Western IPM Center

Project Report Form

How to submit: Please submit this completed form electronically, as an attached Microsoft Word file, to Jane Thomas at jmthomas@tricity.wsu.edu. If you have questions, contact Linda Herbst, (530) 752-7010. **Content:** Complete each section below, and include responses to as many of the questions listed in Attachment A as are relevant to your project. *These are guidelines.* Provide your readers with enough detail that someone who is not familiar with your project can understand what you were trying to achieve, how you went about it, and what you accomplished, but please keep it concise.

A. Report Data

Date: 3/28/10
Reporting Period: year 1
Report Type (please check one):
☒ Progress Report ☐ Final Report

B. Grant Data

- Grant Agreement #:
- Title: Biology of the Walnut Twig Beetle (Pityophthorus juglandis) and the fungus Geosmithia Associated with Walnut Mortality in the Western United States
- Grant Type:
- Lead investigator:
  - Name: Ned Tisserat
  - Title: Professor
  - Institution: Colorado State University
  - Address: Plant Sciences Bldg. 1177
  - Phone: 970-491-6527
  - Fax: 970-491-3862
  - Email: ned.tisserat@colostate.edu
- Team members (name, title, institution): Whitney Cranshaw Colorado State University, William Jacobi, Colorado State University, Steve Seybold, USFS, U.C. Davis, Reed FunkImproving Perennial Plants for Food and Bioenergy
- State(s) involved: CA, CO, UT

C. Nontechnical Summary. An overview of the project, briefly outlining the problem(s), how your project addresses them, and your results, *written to a lay audience.* (500 words)

In the last decade extensive mortality of black walnut (J. nigra) has been reported in the western United States. It has now been attributed to a combination of a dramatic expansion of the geographic range of the walnut twig beetle (WTB), its aggressive feeding behavior, and extensive cankering caused by a fungus (Geosmithia sp.) carried by the beetle. We have named this new disease thousand cankers disease (TCD). TCD is also causing morbidity and mortality of southern and northern California black walnuts in California. The peak flight period of the WTB is mid- to late summer , but flights may extend into late November in California. The beetle prefers to produce galleries in branches larger than 1 inch in diameter and will colonize the main trunk. Preliminary evidence indicates that the genetic makeup of the Geosmithia fungal population in the western United States is diverse and complex. Furthermore, the fungus and WTB is widespread on Arizona walnut, the putative native host of the WTB. No mortality has been observed on this species. These results suggest that the fungus is native to the the southwestern United States. Black walnut and southern California black walnut are susceptible to TCD. Other walnut species show varying degrees of susceptibility whereas hickories (Carya) appear immune

D. Objectives and Progress. List your objectives and describe your progress for each objective.

Our first objective was to understand the biology and interactions of the walnut twig beetle (WTB) and Geosmithia associated with the thousand cankers disease (TCD) . Seasonal beetle trapping studies were conducted in California and Colorado. The peak flight period was in late summer in both states, and extended into November in California. Throughout the year, female trap catch consistently exceeded that of males. In contrast to their common name, WTB preferred to breed in bark on branches that were greater than 1 inch in diameter. The Geosmithia fungus is thermotolerant with opimal growth near 30 C. It can also survive at temperatures as high as 41 C. Our second objective was to determine whether the origin of Geosmithia and TCD. We detected eight rDNA ITS haplotypes from 37 Geosmithia isolates collected throughout the western. The aligned ITS rDNA haplotypes of the Juglans Geosmithia isolates showed six variable positions in the ITS1region. Distribution of haplotypes was not correlated with the geographic site or the Juglans species from which isolates were collected. Multiple haplotypes were present in each state and tree species, whereas identical haplotypes often were found in different states and species. This suggests that the fungus was not recently introduced from a single source. Arizona walnut (J. major), native to the SW United States is the putative native host of the WTB. Both the WTB and Geosmithia were recovered from J. major in many locations in AZ and NM. While both the pathogen and insect are present in these states, there was no noticeable morbidity of J. major. This suggests that J. major is the native host of the beetle and fungus. Surveys of Juglans californica and J. hindsii in CA have revealed widespread evidence of the presence of both TCD and WTB throughout the native ranges of these two tree species. Additionally, preliminary surveys of commercial orchards of English walnut, J. regia, in the Central Valley have detected the insect and disease at low levels. We also determined relative susceptibility to canker formation by Geosmithia of North American and exotic Juglans species. Black walnut (J. nigra) and southern California black walnut were most susceptible to canker formation whereas Carya species appeared immune.

E. Outputs. List your project's outputs, which might include publications, information, data, meetings held, attendance at meetings held, etc.

Publications:
Tisserat, N., Cranshaw, W., Leatherman, D., Utley, C., and Alexander, K. 2009. Black walnut mortality in Colorado caused by the walnut twig beetle and thousand cankers disease. Online. Plant Health Progress doi:10.1094/PHP-2009-0811-01-RS
Kolarik, M. Freeland, E. Utley, C. and Tisserat, N. 200_. Geosmithia morbida sp. nov., a new pathogen of walnuts in the USA associated with walnut twig beetle (Pityophthorus juglandis)
Website:
http://www.colostate.edu/Depts/bspm/extension%20and%20outreach/thousand%20cankers.html
Meetings:
2010. Thousand Canker Workshop, St. Louis.
2010. Western Insect and Disease workshop. Durango.
2008. Thousand Cankers disease of Black Walnut. Symposium on Emerging Pests. Entomological Society of America Annual Meeting

F. Impacts and Potential Impacts. The "impacts" and "potential impacts" sections of your report will help the Western IPM Center highlight the value of IPM research and education by detailing the real-world impacts of Center-funded projects. We will use the information in news articles, reports, and informational brochures to showcase the impacts of projects that our program supports. *See Attachment A at end of form for questions to assist you in describing the impacts of your project.*

1. Impacts. Describe any impacts of your work. ***Impacts*** are specific changes in condition for those affected by your work. Impacts include adoption of technology, creation of jobs, reduced cost to the consumer, less pesticide exposure to farmers, access to more nutritious food, and a cleaner environment and healthier communities.

Our research has led to greater awareness of TCD in the eastern United States. As a result, several states, including Nebraska, Iowa, Missouri and Kansas are implementing quarantines to prevent the movement of walnut wood with bark attached into the states. We are currently working with arborists and city foresters in Colorado to develop best management practices for the safe disposal and use of walnuts killed by TCD. We believe these actions will prevent the movement of the WTB into the native range of black walnut. We are currently developing a national recovery act (through USDA) for strategies to prevent and mitigate impacts of TCD.

2. Potential impacts. Describe your project's potential impacts. ***Potential impacts*** are the ways that your project's outputs could directly lead to changes in condition that will unfold in the future.

We believe that our current work will eventually lead to a national quarantine on the movement of certain types of walnut wood from the western United States to the native range of black walnut.

G. Leveraged Funds. List *additional funding* you have acquired because of the data and results yielded in this WIPMC-funded project.

Additional Funding Award #1:
Date of Award: 8/2009 — Name of Granting Entity: USDA
Dollar Amount: $90,000 — Name of Grant Program: Emerging Pests
Grant Period Duration: 1 year

Additional Funding Award #2:
Date of Award: 8/2009 — Name of Granting Entity: USDA
Dollar Amount: $75,000 — Name of Grant Program: Emerging Pests
Grant Period Duration: 1 year

Additional Funding Award #3:
Date of Award: 7/2009 — Name of Granting Entity: USDA Forest Service
Dollar Amount: $20,000 — Name of Grant Program:
Grant Period Duration: 1 year

H. Appendices

1. With your report, please attach ***at least two (2) photographs*** that illustrate your project. Please describe the photo and indicate the name and institution of the person who took the photo. (If you submit more than two photographs, please include those additional descriptions and photo credits under "I. Additional Information," below.)

Photo #1 description:

Row of dead black walnut trees in Colorado killed by thousand cankers disease

Photo #1 credit (photographer's name and institution):

Curtis Utley, Colorado State University

Photo #2 description:

Declining northern California black walnuts

Photo #2 credit (photographer's name and institution):

Chuck Leslie, UC Davis

2. Also attach any printed fact sheets or other publications resulting from your work that will enhance our understanding of your project and its impacts. Please provide a description of each attached publication below.

Document #1 description:

Fact sheets can be downloaded from the website http://www.colostate.edu/Depts/bspm/extension%20and%20outreach/thousand%20cankers.html

Document #2 description:

Document #3 description:

I. Additional Information

Credit: *Some of the language about impacts and potential impacts was adapted from a PowerPoint presentation by H. Michael Harrington, Executive Director, Western Association of Agricultural Experiment Station Directors, Colorado State University.*

Attachment A

Questions to Help in Reporting Impacts and Potential Impacts

Below are some questions that will guide you in assessing and then describing the impacts and potential impacts of your project. The relevance of each question may vary depending on whether yours is a research or extension project. Please answer as many as you can to the best of your ability, and feel free to describe any additional types of impacts not mentioned below. Remember to identify any potential impacts.

1. ***Innovations in IPM:***
   Are there new IPM practices that have been (impacts) or could be (potential impacts) adopted as a direct result of your project? What is the total number of acres (or homes, schools, greenhouses, nurseries) on which these practices could realistically be implemented?
2. ***Safeguarding human health and the environment:***
   a. Has the project reduced risk (or could it potentially do so) by changing the use of pesticides on farms, in homes, in schools, etc.? For example, could it result in fewer sprays per season or a switch to lower-risk pesticides? If possible, quantify the changes in condition. (Since there is no unanimous definition of *high* and *low risk,* investigators selecting this indicator are asked to categorize the pesticides they are reporting on as *high* or *low risk* according to the particular situation [e.g., lower risk to natural enemies]).
   b. Are there any other impacts or potential impacts on human health or the environment as a result of your project?
3. ***Economic benefits:***
   a. What is (or could be) the economic benefit (e.g., dollars saved) for clientele who adopt IPM strategies and systems you studied? Do you envision potential commercialization or mass production of these systems?
   b. How many clients are satisfied with IPM results (such as improved yield, improved quality of yield, reduced pest populations, more effective pest control, greater preservation of nonpest species)?
   c. Are there other financial benefits that might be realized (potential impact) as a result of your project?
4. ***Implementation of IPM:***
   a. How many IPM strategies and systems have been validated through this project (e.g., through on-farm trials, large plot tests, or other methods used to confirm efficacy)?
   b. How many educational materials were delivered? To whom? And what are the impacts or potential impacts?
   c. What is the number of growers/personnel trained? And what are the impacts or potential impacts?
   d. For a Web site, what volume of traffic and type of use has the site experienced? (For example, number of visitors per day or month; number of page views; number of unique user sessions; change in volume during growing season; average viewing time.) And what are the impacts or potential impacts?
   e. How many more people adopted IPM practices as a direct result of your project, or how many people adopted new IPM practices?
   f. Are there other ways in which your work will result in improved use or increased implementation of IPM strategies in your region or across the West?
5. Has your project or study increased collaboration among stakeholders interested in the development and implementation of improved IPM strategies and systems?