

TITLE: Assessing impacts of an invasive *Myoporum* thrips (*Klambothrips myopori*) infestation in Hawaii: Distribution, Rate of Spread, and Impact on Forest Resources

LOCATION: State of Hawaii (Hawaii, Maui, Molokai, Lanai, Oahu, Kauai)

DATE: September 2009

DURATION: 3-year project

FUNDING SOURCE: Base Plan

PROJECT LEADERS:

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COOPERATORS:

Neil Reimer, Hawaii Dept. of Agriculture, Plant Pest Control (Branch Manager)
Anne Marie LaRosa*, Institute of Pacific Islands Forestry, USDA-FS (Forest Health Coordinator)
*position was vacated and has not yet been filled

FHP SPONSOR/CONTACT:

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PROJECT OBJECTIVES:

1. Initiate an evaluation monitoring survey program to define the current distribution of *Myoporum* thrips (*Klambothrips myopori*) infestation, and map the area of infestation on Hawaii Island.
2. Determine impact of *Myoporum* thrips across a variety of ecosystems/climates and along elevational gradients.
3. Monitor *Myoporum* thrips density and distribution over time in infested areas, and measure rates of spread.
4. Evaluate the potential for management and control of *Myoporum* thrips (feasibility of chemical and biological controls), based on distribution, densities and rates of spread.
5. Help train field surveyors and land managers (state/federal/private) to detect *Myoporum* thrips and identify infestations on all of the main Hawaiian Islands.

JUSTIFICATION:

a. **Linkage** to FHM Detection Monitoring- Detections of new forest pests through ground surveys by state, federal, and private land and resource management agencies, and/or as a result of reports from the general public, are the most common Forest Health Monitoring early detection method used in the State of Hawaii. The initial infestation of naio (*Myoporum sandwicense*) by *Myoporum* thrips (*Klambothrips myopori*) was reported to the Hawaii Dept. of Agriculture (HDOA) in March 2009. HDOA continues to survey nurseries for this pest throughout the state with assistance from the USDA APHIS CAPS program.

b. **Significance** in terms of the geographic scale- Surveys conducted in Year 2 show that *Myoporum* thrips are widespread on the west and north side of Hawaii Island, and populations are spreading to the south and east. Isolated populations have been detected in the east coast city of Hilo, as a result of landscape plantings. Given the frequency of inter-island transport of goods and people, and the precedence of pest range expansions, the species will likely spread to other Hawaiian Islands. Consequently, the scope of this project impacts the health of native forests, and associated biota, on all of the Hawaiian Islands.

c. **Biological impact-** *Myoporum* thrips have been documented to cause high levels of mortality in ornamental *Myoporum* species in California, and initial Hawaiian naio mortality from thrips was observed during Year 2 monitoring. Naio is most dominant in dry forests, and lowland and upland shrublands, however the species also populates mesic and wet forest habitats. Naio is distributed across all of the main

Hawaiian Islands, and is present from sea-level to upwards of 3000m. The loss of naio will be a significant biological and structural loss to native forest habitats, particularly where the plant comprises a key component of Critical Habitat for the palila (*Loxioides bailleui*), a federally endangered species of honeycreeper on Mauna Kea, and, at South Point, where the naio population is morphologically unique, and may constitute a new sub-species or species.

d. **Scientific Basis/Feasibility** – Thrips survey methods have been developed for use in a variety of landscapes. We have implemented standardized survey protocols to determine *Myoporum* thrips presence, distribution and densities. We are collaborating with partners, including University of Hawaii, Invasive Species Committees, Watershed Partnership programs, and HDOA for survey and monitoring efforts.

e. **Priority Issues** addressed from Request for Proposals – We have initiated data collections on **tree mortality** and changes to **crown structure**, as a result of *Myoporum* thrips infestations. The effects of **forest cover fragmentation** will be evaluated now that the pest has moved into habitats which support the endangered Palila.

DESCRIPTION:

a. **Background:** Prior to the 2009 infestation in Hawaii, entomologists from California and Hawaii suggested that native Hawaiian naio was at equal or greater risk of infestation by *Myoporum* thrips. Unfortunately, the predictions were correct and the thrips has readily infested naio and caused initial mortality in both ornamental plantings and naturally occurring naio.

b. **Methods:** Staff has been conducting delimiting surveys of naio populations to map the current distribution of *Myoporum* thrips on Hawaii Island, as well as training personnel responsible for general detection monitoring. A total of nine monitoring sites have been established from sea-level to 7000ft on Hawaii Island. Data are collected to measure dispersal and *Myoporum* thrips impact on forest composition, canopy cover, crown structure and branch growth. Monitoring sites were established in habitats where *Myoporum* thrips were present, and at control sites where the species was not yet established; monitoring has been conducted on a monthly basis. Surveyors have also been looking for potential natural enemies present in the system. These data will provide the foundation for informed management decisions regarding control of *Myoporum* thrips in Hawaii. Workshops for the survey and identification of *Myoporum* thrips will be organized on remaining islands.

c. **Products:** Data collected from *Myoporum* thrips surveys will be summarized and reported by DOFAW, and made available for use by state, private or federal land managers. Maps of *Myoporum* thrips distribution will be created, and rates of spread will be calculated. Whether chemical, biological, cultural, or no controls, are ultimately implemented, sound management decisions will be derived directly from field data. A paper will also be submitted for publication to a relevant scientific journal. The training of surveyors located will increase the likelihood of early detection.

d. Schedule of Activities:

- In year 1 we will fund 1 full-time surveyor, or 2 part-time surveyors to conduct fieldwork (initiate surveys and establish monitoring plots) beginning in the summer months. Fieldwork will continue throughout the fall, winter, and spring, and mapping will be completed according to the progression of field surveys. Monitoring plot data collections will occur on a monthly/quarterly basis. Training for detection and identification of *Myoporum* thrips will be organized in the fall.
- In year 2 we will continue with delimiting surveys [if necessary], create and/or update *Myoporum* thrips distribution maps, collect data from established monitoring plots, and continue to organize educational training sessions.
- In year 3 we will continue monitoring and data collections, and focus on developing maps and calculations of rates of spread of the species. All data analysis, map products and reports will be completed by the end of year 3. A project representative will attend the Annual Forest Service FHM meeting to present the project results.

e. **Progress Statement (Year 2):** This report reflects progress made between October 1, 2010 and the annual report deadline of September 30, 2011. The contract for *Myoporum* thrips survey and monitoring was awarded to Dr. Leyla Kaufman at University of Hawaii at Manoa.

1. Survey - DOFAW entomologist and Dr. Kaufman initiated surveys in October 2011. Surveys were conducted in conjunction with partner agencies and staff, and covered the periphery of the known area of infestation. GPS data were collected to refine distribution maps. Additional infestations were found further north, east and south of the documented infestation. Survey data identified areas where no thrips were yet established, and also where infestations were very recent, to delimit boundaries of infestation.

2. Monitoring site selection - DOFAW entomologist and Dr. Kaufman established eight monitoring sites on Hawaii Island in October 2011: Oweowe (591m), Pelekane (792m), Koaia Sanctuary (975m), Puuwaawaa Low (975m), Puuwaawaa Mid (1280m), Puuwaawaa High (1603m), Kaohe Low (1780m), Kaohe High (2128m). An additional site at Kaloko-Honokohau National Historical Park (2m) was added in February 2011, after permission was granted from the National Park Service. Two sites selected (Kaohe Low and Kaohe High) represented uninfested areas.

3. Monitoring - Monitoring is conducted monthly at each of the nine field sites. In Year 2 UH staff completed seven monitoring trips, and DOFAW staff completed nine trips (time and travel expenses serve as project match); initial site set-up and calibration was completed by both UH and DOFAW staff and partners. Year 2 data indicate that thrips densities, naio infestation rates, and naio branch dieback, have increased at every monitoring site. Thrips were found at Kaohe Low in November 2010, and Kaohe High in May 2011, therefore all sites now contain *Myoporum* thrips. Mortality of one or more trees has been documented at two field sites (Pelekane in April 2011 and Koaia Sanctuary in August 2011) and additional mortality is likely to be observed.

4. Evaluate potential management/control – While rates of spread have not yet been calculated for Year 2 data, it is apparent that the current extent of the infestation and continuing spread of this pest will make it difficult, if not impossible, to control. Our preliminary assessment is biological control is the only feasible method that could effectively control *Myoporum* thrips on a landscape scale.

5. Help train field surveyors and land managers - DOFAW and UH staff has: 1) worked with Oahu Invasive Species Committee to implement early detection surveys on Oahu (June-Aug. 2011); 2) trained Kamehameha Schools (Oct. 2010), Mauna Kea Forest Restoration (Oct. 2010, Feb. 2011), and Three Mountain Alliance (Nov. 2010) staff in thrips identification; 3) power-point presentation at Three Mountain Alliance meeting, Hilo HI (Dec. 2010); 4) poster presentation at Nahelehele Dry Forest Symposium, Kailua-Kona HI (Feb. 2011); 5) poster presentation at Entomological Society of America Pacific Branch meeting, Waikoloa HI (Mar. 2011); 6) poster presentation at Hawaii Conservation Conference, Honolulu HI (Aug. 2011); 7) trained new Hawaii Island survey entomologist in thrips identification (Sept. 2011).

COSTS:

YEAR 1	ITEM	REQUESTED FHM EM \$	OTHER SOURCE \$	SOURCE
Administration	Salary*	39,200.00	38,706.14	DOFAW
	Overhead	1281.00		
	Travel	2000.00		
Procurements	Contracting			
	Equipment	1000.00		
	Supplies	500.00		
Indirect				
TOTAL: Year 1		43,981.00	38,706.14	
YEAR 2				
Administration	Salary*	39,200.00	38,706.14	DOFAW
	Overhead	1236.00		
	Travel	1000.00		
Procurements	Contracting			
	Equipment	500.00		
	Supplies	500.00		
Indirect				
TOTAL: Year 2		42,436.00	38,706.14	

YEAR 3				
Administration	Salary*	39,200.00	38,706.14	DOFAW
	Overhead	1230.00		
	Travel	1500.00		
Procurements	Contracting			
	Equipment			
	Supplies	300.00		
Indirect				
TOTAL: Year 3		42,230.00	38,706.14	
PROJECT TOTAL		128,647.00	116,118.40	

*Salary request covers 1/2 time post-doctoral researcher