

Commonwealth of Pennsylvania Thousand Cankers Disease Action Plan

APRIL 13, 2012

Prepared by:

Pennsylvania Forest Pest Task Force¹

Adapted from the State of Tennessee Thousand Cankers Disease Action Plan October 25, 2010

Contributors: Dana Rhodes, Coanne O'Hern, Shu Ambe, Thomas Hall, Rachel Nyce, Timothy Newcamp, Richard Turcotte, Nicole Bucher, Joseph Demko, Leo Donovall, Mitchell Dykstra, Donald Eggen, Timothy Frontz, Greg Hoover, Bill Elmendorf, Fengyou Jia, James Kaiser, Houping Liu, Rachel Wagoner, D. Wayne Bender, Keith Craig, Paul Lyskava, and Sven-Erik Spichiger

1. Appendix E

Table of Contents

Topic	Page Number
I. Introduction	3
A. History	3
B. Biology.....	4
C. Values at Risk.....	6
II. Purpose of Action Plan.....	7
III. Goals.....	8
A. Detect and Assess.....	8
B. Mitigation.....	9
C. Outreach.....	15
D. Utilization.....	19
E. Research Needs.....	19
IV. Literature Cited.....	20
V. Appendices.....	22
A. Web Links	20
B. Reporting Suspect Thousand Cankers Disease Infestation.....	20
C. State Quarantine Orders and Sample Compliance Agreement Maps.....	21
D. Current TCD Related Maps.....	21
E. Contributing Pennsylvania Forest Pest Task Force Members.....	22
F. Conservation and Natural Resources ACT 18 and Forest Pest Act of 1973.....	22

Pennsylvania Thousand Cankers Disease Action Plan

I. Introduction

Thousand cankers disease (TCD), recently discovered in Pennsylvania, poses a significant new threat to black walnut in Pennsylvania. Thousand Cankers Disease is a complex that is caused by the walnut twig beetle (*Pityophthorus juglandis*) and an associated fungus (*Geosmithia morbida*). Black walnut (*Juglans nigra*) is highly susceptible to this disease (Tisserat et al., 2009).

A. History

The walnut twig beetle (WTB) is native to North America; its native range in the southwest appears to coincide largely with the distribution of Arizona walnut (*J. major*), the likely original native host (Cranshaw and Tisserat, 2008). Records from California suggest that the WTB may be native to that state also; *P. juglandis* was described from specimens collected in California on *J. nigra* (Bright and Stark, 1973) and *J. californica* (Bright, 1981), both of which are susceptible to thousand cankers disease. The first published record of a cluster of black walnut mortality associated with the walnut twig beetle was in the Espanola Valley of New Mexico where large numbers of mature black walnut died in 2001 (Cranshaw and Tisserat, 2008). Similar widespread decline also occurred about this time in the Boise, Idaho area where the insect was first confirmed present in 2003 (Cranshaw and Tisserat, 2008).

Black walnut mortality and the twig beetle have been noted in several Front Range communities in Colorado since 2004 and in most infested cities the majority of black walnut has since died. *P. juglandis* has been recorded from Oregon (Portland) since 1997, has been widely captured in funnel traps in The Dalles since 2004, and is suspected of being associated with recent widespread death of black walnut and black walnut hybrids in the Willamette Valley of Oregon (Cranshaw and Tisserat, 2008).

Prior to these recent reports, WTB was not associated with any significant *Juglans* mortality. In most areas where the die-offs of black walnut have occurred, drought was originally suspected as the cause of the decline and death of trees, with the beetle as a secondary pest. The widespread area across which *Juglans* spp. die-offs have been recently reported, combined with the documented presence of associated canker producing fungal pathogen carried by the twig beetle, and the occurrence of black walnut death in irrigated sites not sustaining drought, all suggest an alternate underlying cause (Cranshaw and

Tisserat, 2008).

The first confirmation of the beetle and fungus within the native range of black walnut was in Knoxville, Tennessee (July 2010) (Seybold, et al., 2010). *Geosmithia morbida* was confirmed in samples under regulatory control in August 2010. The potential damage of this disease to eastern forests could be great because of the widespread distribution of eastern black walnut, the susceptibility of this tree species to the disease, the capacity of the fungus and beetle to invade new areas' and apparent ability to survive under a wide range of climatic conditions (Cranshaw and Tisserat, 2008).

Publications relative to TCD are available online including pest alerts by Colorado State University <http://www.ppd.l.purdue.edu/PPDL/pubs/walnutthousandcankersdisease.pdf> ; and the USDA Forest Service http://na.fs.fed.us/pubs/palerts/cankers_disease/thousand_cankers_disease_low_res.pdf .

B. Biology

The walnut twig beetle *Pityophthorus juglandis* is the only *Pityophthorus* species associated with both *Juglans* and *Geosmithia*, and can be readily distinguished from other members of the genus by several physical features (Cranshaw and Tisserat, 2008). There are a number of bark beetles (Coleoptera: Curculionidae: Scolytinae) that have the potential to serve as alternate vectors of *Geosmithia* conidia (Newton and Fowler, 2009). For instance *Pityophthorus lautus* is known to attack black walnut (*Juglans nigra*) in its native range (Wood 1982). Adult beetles are very small (1.5 to 2.0 mm long or about 1/16 in) and are reddish brown in color. This species is a typical-looking bark beetle that is characterized by its very small size and four to six concentric ridges on the upper surface of the pronotum (the shield-like cover behind and over the head). Like most bark beetles, the larvae are white, C shaped, and found in the phloem. For this species, the egg galleries created by the adults are horizontal (across the grain) and the larval galleries tend to be vertical (along the grain) (Seybold, et al., 2010).

On *J. nigra*, the beetle prefers to colonize the under- side of branches in rough areas and prefers branches larger than 3 cm (1 in) in diameter (Tisserat, 2010). Tunneling sometimes occurs in trunks (Cranshaw and Tisserat, 2008). It also prefers the warmer side of the tree (Cranshaw and Tisserat, 2008).

Recent studies conducted on *J. hindsii* in California have revealed that male beetles colonize newly cut branches in 4-9 days and are joined quickly by 1 to 2 females. Brood galleries are then created. Both sexes contribute to an aggregation pheromone that attracts both sexes to infested branches (Seybold et al., 2009).

Winter is spent, possibly exclusively, in the adult stage sheltered within cavities excavated in the bark of the trunk. Adults resume activity by late April and most fly to branches to mate and initiate new tunnels for egg galleries; some may remain in the trunk and expand overwintering tunnels. During tunneling the *Geosmithia morbida* fungus is introduced and subsequently grows in advance of the bark beetle. Ultimately a nuptial chamber is produced from which one or more radiating egg galleries are excavated. Larvae develop just under the bark and then enter the bark to pupate (Cranshaw and Tisserat, 2008). Larval development takes 6-8 weeks to complete. There are generally two overlapping generations per season in Colorado. Adult beetles can be observed flying from mid-April to late October in Boulder (Cranshaw and Tisserat 2008; Cranshaw 2008). The adult WTB is estimated to fly one to two miles (USDA APHIS PPQ NPAG-Archives, 2008).

A single generation has been observed to be completed in less than two months. Yellow sticky trap sampling in Boulder, Colorado found adult beetles to be present from mid-April through early October, when sampling was discontinued. Peak adult captures occurred from mid-July through late August. These data suggest that two or more generations may be produced annually, which may increasingly overlap later in the growing season (Cranshaw and Tisserat, 2008). WTB populations can reach levels of 30 per square inch; a single black walnut tree may produce tens of thousands of beetles (Cranshaw 2010).

Small, diffuse, dark brown to black cankers, caused by *Geosmithia morbida*, initially develop around the nuptial chambers of the walnut twig beetle in small twigs, branches and even the trunk. *Geosmithia* spp. are associates of bark beetles of hardwood and conifer trees but have not previously been reported as pathogens of *Juglans* or fungal associates of *P. juglandis*. Branch cankers may not be visible until the outer bark is shaved from the entrance to the nuptial chamber; although a dark amber stain may form on the bark surface in association with the cankers. Cankers expand rapidly and develop more expansively lengthwise than circumferentially along the stem. On thick barked branches, cankers may at first be localized in outer bark tissue and extend into the cambium only after extensive bark discoloration has occurred. Eventually multiple cankers coalesce and girdle twigs and branches, resulting in branch dieback. The number of cankers that are formed on branches and the trunk is enormous; hence the name thousand cankers to describe the disease (Cranshaw and Tisserat, 2008).

The disease is scattered throughout western states and reports of walnut mortality are occurring simultaneously in areas that are connected by major highways. This distribution along major commerce routes suggests that movement of thousand cankers disease and its vector may be human assisted (Newton and Fowler, 2009).

The recent USDA-APHIS (2009) pathway assessment on *Geosmithia sp.* and *Pityophthorus juglandis* Blackman movement from the western portion of the nation into the eastern United States, characterized the approach rate of potential TCD pathways. Veneer logs, sawlogs, burls, stumps, firewood, wood packaging material, nursery stock, scion wood for grafting, nuts and natural spread are addressed in the report (USDA APHIS, 2009). The basic principles of the report remain useful and valid. However, the unexpected discovery of TCD deep in native black walnut range, over one thousand miles from the nearest known infestation has confirmed some assumptions while diminishing others. It is important to keep in mind that the Tennessee infestation has likely been present for 10-20 years. An important question now is where else in the native range of black walnut this disease may be present but not yet detected (Newton, 2010). Drought and other symptoms may have masked TCD from being readily detected.

C. Values at Risk

Walnuts are important timber trees with the black walnut (*Juglans nigra*) being the most valuable. Black walnut commonly grows about 75' in height, but can reach a height of 150'. It has similar crown characteristics to butternut, in addition to a well-shaped trunk free of branches. Based on forest inventory and analysis data, Pennsylvania has 28,211,765 black walnut trees on forested land. Commercial value of black walnut in Pennsylvania is the highest per board foot of any native tree species. Although it comprises less than one percent of marketable timber, it is valued at up to ten percent of total sales (Bender-personal communication). Black walnut has commercial value in numerous forms including veneer, lumber, and nut products. The wood is easily worked, durable, retains finish well, has a highly marketable appearance, and a long-standing reputation with consumers as being highly desirable. Final products made of walnut include furniture, cabinets, interior trim, wood carvings, instruments, and gun stocks. Nuts from walnut have a variety of uses from food products to polishing compound. Black walnut hulls are used for flavoring and health food extract for a variety of skin and intestinal ailments.

Although messy due to large, fleshy fruits, black walnut trees are very good landscape trees for a number of reasons. They are one of the last trees to bud out in the spring and one of the first trees to drop leaves in the fall. This makes the tree less susceptible to severe damage from late or early snow and ice storms. Their excellent branch structure helps the trees resist damage from storms with high winds. Because of a pinnately compound leaf, the trees lose much of the mass of leaves and small twigs each year. This allows more sunlight to penetrate the canopy to warm buildings, making it an excellent 'solar tree', especially if planted properly on the west side of structures. Although their wood is highly prized, their value as landscape trees in parks and other spacious areas enjoyed by people may be far greater than timber value. The landscape value of a large, mature black walnut in good condition could be around \$9,000

(Bill Elmendorf- personal communication). Loss of black walnut from backyards and streets would forever change the appearance of Pennsylvania communities. Costs associated with hazard tree removal and replacement tree planting would be very high (At least \$1,500).

Black walnut is a relatively important species for wildlife, mostly for its nutritious nut meat. Wildlife species that consume the nuts are generally rodents such as squirrels and mice. These species are expected to be moderately to severely affected should black walnut be lost from the landscape.

TCD is not a federally quarantined pest. This leaves to the states the role of making decisions regarding quarantines. Some states have established external quarantines that limit or prevent black walnut products originating from states known to have TCD from entering their state. External quarantines prevent movement of Pennsylvania black walnut into these states, and are likely to have a detrimental effect on Pennsylvania walnut value. Internal quarantines are those that Pennsylvania regulatory officials have developed to prevent the movement of TCD infested materials within and out of Pennsylvania. Desired effects of the self-imposed internal quarantine are to slow the spread of TCD and maintain marketability of Pennsylvania walnut products. Quarantines, both internal and external, are a source of great concern to the marketability and commercial value of black walnut in Pennsylvania.

Two important native species within the family *Juglandaceae* were exposed to the *Geosmithia morbida* in pathogenicity tests (Utley et al., 2009). These preliminary tests demonstrated that butternut (*Juglans cinerea*) developed cankers but pecan (*Carya illinoensis*) did not, and appears to be resistant (or entirely immune) to the pathogen (Utley et al. 2009).

II. Purpose of Action Plan

The broad objective of the Pennsylvania Thousand Cankers Disease Action Plan is to slow the spread of TCD. The primary goal of the Action Plan is to detect and contain walnut twig beetle and *Geosmithia morbida*, and then mitigate their impact. The Action Plan has been developed to provide a statewide coordinated response amongst key agencies, and to help local communities plan to respond to the negative effects of the thousand cankers disease. The Action Plan should be considered a dynamic and evolving document that may change as new research and management information becomes available pertaining particularly to the eastern United States.

The Action Plan may reference guidelines established in the National Framework for Thousand Cankers Disease developed by the USDA Forest Service, State and Private Forestry, Forest Health Protection section, and the TCD Technical Working Group.

III. GOALS

A. Detect and Assess

Introduction:

Thousand cankers disease of black walnut (*Juglans nigra*) is a disease – insect complex whereby the pest *P. juglandis* serves as vector for disseminating *Geosmithia morbida* from a diseased black walnut tree to another susceptible black walnut tree. As black walnut is the main host for this disease in the Eastern United States, initial detection surveys focus on locations where susceptible black walnut trees are readily encountered and are in proximity to where a known infestation event has been confirmed or where a high-risk pathway for TCD introduction exists.

Detection Survey Strategies:

Detection surveys should be implemented to cast a wide network of high-risk survey points to determine the distribution of the pest and/or disease. Initial efforts should focus on identifying accessible walnut trees in counties adjacent to confirmed TCD infested counties. Walnut twig beetle (*Pityophthorus juglandis*) survey methodologies that are appropriate to detect this pest would include the use of insect traps designed for attracting and capturing bark beetles. The use of multiple-funnel traps baited with lures to capture the target pest in a liquid reservoir is one effective strategy on which to base detection, monitoring, and delimiting surveys. When the target pest is detected at a specific trap location then a delimiting survey may be implemented. Once the walnut twig beetle is detected, follow-up evaluations of symptomatic trees will be required to determine whether TCD is present. This will necessitate sampling of symptomatic material where live tissues are present and submitting these samples to Pennsylvania Department of Agriculture. Detection and assessment activities will be coordinated through periodic meetings of the Pennsylvania Forest Pest Task Force to avoid duplication of efforts.

Sampling:

1. Samples which include any live material of *Geosmithia morbida*, *Juglans sp.* and/or *Pityophthorus juglandis* must be accompanied by a Permit for Movement or a Certificate of Compliance issued from the Pennsylvania Department of Agriculture.
2. Samples moved from the quarantine area which may include live regulated articles must meet the following procedures for transportation:
 - a) Samples must be contained in a solid packing container, preferably metal or rigid plastic. Styrofoam, plastic baggies, or

cardboard will be not be acceptable. The container must be closed and sealed to prevent opening during transport.

b) Samples must be transported in a solid cooler with ice packs during the transport period. The coolers are to be sealed to prevent opening during transport. Coolers may not be Styrofoam or cardboard.

c) Samples must be received within a 24 hour period when sent via commercial transport. Notice of delivery should be received by the sender.

d) Samples shipped within Pennsylvania must be received by a facility which has been inspected and approved for containment of *Pityophthorus juglandis*, by PDA and/or USDA-PPQ.

3. Any movement of live material associated with Thousand Cankers Disease will be considered a violation of the Quarantine Order and is subject to penalties and fines as described in the Quarantine.

Data Collection and Reporting:

Data collection for detection and assessment activities may differ for various cooperating agencies. Because discovery of a positive TCD location could lead to regulatory action, potential positive samples from new locations must be verified by an official of the Pennsylvania Department of Agriculture. For this reason a minimum data standard established by the Pennsylvania Department of Agriculture will be met by all cooperators. Should additional data be required by a cooperating agency, such data collection will be coordinated through the Pennsylvania Forest Pest Task Force.

B. Mitigation

Introduction:

The regulatory component supports the mitigation effort by ensuring that Thousand Cankers Disease is not spread artificially by human activities. This section provides a general outline of the overall Regulatory component functions and activities.

Regulatory Authorities:

1. The Plant Pest Act (act) (3 P.S. §§ 258.1 – 258.27) empowers the Department of Agriculture (Department) to take various measures to detect, contain and eradicate plant pests.
2. Pennsylvania Department of Agriculture – Plant Pest Act – Under the authority of section 258.20 of the Act (3 P.s. § 258.20) the Department may declare a pest to be a public nuisance when the Department determines a plant pest to be dangerous or destructive to the agriculture, horticulture or forests of this Commonwealth.
3. Pennsylvania Department of Agriculture - Plant Pest Act - Under the authority of section 258.21 of the Act (3 P.s. § 258.21) the Department may establish quarantines to prevent the dissemination of plant pests within this Commonwealth.
4. Order of Quarantine; Thousand Cankers Disease [41 pa.B. 4644] Signed August 10, 2011.
5. Affected local government(s) at sites of infestation.
6. The Forest Pest Act of 1972 (§ 1311.4) and the Conservation and Natural Resources Act 18 (1995) empower the Department of Environmental Resources (Currently known as Department of Conservation and Natural Resources) to make surveys and investigations to determine the presence of infestations of forests pests. (Appendix F)

Regulatory Official:

State Plant Regulatory Official

Dana Rhodes
 Pennsylvania Department of Agriculture
 Bureau of Plant Industry, Division of Plant Protection
 2301 North Cameron Street
 Harrisburg, PA 17110
 (717)772-5205 danrhodes@pa.gov

Regulated Articles:

The regulated articles for TCD include but are not limited to the following:

1. Any life stage of the walnut twig beetle, *Pityophthorus juglandis*.
2. The fungal pathogen, *Geosmithia morbida*.
3. Firewood from all hardwood species.
4. All host material living, dead, cut, or fallen inclusive of nursery stock, logs, green lumber, stumps, roots, branches, and debris of half inch or more in diameter of *Juglans sp.*

5. Any article, product, or means of conveyance when it is determined to present the risk of spread of the TCD.

General Regulatory Activities:

Regulatory activities are directed to the implementation and enforcement of quarantine provisions governing movement of regulated articles (defined in section above) which could result in the artificial spread of TCD. Typical activities include:

1. Identifying persons and establishments whose business or personal activities could result in the artificial spread of TCD. For example, but not limited to:

- Nurseries
- Landscapers and garden centers
- Firewood dealers
- Logging companies
- Utilities companies
- Tree removal companies
- Tree pruning companies
- Municipalities whose workers remove or trim trees
- Sanitation workers, as well as other municipal or community services
- Yard waste removal firms
- Campgrounds
- Civil War Re-enactors
- Wood Workers
- Others as designated

2. Contacting by telephone, mailings and/or personal visits to those identified persons or establishments to explain quarantine provisions.

3. Determining if provisions in the quarantine (e.g., treatment or processing) may be applied to permit the person or establishment to move regulated materials out of the quarantined area. If such provisions are applicable, enter into a formal compliance agreement with the person or establishment. The compliance agreement will stipulate the specific way host materials must be handled by the person or establishment to meet the provisions of the quarantine.

4. Issuing limited permits to allow movement of regulated articles out of the quarantine area to a specific destination for further processing or treatment, if allowable.
5. Issuing certificates to allow movement of regulated articles out of the quarantine area when they have been treated or processed in such a manner that they no longer present a risk of artificially spreading TCD.
6. Monitoring the activities of those persons or establishments placed under compliance agreement by overseeing treatments or other processes and activities.
7. Conducting and/or assisting with investigations of suspected violations of the quarantine as necessary and appropriate.
8. Recording information about contacts, visits, and compliance agreements and maintaining a database of persons or establishments affected by the quarantine.
9. Periodically reporting results of regulatory activities to management officials.

Regulatory Host Disposal Activities:

The focus of disposal activities will be to locate appropriate marshaling/collection sites and set up a system where municipalities, tree service companies, utilities, and individuals can drop off cut host material which will be further processed and disposed of in a manner to support program objectives to prevent artificial spread.

Designated marshaling locations will be required to meet certain size, security, operational, and accessibility criteria. Processing and disposal activities will be specified and supervised by regulatory personnel and will be consistent with those specified in the quarantine.

Designated marshaling/collection locations may be identified by the program or they may be provided by municipalities or other entities that are willing to cooperate with the activity. Marshaling locations, processing activities, and disposal activities will operate under a Memoranda of Understanding, and/or Compliance Agreements to ensure that stipulated activities are clear and consequences for noncompliance are known.

As part of good regulatory practices, marshaling yards will be only located within the quarantine area.

The following general disposal activities will be performed by regulatory personnel:

1. Develop general specifications for marshaling yards, processing activities, and disposal activities.
2. Monitor the operations of the marshaling yards.
3. Enter into compliance agreements with disposal sites to ensure that stipulated activities are clear and consequences for noncompliance are well known.
4. Conduct or assist with investigations of suspected violations of specified procedures as necessary and appropriate.
5. Record information about contacts, visits, and compliance agreements and maintain a database of persons or establishments affected by the quarantine.
6. Report activities and results on a regular basis to TCD management officials.

Enforcement Activities:

Compliance agreements with the regulated establishments listed previously are required to move regulated articles if program inspectors are not present to monitor the movement. An example of a compliance agreement can be found at the end of this section. All firewood (of hardwood species), TCD-infested host material, and dead, cut, or fallen logs, green lumber, stumps, roots, branches, and debris of ½ inch or more in diameter, of regulated species are required to be chipped to a size of less than 2 inch in at least two dimensions prior to leaving the regulated area.

Nursery stock in the regulated area is subject to inspection. Any infested host material found in the nursery trade is required to be chipped. Chipped material must be no larger than 1 inch in at least two dimensions. Uninfested host material in the nursery trade is allowed to leave the regulated area if accompanied by a certificate of inspection and the approved permits. When uninfested host material is sold for planting the seller will keep records of the sale. These records will include the name, address, and phone number of the buyer so that regulatory officers can inspect the host material after planting for the presence or absence of TCD.

Regulatory Investigations and Violations:

Regulatory incidents are movement of regulated articles by artificial means (firewood, nursery stock, logs, etc.) to areas not contiguous with the natural spread of the TCD. When regulated material is suspected to have been moved out of the regulated area in violation of the quarantine, regulatory personnel will conduct investigations to determine if a violation of the quarantine has occurred. Penalties for willful violations of the quarantine could result in civil or criminal prosecution with fines up to \$20,000 under the Pennsylvania Plant Pest Act. These investigations will also attempt to identify and to trace (trace back and trace forward) the source and destination of any other related shipments of regulated materials that may have occurred.

- Trace back inspections will be conducted in an attempt to determine the source of the infestation. These inspections will begin at the epicenter of the infestation and work outward from there.
- Trace forward inspections will be conducted to determine if infested host material has been moved out of the regulated area. These inspections will start with the regulated establishments located in and/or conducting business within the regulated area. Once these establishments are identified, the survey protocols used for the High Risk Establishment survey will apply.

Quarantine Boundaries:

Initial quarantine boundaries are established through consultation with the cooperating regulatory agencies on the project. Generally quarantine boundaries may follow the established county boundaries as defined by the Commonwealth of Pennsylvania. The county will be called once official confirmation is determined by the Pennsylvania Department of Agriculture.

Hot spot infestations are those areas which contain TCD-infested host material that can be directly linked to the movement of regulated articles outside of an existing quarantined area. These infestations are identified through the High Risk Site Survey protocols or Trace Forward Inspections. They are characterized by their small size (all infested trees are contained within a 300-yard radius). With the consensus of the cooperating regulatory agencies on the project, these areas can be placed under a transitional quarantine boundary a ½ mile in radius. These areas will be monitored throughout the year, using intensive core area and delimiting survey methods. If spread beyond a ½ mile is identified, then the standard quarantine boundary protocols will be applied.

Reports for Regulatory Activities:

The regulatory program will employ a computerized database for regulatory personnel to record regulatory activities. The greatest possible use will be made of electronic data collection devices in the field to promote speed and accuracy in submitting data. Regulatory personnel will use a database to record information and generate periodic status reports.

Quality Assurance:

Regulatory Officers will spot check the removal of TCD-positive host material to ensure that contractual obligations are being met.

C. Outreach

Introduction

The public outreach component supports the Thousand Cankers Disease (TCD) action plan by providing information services that increase public awareness, understanding, and support for the program. Increased public awareness and understanding enhance the effectiveness of detection survey efforts, help to prevent adverse public reaction to management efforts, and promote compliance with state regulations. This section provides a general outline of the overall public outreach component functions and activities. The outreach component will provide multiple sources of contact to work cooperatively with state and local authorities, federal agencies, industry groups, community groups, and others to establish and convey a consistent message regarding TCD.

General Outreach Activities:

1. Coordinate outreach efforts among cooperators to ensure that the program has a consistent message.
 - a. Establish a Pennsylvania TCD outreach committee with membership from state, federal, private, and Penn State Extension partners.
 - Identify roles and responsibility—individually and as a whole
 - Identify policies and procedures for releasing information to the public and stakeholders such as professional landscapers and arborists, the lumber and wood industry, nursery owners, environmental organizations, and any other group who may be economically impacted by the program.
 - Address financial responsibilities for outreach activities.
2. Develop outreach materials to meet various programs needs and reach

various audiences.

a. The public outreach staff will work with the Pennsylvania Forest Pests Task Force to identify areas or activities where outreach materials are needed and develop informational materials to meet those needs.

Priorities:

- Identify target audiences
- Identify commonly ask questions and develop appropriate, consistent responses
- Identify key messages for all program initiatives; don't move firewood, examine your trees, know state quarantines / regulations, etc.

3. Deliver outreach materials through a variety of outlets to ensure widest exposure.

a. Create a marketing mix using mainstream media to reach targeted audiences—television, radio, internet, outdoor, recreational, newspaper, and industry publications.

b. Network with the Pennsylvania Forest Pests Task Force and other groups to support the program's communication to specialized target audiences through industry newsletters, website links, and association meetings.

c. Deliver education information on TCD to stakeholders and the public at country fairs, home and garden shows, regional association meetings, chamber of commerce events, etc.

d. Create PowerPoint presentations on various aspects of TCD.

4. Maintain a website in the Department of Entomology at the Pennsylvania State University to provide access to current information on TCD. Coordinate with public outreach efforts in Colorado, Missouri, Tennessee, Virginia, and other states.

a. Establish policies and procedures for placing information on the website.

b. Ensure links are in place from other related websites (cooperators) (Appendix B).

c. Ensure that the Pennsylvania Forest Pests Task Force website incorporates all cooperator logos.

5. Plan to train knowledgeable personnel who can answer questions

about TCD and for establishing a tracking mechanism of public TCD inquiries.

6. Catalogue and review existing informational materials (brochures, posters, pest alerts) to prevent duplication of effort and to ensure consistency.
7. Develop public service announcements and arrange for broadcast on radio and/or television as needed.
8. Arrange, moderate, and provide presentations and audiovisual support at public meetings.
9. Choose some specialized communication vehicles (magnets, tattoos, stickers, door knob hangers, etc.) to support TCD awareness.
10. Continually refine and develop communication vehicles (brochures, posters, newsletters, etc.) to ensure accuracy and current program information.
11. Develop news releases for mainstream and ethnic media.
12. Public announcement in the state park campsite reservation system(TCD and firewood).

Public Meetings:

Public meetings will take place where management efforts might have an impact on a community. The purpose of these meetings will be to address public concerns and secure community support for TCD management activities. Outreach personnel will coordinate scheduling and facilities and ensure that public meeting notifications are posted in appropriate newspapers and other media outlets. Handouts, fact sheets, informational posters, and other outreach materials should be available at these meetings. Public meetings will include the following:

1. A moderator who can ensure the orderly conduct of the meeting and direct questions to the appropriate person(s) for response.
2. Political representatives and community leaders who are recognized by the local community.
3. State, federal, and Penn State Extension program representatives who can respond to questions about TCD, state quarantine restrictions, management measures, and community impact.

Media and Community Relations:

The Pennsylvania Forest Pest Task Force will identify an individual from each participating or cooperating agency as a media and community relations

spokesperson to maintain contact with the media and involved community groups. The spokespersons will develop and maintain contacts with each other, reporters and community group leaders. A representative from the PA TCD outreach committee will be designated to keep in touch with outreach personnel in other infested states to provide accurate and consistent information.

Stakeholders:

Organizations and agencies which may be affected by TCD, will be kept informed about and may be asked to participate in TCD activities. These include but are not limited to:

Pennsylvania Invasive Species Council

Pennsylvania Landscape and Nursery Association

Local governments (county, township, city, borough)

Pennsylvania Campgrounds Association

Sawmills

Utility companies

Arborists

Tree care companies

Arboreta (e.g. Morris Arboretum, Tyler Arboretum, Longwood Gardens)

The Nature Conservancy

Fairmount Park Commission

PA Forest Products Association

PA Hardwoods Development Council

PA Urban and Community Forestry Council

Woodlands Owners Associations

Conservation Districts

Watershed Councils

International Society of Arboriculture, Penn-Del Chapter

D. Utilization

Currently no utilization, silvicultural or stewardship guidelines are available for dealing with TCD. This task force will explore wood waste utilization opportunities with the forest products industries and other partners to reclaim walnut material to its highest possible use in the event a large volume of material suddenly becomes available. The task force will evaluate and encourage local market utilization. Under no circumstances should firewood be moved from an infested site.

E. Research Needs

1. Identify funding sources and expertise in specialty areas to collaborate in the development of specific information needs through cooperative research efforts.
2. Investigate impacts of TCD in eastern forest systems and urban areas.
 - a) Investigate pathways for fungal pathogen establishment independent of the insect vector.
 - b) Clarification of the nature of the disease cycle and progression of disease development.
 - c) Explore the role of asexual and sexual propagules in the dissemination of the disease.
 - d) Investigate the longevity of *Geosmithia morbida* in intact host tissue and debris, noting unique differences between eastern and western regions.
 - e) Evaluate existing black walnut families and seed sources for resistance to *Geosmithia morbida* or walnut twig beetle attack.
 - f) Characterize genetic resistance factors for tree improvement projects related to timber and commercial nut grower products.
 - g) Develop DNA/RNA primers for characterization of insect and pathogen variation and detection of new strains of the pathogen.
3. Develop strategies for mitigation of quarantine regulated items and determine effectiveness of treatment options.
4. Explore potential economic and ecological impacts of TCD in Pennsylvania.
5. Develop effective trapping and detection methods.

6. Identify potential pathways for TCD spread in the east.
7. Develop mitigation, management, and utilization strategies.

IV. Literature Cited

- Bright, D.E. and R.W. Stark. 1973. The bark and ambrosia beetles of California. Bull. Calif. Insect Surv. 16.
- Bright, D.E. 1981. Taxonomic monograph of the genus *Pityophthorus* Eichhoff in North and Central America (Coleoptera: Scolytidae). Memoirs of the Entomological Society of Canada. No. 118.
- Cranshaw, W. 2008. The walnut twig beetle and its association with 1000 cankers disease of walnut. 2008 Annual Meeting of the Entomological Society of America: Metamorphosis – A new beginning, Reno, Nevada. November 16-19, 2008.
- Cranshaw, W., and N. Tisserat. 2008. Pest Alert: Walnut Twig Beetle and Thousand Cankers Disease Of Black Walnut. Colorado State University. <http://wci.colostate.edu/Assets/pdf/ThousandCankers.pdf> .
- Cranshaw, W., 2009. Thousand Cankers Disease Management in Urban Forests – Draft August 2009. Newton, L., and G. Fowler. 2009. Pathway Assessment: *Geosmithia* sp. And *Pityophthorus juglandis* Blackman movement from the western into the eastern United States. USDA APHIS Rev. 19 August 2009. http://www.ksda.gov/includes/document_center/plant_protection/Plant_Disease_Fact_Sheets/GeosmithiaPATHWAYRev1101909.pdf
- Seybold, S. J., D. Haugen, J. O'Brien, and A. Graves. 2010. Pest Alert: Thousand Cankers Disease. USDA Forest Service, Northeastern Area, State and Private Forestry. Rev. August 2010.
- Seybold, S. J., T. W. Coleman, and A. D. Graves. 2009. The impact of invasive organisms on hardwoods in California urban landscapes with emphasis on the goldspotted oak borer [Abstract]. 93rd Annual Meeting of the Pacific Branch of the Entomological Society of America, San Diego, CA.
- Tisserat, N., W. Cranshaw, D. Leatherman, C. Utley, and K. Alexander. 2009. Black walnut mortality in Colorado caused by the walnut twig beetle and thousand cankers disease Plant Health Progress Published 11 August 2009.
- Tisserat, N. edits to TCDAP. September 2010.
- Utley, C., W. Cranshaw, S. Seybold, A. Graves, C. Leslie, W. Jacobi, and N. Tisserat. 2009. Susceptibility of *Juglans* and *Carya* species to *Geosmithia*; a cause of thousand cankers disease. Poster presentation, American Phytopathological Society Meeting, August 1-5, 2009, Portland, Oregon.
- USDA APHIS. 2009. Pathway Assessment: *Geosmithia* sp. and *Pityophthorus*

juglandis Blackman movement from the western into the eastern United States. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, Center for Plant Health Science and Technology, Pest Epidemiology and Risk Analysis Laboratory. Rev. 1, 19 October 2009.

V. Appendices

APPENDIX A - Web Links

National Program Page

<http://thousandcankers.com/>

USDA

<http://www.invasivespeciesinfo.gov/microbes/thousandcankers.shtml>

Pennsylvania Department of Agriculture

<http://pda.state.pa.us/ThousandCankersDisease>

USDA Forest Service

<http://www.fs.fed.us/foresthealth/fhm/sp/tcd/tcd.shtml>

PA-DCNR

<http://www.dcnr.state.pa.us/forestry/insectsdisease/diseases/index.htm>

Colorado State

<http://www.colostate.edu/Dept/bspm/extension%20and%20outreach/thousand%20cankers.html>

USDA Forest Service Fact Sheet

http://na.fs.fed.us/pubs/palerts/cankers_disease/thousand_cankers_disease_screen_res.pdf

Penn State Cooperative Extension

<http://extension.psu.edu/greenindustry/news/2011/housand-cankers-disease-tcd-detected-in-pa>

APPENDIX B - Reporting Suspect Thousand Cankers Disease Infestation

Reporting Process:

General public:

Suspect TCD infestations may be reported by calling 1-866-253-7189. Provide name, location, phone number, date and site/tree characteristics and symptoms.

Information may also be submitted online at **badbug@pa.gov**

Or by contacting your local county's Penn State Extension Office

APPENDIX C - State Quarantine Orders and Sample Compliance Agreements

<http://www.pabulletin.com/secure/data/vol41/41-35/1462.html>

APPENDIX D - Current TCD Related Maps

[Quarantine Map of Pennsylvania](#)
[Map of States Known to Have TCD](#)

APPENDIX E – Contributing Pennsylvania Forest Pest Task Force Members

Pennsylvania Department of Agriculture:
Dana Rhodes, Shu Ambe, Nicole Bucher, Sven-Erik Spichiger, Leo Donovall

United States Department of Agriculture:
Animal and Plant Health Inspection Service, Plant Protection and Quarantine-
Coanne O'Hern, Rachel Nyce, Timothy Newcamp, Mitchell Dykstra
United States Forest Service- Richard Turcotte

Pennsylvania Department of Conservation and Natural Resources:
Bureau of Forestry- Donald Eggen, Timothy Frontz, Fengyou Jia, Houping Liu, Thomas Hall
Bureau of Parks- Rachel Wagoner

Pennsylvania Department of Transportation: Joseph Demko
Pennsylvania Turnpike Commission: James Kaiser
Pennsylvania State University Department of Entomology: Greg Hoover

APPENDIX F – Conservation and Natural Resources ACT 18 and Forest Pest Act of 1973

Conservation and Natural Resources Act 18 (1995):
<http://www.dcnr.state.pa.us/legal/cnract/index.htm#302>

Act 18 directs DCNR "... to protect all forest land in this Commonwealth from forest fires, fungi, insects and other enemies, ..."

Forest Pest Act of 1973:
<http://www.legis.state.pa.us/CFDOCS/Legis/PN/Public/btCheck.cfm?txtType=PDF&sessYr=1973&sessInd=0&billBody=S&billTyp=B&billNbr=0584&pn=0619>

The Forest Pest Act authorizes the DCNR to "... make surveys and investigations to determine the presence of infestations of forest pests. For this purpose duly designated representatives of the department may enter at reasonable times on public and private lands for the purpose of conducting such surveys, investigations and controls. Said representatives shall carry

credentials and identification papers when entering private lands and, if possible and practical, shall consult the owners or persons in possession of said lands before entering upon private lands.”

In addition, “whenever the department finds that any area in the Commonwealth is infested or threatened to be infested with forest pests it shall determine whether measures of control are needed and are available and the area over which the control measures should be applied.”

“Control Areas. – Upon establishment of a control area the department shall apply measures of infestation control on public and private forest and other lands within such area and to the trees, timber, plants or shrubs thereon, harboring or which may harbor the forest pests. For this purpose the duly authorized representatives of the department are authorized to enter upon any lands, public or private, within such areas.”

“Quarantine Authority Unaffected. – Nothing in this act shall be construed to change the quarantine authority of the Pennsylvania Department of Agriculture granted under The Pennsylvania Plant Pest Act.”