advocating for parity with other US states in regulatory treatment, but from specific requests that reduce regulatory burdens on local growers through faster prioritization for commodity approvals and support for pest-risk treatment, along with more resources for the eradication of economically important quarantine pests with the collaboration of state officials.

The pursuit of eradication efforts for existing high-profile pests of concern provide the biggest opportunity to relieve quarantine measures as a whole. Greater coordination between state, federal, and international officials can help to lower the risk of in-bound pest introductions by reducing introduction pathways into Hawaii, preventing future pests from occurring. Federal funding for eradication and control efforts for tephritid fruit flies in Hawaii in particular has lagged other states such as California. With regards to the quarantine regulations itself on the federal side, it is likely that reforms that prioritize Hawaii commodities within the existing administrative process can reduce the amount of time, and thus impact, of the quarantine on local growers.

[10] **See Fig. 4 for estimate breakdown.**



# About this Brief

The analysis in this piece was conducted by combing through federal laws (U.S. Code), federal regulations (Code of Federal Regulations), federal court rulings, Congressional testimony, interviews with local farmers, land data, newspaper archives, and a review of State laws and programs related to agriculture and biosecurity.

We have appreciated the input and comments on drafts of this report from experts at the following organizations: the Hawaii Department of Agriculture and Biosecurity (DAB), Daniel K Inouye US Pacific Basin Agricultural Research Center (PBARC), US Department of Agriculture Animal and Plant Health Inspection Service, Hawaii Invasive Species Council (HISC), Coordinating Group on Alien Pest Species (CGAPS), Ulupono, Mahi Pono, Volcano Wasabi, and the Hawaii Institute for Public Affairs (HIPA).

The preliminary findings of this report were previewed in collaboration with the Ulupono Initiative in the Summer 2025 edition of the Hawaii Food Industry Magazine and in the July 20th, 2025 edition of the Honolulu Star-Advertiser. We also note that early working drafts of this work were referenced by media outlets and that a University of Hawaii CTAHR statewide community survey was conducted in Summer 2026 to revitalize invasive fruit fly management efforts in Hawaii. The current form of this publication was published at the Hawaii Tropical Fruit Growers 36th Annual Conference and is intended to better document Hawaii's federal quarantine and revitalize discussions related to agricultural barriers and biosecurity issues.

The report is structured as follows: (1) a description of key features of the current federal quarantine regulations; (2) an overview of the impacts of the quarantine in Hawaii; (3) historical analysis of the origins of the federal quarantine in Hawaii; (4) comparative analysis of Hawaii's quarantine treatment to domestic and international quarantines; (5) information on tephritid fruit flies and response efforts as a major quarantine pests in Hawaii; and (6) a conclusion and initial discussion of opportunities to address invasive species issues and mitigate the impacts of the federally-imposed quarantine.

# Part I: Description of the Federal Quarantine & Impacts on Hawaii

Although Hawaii is a state, it is treated separately in the US Code of Federal Regulations, along with US territories in the ability of farmers to export fresh fruits and vegetables to other parts of the US. Hawaii's quarantine rules are encapsulated in 7 CFR 318, with additional detailed instruction for federal personnel enforcing the quarantine at ports being provided by the USDA APHS manual, "Hawaii Manual: Regulation and Clearance from Hawaii to Other Parts of the United States." The statutory basis for these restrictions are authorized through 7 USC 7712. Additional enforcement mechanisms of Hawaii's regulatory program have been codified into federal law under 7 USC 8307.

We focus on two core components to Hawaii's quarantine that impact local industry: the first is the prohibition of the movement of fruits and vegetables from Hawaii to other parts of the US, and the second outlines inspection requirements for passengers, baggage, and vehicles to help enforce the prohibition. Transshipment to international markets, which is governed under 7 CFR 318, is discussed briefly in a case study note.

## Component One: Prohibition on Fruit and Vegetable Imports from Hawaii.

Hawaii's quarantine is broad and explicitly entails a default ban on the export of fresh fruits and vegetables from the entire state, unless pest risks are mitigated. By default, any fruit or vegetable travelling from Hawaii to any other part of the US is viewed as a pest risk. The CFR states:

> "**Determination by the Administrator.** No fruit or vegetable is authorized for the interstate movement [of APHIS] from Hawaii or the territories unless the Administrator has determined that the risk posed by each quarantine pest associated with the fruit or vegetable can be reasonably mitigated by the application of one or more phytosanitary measures designated by the Administrator." [11]

USDA maintains a list of commodities that have been evaluated for domestic export from Hawaii, "Approved Fresh Fruits, Herbs, and Vegetables from Hawaii (hereinafter referred to as the "approved commodities list")."[12] These approved commodities are subject to specific treatment or handling in order to be shipped, which is also included in the footnotes to the list.[13]

For a commodity to be considered by USDA for inclusion on the list, it must first be requested by the Hawaii Department of Agriculture and Biosecurity (DAB). Subsequently, USDA undergoes a specific sequence of research, consultations, and comments to evaluate pest risks. There are 13 identifiable steps in the Commodity Import Approval Process in order for a fruit or vegetable to be added to Hawaii's approved commodities list. This process can take 5+ years before a commodity successfully receives market access.

---

[11] **7 CFR 318.13-4**

[12] **US Department of Agriculture, Animal and Plant Health Inspection Service, "Hawaii Manual: Regulation and Clearance from Hawaii to Other Parts of the United States."**

[13] **See Appendix I.**

Fig. 1

## Federal Regulatory Process to Add Commodity as "Approved Fresh Fruits, Herbs, and Vegetables from Hawaii" for Export to US[14]




The successful outcome of this process is market access to the US, subject to certain handling or treatment specifications. One of the most common prescribed treatments for Hawaii produce is irradiation, whereby fruits and vegetables are run under an industrial machine– being exposed to high-powered x-rays or other forms of ionizing radiation safely kills insects and microbes, and extends the shelf life of food without compromising the quality of produce.[15] This tool was pioneered in Hawaii as a method to address federal quarantine restrictions and mitigate pest issues. Additional requirements may include interventions like specifying required farm management practices, physical inspections of shipped goods by regulatory personnel, and processing/shipping requirements in order to reduce the risks posed by specific pests.

[14] US Department of Agriculture, "Commodity Import Approval Process."

[15] Moy, "Problems and Prospects of Radiation and Disinfestation and Shelf-Life, Extension of Tropical Fruits and Vegetables."

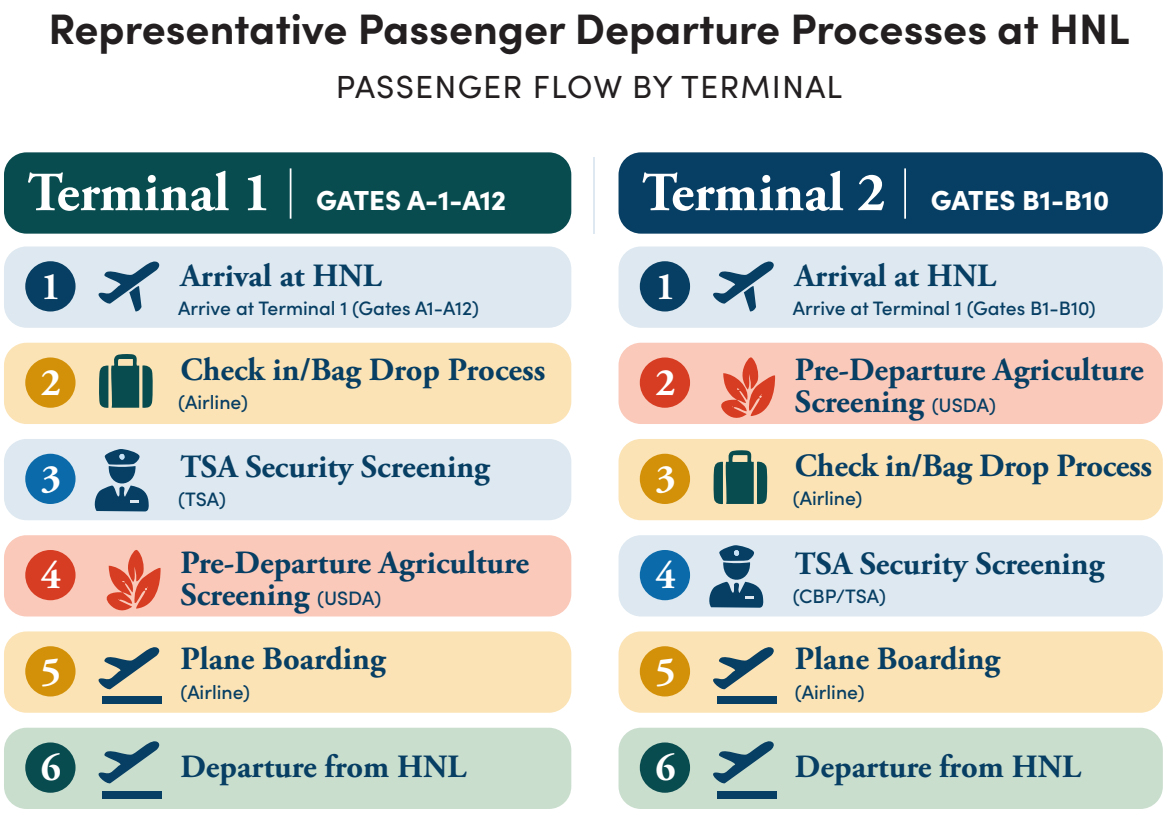
## Component Two: Mandatory Inspections of All Persons, Baggage, Cargo, and Vessels Bound for US

The second component that both locals and visitors may be familiar with having traveled out of Hawaii, is the requirement that all articles and persons be subject to search when moving between Hawaii and other parts of the US. This requirement was codified in federal law through the Farm Security and Rural Investment Act of 2002, requiring APHIS to conduct "preclearance quarantine inspections of persons, baggage, cargo, and any other articles destined for movement from the State of Hawaii" to any other part of the US.[16] As such, people, planes, baggage, and vessels are unable to depart to a US location without prior approval of USDA personnel.

As an example, agriculture screening by the USDA at Terminal 2 of Honolulu's Daniel K. Inouye International Airport (HNL), Hawaii's largest airport, typically takes place as a distinct screening process prior to passenger check-in/bag drop. Terminal 2 handles the bulk of HNL's US mainland carriers, however international and inter-island passengers are allowed to bypass this screening. The inspection involved the required declaration of fresh fruits/vegetables and included the standard inspection of baggage and belongings through x-ray machines–passengers are required to load, and if directed further, to open their baggage to comply with this inspection.[17]

There are protective benefits that Hawaii receives as a result of US territories being subject to these screenings, such as helping augment DAB screenings for brown tree snakes from Guam. Brown tree snakes would be a particularly disruptive invasive species for Hawaii's native bird populations as well as electrical infrastructure.[18]

Fig. 2




[16] Section 108011 of the Farm Security and Rural Investment Act of 2002 (7 U.S.C. 8307 note); 7 CFR 318.13-8.

[17] 7 CFR 318.13-10.

[18] Burnett et al., "Beyond the Lamppost: Optimal Prevention and Control of the Brown Tree Snake in Hawaii."

# PART II: Impacts of the Federal Quarantine on Hawaii

Regulations related to Hawaii's quarantine impact the state in a variety of ways, the biggest being the inability to effectively sell locally grown fresh produce to the US. Limited market access for growers of new commodities impacts the ability for local farms to scale. Farmers who are able to receive regulatory clearance might be impacted by complications related to risk mitigation compliance. In addition, there are general disruptions as a result of the quarantine enforcement to travelers and vessels subject to agricultural screening. On the whole, the quarantine has a significant impact in Hawaii, as much as $800M annually– though more work is needed to better quantify this number.

## Regulatory Delays

The structure of Hawaii's quarantine poses a challenge for diversified agriculture. Barring inclusion on the list, the average Hawaii farmer growing a new commodity is unable to export fresh produce from Hawaii to other parts of the US.

While the approved commodities list in some cases encompasses fruit and vegetable products broadly under a generalized commodity name (e.g. taro, which would include the 80+ different cultivars known to occur in modern Hawaii),[19] some commodities are specified down to the cultivar level (e.g. Sharwil avocado or tahitian limes) which expands the regulatory scrutiny for specific groups.[20] Market access may be restricted for years due to pending regulatory requirements, and could grow with multiple cultivars or varieties within a single agricultural operation. Meanwhile pressures from debt payments, scaling requirements of a farm venture, or crop maturity (and thus disposal of produce with no markets) may add additional cost and operational challenges while waiting for the regulatory process to complete.

As seen with the following case studies, being unable to export a crop to the US market is a major barrier to scaling an agricultural operation and its viability, regardless of the size of a farm's operations.

---

[19] **University of Hawaii, College of Tropical Agriculture and Human Resilience, "Taro Varieties in Hawaii."**

[20] **See Appendix I.**





## Case Study 1: Wasabi (Eutrema japonicum) and Volcano Wasabi, Hawaii Island

Volcano Wasabi has been awaiting USDA APHIS approved commodity status for over four years. Even with anticipated regulatory approval being around the corner, administrative delays and standard inspection requirements by USDA threaten the commercial success of wasabi exports to the continental US.

Introduction: Volcano Wasabi is a wasabi farm that was founded in 2021 in Volcano, Hawaii Island, by Maui resident Jon Kindred, and is the first successful example of commercial wasabi production in Hawaii. Since the farm's founding, in addition to scaling up their operations, Volcano Wasabi has partnered with the University of Hawaii at Manoa and Japanese Wasabi producer Kinjirushi to research wasabi cultivation in Hawaii and growing techniques to further develop local industry in the State.

About Japanese Wasabi: Wasabi is a niche and highly desirable crop for Hawaii due to ample rainfall in certain parts of the State and the high value of fresh wasabi rhizomes and leaves (whole wasabi rhizomes range from $100-$200 per pound, one of the most expensive agricultural commodities in the world).[21] Most of the "wasabi" consumed in the United States is not actual Japanese wasabi *(Eutrema japonicum)*, but rather commercially processed and green-dyed western horseradish *(Armoracia rusticana)*. Unlike western horseradish, which can be grown relatively easily in temperate climates and matures in just 4-6 months, true wasabi requires stringent growing conditions, takes up to 24 months to mature, along with continual climate control to ensure quality.[22]

[21] **Asahi Shimbun Staff, "Feature 'Wasabi, Japanese Flavor.'"**

[22] **Miles and Daniels, "Growing Wasabi in the Pacific Northwest."**

**Impacts of Federal Regulations:** Volcano Wasabi has invested roughly $2 million to set up a successful wasabi farm on the Big Island, and is currently selling to local restaurants within the State. However, without access to the large mainland food market, it is unlikely Volcano Wasabi will be able to reach a sales volume that generates a profit. Wasabi can currently be shipped fresh into Hawaii from both Japan and the rest of the United States.

**Major Regulatory Milestones for Wasabi:**

- ***May 27th, 2022:*** **Volcano Wasabi submits Commodity Risk Assessment Request to Hawaii Department of Agriculture and Biosecurity.[23]**
- ***January 22nd, 2024:*** **Draft Pest Risk Assessment completed by USDA APHIS.[24]**
- ***December 5th, 2024:*** **Draft Risk Mitigation Document completed by USDA APHIS.[25]**
- ***March 2025:*** **Draft Risk Mitigation Document undergoing agency review and comments at HDOA.**
- ***August 19, 2026:*** **USDA APHIS staff conduct site visit at Volcano Wasabi.**

**Current Implications:** Having navigated through most of the USDA's permitting process for nearly three years, Volcano Wasabi's farm growth has been limited by the speed of regulation.

USDA APHIS's research on wasabi "found no organisms that met the threshold for unacceptable consequences of introduction and can follow the pathway [between Hawaii and the rest of the US,"[26] though proposing risk mitigation requirements for domestic export of wasabi that include physical inspection by agriculture authorities in Hawaii, which threatens Volcano Wasabi's profitability.

Being located on a predominantly rural island, the inspection requirement imposes additional logistical challenges for the farm which must route shipments to a plant quarantine inspection facility. At the facility, additional hand inspections of in-transit produce threaten the viability of shipped wasabi rhizome/leaves by disrupting the climate controlled packaging used to preserve wasabi quality in the shipping process.

A bright spot is regulatory approval is anticipated. Additionally, USDA staff and State of Hawaii personnel have been exploring opportunities for temporary direct shipping pending formal commodity approvals and farm-specific certification which may allow Volcano Wasabi to ship wasabi directly without individual package inspections. Efforts such as this could be expanded to other low-risk, high-value commodities that are awaiting approval on the commodities list.

---

**[23] See Appendix IIa - Commodity Risk Assessment Request (Volcano Wasabi to HDOA)**

**[24] See Appendix IIb - USDA Pest Risk Assessment (Version 1), Interstate movement of wasabi *(Eutrema japonicum)* from Hawaii into the continental United States for consumption**

**[25] See Appendix IIc - Risk Management Document, Interstate movement of wasabi (Eutrema japonicum) from Hawaii into the continental United States for consumption.**

**[26] See Appendix IIb.**

## Case Study #2: Tahitian Limes (citrus x latifolia) and Mahi Pono, Maui

Mahi Pono is the largest US producer of limes and has been working through USDA export approvals for the last two years for their lime crop. The farm has planted 3,000 acres of limes in Central Maui, however has been unable to sell limes to the mainland US market due to the quarantine restrictions and their pending application for the approved commodities list which they have been waiting for since 2023.

Introduction: Mahi Pono is Hawaii's largest diversified agricultural operation, growing "lime, lemon, orange, tangerine, coffee, avocado, macadamia nut, 'ulu [(breadfruit)], onion, watermelon, bananas, coconut, and lilikoi [(passionfruit)]."[27] The farm manages over 12 million trees across 41,000 acres of former sugar plantation land. It has found particular success in growing tahitian limes (also known as persian limes), which once established, can be harvested year-round. Limes are one of Hawaii's top imported crops, so the growth of a local lime industry helps reduce out-of-state food reliance and also serves as a potentially lucrative export crop for the state, which can support further agricultural development at the company to address unique staple crop needs in Hawaii's local markets.

Impacts of Federal Regulations: Mahi Pono has been waiting since 2023 for regulatory approval for its tahitian limes. Without access to US markets, the operation has relied on providing limes for Hawaii's local food market and has been able to export to Canada via transshipment through the continental US via commercial passenger airliners, primarily through Seattle then via truck into Canada. Being left out of the US market is a serious issue for Mahi Pono that impacts business profitability given the scale of its operations.

Transshipment allows for commodities that are not approved for US markets to transit within the US with final destination in a foreign country, subject to certain pest risk mitigation steps, such as insect-proof netting, while the commodity is transiting on US soil. These regulations are governed within 7 CFR 318.13-6.

Current Implications: Without access to the US market, the farm will likely resort to burying fruit that is unable to be absorbed locally or abroad. The farm's operations are already at scale to supply US consumers on the continental US and output will continue to expand as their lime trees continue to mature. Despite a favorable pest risk assessment, discussions have been taking place between Mahi Pono and the USDA over continued risks related to tephritid fruit flies.

Additional issues in 2026 have emerged, such as a change in USDA enforcement potentially turning away fruit bound for Canada's market via transshipment, which could threaten the company's access to international markets as well. The enforcement change has paused for the time being, but changes in regulatory enforcement under Hawaii's quarantine could further restrict Mahi Pono's ability to sell its limes, even abroad.

---

[27] **Mahi Pono, "Facts And Figures."**



# Impacts Related to Pest Risk Mitigation

Once approved, it is also possible that certain pest-risk mitigation requirements may disadvantage Hawaii-grown produce, such as treatment cost or labelling issues. As mentioned, irradiation of fruits was a breakthrough that allowed Hawaii-grown produce to be exported at scale while limiting pest risks. However, there are treatment costs associated with irradiation, along with federal regulations that impact the marketability of these products.

The US Food and Drug Administration requires irradiated food to be labeled publicly with the "radura symbol," along with the words "Treated with radiation" or "Treated by irradiation."[28] It has been found that the specific labelling results in adverse consumer impressions on food quality, despite the technique being a safe and effective means of treatment.[29]

Fig. 3 -




# Impacts Related to Passenger Travel and Enforcement

There are also hidden costs related to regulatory enforcement in the delays and additional time added to travelers in screenings at Hawaii airports. Just 15 seconds of additional screening per passenger traveling to other parts of the US results in over $2.85M in time losses for the annual 14.4M travelers subject to these requirements in the state (based on federal guidance for Value of Time Travel).[30] This does not consider the impact that mandatory agriculture inspections have on commercial aviation, the maritime industry, and shipping, which is likely costlier.

These cumulative activities authorized in the statute and regulations are administered through USDA APHIS pre-departure inspections which cost an additional $40.7M annually in program expenses for the federal government.[31]

---

[28] **US Food and Drug Administration, "21 CFR 179.26."**

[29] **Bearth and Siegrist, "'As Long as It Is Not Irradiated' – Influencing Factors of US Consumers' Acceptance of Food Irradiation."**

[30] **US Department of Transportation, "The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2016 Update)."**

[31] **US Department of Agriculture, "2025 Budget for the U.S. Department of Agriculture (USDA), Explanatory Notes-- Animal and Plant Health Inspection Service."**

# Estimates on the Cost of Federal Regulations in Hawaii

There has not been a recent study on the cumulative cost of the quarantine on Hawaii. In 1989, the most recent and cited study, it was estimated that market losses for agricultural products due to quarantine status related to tephritid fruit flies in Hawaii was $300M, or just about $760M in 2024 dollars.[32] Unfortunately, the full methodology behind the 1989 figure has likely been lost, despite being cited in a number of publications and likely includes other considerations, such as lost foreign markets as well. In addition, other cost considerations will need to be quantified, such as compliance costs related to pest mitigation requirements for allowed exports and the USDA pre-departure inspection time and administrative costs to Hawaii's aviation and maritime vessel operators, which could be significant.

Despite these limitations, tabulating the estimated costs of increased passenger screening times in Hawaii by the USDA, the direct program costs for USDA to administer pre-departure inspections associated with Hawaii's quarantine, and also the market losses for Hawaii's agricultural industry, results in an annual cost of over $800M. For reference, in 2022 the value of Hawaii's total agricultural sales were just $673M.

Work to further quantify the impacts of Hawaii's federal quarantine is a key area of need.

Fig. 4 -

## Documented Annual Costs Related to Federal Quarantine Restrictions on Hawaii

| Documented Cost Type | Estimated Annual Costs (2024 dollars) |
|---|---|
| Market Losses for Hawaii Agriculture | $760M[34*] |
| Pre-Departure Inspection Costs (USDA-APHIS) | $40.7M[35] |
| Time Costs on Travelers (USDA Pre Departure Inspections) | $2.85M[36,37] |
| Pest Mitigation Compliance Costs for Farmers (USDA-APHIS) | $2.54M[38*] |
| **Total** | **$806M** |

*adjusted from 1989 to 2024 dollars.

[32]Staples and Cowie, *Hawai'i's Invasive Species.*, 52.

[33]National Agricultural Statistics Service, "2022 Census of Agriculture - State Data, Hawaii."

[34]Jang, "Fruit Flies and Their Impact on Agriculture in Hawaii."

[35]US Department of Agriculture, "2025 Budget for the U.S. Department of Agriculture (USDA), Explanatory Notes-- Animal and Plant Health Inspection Service."

[36]US Department of Transportation, "The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2016 Update)."

[37]Curlett, "PPQ 2022 Annual Report, Strengthening Pest Exclusion at the Border."

[38]Staples and Cowie, *Hawai'i's Invasive Species*, 52.

# Part III: Regulatory Origins of the Quarantine

To understand where Hawaii is today with its quarantine, it is also instructive to understand the quarantine's origins. The quarantine originated in 1911 as an action taken by the State of California against the Territory of Hawaii, which was then adopted by the federal government in 1912.[39] The creation and design of Hawaii's quarantine can largely be credited to the traveling entomologist George Compere, who worked as a government entomologist in Western Australia and the State of California. As early as 1903, Compere was featured in California newspapers sounding the alarm for California fruit growers based off of his work in studying Mediterranean fruit fly for the Western Australian government.[40] However, by 1910, his focus was the threat that "Mexico, and... especially the Hawaiian Islands" posed to the State of California and the rest of the US.[41]

Based on the finding in Hawaii of Mediterranean fruit flies, or Medfly, Compere raised the issue to California's fruit industry about the prospect of a Mediterranean fruit fly invasion. He published a widely reproduced paper profiling tephritid fruit flies and gave remarks at the 1910 California state convention of fruit growers, through which he pushed for a full quarantine on Hawaii. Compere, in his paper, writes of tephritid fruit flies as "the most destructive of all the insect pests" and urged "immediate action to prevent this calamity and protect our fruit industry from the certain destruction that has attended the introduction of this Mediterranean fruit fly."[42]

A reporter from the San Francisco Chronicle described the convention's proceedings:

> "All other considerations were practically cast aside when the full farce of the peril became realized, and immediate and drastic steps were taken towards securing protection. A resolution is now in the course of construction which a special session of the legislative committee will be armed to secure a quarantine law, a remedy endorsed by the convention as the only one which can fight the peril with any degree of certainty."[43]

On June 17, 1911, the State of California, with the cooperation of the steamship operators that served the California-Hawaii route, issued an embargo on all produce from Hawaii due to the presence of Medflies discovered in the then territory.[44] Beyond just commercial shipments of fruits, the steamships required passengers to consent to the search of their persons and baggage by Californian officials. Compere in his 1910 paper argues in favor of these across-the board passenger searches, describing the deficiencies of California's regulations against Hawaii "in the case of passengers coming from the Hawaiian Islands, there is no such inspection of baggage by Uncle Sam's agents, and under our state quarantine law they have no right to open baggage to see if it contains fruits, vegetables, or plants."[45]

This was the structural birth of Hawaii's quarantine, which also served to endow it with two of its defining features: (1) the breadth of restricted items through the restriction of all produce; and (2) the implementation of interstate agriculture inspections of vessels, persons, and baggage. This was recognized at the time as one of the strictest agricultural quarantines established, with the headline from the Hawaiian Star proclaiming the actions, "The most rigid quarantine regulation ever put into effect between California and the Hawaiian Islands."[46]

---

**[39] Commercial Advertiser Staff, "May Bar Out Hawaii's Fruit: Secretary Wilson Is to Grant Hearing Before Ordering a Strict Quarantine."**

**[40] The San Francisco Examiner Staff, "If a Fly Should Come to California."**

**[41] The Evening Mail Staff, "Nation's Fruit Industry Declared to Be in Peril: Destructive Mediterranean Fly Menaces Horticulture and Fruit Men Will Ask for Legislative Action."**

**[42] Compere, "Flies That Threaten the Fruit Industry: Full Text of George Compere's Paper That Aroused the State Convention, What Should Be Done to Fight the Mediterranean Fly."**

**[43] San Francisco Chronicle Staff, "Sounds Alarm to Fruit-Growers: George Compere Urges Action to Prevent Entry of the Mediterranean Fly."**

**[44] The Hawaiian Star Staff, "Most Rigid Rules of Quarantine Against Hawaii's New Fruit Pest."**

**[45] Compere, "Flies That Threaten the Fruit Industry: Full Text of George Compere's Paper That Aroused the State Convention, What Should Be Done to Fight the Mediterranean Fly."**

**[46] The Hawaiian Star Staff, "Most Rigid Rules of Quarantine Against Hawaii's New Fruit Pest."**

Both Congress and the US Secretary of Agriculture followed California's lead to provide the USDA the power to implement and enforce agricultural quarantines through the Plant Quarantine Act of 1912.[47] Thereafter, the USDA invoked a full quarantine on Hawaii as one of the first federal plant quarantines established. The Honolulu Advertiser wrote in August 1912, "The secretary of agriculture today announced his intention, under the provisions of the new federal plant quarantine law, of declaring a strict quarantine against Hawaii for the fruit fly."[48]


IF A FLY SHOULD COME to CALIFORNIA

Why George Compere Has Started Around the World With a Magnifying Glass to Find a Bug, and Why It Is Vitally Important to the Fruit Industry That His Search Be Successful.

Geo. Compere

THE QUEENSLAND FRUIT FLY (Dacus Tryoni)

METHOD OF ATTACK UPON FRUIT.

How to Look Your Prettiest in a Photograph.

Copyright © 2025 Newspapers.com. All Rights Reserved.

The 1912 quarantine provisions rolled back passenger inspection requirements, however these were put back in place by 1914, essentially preserving California's initial quarantine regime, albeit with federal employees conducting inspections of both commercial fruit shipments and travelers/baggage, rather than Hawaii and California officials, and with a broader scope impacting shipments bound to other parts of the US.[49]

There were caveats pointed out by contemporaries to Compere. It was known in 1914 that bananas were capable of serving host to tephritid fruit flies, but only at the point of being "far too ripe."[50] By the time these bananas would have reached the mainland US by steamship, which was about 5-7 days, they would be extremely decomposed—so the commercial risks for bananas transmitting fruit flies of any type were very low. For these reasons, there were exemptions made to the 1912 quarantine to ensure that banana shipments would not be impeded. Pineapple too, after some significant lobbying and testing, proved incapable of hosting fruit flies in any form and were allowed to be exempted as well.

Farmers looking to export fresh produce from the islands would, like growers from the banana and pineapple industry, henceforth need to provide justification that proved a lack of pest risk. This regulatory practice lives on today through the approved commodities list. Any passengers traveling from Hawaii to the rest of the US must undergo an inspection of their belongings by agricultural personnel. This too continues through USDA's pre-departure inspections.

By 1914, the quarantine requirements on Hawaii were already impacting commercial and business preferences against Hawaii fruits, with a pair of prospective fruit buyers noting, "We came here to look into the possibility of obtaining alligator pears [(avocados)] and other fruits… if some arrangement can be made by which the fruit can be shipped without danger of carrying the fruit fly, so that it will be exempted from the federal quarantines."[51] Today, most fruits and vegetables, including avocados (save for Sharwil avocados and certain avocado shipments to Alaska), are not approved for export from Hawaii to the mainland US.[52]

---

**[48] 7 U.S.C. 151 et seq.**

**[48] Commercial Advertiser Staff, "May Bar Out Hawaii's Fruit: Secretary Wilson Is to Grant Hearing Before Ordering a Strict Quarantine."**

**[49] US Department of Agriculture, "Notice of Quarantine No. 13. With Regulations (Effective on and after May 1, 1914)."**

**[50] Commercial Advertiser Staff, "Report of Pineapple and Banana Exclusion Exploded by Dr. Back: Associated Press Dispatch Is Correct, but Headlines Are Misleading."**

**[51] Honolulu Star-Bulletin Staff, "Californians Investigating Fruit Industry: Outcome of Visit May Mean Trade Worth Millions to Territory of Hawaii."**

**[52] See Appendix I.**

# PART IV: Comparative Analysis of Hawaii's Treatment Under 7 CFR 318

Despite regulations governing the plant quarantine in Hawaii having their own section in the CFR, the state's treatment is, practically speaking, largely consistent with that of other states as a result of the invasive species risk profile within the state – though from a technical, bureaucratic standpoint, Hawaii is treated more like a foreign country than a state. Were Hawaii to be treated under domestic quarantine regulations, it would likely result in a similar regulatory treatment, though with trade-offs. Analyzing tephritid fruit fly commodities, the domestic quarantine list is extensive, though less broad than a default ban. Meanwhile Hawaii and foreign quarantines more commonly allow for a systems approach through farm practices in lieu of specific fruit treatment application, while this is less common in domestic quarantine regulations for more significant pests like exotic fruit flies.

Minimizing the economic impact of existing quarantine regulations and addressing the underlying reason for Hawaii's quarantine status, established invasive species, are likely the most important areas for improvement related to the quarantine in lieu of advocating for regulatory parity.

When comparing the Hawaii and domestic quarantine notices, the fruit fly subpart of the domestic quarantine notice is used (7 CFR 301 Subpart C). This is because of exotic fruit fly's historical role in the establishment of the Hawaii quarantine, their current presence in Hawaii's agricultural landscapes, and their status as a major quarantine pest around the world. While exotic fruit flies are a major pest of concern, the Hawaii quarantine notice is broader and potentially applicable to any number of current and future pests. Therefore, the comparative analysis that follows may actually overstate the degree to which Hawaii's treatment differs from that of other states. Additionally, when comparing Hawaii and foreign quarantine notices, the fruit and vegetable subpart of the foreign quarantine is used (7 CFR 319 Subpart L). Because Hawaii is not a major producer of the commodities governed by other subparts and the regulations are not pest-specific, the comparative analysis of Hawaii and foreign country treatment isn't expected to be biased.[53]

## Hawaii and Territories Quarantine and International Quarantines

The regulations governing Hawaii and foreign quarantines are so closely aligned that oftentimes the language used in one is repeated verbatim in the other.[54] Generally, all products originating in Hawaii or a foreign country are considered vectors for plant diseases and pests unless proven otherwise.

Proving otherwise under both quarantines is done through a risk assessment, which seeks to determine if, and under what conditions, imports can be conducted in a way that mitigates the potential of spreading plant diseases and pests in the United States. Risk assessments are limited to specific geographic regions and commodity pairs. For example, the approval of sour lime imports from Mexico does not mean all fruits and vegetables from Mexico can now be imported nor does it mean sour limes from any country are permitted. While the US will import sour limes from Mexico, sour limes from dozens of countries are not accepted, including from large citrus producers such as Argentina and South Africa.[55] Furthermore, there are currently 188 fruits and vegetables that Mexico cannot ship to the US that other countries can.[56] This is because, as APHIS says, "a pest may pose a different level of risk for the same commodity from a different country, or from a different commodity from the same host plant species."[57]

---

**[53] Coffee is listed in Subpart O and Hawaii is one of the only areas in the U.S. that produces coffee. However, these regulations concern protecting Hawaii's coffee industry from pest introduction.**

**[54] 7 CFR 319.56-4 (Foreign) and 7 CFR 318.13-4 (Hawai'i).**

**[55] US Department of Agriculture, Animal and Plant Health Inspection Service, "Commodity Import Requirements: Sour Lime and Persian Lime from Inadmissible Countries into All Ports."**

**[56] US Department of Agriculture, Animal and Plant Health Inspection Service, "Plants and Plant Products Not for Propagation."**

**[57] US Department of Agriculture, Animal and Plant Health Inspection Service, "Risk Assessment for the Importation of Fresh Lemon (Citrus Limon (L.) Burm. F.) Fruit from Northwest Argentina into the Continental United States (August 6, 2007)."**

Once a risk assessment is complete, published, and comments from the public have been solicited, both the Hawaii and foreign quarantines then allow commodities with a favorable determination to be placed on an authorized list and imported, subject to certain conditions. These conditions include permitting/certification, inspection, and adherence to proscribed phytosanitary measures. Exact requirements will vary depending on the particular risk assessment, but the process used under both the Hawaii and foreign quarantine notices largely mirror one another. According to current regulatory staff, this dynamic involves competing procedural resources from USDA APHIS research and administrative staff that often de-prioritizes Hawaii commodities. The issue of prioritization is a key area for potential reform.

## Hawaii and Territories Quarantine and Domestic Quarantines

While in many respects Hawaii is treated more similarly to a foreign country than a state, the practical impact of the different regulatory regimes is likely negligible, and the process used for Hawaii can be reasonably explained by a risk profile that is different from that of states on the mainland. A 1993 assessment by the Congressional Office of Technology Assessment says about Hawaii that "no other area of the United States receives as many new species annually, nor has a greater proportion of non-indigenous species established in the wild." This is attributed to geography, climatic conditions, tourism, military traffic, and high import dependence.[58]

To illustrate the limited practical impacts of the separate regulatory regimes, imagine a scenario in which the Hawaii quarantine notice is repealed. Hawaii still has established and widespread populations of exotic fruit flies and the entire state would therefore be designated as a quarantine area under the domestic fruit fly quarantines, leaving the agricultural sector's situation virtually unchanged.

### *Regionalization of Quarantine*

While provisions exist under the domestic notice for less than an entire state to be quarantined, that is dependent on "the state enforcing restrictions on the intrastate movement of regulated articles that are equivalent to those imposed by this subpart on interstate movement of regulated articles."[59] Hawaii does not impose such restrictions as exotic fruit flies are established throughout the island chain. If Hawaii was subject to the domestic quarantine and eradicated or sufficiently suppressed exotic fruit flies in a particular area of the state, then a pathway would exist for portions of the state to avoid a quarantine order and trade more freely with the mainland.

However, this is also the case with the current Hawaii-specific quarantine, which includes procedures for designating areas within the state as pest-free.[60] Included in this process is the state submitting information to APHIS, a determination being announced, public comment being accepted for 60 days, and a final decision then being made.[61] It is true that this process is more cumbersome than for the removal of the domestic fruit fly quarantine, which requires only sufficient time passing without evidence of infestation.[62] But this is because other states have periodic detection of exotic fruit flies followed by eradication – or significant suppression in major growing areas – while Hawaii has widespread establishment with no ongoing eradication efforts.

### *Scope of Restricted Commodities in Quarantines*

In addition to offering limited, if any benefits, in the designation of pest-free areas, being subject to the domestic quarantine would still greatly restrict the products that Hawaii could ship interstate. Currently, the list of regulated articles, whose movement is restricted from areas under domestic fruit fly quarantine, totals more than 80 pages for the four types of exotic fruit flies established in Hawaii.[63] Furthermore, the regulation provides for immediate designation as a regulated article, whose movement is restricted, any product an inspector determines presents a risk.

---

**[58] U.S. Congress, Office of Technology Assessment, *Harmful Non-Indigenous Species in the United States.***

**[59] 7 CFR 301.32-3b.**

**Similar provisions for establishing pest-free areas are also present in the foreign quarantine notice, 7 CFR 319.56-5.**

**[60] US Department of Agriculture, Animal and Plant Health Inspection Service, "Plants and Plant Products Not for Propagation."**

**[61] 7 CFR 318.13-5a, b, c.**

**[62] 7 CFR 301.32-3d.**

**[63] US Department of Agriculture, Animal and Plant Health Inspection Service, "Fruit Fly Host Lists."**

While the domestic fruit fly quarantine has the potential to be extremely broad, it is less so than the Hawaii quarantine. But importantly, as mentioned above, the Hawaii quarantine is aimed at a wide swath of pests – not just exotic fruit flies. Nevertheless, even under just a domestic quarantine notice for exotic fruit flies, it is conceivable that some of the novel crops grown in Hawaii, that are not widely grown elsewhere and for which risk assessments are limited, would be designated as regulated articles at the discretion of inspectors out of an abundance of caution.[64]

***Flexibility in Treatment Measures***

Adding products to the authorized commodity list under the Hawaii quarantine notice can, like most bureaucratic processes, harm local producers due to delays and barriers; however, it is also true this mechanism provides a lifeline for those farms who are able to export under the terms of the regulation. The reason for this is the potential to ship certain commodities, without post-harvest treatment, using a systems approach. An example of this is the proposal for the Hawaii fruit sector to use this approach, instead of post-harvest forced hot air treatment or irradiation, to ship tahitian limes to the mainland– helping to avoid extra treatment costs or the impacts of labelling requirements.[65]

While final approval of the proposal for tahitian limes is still not complete, it is highly likely given a favorable risk assessment and utilization of the systems approach for sour limes in other regions with established fruit flies.[66] Conversely, the domestic exotic fruity fly quarantine notice lacks such flexibility within core detection areas,[67] even for products like sour limes that are considered relatively poor exotic fruit fly hosts.[68] However, just because past exotic fruit fly domestic quarantine notices have required post-harvest treatment of regulated articles in core detection areas does not necessarily mean APHIS and state regulators would not consider systems approaches in the future, as they have for other types of domestic pest quarantines.[69]

***Takeaways from Comparative Analysis***

Quarantine notices and the pests that trigger them are costly. No regulatory regime designed to balance controlling pests and facilitating trade will be perfect, but they should be reasonable. Hawaii is geographically far and quite different from other states. As such, it makes sense that quarantine regulations would be structured differently. But the different structures alone likely do not lead to vastly different outcomes, as the examination above illustrates. That being said, impacts to Hawaii's economy can be minimized through administrative reforms and greater prioritization of Hawaii growers in terms of attention and resources, given the unique set of challenges the state faces.

The fact that exotic fruit flies, a major quarantine pest all around the world, are established in Hawaii is the fundamental reason trade with the mainland is restricted. Additional analysis that incorporates other pests currently present in Hawaii or those that have a high risk of being established in the state would put a finer point on any practical difference, or lack thereof, in outcomes.

---

**[64] 7 CFR 302.32-2d.**

**[65] US Department of Agriculture, Animal and Plant Health Inspection Service, "Notice of Proposed Revision to Requirements for the Movement of Fresh Persian Lime Fruit for Consumption From Hawaii Into the Continental United States."**

**[66] US Department of Agriculture, Animal and Plant Health Inspection Service, "Hawai'i-Grown Lemons and Limes Ready for Export."**

**[67] California Department of Food and Agriculture, "Harvest and Crop Movement Requirements for Growers Within and Adjacent to Invasive Fruit Fly Quarantine Areas."**

**[68] US Department of Agriculture, Animal and Plant Health Inspection Service, "Mediterranean Fruit Fly, Ceratitis Capitata (Wiedemann), Regulated Host List, 2026."**

**[69] US Department of Agriculture, Animal and Plant Health Inspection Service, "Protocols for the Management and Movement of Regulated Articles Produced in Areas Quarantined for European Grapevine Moth (Lobesia Botrana), Systems Approach for Fresh Grape Shipments (Consumption Only)."**

# Part V: Quarantine Pests in Hawaii– Tephritid Fruit Flies

The establishment of tephritid fruit flies in Hawaii was the original justification to begin quarantining the islands from the rest of the country, and remain some of the biggest justifications for continuing any form of quarantine regime.

Tephritid fruit flies are notorious in the agriculture industry due to the breadth of crops certain species of fly can impact– for example the Mediterranean fruit fly *(Ceratitis capitata)*, which has a native range in Northern Africa and has been introduced to Southern Europe, Australia, and the Americas, impacts over 200 fruits. Hawaii has four of the major species of these flies that are damaging to agriculture, with each species impacting a unique set of fruits and vegetables. None of these four specific pest flies are native to Hawaii.

The primary mechanism by which these specific tephritids cause economic harm to fruits is during their larval stage– adult flies lay their eggs into fresh fruits/vegetables, the eggs then hatch into larvae which consume the fruit from the inside. While consuming the fruit, the fly maggots spread bacteria and cause rot to set in, damaging the fruit and rendering the crop either unviable or completely unmarketable. These larvae, when mature, evacuate the infested fruit in order to pupate in soil, where after some time the adult flies emerge. Because of this development cycle, fruit flies especially take advantage of windfallen fruits and vegetables, and are known to breed heavily in yards or farms that do not practice good field hygiene.[70]

It is actually an uncommon trait for tephritid fruit flies to be generalist feeders– most tephritids are "highly host specific and susceptible to control by cultural practices such as staggering crops, isolating plantings, and removing crop debris."[71] Rather than targeting a specific host plant, the four major tephritid pests in Hawaii are generalists. Despite the breadth of potential host plants, the degree of impact and ability to infest fruits really varies between commodity types and even between varieties within a specific species of fruit. Certain fruits that are designated as hosts are only susceptible when they are essentially rotting, while others may be vulnerable during development and ripening.[72]

[70] **Mau et al., "The Hawaii Area-Wide Fruit Fly Pest Management Programme."**

[71] **Whitfield et al., *Daly and Doyen's Introduction to Insect Biology and Diversity*. (p 566)**

[72] **Follett et al., "Host Status of Persian Lime (Citrus Latifolia Tan.) to Oriental Fruit Fly and Mediterranean Fruit Fly."**

Fig. 5

# The Fruit Fly Pest Complex in Hawaii



**Image 1: Mediterranean fruit fly, *Ceratitis capitata***

© Scott Bauer, USDA Agricultural Research Service, Bugwood.org - licensed under a Creative Commons Attribution 3.0 License. (https://www.invasive.org/browse/detail.cfm?imgnum=1317085)



**Image 2: Melon fly, *Bactrocera cucurbitae***

© David Anderson - licensed under a Creative Commons Attribution 4.0 License (https://www.inaturalist.org/photos/26166664)



**Image 3: Oriental fruit fly, *Bactrocera dorsalis***

© budak - licensed under a Creative Commons Attribution-NonCommercial 4.0 License (https://www.inaturalist.org/photos/79313951)



**Image 4: Malaysian fruit fly, solanaceous fruit fly, *Bactrocera latifrons***

© icipe_Biosystematics_unit-R_Copeland - Creative Commons Attribution-NonCommercial 4.0 License (https://www.inaturalist.org/photos/140589036)

An important distinction to make is that these noxious fruit flies belong to the family of flies called Tephritidae. These flies are different from the "fruit flies" most individuals are familiar with, which are typically found around overripe fruit or trash cans in households. These small flies are actually in a different family, Drosophilidae. They are commonly referred to among entomologists as "vinegar flies" or "pomace flies" to better distinguish between the two families. Unlike the generalist tephritid fruit flies, these drosophilid vinegar flies generally do not impact undamaged fruit.

Hawaii is also home to species of endemic tephritid fruit flies, however they are not agricultural pests and instead colonize a few species of endemic plants. The knowledge of endemic tephritids and maintaining historical insect records such as through the Hawaii Biological Survey at the Bishop Museum is critical for efforts involving biocontrol research. The importation of new organisms to reduce populations of pests, a critical tool in economically controlling invasive pest populations, must be tested to minimize impact to these native insects, which can be inadvertently harmed through biocontrol implementation.[73] This is particularly important for Hawaii, given the diversity of native fauna and the fragility of many species due to habitat disruption. The better Hawaii is able to understand its native wildlife, the greater confidence researchers and regulatory officials are able to conduct needed biocontrol work on invasives.

## Fruit Fly Management in Hawaii

Despite having been established in Hawaii as far back as the 1910s, Hawaii farmers have grown citrus, melons, papayas, and many of the other crops impacted by the fruit fly for both local markets and export. This was not without sustained efforts from local farmers, government entomologists, and researchers to manage fruit fly populations.

With modern technology, farm hygiene practices, pesticides, viable biocontrol organisms, and integrated pest management (IPM) principles, many of which have been pioneered in Hawaii, farmers are able to effectively grow susceptible crops even with the established presence of fruit flies. Currently, there are at least 12 commercial fruit fly treatments available and registered in the state,[74] and Hawaii has pioneered biocontrol work against fruit flies by introducing 30+ organisms to target and weaken fruit fly populations.[75]

As a result of these innovations, local farms with crops vulnerable to fruit flies such as Aloun Farms on Oahu, have seen direct crop losses from tephritids reduced from 22% to less than 1%.[76]



**[73] HIPA, Report on the State of Physical Infrastructure in Hawaii, Phase II (2014).**

**[74] See Fig. 6.**

**[75] Bokonon-Ganta, Wang, and Messing, "Biological Control of Tephritid Fruit Flies in Hawaii with Special Reference to the Newly Discovered Egg-Larval Parasitoid, Fopius Ceratitivorus (Wharton)."**

**[76] Creamer, "Breakthrough Reached in Fight against Fruit Fly."**

Fig. 6 -

## Commercial Fruit Fly (Tephritid) Treatments in Hawaii [77]

| REGISTRATION NO. | PRODUCT NO. | PRODUCT NAME | LABEL TYPE | YEAR | FORM |
|---|---|---|---|---|---|
| 1021-1771 | 9472.18 | Pyganic Crop Protection EC 1.4 II | Section 3 – Regular | 2025 | Emulsifiable Concentrate |
| 1021-1771 | 9472.67 | PyGanic Gardening | Section 3 – Regular | 2027 | Emulsifiable Concentrate |
| 1021-1771 | 9472.71 | Pyganic Livestock and Poultry Insecticide | Section 3 – Regular | 2027 | Emulsifiable Concentrate |
| 1021-1771-54705 | 9699.96 | Bug Buster-O | Section 3 – Regular | 2027 | Emulsifiable Concentrate |
| 1021-1772 | 9472.19 | Pyganic Crop Protection EC 5.0 II | Section 3 – Regular | 2025 | Emulsifiable Concentrate |
| 1021-1772 | 9472.65 | PyGanic Specialty | Section 3 – Regular | 2026 | Emulsifiable Concentrate |
| 1021-2616 | 9472.55 | Tersus Insecticide | Section 3 – Regular | 2025 | Soluble Concentrate |
| 53883-308 | 8218.56 | Stryker Insecticide Concentrate | Section 3 – Regular | 2025 | Emulsifiable Concentrate |
| 62719-498 | 9786.234 | GF-120 NF Naturalyte Fruit Fly Bait | Section 3 – Regular | 2026 | Granular |
| 62719-592 | 9786.282 | SPLAT-MAT Spinosad ME | Section 3 – Regular | 2027 | Ready-to-Use Solution |
| 62719-592 | 9786.291 | Static Spinosad ME | Section 3 – Regular | 2026 | Ready-to-Use Solution |
| 7969-253 | 9131.131 | Amulet C-L Fruit Fly Stations | Section 3 – Regular | 2025 | Impregnated Materials |

Source: Hawai'i Department of Agriculture, Pesticides Branch.

[77] **Hawaii Department of Agriculture, Pesticides Branch.**

Fig. 7 -

# Biocontrol Parasitoid Species Introduced to Hawaii for Tephritid Suppression [78]

| INTRODUCED SPECIES NAME | IMPACTED TEPHRITID SPECIES |
|---|---|
| Diachasmimorpha fullawayi | Z. cucurbitae*, C. capitata** |
| Diachasmimorpha krausii | B. latifrons*** |
| Diachasmimorpha longicaudata | Z. cucurbitae, B. dorsalis,**** B. latifrons, C. capitata |
| Diachasmimorpha tryoni | Z. cucurbitae, C. capitata |
| Fopius arisanus | Z. cucurbitae, B. dorsalis, B. latifrons, C. capitata |
| Fopius caudatus | B. latifrons, C. capitata |
| Fopius ceratitivorus | C. capitata |
| Fopius persulcatus | B. dorsalis, B. latifrons, C. capitata |
| Fopius vandenboschi | B. dorsalis |
| Psyttalia fletcheri | Z. cucurbitae, C. capitata |
| Psyttalia humilis | Z. cucurbita |
| Psyttalia incisi | B. dorsalis, B. latifrons |
| Dirhinus anthracia | Z. cucurbitae |
| Dirhinus giffardii | Z. cucurbitae, C. capitata |
| Coptera silvestrii | Z. cucurbitae, C. capitata |
| Aceratoneuromyia indica | C. capitata |
| Tetrastichus giffardianus | Z. cucurbitae, B. latifro |
| Aganaspis daci | C. capitata |
| Pachycrepoideus vindemmiae | Z. cucurbitae, C. capitata |

*Melon Fly, *Bactrocera cucurbitae* (syn. *Zeugodacus cucurbitae*)
**Mediterranean fruit fly, *Ceratitis capitata*
***Malaysian fruit fly, *Bactrocera latifrons*
****Oriental fruit fly, *Bactrocera dorsalis*

[78] **Bokonon-Ganta et al., *Biological Control of Tephritid Fruit Flies in Hawaii with Special Reference to the Newly Discovered Egg-Larval Parasitoid, Fopius Ceratitivorus (Wharton).***

# Fruit Fly Management in California

California, one of the major agricultural economies that Hawaii's quarantine is set up to protect from fruit flies, manages tephritid fruit fly outbreaks extensively with major federal funding. It is estimated that over 40 years, California spent about $500M in controlling and eradicating tephritid fruit flies.[79] These costs to control and attempt the eradication of fruit fly populations, while large, are likely less burdensome economically than the regulatory impact of a quarantine and are worth the effort.

Academics at the University of California Riverside and official guidance from the California Department of Food and Agriculture (CDFA) have predicted the damage of having fruit fly populations recognized as being established in California to be between $44M to $176M annually.[80] These estimates take into account crop losses, treatment regimes, and market losses. Meanwhile, past estimates from the CFDA have claimed even larger potential impacts, between $1.3B and $1.8B annually on California's fruit industry.[81] California is currently home to a few, more host-specific tephritid pests than those commonly cited in Hawaii: the apple maggot (Rhagoletis pomonella),[82] olive fruit fly (Bactrocera oleae)-- Hawaii now hosts populations of olive fruit flies,[83] and walnut husk fly (Rhagoletic complete).[84] To help with eradication and suppression efforts of the more generalist tephritid fruit flies found in California, CFDA runs a sterile fruit fly rearing facility in Waimanalo. The facility mass-rears male Mediterranean fruit flies, sterilizes them, and transports them to California for release as a preventative control technique and eradication measure.[85]

cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE



[79] Kaplan, "Less Pesticide, Fewer Fruit Flies."[19]OPSD, TOD Infrastructure Finance and Delivery Strategy (Deliverable 4, 2023).

[80] OBernstein, "One of the World's Worst Pests Attacks California."

[81] California Department of Food and Agriculture, "Mediterranean Fruit Fly Fact Sheet."

[82] Zhao et al., "Economic Effects of Mitigating Apple Maggot Spread."

[83] Yokoyama, "Olive Fruit Fly in California Table Olives."

[84] Emery and Mills, "Sources of Variation in the Adult Flight of Walnut Husk Fly (Diptera: Tephritidae): A Phenology Model for California Walnut Orchards."

[85] California Department of Food and Agriculture, Office of Public Affairs, "CDFA in Hawaii - Secretary Ross and Washington Ag Director Tour Medfly Program Breeding Facility."

# Federal Efforts Support for Tephritid Fruit Flies in Hawaii

The federal government invests in robust eradication support programs across the US and also for foreign countries. In 2025, the federal government dedicated $129.2M on top of regular funding allocations from the USDA to reduce tephritid fruit fly populations through techniques such as pesticide application and sterile insect release.[86] Hawaii is poised to receive just $1.78M for 2025 in federal funding to conduct control research for all plant pests facing the state.[87] California, Texas, and even foreign countries (Mexico-Guatemalan Zone Eradication program) will receive the bulk of funding for tephritid fruit flies.

Past state and federal efforts in Hawaii have been successful in working on the control of pests such as tephritid fruit flies. The USDA's Hawaii Area-Wide Fruit Fly Pest Management Program was a federal research and outreach program implemented in coordination with the State of Hawaii and University of Hawaii to help address fruit fly populations in the islands, which ran from 1999 to 2005. The focus of this program was on managing fruit fly populations, not eradicating them: "One of the principal differences between IPM [integrated pest management] and eradication is that IPM sets the goal of keeping pest damage below an economically significant threshold rather than trying to eliminate every last fly."[88]

From the perspective of an IPM strategy, this program and the control methods that were implemented through it were a success in reducing crop losses for participating farms to single percentage points. The program cost $12M in federal funding for its six-year run.[89] However, the program did not address the impact to Hawaii and its agricultural sector from federal quarantine requirements which are typically much more costly in economic impact than the direct pest damage to things like fruit crops.

There is a large difference between the resources required to control a species below the economic injury level, as it is referred to in IPM, and what it takes to eradicate a quarantine pest, which would remove quarantine risks. Much larger state and federal efforts would be required in Hawaii in order to pursue such a program, and would need to take place for each quarantine pest species of concern– there are four different species of the most damaging of tephritid fruit flies alone.

Despite these challenges, there have been examples of localities that have successfully eradicated multiple species of tephritid fruit flies over years of focused effort. Okinawa was freed of firmly established melon fly and oriental fruit fly populations, which resulted in the growth of a burgeoning export-driven Okinawan fruit industry.[90] Oriental fruit flies were also eradicated in the Mariana Islands, including Guam, Saipan, Tinian, and Rota by the USDA, Government of Guam, and the Trust Territory of the Pacific Islands (today CNMI) using sterile male and male annihilation techniques.[91] California also continues aggressive eradication and control of multiple species of fruit fly year after year over areas much larger than the combined landmass of Hawaii in order to contain incidental introductions and outbreaks.[92]

---

**[86] USDA Anim. Plant Health Insp. Serv., "USDA Secures $129.2 Million in Emergency Funds to Combat Exotic Fruit Fly Outbreaks."**

**[87] US Department of Agriculture, Animal and Plant Health Inspection Service, "Plant Protection Act Section 7721 Fiscal Year 2025 Spending Plan."**

**[88] US Department of Agriculture, Animal and Plant Health Inspection Service, "Hawaii Area Wide Fruit Fly Integrated Pest Management Program: A Model System."**

**[89] Mau et al., "The Hawaii Area-Wide Fruit Fly Pest Management Programme."**

**[90] Koyama et al., "Eradication of the Oriental Fruit Fly from the Okinawa Islands by a Male Annihilation Method."**

**[91] Steiner et al., "Eradication of the Oriental Fruit Fly from the Mariana Islands by the Methods of Male Annihilation and Sterile Insect Release."**

**[92] Mau et al., "The Hawaii Area-Wide Fruit Fly Pest Management Programme."**

# Part VI: Conclusion and Opportunities to Mitigate Impacts from the Federal Quarantine

It is clear that the federal quarantine is a major barrier for agriculture in Hawaii and likely has a very large annual impact on the state's economy. As such, it is not just an agricultural issue, but an important and underappreciated economic issue with statewide importance. Reducing the quarantine's impact should be a high priority for state government, federal officials, and local stakeholders.

Hawaii's regulatory treatment results in challenges, mainly market access issues and regulatory costs, that impact the viability of Hawaii-grown produce. Hawaii's quarantine is unique compared to other US states, however it is unique because of the state's challenges with damaging invasive species pests such as tephritid fruit flies, which inspired the quarantine to be first implemented by the federal government in 1912. Seeking parity treatment with other US states will not fix Hawaii's situation, instead Hawaii needs even greater prioritization and consideration when it comes to quarantine issues precisely because the state's needs are great due to both the regulatory burdens it faces as a state and the presence of damaging invasive species.

Historically, Hawaii has received support for control efforts for established pests. However, control efforts alone primarily deal with the direct impact of pests, not the far greater impact of quarantine measures. If quarantine pests are eradicated in Hawaii, it reduces pest risk across the board for other important agricultural states like California.

Efforts to reduce the impact are likely best spent in a few ways: reducing regulatory impacts and market access delays, pursuing more aggressive eradication efforts for invasive species in Hawaii, reducing the risk of future invasive species introductions into Hawaii, and better quantifying the economic impacts of the federal quarantine in Hawaii.



Photo courtesy of USDA Natural Resources Conservation Service.

# Key Recommendations

- **Federal Government: Reduce regulatory impacts related to the administration of Hawaii's federal quarantine. Interventions that could significantly reduce burdens on Hawaii involve lowering the time it takes for a commodity to receive approval, and more proactive regulatory engagement:**
    - *Prioritize pest risk assessment request and administrative processing for Hawaii commodities over foreign nations.*
    - *Reducing processing times for USDA to approve commodities for export from Hawaii to less than one year.*
    - *Continue exploration and expansion of temporary shipments of commodities that have already completed their risk assessments with findings of low or no pest risk.*
    - *Work with the State of Hawaii and local growers to approve export commodities in batches of similar groups of fruits/vegetables with market potential in Hawaii, proactively.*
    - *Integration of pre-departure inspections by USDA with standard passenger screening processes already in place.*
- **Federal Government and State of Hawaii: Better resource eradication efforts in Hawaii for invasive quarantine species established in Hawaii. Efforts might include:**
    - *Increased federal, state, and philanthropic contributions to invasive species eradication measures. Hawaii receives a very small share of federal funding for these efforts, and work is primarily based on controlling established populations.*
    - *Investment into facilities for locally controlled capacity for mass-rearing sterile insects with modern methods, which can be used to both control or eradicate pests of concern.*
    - *Faster and more aggressive state, federal, and community responses to adventive invasive occurrences, along with proactive statewide sampling for newly arrived invasives. This requires greater personnel dedicated to response work, along with a more formal community engagement program to involve manpower when needed.*
    - *Investment into the continuation of the Hawaii Biological Survey at the Bishop Museum, which represents the official historical record of all plants and animals found in Hawaii. Without an updated and accurate record, it is difficult to distinguish what organisms are expected, and should not be expected, to occur in Hawaii and is an essential tool to inform response efforts locally.*
- **Federal Government and State of Hawaii: Reduce the risk of further invasive species introductions into Hawaii. This may involve:**
    - *Greater investment into inspection personnel and greater authority to conduct more extensive, in-bound searches and treatment in Hawaii, similar to requirements for passengers leaving the state.*
    - *Proactive trapping and monitoring of insect populations statewide to understand population dynamics and pest risks.*
    - *Update state and federal pest risk pathway assessments for pests coming into Hawaii.*
    - *Developing cooperative agreements with regional partners to help prevent potential species of concern at their point of origin.*
- **Pursue further quantification of economic impacts of the federal quarantine on Hawaii.**

# References


**Asahi Shimbun Staff.** "Feature 'Wasabi, Japanese Flavor.'" *The Asahi Shimbun Digital*, December 29, 2016. https://www.asahi.com/special/tsukiji/en/wasabi/.

**Bearth, Angela, and Michael Siegrist.** "'As Long as It Is Not Irradiated' – Influencing Factors of US Consumers' Acceptance of Food Irradiation." *Food Quality and Preference* 71 (January 2019): 141–48. https://doi.org/10.1016/j.foodqual.2018.06.015.

**Bernstein, Jules.** "One of the World's Worst Pests Attacks California." *UC Riverside News*, November 21, 2023. https://news.ucr.edu/articles/2023/11/21/one-worlds-worst-pests-attacks-california.

**Bokonon-Ganta, Aimé, Xingeng Wang, and Russell Messing.** *Biological Control of Tephritid Fruit Flies in Hawaii with Special Reference to the Newly Discovered Egg-Larval Parasitoid, Fopius Ceratitivorus (Wharton).* January 1, 2007.

**Burnett, Kimberly M., Sean D'Evelyn, Brooks A. Kaiser, Porntawee Nantamanasikarn, and James A. Roumasset.** "Beyond the Lamppost: Optimal Prevention and Control of the Brown Tree Snake in Hawaii." *Ecological Economics* 67, no. 1 (2008): 66–74.

**California Department of Food and Agriculture.** "Harvest and Crop Movement Requirements for Growers Within and Adjacent to Invasive Fruit Fly Quarantine Areas." CDFA, January 11, 2024. https://www.cdfa.ca.gov/plant/fruitfly/docs/IFFHarvestandTreatmentInfoforGrowers.pdf.

**California Department of Food and Agriculture.** "Mediterranean Fruit Fly Fact Sheet." October 23, 2008. https://www.cdfa.ca.gov/plant/factsheets/MedFlyFactSheet.pdf#:~:text=%E2%80%A2%20Establishment%20of%20these%20flies%20would%20cause,and%20internationally%2C%20and%20adverse%20impacts%20on%20native.

**California Department of Food and Agriculture, Office of Public Affairs.** "CDFA in Hawaii - Secretary Ross and Washington Ag Director Tour Medfly Program Breeding Facility." *CDFA's Planting Seeds Blog*, August 2, 2019. https://plantingseedsblog.cdfa.ca.gov/index.php/2019/08/02/cdfa-in-hawaii-secretary-ross-and-washington-ag-director-tour-medfly-program-breeding-facility/.

**Commercial Advertiser Staff.** "May Bar Out Hawaii's Fruit: Secretary Wilson Is to Grant Hearing Before Ordering a Strict Quarantine." *Commercial Advertiser* (Honolulu), August 29, 1912. Thursday Edition.

**Commercial Advertiser Staff.** "Report of Pineapple and Banana Exclusion Exploded by Dr. Back: Associated Press Dispatch Is Correct, but Headlines Are Misleading." *Commercial Advertiser* (Honolulu), April 6, 1914. Monday Edition.

**Compere, George.** "Flies That Threaten the Fruit Industry: Full Text of George Compere's Paper That Aroused the State Convention, What Should Be Done to Fight the Mediterranean Fly." *The Evening Mail* (Stockton), December 9, 1910. Friday Edition.

**Curlett, Heather L.** "PPQ 2022 Annual Report, Strengthening Pest Exclusion at the Border." US Department of Agriculture, Animal and Plant Health Inspection Service, 2022. https://aphis-direct.stg.platform.usda.gov/sites/default/files/2022-annual-report-strengthening-pest-exclusion-at-the-border.pdf.

**DBEDT Research and Economic Analysis Division.** "Hawaii State Databook: Table 6.03-- ESTIMATED ACREAGE OF LAND USE DISTRICTS: 1993 TO 2023." State of Hawaii, Department of Business, Economic Development, and Tourism, 2023. https://files.hawaii.gov/dbedt/economic/databook/2021-individual/06/060321.pdf.

**Duan, Jian J., and Russell H. Messing.** "Effect of Two Opiine Parasitoids (Hymenoptera: Braconidae) Introduced for Fruit Fly Control on a Native Hawaiian Tephritid, *Trupanea Dubautiae* (Diptera: Tephritidae)." *Biological Control* 8, no. 3 (1997): 177–84. https://doi.org/10.1006/bcon.1997.0503.

**Follett, Peter A., Xiuxiu Sun, and Spencer S. Walse.** "Host Status of Persian Lime (Citrus Latifolia Tan.) to Oriental Fruit Fly and Mediterranean Fruit Fly (Diptera: Tephritidae) in Hawai'i." *Insects* 15, no. 10 (2024): 799. https://doi.org/10.3390/insects15100799.

**Honolulu Star-Bulletin Staff.** "Californians Investigating Fruit Industry: Outcome of Visit May Mean Trade Worth Millions to Territory of Hawaii." *Honolulu Star-Bulletin* (Honolulu), July 15, 1014. Wednesday Edition.

**Jang, Eric B. "Fruit Flies and Their Impact on Agriculture in Hawaii.** "*Proceedings of the Hawaiian Entomological Society*, no. 39 (2007): 117–19.

**Kaplan, Kim.** "Less Pesticide, Fewer Fruit Flies." *USDA AgResearch Magazine*, May 2007. https://agresearchmag.ars.usda.gov/2007/may/flies/.

**Koyama, Juro, Tadashi Teruya, and Kenji Tanaka.** "Eradication of the Oriental Fruit Fly (Diptera Tephritidae) from the Okinawa Islands by a Male Annihilation Method." *Journal of Economic Entomology* 77, no. 2 (1984): 468–72. https://doi.org/10.1093/jee/77.2.468.

**Li, Binsheng, and Joseph Roos.** "Hawaii Economic Structure Analysis Using the Industry Level Gross Domestic Product Data." State of Hawaii, Department of Business, Economic Development, and Tourism, April 2022. https://files.hawaii.gov/dbedt/economic/reports/GDP_Report_Final_April_2022.pdf.

**Mahi Pono.** "Facts And Figures." Mahi Pono, September 1, 2024. https://www.mahipono.com/facts-and-figures.

**Mau, R. F. L., E. B. Jang, and R. I. Vargas.** "The Hawaii Area-Wide Fruit Fly Pest Management Programme: Influence of Partnerships and a Good Education Programme." *Area-Wide Control of Insect Pests*, 2007, 671–83. https://doi.org/10.1007/978-1-4020-6059-5_62.

**Miles, Carol A., and Catherine H. Daniels.** "Growing Wasabi in the Pacific Northwest." *PNW, Washington State University Extension* 605 (July 2019). https://s3.amazonaws.com/na-st01.ext.exlibrisgroup.com/01ALLIANCE_WSU/storage/alma/F8/D0/E9/C8/A3/CA/9B/73/E7/DD/BF/2C/62/CF/42/C5/PNW605.pdf?response-content-type=application%2Fpdf&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Date=20250314T201120Z&X-Amz-SignedHeaders=host&X-Amz-Expires=1-19&X-Amz-Credential=AKIAJN6NPMNGJALPPWAQ%2F20250314%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Signature=907a3c7d0ec3cf2330aefd99100710b9aba17de0f8d251029f17f44da4edf79e.

**Moy, J. H.** "Problems and Prospects of Radiation and Disinfestation and Shelf-Life, Extention of Tropical Fruits and Vegetables." *Aspects of the Introduction of Food Irradiation in Developing Countries*, 1973, 13–20.

**National Agricultural Statistics Service.** "2022 Census of Agriculture - State Data, Hawaii." US Department of Agriculture, 2024. https://www.nass.usda.gov/Publications/AgCensus/2022/Full_Report/Volume_1,_Chapter_1_State_Level/Hawaii/st15_1_002_002.pdf.

**San Francisco Chronicle Staff.** "Sounds Alarm to Fruit-Growers: George Compere Urges Action to Prevent Entry of the Mediterranean Fly." *San Francisco Chronicle* (Stockton), December 9, 1910. Friday Edition.

**Staples, George, and Robert H. Cowie.** *Hawai'i's Invasive Species: A Guide to Invasive Plants and Animals in the Hawaiian Islands.* Bishop Museum, 2001.

**Steiner, L. F., W. G. Hart, E. J. Harris, R. T. Cunningham, K. Ohinata, and D. C. Kamakahi.** "Eradication of the Oriental Fruit Fly from the Mariana Islands by the Methods of Male Annihilation and Sterile Insect Release." *Journal of Economic Entomology* 63, no. 1 (1970): 131–35. https://doi.org/10.1093/jee/63.1.131.

**The Evening Mail Staff.** "Nation's Fruit Industry Declared to Be in Peril: Destructive Mediterranean Fly Menaces Horticulture and Fruit Men Will Ask for Legislative Action." *The Evening Mail* (Stockton), December 8, 1910. Thursday Edition.

**The Hawaiian Star Staff.** "Most Rigid Rules of Quarantine Against Hawaii's New Fruit Pest." *The Hawaiian Star* (Honolulu), June 27, 1911. Tuesday Edition.

**The San Francisco Examiner Staff.** "If a Fly Should Come to California." *The San Francisco Examiner* (San Francisco), February 8, 1903. Sunday Examiner Magazine Edition.

**University of Hawaii, College of Tropical Agriculture and Human Resilience.** "Taro Varieties in Hawaii." Accessed September 26, 2026. https://www.ctahr.hawaii.edu/site/taro.aspx.

**U.S. Congress, Office of Technology Assessment.** *Harmful Non-Indigenous Species in the United States.* OTA-F-565. U.S. Government Printing Office, 1993.

**US Department of Agriculture.** "2025 Budget for the U.S. Department of Agriculture (USDA), Explanatory Notes-- Animal and Plant Health Inspection Service." 2025. https://www.usda.gov/sites/default/files/documents/22-APHIS-2025-ExNotes.pdf.

**US Department of Agriculture.** "Commodity Import Approval Process." August 23, 2018. https://www.aphis.usda.gov/sites/default/files/commodity-import-request-process-pv.pdf.

**US Department of Agriculture.** "Notice of Quarantine No. 13. With Regulations (Effective on and after May 1, 1914)." *Honolulu Star-Bulletin* (Honolulu), April 10, 1914. Friday Edition.

**US Department of Agriculture, Animal and Plant Health Inspection Service.** "Commodity Import Requirements: Sour Lime and Persian Lime from Inadmissible Countries into All Ports." USDA Animal and Plant Health Inspection Service, US Department of Agriculture, Animal and Plant Health Inspection Service. Accessed September 25, 2026. https://acir.aphis.usda.gov/s/acir-document-detail?rowId=a0j3d000000pswOAAQ&Document_Type=Commodity%20Import%20Requirements.

**US Department of Agriculture, Animal and Plant Health Inspection Service.** "Fruit Fly Host Lists." Accessed September 25, 2026. https://www.aphis.usda.gov/plant-pests-diseases/fruit-flies/fruit-fly-host-lists.

**US Department of Agriculture, Animal and Plant Health Inspection Service.** "Hawaii Area Wide Fruit Fly Integrated Pest Management Program: A Model System." US Department of Agriculture, 2008. https://www.ars.usda.gov/ARSUserFiles/20400000/AreaWideBrochure.pdf.

**US Department of Agriculture, Animal and Plant Health Inspection Service.** "Hawaii Manual: Regulation and Clearance from Hawaii to Other Parts of the United States." 2024. https://www.aphis.usda.gov/sites/default/files/hawaii.pdf.

**US Department of Agriculture, Animal and Plant Health Inspection Service.** "Hawai'i-Grown Lemons and Limes Ready for Export." USDA APHIS, July 31, 2026. https://www.ars.usda.gov/news-events/news/research-news/2025/hawai-i-grown-lemons-and-limes-ready-for-export/.

**US Department of Agriculture, Animal and Plant Health Inspection Service.** "Mediterranean Fruit Fly, Ceratitis Capitata (Wiedemann), Regulated Host List, 2026." July 29, 2026. https://www.aphis.usda.gov/sites/default/files/ceratitis-capitata-regulated-host-list.pdf.

**US Department of Agriculture, Animal and Plant Health Inspection Service.** "Notice of Proposed Revision to Requirements for the Movement of Fresh Persian Lime Fruit for Consumption From Hawaii Into the Continental United States." Federal Register, National Archives and Records Administration, January 28, 2026. https://www.federalregister.gov/documents/2026/01/28/2026-01649/notice-of-proposed-revision-to-requirements-for-the-movement-of-fresh-persian-lime-fruit-for.

**US Department of Agriculture, Animal and Plant Health Inspection Service.** "Plant Protection Act Section 7721 Fiscal Year 2025 Spending Plan." US Department of Agriculture, January 2025. https://www.aphis.usda.gov/sites/default/files/fy2025-ppa-ppdmdpp-spending-plan-508-final.pdf.

**US Department of Agriculture, Animal and Plant Health Inspection Service.** "Plants and Plant Products Not for Propagation." n.d. https://acir.aphis.usda.gov/s/acir-global-search?category=Plants-and-Plant-Products-Not-for-Propagation.

**US Department of Agriculture, Animal and Plant Health Inspection Service.** "Protocols for the Management and Movement of Regulated Articles Produced in Areas Quarantined for European Grapevine Moth (Lobesia Botrana), Systems Approach for Fresh Grape Shipments (Consumption Only)." July 2011. https://www.aphis.usda.gov/sites/default/files/FreshGrapeShipments.pdf.

**US Department of Agriculture, Animal and Plant Health Inspection Service.** "Risk Assessment for the Importation of Fresh Lemon (Citrus Limon (L.) Burm. F.) Fruit from Northwest Argentina into the Continental United States (August 6, 2007)." Regulations.Gov, August 6, 2007. https://www.regulations.gov/document/APHIS-2007-0112-0002.

**US Department of Transportation.** "The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2016 Update)." September 27, 2016. https://www.transportation.gov/sites/dot.gov/files/docs/2016%20Revised%20Value%20of%20Travel%20Time%20Guidance.pdf.

**US Food and Drug Administration.** "21 CFR 179.26." National Archives and Records Administration, April 1, 2024. https://www.govinfo.gov/content/pkg/CFR-2024-title21-vol3/pdf/CFR-2024-title21-vol3-sec179-26.pdf.

**USDA Animal and Plant Health Inspection Service.** "USDA Secures $129.2 Million in Emergency Funds to Combat Exotic Fruit Fly Outbreaks." January 17, 2025. https://www.aphis.usda.gov/news/agency-announcements/usda-secures-emergency-funds-combat-exotic-fruit-fly.

**Whitfield, James Bryan, John T. Doyen, Alexander H. Purcell (III), and Alexander H. Purcell.** *Daly and Doyen's Introduction to Insect Biology and Diversity*. Oxford University Press, 2013.

**Yokoyama, Victoria Y.** "Olive Fruit Fly in California Table Olives." *Journal of Integrated Pest Management* 6, no. 1 (2015): 14. https://doi.org/10.1093/jipm/pmv014.

**Zhao, Zishun, Thomas Wahl, and Thomas Marsh.** "Economic Effects of Mitigating Apple Maggot Spread." *Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie* 55, no. 4 (2007): 499–514. https://doi.org/10.1111/j.1744-7976.2007.00105.x.

HIPA

HAWAII INSTITUTE FOR PUBLIC AFFAIRS

The Hawaii Institute for Public Affairs is a nonprofit, tax-exempt educational organization (tax ID number 22-3859306) under Section 501(c)(3) of the Internal Revenue Code. Donations are tax-deductible as allowed by law.

Address: PO Box 1851, Honolulu, HI 96805 Contact: info@hipa.org