



# **PINE WILT COMMUNITY READINESS PLAN**

## **A Guide to Aid Local Central/Western Government in Addressing Pine Wilt Disease**



**State of Kansas  
Kansas Department of Agriculture  
Plant Protection and Weed Control Program**

2008 Version

**Contributing agencies:**

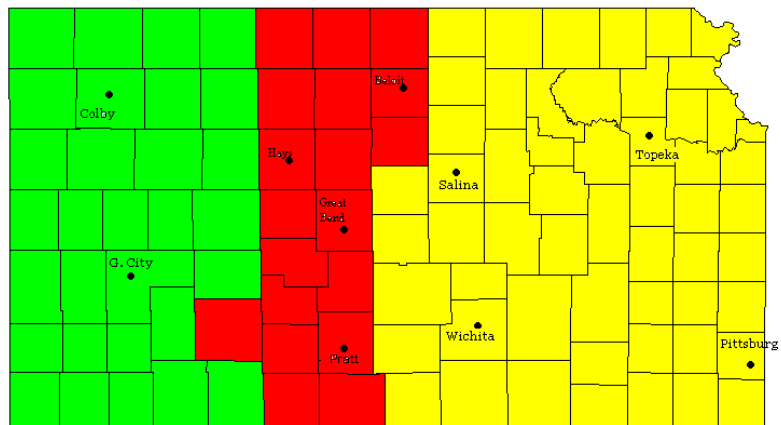


## Overview:

The objective of this plan is to help local communities to eradicate or minimize the establishment of pine wilt disease caused by the nematode *Bursaphelenchus xylophilus* and pine sawyer beetles of the genus *Monochamus* that vector the disease causing nematode. In Kansas, the disease commonly affects Scotch and Austrian pines and recently mugo pines.

By using this plan as a guide, the threat of pine wilt epidemics in communities can greatly be reduced and allow pines to remain an important part of the urban tree population in western Kansas communities.

Communities in central and western Kansas where pine wilt has not been reported or is not fully established should develop a local plan to protect their trees. Those are the counties in red or green on the adjacent map. The plan also may be used as a tool for communities in the eastern half of the state in addressing established pine wilt infestations.



**Risk Map for Pine Wilt Establishment - 2008  
Information**

Yellow - established Red - high risk  
Green - low to moderate

The elements of the plan are suggestions which taken as a whole should provide the necessary tools to manage or eradicate the disease. The community plan adopts to fit the local needs, circumstances, and resources in a flexible but timely manner.

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## Check List for Elements of a Pine Wilt Community Readiness Plan:

- \_\_\_\_ 1. Determine the lead agency or group within the community and designate a program supervisor or leader. Identify the role of stakeholders and other government agencies who will aid in implementation of the plan. An organizational chart may aid in the development of a command or coordination system. Communication is important for the success of the command system.
- \_\_\_\_ 2. Determine what regulations or laws apply to controlling a pest or a nuisance tree. Legislate with ordinances if determined needed.
- \_\_\_\_ 3. Develop an educational plan and address public relations issues for the community by determining who, what, and when. Inform the public and first detectors of the facts about the disease and the community readiness plan. The KSU Extension Service can be of great service in this regard.
- \_\_\_\_ 4. Develop a budget or other financial assistance items that would apply in detection, removal, and disposal of infected trees.
- \_\_\_\_ 5. Conduct a pine tree inventory/assessment and determine locations of high populations of pines or at risk pines. Promote a diversification of the urban tree population in age and species of trees.
- \_\_\_\_ 6. Develop and conduct a surveillance program for pine wilt. This program should include possible pathways of introduction, those parties that will contribute information, an information recording system, and the reporting of results to the state survey staff.
- \_\_\_\_ 7. Develop a removal policy. This element will be the major section of your community's readiness plan. It will describe how your community intends to manage its pine trees and will guide decision making relative to how the community will address issues such as removal/disposal, hazard tree assessment, private property trees, and replanting.
- \_\_\_\_ 8. You may submit your community readiness plan for review and comments to either the Kansas Forest Service or the Kansas Department of Agriculture.

**Remember that the causal agent and the insect vector spend all but one life stage inside a pine and early detection and proper disposal of the infected tree will aid elimination of the disease agent and vector.**

Courtesy of USDA  
Forest Service



Pupa of sawyer beetle.

**Element 1.**

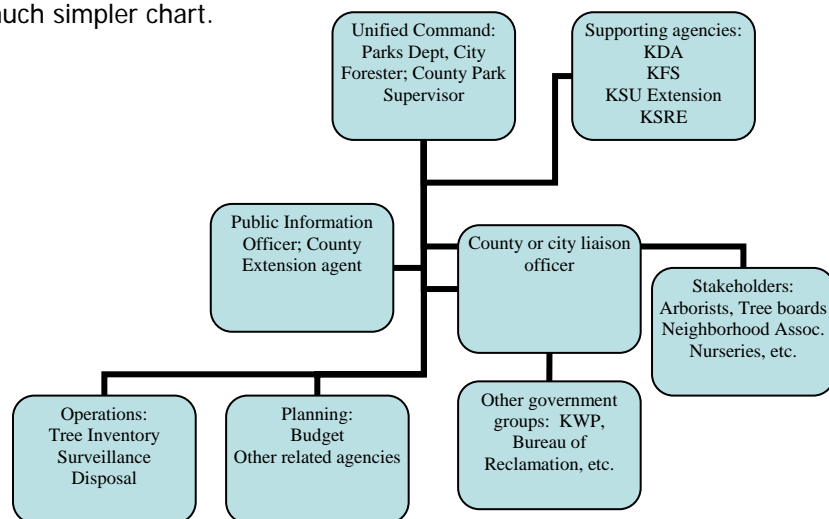
*Determine the lead agency or group within the community and designate a program supervisor or leader. Identify the role of stakeholders and other government agencies who will aid in implementation of the plan. An organizational chart may aid in the development of a command or coordination system. Communication is important for the success of the command system.*

A lead organization and individual should be designated for each community. This organization should be in local government or a community tree board. The party will be responsible for integrating various resources into the plan and implementing the pine wilt plan. It will also aid in planning and working with various agencies such as the Kansas Forest Service and Kansas Department of Agriculture.

Stakeholders within the plan can be a few or the plan may contain many groups or individuals. The number of stakeholders is proportional to the population of an urban community. Some examples include residents, garden clubs, nurseries or live plant dealers, arborists, landscapers, pesticide applicators, neighborhood associations, tree and conservation boards, and various private and public landowners. Stakeholders are important first detectors in the surveillance aspect of a pine wilt plan and education and communication with this group is essential. Cities that require professional licenses for such occupations as arborists and pesticide applicators may use this conduit to work closely with these groups as partners in early detection and proper disposal. It is important that both city and county government groups recognize the potential for pine wilt and work together as many neighborhoods or developments in larger urban centers are sometimes just outside of municipality boundaries and contain a large number of pine trees.

Communication is essential for any pine wilt plant to work. A public information officer should be determined. Keep up to date lists of personnel or parties in the organizational chart for communications between agencies and allow real time information out to the public and stakeholders. Internal and external communication from the lead municipal departments is essential. It is recommended to work up a list of frequently asked questions FAQ's for the general public, stakeholders, and government bodies to inform them of the program, pest, and other background information. Distribute pine wilt facts and updates throughout the lead department to keep personnel informed and to external outlets such as radio station or newspaper educational programs. Communicate an alert if pine wilt is found to the first detectors and public.

Below is an example of an organization chart for a large community or county. A smaller community would have a much simpler chart.



**Element 1 Worksheet:** the following should be developed and added to a preparedness plan.

1. City or community lead agency:
2. Contact Person:
3. List of stakeholders (include nurseries, arborists, other governmental groups, garden clubs, etc). Describe in short the expected contribution may be or other related topic. An example would be: an arborist was asked to take a tree out by a private landowner. The arborist then reports a dead pine or notices this tree changing color with a lack of resin/sap to the city and a sample is taken before removal to determine if it died from pine wilt.
4. Develop an organizational chart:
5. Develop a communication list: names, titles, responsibilities, phone and email information.

## **Element 2.**

*Determine what regulations or laws apply to controlling a pest or a nuisance tree. Legislate with ordinances if determined needed.*

Regulations, ordinances, permits, or laws are important to the pine wilt preparedness plan.

Many large communities require professional licenses and registration to work within a municipality. This requirement raises the standard of professionalism within the community and increases the public safety. Cities may require these professions to report suspect pine wilt and practice proper disposal of infected trees.

Review community tree ordinances. Tree ordinances may outline the authorities and persons responsible for tree planting, care and removal of trees on public property and sometimes-private property, and define ownership of trees.

A tree ordinance should include goals, Tree Board establishment, authorities/responsibilities, performance standards, and enforcement/penalties.

Through code/ordinance, communities may exercise their authority to require infested private property trees to be removed to prevent further spread of disease. Many Kansas communities still have nuisance ordinances that are on the books for Dutch elm disease. Typically, the removal of trees either is at the cost of the landowner as direct billing or added to property taxes. We recommend a review of these costs to private landowners as the city may wish to provide some assistance in the form of direct assistance for either cutting the tree down, removal, disposal and replacement.

The lead agency or program supervisor should be aware of the following (see appendix):

1. Kansas Tree and Shrubbery Law
2. Notice of Regulatory Action, KDA
3. Kansas Plant Pest and Ag Commodity statute (portion of)
4. Pesticide applicators require by state statute, to undergo continuing education and certification.
5. It is required by state statute that persons, businesses selling, or moving plants to be licensed with the Kansas Department of Agriculture and the material must meet pest freedom standards.
6. Local tree ordinances already in place

**Element 2 Worksheet:** List local ordinances that may apply to the pine wilt plan.

### Element 3.

*Develop an educational plan and address public relations issues for the community by determining whom, what, and when. Inform the public and first detectors of the facts about the disease and the community readiness plan. The KSU Extension Service and Kansas Forest Service can be of great service in this regard.*

It is important in larger communities to heighten public awareness and to use stakeholders as first detectors. There are numerous fact sheets on pine wilt available from county extension agents or on the web. Some key points to develop frequently asked questions FAQ's for use are listed below and best management practices BMP's (appendix g). Use these FAQ's and BMP's along with others to address public information concerns and tailor to meet a community program. You may list the contact information (see appendix e) for the various agencies of state government with local contact information to stakeholders. The best time to get information out to the public is during late summer, fall, and early spring. *Tree removal and disposal needs to be done in the spring before May to break the life cycle of both the nematode and pine sawyer beetle.*

**Element 3 Worksheet:** Develop an educational plan for in-house departmental staff including administrators or commissioners, stakeholders, and the general public. Below are examples of FAQ's for use.

- *What is pine wilt?* Pine wilt is a disease caused by a nematode or microscopic roundworm that kills the tree systemically. The nematode's only means of transmission from tree to tree is by a long horned beetle called the pine sawyer. The beetle is capable of flying and transmits the nematode during feeding on needles or laying eggs in the wood of stressed and dying pine trees.
- *What are symptoms of the disease?* Beginning in August pine trees suddenly turn brown and die. The displaying of symptoms continues through the fall into December and in some cases may not be noticeable to the spring.
- *Does pine wilt affect all pines or other trees?* No, the disease infects primarily Scotch and Austrian and recently reported on mugo pines in central and western Kansas. Ponderosa pine and other pines are tolerant or resistant to the disease. It does not affect spruce, cedar, or other trees outside of the genus *Pinus*.
- *Where is the disease and is there something, I need to do now to protect my trees?* The disease and vector beetle are moving westward from parts of central Kansas. Scattered reports have been made in Mitchell, Lincoln, Russell, Ellis, Barton, western areas of Reno and Kingman counties. Some reports have been also made in Dodge City, Garden City, and Colby but these were believed to be introduced by human activities and have been eradicated. There is little to be done to protect trees with any type of pesticide sprays. The best protection is to keep trees in good health and remove trees if they show signs of disease. In certain circumstances, preventative injection of pesticides into the tree can reduce the risk of pine wilt infection. You should contact a professional arborist or pesticide applicator regarding this possibility. The cost of this treatment only allows for the use of the injection for those historic or specialty trees.
- *I think that pine wilt may be affecting one of my trees. To whom do I report it?* You can contact your county extension agent, local park or tree board, the Kansas Forest Service, or the Kansas Department of Agriculture. Diagnosis will be made from a sample. Other diseases, insects, and stress do kill trees and it is important for a proper diagnosis.
- *Will somebody pay for removal of the tree?* The Kansas pine wilt program focuses on survey, communication and outreach, containment and regulatory enforcement. All tree removal by the state is done at isolated areas where the disease likely was introduced by human activities instead of natural spread. Local communities have their own programs

- for tree removal and disposal. Some assistance may be available. Check with your local extension agent, Tree Board, KFS district community forester, or parks department.
- *What is meant by being introduced by humans?* The disease can naturally be introduced into an area by the flight of the beetle vector. Those beetles are attracted to stressed trees but sometimes visit what appears to be a healthy tree. Beetles generally fly no more than a distance of about 10 miles a year sometimes more and sometimes less. That is natural spread. When we talk about human-introduced spread then sometimes long distances can be involved. Ways of introducing pine wilt by humans include moving infested firewood and moving pine trees into new areas during the summer months from areas of established pine wilt. Those areas include eastern half of Kansas, Oklahoma, and Nebraska. Pine trees that are nursery stock may be infected in the summer but not display symptoms for a few weeks. Firewood if left unburned from the winter and over the spring may allow the beetles to emerge and spread the disease.
  - *My pine is already dead, why should I care?* Dead pines may harbor both the nematode causing organism and vector long horned beetle. It is important to control the disease by proper disposal of the tree. There is no recovery of the tree and it may be a hazard tree. It should be removed and will greatly reduce the risk to your other pines and the pines in the neighborhood. The nematode and long horned beetle spend almost their entire life cycle inside the tree so with the infested pine's removal the cycle can be broken. Be a good steward of the land and remove all dead pines regardless of cause in order to protect the broader community.
  - *Why does the disease only appear in the summer and fall?* The beetles that spread the disease overwinter as larvae in the trunk and branches. They emerge as adults in May and June, feed, and lay eggs on pines during the summer months. During this time, the nematode builds up rapidly in the tree and chokes out the tree by stopping the uptake of water. In addition, some evidence points to a second generation of pine sawyer that may emerge in August and September and a new cycle of disease may develop into late fall and early winter with favorable conditions.
  - *What are some things that I can do to prevent pine wilt?* Some best management practices include pruning only in late fall or winter as to not attract long horned beetles, proper spacing of trees, planting Ponderosa or other native North American pines and other trees not listed as hosts, and report any suspect trees to your local tree board, parks department or the county extension office.
  - *Pine wilt is everywhere; I traveled out west and saw many dead pine trees in the Rocky Mountains.* What you saw likely was not pine wilt. Pine wilt is primarily in the eastern half of the United States. Colorado has had only a handful of reports in residential plantings. In the Great Plains, pine wilt has been gradually moving westward over parts of Nebraska, Kansas, and Oklahoma. The pines in the mountains you saw dead were likely from other insects such as bark beetles, other diseases, and under prolonged drought stress.

## Element 4.

*Develop a budget line or other financial assistance items that would apply in detection, removal, and disposal of infected trees.*

Communities should develop a budget to address their pine wilt community action plan. Costs may include surveillance activities, costs of attending or conducting meetings, removal of trees, disposal of trees, and replacement of trees. Consider providing funding for removal and disposal of infected trees by a line item budget or other means to facilitate the timely removal of infested trees. A little money spent on early detection and removal can save thousands and thousands of dollars in the long term and maintain pines as a part of the urban tree population. If trees are on private land, it may be cost prohibitive for owners to remove the tree. Cities may choose to subsidize removal costs by direct removal of the tree or reimbursement to private arborists. This is of heightened importance in areas in central Kansas near the established range of the disease, in western Kansas where it was introduced by human activities, and those cities with significant populations of pines.

The Kansas Department of Agriculture has a limited amount of financial resources in an emergency pest response fund that can be used in cases where human introduced infestations are found outside of what is considered the established range of pine wilt. These situations are reviewed on a case-to-case basis and are primarily used when private landowners have limited financial resources to address the problem.

Every community should evaluate building in some surveillance and control costs into their annual work plan and budget.

**Element 4 Worksheet:** Develop a line item budget or other financial assistance items.

## Element 5.

*Conduct a pine tree inventory/assessment and determine locations of high populations of pines. Promote a diversification of the urban tree population or at risk pines.*

An important step in preparing for pine wilt is to determine the potential risk to your community's urban forest resource. This can be in part identified using information contained in a street tree inventory. If your community has a current street tree inventory, review it to see if it is up to date and fits the needs of the pine wilt plan.

A tree inventory/assessment should include accounting of pines on private property and neighborhoods outside from municipal boundaries. The assessment does not need to be as detailed as a street tree inventory but be specific to pines.

Consider the tree species, size or age of the tree, condition, and location.

Windshield surveys are quick and inexpensive way of estimating inventories. In large urban areas, a system can be prescribed to take random stops, do counts, and then prorate those for the entire area. A good rule of thumb is to survey about twenty percent and then prorate. Some type of mapping of high-risk trees such as older Scotch and Austrian pines and high intensity plantings should be noted in an inventory and map. The intensity of the survey is determined by the resources and risk to the community and determined at the local level. A KFS community district forester can conduct an assessment quickly for the purposes of this plan.



A good inventory will allow better surveillance, budgeting, and assessing risk to the urban forest. It will also allow for determination of the need for better diversification of tree species in a community. Seek consultation from staff of the Kansas Forest Service in developing an inventory of pines.

**Element 5 Worksheet:** Determine the inventory both on public and private land within the community noting age and pine species. The inventory should note areas/locations of older Scotch and Austrian pines and high intensity plantings such as windbreaks or Christmas tree farms.

## Element 6.

*Develop and conduct a surveillance program for pine wilt. This program should include possible pathways of introduction, those parties that will contribute information, an information recording system, and the reporting of results to the state survey staff.*

A surveillance program is the next step after consideration of your tree inventory where you have determined areas of pine plantings and high-risk populations. A plan should be developed and implemented for a pine wilt survey and detection strategy. Below are brief descriptions of survey methods and considerations that should help develop the program. Again based on each community's needs, risks, and resources the survey can be adjusted to fit the local situation.

**The survey** should be conducted in most communities by simply driving down the streets and looking properties over for dead pine trees. This windshield survey is effective and relatively cheap to conduct. Take the time to slow down and visually observe back yards, alleyways, and other out of the way places. In larger communities, survey by driving the roads that run east west then the next survey is conducted by driving the north south roads. This allows for better vision of different angles of a property that might not be easily observed from casual driving. From experiences in surveying communities, it takes roughly two hours per 1,000 in population for a one-time windshield survey. Survey should be conducted at least twice in a community (see time of year) during each year when the risk is believed to moderate to high.

Survey record keeping is important. It is very useful for planning to make records of areas surveyed and integrate the information from your tree inventory and areas considered high risk. This information will be useful to share with Kansas Forest Service and Kansas Department of Agriculture officials that conduct surveys in high-risk communities.

If a positive is found, the information on the location will allow follow up or delimiting survey of the immediate area. Often when a positive is found, other nearby trees will display symptoms sometime during that fall or the following year. The size of the delimited area should be about 1-2 miles in all directions from the location. Emphasize on the immediate area within ½ mile. This delimiting survey is an important part of any community's surveillance and elimination of pockets of the disease.

**Hosts** recognized in the state include the pines not native to North America pines: Scotch, Austrian, and mugo.

**Symptoms (appendix a)** and signs of pine wilt are generally apparent in late summer and the fall. Pines rapidly die when infected with pine wilt nematode under hot conditions because the nematode destroys the ability of the tree to utilize water by feeding on xylem resin canals. Tree needles systemically progress from a normal green to a dull green to brown or tan color in a period of weeks. Needles display a slight wilt as the color change is in progress. The entire tree is dead when the brown to tan symptom appears. Resin flow is reduced in the wood and compared to normal wood is lighter in weight. In late fall and early winter, trees may not rapidly change color because of less demands for water translocation but will turn brown and show

death slowly or in the early spring. Also late infection can produce a branch-flagging symptom where parts of the tree die out. Blue stain fungi is often associated also with pine wilt whereas the wood will often show blue stain when cut in a cross section. Blue stain can be found in wood that is attacked by other insects such as bark beetles and in a stage of decay.

**Ages** of trees that become diseased are generally those older than ten years. This may be in part because those trees have developed stress or have lost branches to pruning or to storms. The sawyer beetle is attracted to such trees to feed on and to lay eggs for the next generation. Sawyer beetles and pine wilt disease have been observed in young trees also so age is not entirely a surveillance criterion.

**Time of year** has been already referenced in the short description of symptoms. Much of the reason for late summer and fall symptom development is because of the life cycle of the sawyer beetle. It emerges as an adult from the larvae stage in the wood over late spring and early summer. Once it emerges, the beetle begins to feed on new growth. The nematode inside the trachea of the beetle literally crawls out of the insect and moves into the feeding wounds and into the wood. It then takes about six weeks of multiple life cycles and systemic infection by the nematode to affect the tree's health producing the rapid decline. Pine sawyer beetles have staggered emergence or non-synchronized meaning that adult emergence occurs anytime over a summer from the same tree or nearby trees. Their life cycle is also about 50-60 days during summer conditions. Therefore, beetles may have two generations in the state. Sawyer trapping in 2007 collected beetles in May and early June and again in late August and early September. This may indicate two generations. The important point though is that anytime from August through the late fall symptoms may develop that are linked directly to the activity of pine sawyers. Surveillance can begin in late August and continue until late November. October is generally a high peak of symptom development but because of changing of the colors of deciduous trees, survey is sometimes difficult. *It is recommended that moderate to high risk communities actively survey occur at least two times during this period with one after in late September and with a follow up in sometime after Thanksgiving till February. Passive surveys or observations should continue through the entire period of August to early December.*

**High-density plantings** found in Christmas tree farms, windbreaks around athletic fields, or other situations generally attract sawyers to a higher degree than that found by a single tree. This is not always true but is a general rule of thumb. In high-density plantings, an abundance of new tissue attracts sawyer beetle for feeding and have a greater chance for injury or stress that attracts beetles to oviposition or lay eggs in the wood of dead or dying trees.

**Pathways** are also of importance especially in areas believed where the disease and vector are not known to be. If pine firewood is brought into an area, it may contain sawyer beetles and nematodes. This has been documented in the state. Nursery stock may also carry pine wilt and possibly sawyers, as symptom expression does not occur for six to about ten weeks after infection. This is plenty of time for a tree to be dug and transported to a new location during the summer or fall months. Survey should therefore consider areas where houses have fireplaces or landscape projects that may bring in large trees particularly from eastern regions of Kansas, Nebraska, Oklahoma and all of Missouri where the disease is well established. Campgrounds are another type of site where imported firewood if left unburned may pose a risk.

**First detectors** are important resources to a successful surveillance program. Arborists are often called out to remove dead trees. It is important to sample any pine tree that has died because of disposal concerns and intelligence regarding the status of the disease. A problem that we have encountered is the removal of pine trees without sampling leads us to believe that pine wilt is not in an area because survey was negative. We encourage that in municipalities that require professional licenses for arborists that sampling would be stipulated as mandatory for pine wilt. Other groups such as garden clubs, tree and conservation boards, nurseries, pesticide applicators, and other city employees may also be used as first detectors.

**Sampling and diagnosis** is rather simple (appendix b). A city, county, or state employee should collect an official sample. Collect the sample by cutting 2-3 cross sectional discs of about an inch in thickness from a branch and repeat in 2-4 branches of a tree displaying symptoms. These wood discs should be placed in a plastic bag, labeled with location, species of tree, and contact information of the sampling official, and forwarded to the Kansas Department of Agriculture. There is currently no charge for this diagnosis if taken by city, county, or KFS personnel. The sample can be forwarded through the KSU extension service for diagnosis but at a fee.

**Worksheet Element 6:** Develop a surveillance program with information from the tree inventory information and with budget considerations. Target high-risk areas, utilize first detectors, and aim for at least two surveys of pines in your community in the fall of the year.

## **ELEMENT 7.**

*Develop a pine wilt removal policy. This element will be the major section of your community's readiness plan. It will describe how your community intends to manage its pine trees and will guide decision making relative to how the community will address issues such as removal/disposal, hazard tree assessment, private property trees, and replanting.*

Remove trees that test positive for pine wilt nematode from the site and immediately chip, burn, or bury to prevent further infection of trees in the area. The root system does not pose a threat to further infection and the chips do not although live nematodes may be present in the material. Timing of the removal and disposal should be as soon as possible or least by April 1 of the following year. It is advisable to remove trees as soon as possible in the late summer as those trees may provide a second generation of sawyer beetles based on recent information here in the state. *Communities should note that dead or dying pine trees regardless of their demise attract the sawyer beetles for oviposition.* Communities may choose to handle all dead pine trees as the same for disposal in order to reduce sites for sawyer beetle reproduction.

Work closely with arborists in the removal and disposal of trees. The city will want to designate a burn or burial site for the trees. An added incentive for arborists and landowners would be to waive any fees associated with disposal at public sites. Cutting of firewood should be prohibited from this material since there is no guarantee the wood would be burned.

Trees that died from pine wilt can be hazard trees and should be considered for removal in regions of the state where the disease is established. The wood is weakened from possible borers, secondary insects, and rot producing fungi. Ice storms and high winds can more easily topple or break off trees raising risk to property or humans.

The pine wilt management plan must address trees on private property. A review of ordinances, regulations, or other laws should be conducted and the legal protocol established well before a situation arises and delays the needed removal in a timely fashion. In most cases, discussion with the landowner can achieve the desired result of removing the tree but there may be cases because of financial concerns or just the lack of understanding and apathy that a legal avenue will have to be followed before the removal.

Consider liability issues of the removal, electric hazard assessment, contracts and bidding for tree removal by arborists, and replacement costs of trees on public property.

**Worksheet Element 7:** Develop a disposal plan for infected trees.

## **Element 8.**

You may submit your community readiness plan and current tree ordinances for review and comments to either the Kansas Forest Service or the Kansas Department of Agriculture. Please contact either a district forester or area field staff of KDA for review of the community plan (appendix e). Simply complete a worksheet for each element and combining into one document. Smaller communities may choose only to detail a few of the elements while larger communities will likely need all of the elements in detail to have a successful preparedness plan.

## **Appendix Index:**

**APPENDIX A: Images of various trees with pine wilt symptoms.**

**APPENDIX B: Sampling for pine wilt**

**APPENDIX C: Tree and shrubbery law for municipalities in the state of Kansas**

**APPENDIX D: State plant health information, Kansas Department of Agriculture**

**APPENDIX E: Contact information**

**APPENDIX F: Pine wilt sample submission forms to KDA**

**APPENDIX G: Best management practices for pine trees**

**APPENDIX H: Identification guide to pine species**

**Appendix A:** Images of various trees with pine wilt symptoms and associated organisms.



**Figure 1.** Austrian pine in a Kingman County windbreak, September.



**Figure 2.** Scotch pine in Riley County, March



**Figure 3.** A burn pile of mostly pines, Harvey County.

**Figure 4.** Scotch pine in windbreak in Manhattan, December.





Appendix A. continued

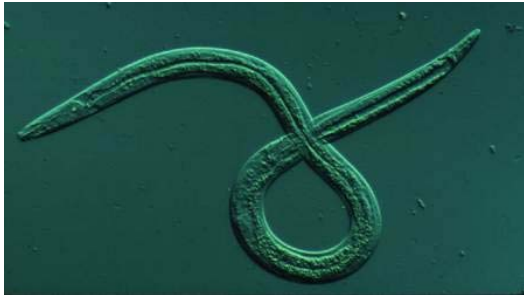


**Figure 5. Flagging in same Scotch pine windbreak, Manhattan**



**Figure 6. Late season flagging on Scotch pine, Riley**

**Figure 7. The pine wilt nematode, APS.**



**Figure 2. Pine sawyer, unknown source**



**Figure 3. Blue stain fungus**

## Appendix B: Sampling for pine wilt



Step 1. Branch cut for sampling pine wilt

Step 2. Cut branch discs about 1 inch thick with chain saw or limb saw, 2-3 discs per branch.



Figure 3. Sample 2-4 branches from a tree at about chest height.

Figure 4. Bag the sample and label with information, keep out of direct sunlight and heat.





## Appendix C: KANSAS TREE & SHRUBBERY LAW

### SUMMARY AND RELEVANCE

The Kansas Tree and Shrubbery Law provides authority to the governing body of a city to regulate by ordinance the planting, maintenance, treatment and removal of trees and shrubbery along on all public right of ways within the city. (K.S.A. 12-3201)

Additionally, if a city determines that a tree or shrub on private property poses a threat to other trees and shrubs because of insect or disease infestations, the city can order the property owner to treated or destroy the infested plants. City officials may call upon competent authorities (i.e. K.D.A. Plant Protection and Weed Control program staff) to provide evidence that a tree or shrub is infested with plant pests that pose a risk to other plants in the community. (K.S.A. 12-3204)

### KANSAS TREE & SHRUBBERY LAW

#### **12-3201. Trees and shrubbery on streets and alleys; regulation; costs, special assessment.**

The governing body of any city is hereby authorized to regulate, by ordinance, the planting, maintenance, treatment and removal of trees and shrubbery upon all streets, alleys, avenues, boulevards and public rights-of-way within such city. Upon the failure of the owner of property abutting streets, alleys, avenues, boulevards and public rights-of-way to comply with such regulations, and after reasonable notice the city may trim and maintain or, where necessary, remove such trees and shrubbery and assess the costs of such work against the abutting property as a special assessment.

#### **12-3202. Same; municipal function; authority vested in park commissioners, when.**

The governing body of any city may provide for the planting, maintenance, treatment or removal of trees and shrubbery upon all streets, alleys, avenues, boulevards and public rights-of-way of the city as a municipal function. In any city which now has, or may hereafter have a board of park commissioners, the governing body may vest such authority in the board of park commissioners.

**12-1203.** Repealed 1975.

#### **12-3204. Treatment or removal of shrubbery, trees and materials in cities; payment of costs;**

**notice.** Whenever any competent city authority, or competent state or federal authority when requested by the governing body of the city, shall file with the governing body a statement in writing

based upon a laboratory test or other supporting evidence that trees or tree materials or shrubs located upon private property within such city are infected or infested with or harbours any tree or

plant disease or insect pest or larvae, the uncontrolled presence of which may constitute a hazard to or result in the damage or destruction of other trees or shrubs in the community, describing the same and where located, said governing body shall direct the city clerk to forthwith issue notice requiring the owner or agent of the owner of the premises to treat or remove any such designated tree, tree material or shrub within a time specified in such notice; said notice shall be served by registered or certified mail or personal service may be made by the city marshal or other police officer, by delivering a copy thereof to the owner, or agent of such property. If the property is unoccupied and the owner a nonresident, then the city clerk shall notify the owner by mailing a copy of the notice to the owner's last known address by registered or certified mail.

If the owner or agent shall fail to comply with the requirements of said notice within the time specified in the notice, then the city forester, street superintendent or other designated officer shall proceed to have the designated tree, tree material or shrub treated or removed and report the cost thereof to the city clerk, and the cost of such treatment or removal shall be paid by the

## Appendix C: KANSAS TREE & SHRUBBERY LAW, page 2

owner of the property or shall be assessed and charged against the lot or parcel of ground on which the tree, tree material or shrub was located. The city clerk shall at the time of certifying other city taxes to the county clerk, certify the unpaid costs and the county clerk shall extend the same on the tax roll of the county against said lot or parcel of ground. The cost of such work shall, except as hereinafter provided, be paid from the general fund or other proper fund of the city or from moneys derived

from the levy authorized by K.S.A. 12-3203 and such fund shall be reimbursed when payments therefore are received or when such assessments are collected and received by the city.

**12-3205. Same; preventive measures or treatment by city, when; costs.** The governing body

of any city, when it appears that there is or is likely to be a general infection or infestation of the trees or shrubs within the city by tree or plant disease or insect pest or larvae resulting in damage to or the death of many trees or shrubs, may provide such preventive measures or treatment as may be necessary and may pay the cost from the general fund or other proper fund or from moneys derived from the levy provided in K.S.A. 12-3203 by the issuance of warrants as hereinafter provided.

**12-3206. Same; no-fund warrants, when; tax levies.** The governing body of any city, in the exercise of the power and authority herein granted for the purposes of carrying out the provisions of K.S.A. 12-3204 and 12-3205, from and after the effective date of this act and prior to the time that moneys may be available from the levy authorized by K.S.A. 12-3203, may issue no-fund warrants in an amount not to exceed the total amount such city could levy in one year under the provisions of K.S.A. 12-3203.

Whenever no-fund warrants are issued under the authority of this act the governing body of such city shall make a tax levy at the first tax levying period for the purpose of paying such warrants and

the interest thereon. All such tax levies shall be in addition to all other levies authorized or limited by law and shall not be subject to the aggregate tax levy prescribed in article 19 of chapter 79 of the Kansas Statutes Annotated, and amendments thereto. Such warrants shall be issued, registered, redeemed and bear interest in the manner and in the form prescribed by K.S.A. 79-2940, except they shall not bear the notation required by said section and may be issued without the approval of the state board of tax appeals.

**12-3207. Same; title to and property in growing trees and shrubs in abutting owners;**

**damage actions; injunctions.** The owners of property abutting upon streets, avenues and boulevards in cities shall have such title to and property in growing trees, shrubbery and the parking

situated in front of such real estate between the curb line and the property line as to enable the owners, in case of injury to or destruction of such trees, shrubbery and parking, to recover from the

person, company or corporation causing said injury or destruction the full damages which the abutting property in front of which they are situated may sustain by reason thereof, and such abutting property owner shall also have the right of action in any court of competent jurisdiction to

enjoin injury to or destruction of such trees, shrubbery and parking, except that no recovery or injunction shall be had against the city in the making of public improvements or in any other reasonable exercise of its authority over such streets, alleys, avenues or boulevards or over the trees and shrubbery located thereon.

# Appendix D: State plant health information, Kansas Department of Agriculture: Notice to condemn tree.

## Notice of Regulatory Action, KDA

Kansas Department of Agriculture  
Plant Protection & Weed Control Program  
Forbes Field, Bldg. 282, Box 19282  
Topeka, KS 66619-0282  
PH (785) 862-2180 FAX (785) 862-2182

### Notice of Regulatory Action

Failure to comply with this notice is a violation of the Kansas Plant Pest and Agricultural Commodity Certification Act.

Client Name, Address & Phone:

Sub location Name & Address:

Account #:

Sub-location #:

Shipper Name, Address & Phone:

Material Rejected (Kind and Amount):

State of Origin:

Grower Name, Address & Phone:

Reason for Rejection:

The occurrence of this pest in this shipment exceeds the tolerances allowed by Kansas Pest Standards K.A.R. 4-15-10

Documentation Collected:

Specimen

Photos

Shipping Documents

Phytosanitary Certificates

Other (explain)

Regulatory Actions to be Taken:

**Date that regulatory actions are to be completed:**

Return to Shipper

Obtain Permit/Certificate

Provide Origin

Destroy

Authorize Treatment

Other

Additional instructions for regulatory action:

State Plant Quarantine Officer:

Date Inspected:

The pest listed above may be detrimental to Kansas native and cultivated plants and can add greatly to the price you are now paying for food and landscape materials. Help us to help you by preventing the spread of these destructive plant pests in the state of Kansas.

## **Appendix D:** State plant health information, Kansas Department of Agriculture, page 2,. Relevant portion of the Kansas Plant Pest And Commodity Certification Act. KS is below

December, 2005 KANSAS DEPARTMENT OF AGRICULTURE  
Plant Protection & Weed Control Program  
Forbes Field - Building 282, P.O. BOX 19282  
Topeka, KS 66619-0282  
PH: 785-862-2180  
FAX: 785-862-2182  
Records Center  
109 S.W. 9<sup>th</sup> Street  
Topeka, KS 66612  
PH: 785-296-2263  
FAX: 785-296-0673

The following copy of selected statutes and regulations is being made available by the Kansas Department of Agriculture for the convenience of the public and is meant to be used only as a reference. While the Kansas Department of Agriculture has made every effort to accurately reproduce these statutes and regulations, they are not the official statutes and regulations of the State. The Kansas Statutes Annotated (K.S.A.), published by the Revisor of Kansas Statutes, and the Kansas Administrative Regulations (K.A.R.), published by the Secretary of State should be consulted for the text of the official statutes and administrative regulations of the State.

### **Plant Pest and Agriculture Commodity Certification Act**

**2-2112. Name of act.** This act shall be known as the plant pest and agriculture commodity certification act. The authority to

regulate plant pests, live plant dealers, plants and plant products and commodity certification in Kansas is vested exclusively with the secretary of agriculture.

**2-2113. Definitions.** As used in this act: (a) "Plant pests" include any stage of development of any insect, nematode, arachnid, or any other invertebrate animal, or any bacteria, fungus, virus, weed or any other parasitic plant or microorganism, which can injure plants or plant products.

(b) "Secretary" means the secretary of the Kansas department of agriculture, or the authorized representative of the secretary.

(c) "Plants and plant products" means trees, shrubs, grasses, vines, forage and cereal plants and all other plants; cuttings, grafts, scions, buds and all other parts of plants; and fruit, vegetables, roots, bulbs, seeds, wood, lumber, grains and all other plant products.

(d) "Location" means any grounds or premises on or in which live plants are propagated, or grown, or from which live plants are removed for sale, or any grounds or premises on or in which live plants are being fumigated, treated, packed, stored, or offered for sale.

(e) "Live plant dealer" means any person, unless excluded by rules and regulations of the secretary, who:

- (1) Grows live plants for sale or distribution;
- (2) buys or obtains live plants for the purpose of reselling or reshipping within this state;
- (3) plants, transplants or moves live plants from place to place within the state with the intent to plant such live plants for others and receives compensation for the live plants, for the planting of such live plants or for both live plants and plantings; or
- (4) gives live plants as a premium or for advertising purposes.

## Appendix D: State plant health information, Kansas Department of Agriculture, page 3 continued

(f) "Person" means a corporation, company, society, association, partnership, governmental agency and any individual or combination of individuals.

(g) "Permit" means a document issued or authorized by the secretary to provide for the movement of regulated articles to restricted destinations for limited handling, utilization, or processing.

(h) "Host" means any plant or plant product upon which a plant pest is dependent for completion of any portion of its life cycle.

(i) "Regulated article" means any host or any article of any character as described in a quarantine or regulation carrying or being capable of carrying the plant pest against which the quarantine or regulation is directed.

(j) "Live plant" means any living plant, cultivated or wild, or any part thereof that can be planted or propagated unless specifically exempted by the rules or regulations of the secretary.

(k) "Quarantine pest" means a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled.

(l) "Regulated nonquarantine pest" means a nonquarantine pest whose presence in plants for planting affects the intended use of those plants with an economically unacceptable impact and which is therefore regulated.

(m) "Official control" means the active enforcement of mandatory phytosanitary regulations and the application of mandatory phytosanitary procedures with the objective of eradication or containment of quarantine pests or for the management of regulated nonquarantine pest.

(n) "Regulated area" means an area into which, within which and/or from which plants, plant products and other regulated articles are subjected to phytosanitary regulations or procedures in order to prevent the introduction and/or spread, or both, of quarantine pests or to limit the economic impact of regulated nonquarantine pests.

1

(o) "Bee" means a honey-producing insect of the genus *Apis* including all life stages of the insect.

2

(p) "Beekeeping equipment" means all hives, supers, frames or other devices used in the rearing or manipulation of bees or their brood.

(q) "Bee pest" means any infectious, contagious or communicable disease or harmful parasite or insects affecting honey bees or their brood.

**2-2114. Secretary's duties.** The secretary, either independently, or in cooperation with counties, cities, other political subdivisions of the state, federal agencies, agencies of other states or private entities may enter into contracts and agreements and may carry out official control operations or measures to locate, and to suppress, control, eradicate, prevent, or retard the spread of, any plant pests.

**2-2115. Inspections by secretary.** To effectuate the purposes of this act, the secretary shall have the right to enter and inspect any property in this state, except private dwellings; or, to stop and inspect any means of conveyance moving within this state, upon probable cause to believe it contains or carries any plant pest or other article subject to this act.

**2-2116. Disposition of plant pests.** Wherever the secretary finds a plant, plant product or other regulated article that is infested by a plant pest or finds that a plant pest exists on any premises in this state or is in transit in this state, the secretary, upon giving

## **Appendix D:** State plant health information, Kansas Department of Agriculture, page 4 continued

notice to the owner or an agent of the owner in possession thereof, may seize, quarantine, treat, or otherwise dispose of such plant pest in such manner as the secretary deems necessary to suppress, control, eradicate, or prevent or retard the spread of such plant pest, or the secretary may order such owner or agent to so treat or otherwise dispose of the such plant pest.

**2-2117.Quarantines; notice and hearings.** The secretary is authorized to quarantine this state or any portion thereof when the secretary determines that such action is necessary to prevent or retard the spread of a plant pest and to quarantine any other state or portion thereof whenever the secretary determines that a plant pest exists therein and that such action is necessary to prevent or retard its spread into this state. Before promulgating the determination that a quarantine is necessary, the secretary, after due notice to interested parties, shall hold a public hearing at which any interested party may appear and be heard either in person or by attorney. The secretary may impose a temporary quarantine for a period not to exceed 90 days during which time a public hearing, as provided in this section, shall be held if it appears that a quarantine for more than the 90-day period will be necessary to prevent or retard the spread of the plant pest. The secretary may limit the application of the quarantine to the infested portion of the quarantined area and appropriate environs, to be known as the regulated area, and, without further hearing, may extend the regulated area to include additional portions of the quarantined area. Following the establishment of the quarantine, no person shall move the plant pest against which the quarantine is established or move any regulated article described in the quarantine, within, from, into or through this state contrary to the quarantine promulgated by the secretary. The quarantine may restrict the movement of the plant pest and any regulated articles from the quarantined or regulated area in this state into or through other parts of this state or other states and from the quarantined or regulated area in other states into or through this state. The secretary shall impose such inspection, disinfection, certification or permit and other requirements as the secretary shall deem necessary to effectuate the purposes of this act. The secretary is authorized to establish regulations defining pest freedom standards for live plants, plants and plant products or other regulated articles that pose risk of moving plant pests that may cause economic or environmental harm.

## Appendix E: Contact information

Information regarding programs and related pine wilt information can be found at these websites.

### Kansas Department of Agriculture, Plant Protection and Weed Control Program [http://www.ksda.gov/plant\\_protection/](http://www.ksda.gov/plant_protection/)

Bill Scott, Program Manager, P.O. Box 19282, Topeka, 66619-0282  
785.862.2180 Fax 785.862.0282 email: [bscott@kda.state.ks.us](mailto:bscott@kda.state.ks.us)

Jon A. Appel, Plant Pathologist, 1711 Westbank Way, Manhattan 66503, 785.537.3155  
mobile 785.564.0071 email: [jappel@kda.state.ks.us](mailto:jappel@kda.state.ks.us)

Northwest. Bob Buhler 785-627-3574. [bbuhler@kda.state.ks.us](mailto:bbuhler@kda.state.ks.us) Cheyenne, Decatur, Ellis, Gove, Graham, Greeley, Jewell, Lane, Lincoln, Logan, Mitchell, Ness, Norton, Osborne, Phillips, Rawlins, Rooks, Rush, Russell, Scott, Sheridan, Sherman, Smith, Thomas, Trego, Wallace, Wichita.

Northeast. Bill Hilbert: 785-246-4211. [bhilbert@kda.state.ks.us](mailto:bhilbert@kda.state.ks.us) Atchison, Brown, Clay, Cloud, Dickinson, Doniphan, Geary, Jackson, Jefferson, Leavenworth, Marshall, Morris, Nemaha, Ottawa, Pottawatomie, Republic, Riley, Shawnee, Wabaunsee, Washington, Wyandotte.

South Central. Cherie Copeland: 316-943-0438. [ccopeland@kda.state.ks.us](mailto:ccopeland@kda.state.ks.us) Butler, Chase, Chautauqua, Cowley, Elk, Greenwood, Ellsworth, Harper, Harvey, Kingman, Lyon, McPherson, Marion, Reno, Rice, Saline, Sedgwick, Sumner.

Southeast. Tom Sanders: 785-862-2180 [tsanders@kda.state.ks.us](mailto:tsanders@kda.state.ks.us) Anderson, Bourbon, Cherokee, Coffey, Crawford, Douglas, Franklin, Johnson, Labette, Linn, Miami, Montgomery, Osage, Neosho.

Southwest. Terry Clarkson: 620-855-2403 [tclarkson@kda.state.ks.us](mailto:tclarkson@kda.state.ks.us) Barber, Barton, Clark, Comanche, Edwards, Finney, Ford, Grant, Gray, Hamilton, Haskell, Hodgeman, Kearny, Kiowa, Meade, Morton, Pawnee, Pratt, Seward, Stafford, Stanton, Stevens

### Kansas Forest Service <http://www.kansasforests.org/>

Ray Aslin, State Forester, 2610 Claflin Road, Manhattan 66502 email: [raslin@ksu.edu](mailto:raslin@ksu.edu)  
785.532.3300 fax, 785.532.3305

Tim McDonnell, Community Forestry Coordinator and District Community Forester -  
South Central, Southeast Districts, 1901 E 95th Street South, Haysville, KS 67060, email:  
[tmcdonne@ksu.edu](mailto:tmcdonne@ksu.edu) | 316-788-0492, or FAX 317-788-3844

Jim Strine, District Community Forester - Northwest District  
Champion Tree Program Coordinator  
1232 240th Avenue, Hays, KS 67601  
email: [jstrine@ksu.edu](mailto:jstrine@ksu.edu) 785-625-3425, or FAX 785-623-4369

Kim Bomberger, District Community Forester - North Central, Northeast Districts  
2610 Claflin Rd, Manhattan, KS 66502 email: [kbomberg@ksu.edu](mailto:kbomberg@ksu.edu) 785-532-3315, or  
FAX 785-532-3305

Southwest : Filled Spring of 2008

**Kansas State University, Plant Pathology Extension**  
<http://www.plantpath.ksu.edu/>

Doug Jardine, Ph.D., State Extension Leader, email: [jardine@ksu.edu](mailto:jardine@ksu.edu) ,  
Department of Plant Pathology Kansas State University, 4<sup>th</sup> floor of  
Throckmorton Plant Sciences Center, Manhattan, KS 66506 Ph: 785-532-  
6176 Fax: 785-532-5692

Megan Kennelly, Ph.D., Commercial Horticulture, email: [kennelly@ksu.edu](mailto:kennelly@ksu.edu)  
Department of Plant Pathology Kansas State University, 4<sup>th</sup> floor of  
Throckmorton Plant Sciences Center, Manhattan, KS 66506 Ph: 785-532-  
6176 Fax: 785-532-5692

Judy O'Mara, Director Diagnostic Lab, email: [jomara@ksu.edu](mailto:jomara@ksu.edu) Department of  
Plant Pathology Kansas State University, 4<sup>th</sup> floor of Throckmorton Plant  
Sciences Center, Manhattan, KS 66506 Ph: 785-532-6176 Fax: 785-532-  
5692



## Appendix F. Pine wilt sample submission form

### **PINE WILT SAMPLE SUBMISSION:**

Send to Jon Appel, KDA, 1711 Westbank Way, Manhattan, KS  
66503 Samples should be cut in 1" disks, bagged, and labeled.  
Email: [jappel@kda.state.ks.us](mailto:jappel@kda.state.ks.us)



DATE SAMPLED:     /     /

SPECIES OF TREE: SCOTCH, AUSTRIAN, MUGO   OTHER -

COUNTY OF SAMPLE ORIGIN:

CITY IF APPLICABLE:

PROPERTY OWNER INFORMATION IF KNOWN:

STREET ADDRESS OR OTHER IDENTIFYING LOCATION  
INFORMATION:

SUBMITTER'S NAME AND CONTACT INFORMATION (EMAIL  
PREFERRED):

## Appendix G: Management guidelines

### BEST MANAGEMENT PRACTICES FOR PINE TREES

- **Proper planting procedure:** The health of a tree begins with the planting process. Poorly planted trees often perform poorly throughout their entire life. Plant trees at the correct depth and mulch to avoid drought stress. Spread out planting distances of pines in windbreaks and the landscape.
- **Buy certified disease free stock:** Always purchase trees that are certified disease free. The State of Kansas requires all trees to meet specific pest freedom standards.
- **Plant a mix of tree species:** Do not over plant pine trees. Mix the trees with hardwoods or shrubs. Almost all trees have some insect and disease problems. By planting a mix of species then you avoid a potential disaster.
- **Don't plant Scotch pine and look at Ponderosa:** Scotch pine is highly susceptible to pine wilt and likely will harbor the nematode and beetle. Ponderosa pine is preferred for planting since there is scientific evidence pointing to some tolerance or resistance to the disease complex in Ponderosa and possibly Southwest white pine, and pinyon pine.
- **Avoid stress:** The beetles are attracted to drought stressed trees. Provide water during dry periods for pines of all ages. Pines prefer dry soils but prolonged drought disposes them to stress. It is also important to inspect on a regular basis for early symptoms of insect or disease damage. Early detection is critical for controlling insects and diseases and avoiding additional stress. Stressed or declining trees can attract the pine sawyer beetle.
- **Sanitation:** The most important step is sanitation. Sample pines that die in the late summer or fall for pine wilt. Bring a sample to your County Extension office for submission to the K-State Plant Disease Diagnostic lab. A branch that is at least 2 inches in diameter and 6-8 inches long taken next to the trunk is adequate. Another option is a wedge or cross-section of trunk. If the test is positive, cut the tree down as soon as possible, or by May 1 *at the latest*, before the beetles emerge. In fact, April 1 might be a better deadline just to make sure no beetles emerge. Cut the tree to the ground—do not leave a stump. Chip, bury, or burn the wood immediately to destroy the beetles and nematodes. **Break the cycle of infection** and do not save the wood for firewood. Trees that are in a state of decline or dead should be removed regardless of the cause.
- **Prevent new infestations (especially in western half of Kansas):** Do not import pine firewood from contaminated areas. Be wary of pine nursery stock from infested areas, and monitor nursery stock carefully for a year after planting. If pine wilt is introduced, then remove the tree and continue to monitor surrounding pines for the next two years. Careful scouting and sanitation can eliminate sporadic outbreaks before they get out of control. Contact immediately K-State, the Kansas Forest Service, or the Kansas Department of Agriculture for assistance.
- **Proper Pruning and eliminate competition:** Conduct pruning during the dormant season (December thru February). Pruning during the growing season may attract the pine sawyer beetle. Tree roots and grass roots are not compatible. A tree will have a healthier and more fibrous root system if it does not have to compete with grass roots for space, water, and soil nutrients. Eliminating grass competition and mulching an area as large as possible under the tree is advisable.
- **Preventative injections:** There are several products available now for preventative injections for highly valuable individual pine trees. While they do not provide 100% control, they significantly decrease the likelihood that a tree will be infected with pine wilt. These materials provide no curative activity. That is, once a tree is infected there is no way to stop the disease. The materials need to be applied by a trained tree care professional and are a considerable financial consideration. Contact your local Extension office or the K-State Diagnostic Lab for more information
- **Employ professionals when seeking help with trees:** Whether it is a nurseryman, pesticide applicator, or arborist they all have professional organizations and credentials. Talk with them and determine who is the best qualified. Get something in writing regarding costs, treatments, and expected results. A cheap deal is not always the best deal.
- **Keep educated:** Consult with your local extension agent, conservation board, tree board, garden club or others who might help. The internet contains much information at your fingertips regarding tree health. Be aware of the major insect and disease problems in your area. Pines that die over the summer and fall are suspects for pine wilt.

## Appendix H:

### **Guide to Identifying Austrian, Ponderosa, and Scotch Pines**

The first step in identifying these pines is to make sure the tree in question is a pine species. Closely examine the base of the evergreen needles. The needles of most of the pine species join at the base in multiples of two, three, or five needles per bundle depending on the species. **Other conifer (evergreen) species do not have their needles joined at the base. Their needles occur singularly.** Listed below are some of the common characteristics of Austrian, Ponderosa, and Scotch pines.

#### **Austrian Pine (non native to North America)**

Needles: 4 to 6 inches in length. Occur in bundles of 2.

Bark: Grey in color with black furrows forming a blocky pattern.

Buds: Large, silver in color.

Cones: 2 to 3 inches long.

#### **Ponderosa Pine (native to North America including such states as Colorado and Nebraska)**

Needles: 5 to 10 inches in length. Occur in bundles of 2 or 3 on the same tree.

Bark: Brown in color on young trees, becoming cinnamon-red on older trees.

Buds: Large, silver-brown in color.

Cones: 3 to 6 inches long with a small spine at the end of the cone scales.

#### **Scotch Pine (non native to North America)**

Needles: 1 to 4 inches in length. Occur in bundles of 2.

Bark: Brown in color on young trees, upper trunk becoming orange-red on older trees.

Buds: Small, brown in color.

Cones: 1 ½ to 2 ½ long.