Great Plains Tree Pest Council

Colorado State University
Plant Science Building
Fort Collins, CO

March 23-24, 2000

Thursday, March 23, 2000

The meeting was called to order by Chairperson Marcus Jackson.

Attendees:

Kurt Allen (USFS - Rapid City, SD)
Henry Burkwhat (South Dakota Dept of Agric.)
Gregg DeNitto (USFS - Missoula, MT)
Loren Giesler (University of Nebraska)
Jeri Lyn Harris (USFS - Rapid City, SD)
Marcus Jackson (North Dakota State University)
Bill Jacobi (Colorado State University)
Dave Johnson (USFS - Lakewood, CO)
Les Koch (Wyoming State Forestry Division)
Dave Leatherman (Colorado State Forest Service)
Dan Long (USFS - Rapid City, SD)
Lee Pederson (USFS - Lakewood, CO)
Matt Schlitzer (Colorado State Forest Service)
Mike Schomaker (Colorado State Forest Service)
Laurie Stepanek (Nebraska Forest Service)
Jim Walla (North Dakota State University)

Guests: Mike Gebre, Steve Geist.

Corrections and updates were noted in the mailing list, and copies of the 1999 minutes were distributed.

Special Reports

National Forest Health Monitoring - Mike Schomaker

Forest Health Monitoring has been combined with Forest Inventory and Analysis. The program consists of three phases: phase 1 - remote sensing and aerial analysis, phase 2 - forest inventory and analysis (FIA), and phase 3 - forest health monitoring (FHM). FHM uses a subset of plots from FIA. Approximately 32 states are now participating; Alaska and Hawaii are the most recent participants. All 50 states should be included in the program by 2002.

The importance of monitoring riparian, windbreak, and urban forests in the Great Plains was discussed. Many of the forest resources of the Great Plains are transition areas, which are the type of areas that should be monitored to detect global change. Focus groups at FHM meetings have emphasized the importance of riparian, windbreak, and urban areas, but there appears to be little support for including plots in these areas. If a state wants more plots, it may have to pay for them. Voicing the concerns of the Great Plains states was discussed. A letter to the National Association of State Foresters from the GPTPC will include an account of the riparian, fringe,

windbreak and other similar forest resources in each state, and will emphasize the importance of monitoring these areas. **State contacts who will provide this information are: Marcus Jackson** - ND, **Kurt Allen** - SD and NE, **Mike Schomaker** - CO, **Les Koch** - WY. **Marcus Jackson will** contact people in other Great Plains states for information and support. **Mike Schomaker will** provide a list of plot locations to each Great Plains state.

Nursery Pest Management and Alternatives to Methyl Bromide - Jeri Lyn Harris

Production of methyl bromide will end after 2004. Alternative methods being tried in the U.S. Forest nurseries include subsoiling (deep tilling), bare fallow, dazomet (Basamid) fumigation, soil steaming, soil solarization, and spring lifting. Control of soil-borne pests has been inconsistent with these methods and often less effective than methyl bromide.

Phomopsis blight on eastern redcedar at the Bessey Nursery has been extremely damaging in the past two years. A proposed study for 2000 would evaluate the survival of outplanted redcedar infected with Phomopsis as well as identify and develop disease resistant seed sources. Fungicides used to control Phomopsis over the years may no longer be effective, and alternative fungicides are being tested.

State, Provincial, and Organizational Reports

Laurie Stepanek - Nebraska

Oak wilt and Dutch elm disease were more of a problem in 1999. Incidence of pine wilt is increasing in the southeast part of the state and is spreading farther north and west. Historic pines in Nebraska City have been lost.

The state is experiencing several problems with conifers. A disease, believed to be annosum root rot, is killing redcedar near Tryon. Central and eastern Nebraska are experiencing serious drought conditions, and many pine show significant yellowing and browning. An unknown agent is killing white pine in eastern Nebraska. The trees usually die suddenly in the fall, often beginning on lower branches and progressing up. Possible causes were discussed.

An insect known to infest wild sunflower, *Isophrictis similiella*, has killed many first-year transplanted redcedar seedlings over the past several years by boring into the stems. The larvae apparently seek new shelter when their natural sunflower hosts are destroyed during ground preparation for tree planting.

Gregg DeNitto - Region 1 Missoula

Tree mortality caused by Douglas-fir beetle increased dramatically in 1999. Over 508,000 trees were killed. This is the highest level of mortality caused by Douglas-fir beetle in the region since the early 1950's.

Mountain pine beetle populations increased significantly, with most mortality occurring in lodgepole pine.

Limber pine decline and mortality continued in central and eastern Montana. Defoliation by Dothistroma needle blight has occurred for several years and is likely the main cause for mortality. Fire suppression has allowed encroachment of limber pine into grasslands, and this stressful environment may be contributing to the decline.

Dave Johnson & Lee Pederson - Region 2 Lakewood

One gypsy moth was caught in a delimitation trap in Moraine Park Campground in the Rocky Mountain National Park. No moths were caught at Warren Air Force Base in Cheyenne, and delimitation trapping will likely be discontinued in 2000. Dave Leatherman noted that APHIS requires 2 years of zero catches before gypsy moth is considered absent from an area.

Mountain pine beetle populations are building in several areas of Colorado. A 1998 aerial survey identified approximately 150,000 beetle-infested trees, however Dave Leatherman believed it was 75,000 trees in 1998 and 150,000 trees in 1999.

Spruce beetle populations are building in Routt National forest where a blowdown occurred a few years ago.

White pine blister rust was found for the first time in Colorado on limber pine near the Wyoming border, where the disease is known to occur. Incidence appears low but may be spreading.

Les Koch - Wyoming

State lands and the Shoshone National Forest have had large increases in Douglas-fir beetle populations, while the Bighorn National Forest had high levels of mountain pine beetle. Limber pine is being killed by mountain pine beetle and white pine blister rust.

Spruce beetle populations are expected to increase near the North and South Forks of the Shoshone River following recent avalanches and in the Medicine Bow National Forest following a 200,000 acre spruce blowdown. Spruce beetle is also a concern in Saratoga, where the Louisiana-Pacific mill is processing beetle-infested logs. Residents of the town are concerned that the logs will not be processed before beetle emergence in May.

Three gypsy moths were captured in one trap in Washakie County, and so the area will be intensively trapped in 2000. As mentioned by Dave Johnson, no moths were caught in 1999 at Warren AFB, which had multiple catches from 1996 to 1998.

Dave Leatherman - Colorado

Photos of some problems were passed around.

Mountain pine beetle populations are going up. Numbers are approaching the very high levels present in the 1970's. Surveys of the Black Forest east of Colorado Springs (a prairie-like area) found mountain pine beetle and other problems that cause similar symptoms: hail damage, pine sawfly, road salt injury, and needleminer. The need for ground surveys to back up aerial surveys was emphasized.

The Colorado State Forest Service has had trouble obtaining gypsy moth trapping supplies for the past few years. More moths were caught this year with fewer traps, possibly because of import of infested nursery stock from Michigan.

A pine sawfly (*Neodiprion* sp. (*fulviceps*?)) is defoliating old foliage on ponderosa pine in the Black Forest. These short-lived sawfly outbreaks generally do not require control, but some developers are spraying to keep the trees looking good and property values high.

Cynipid gall wasps are affecting nursery oaks making them unmarketable. The rough bullet gall wasp (*Disholcaspis quercusmamma*) is suspected. Adults emerge in winter. Control is limited to removing galls in the fall. The problem may be increasing because more bur oak is being planted.

A previously unidentified larva found beneath ash trees in the fall was identified as ash seed weevil (*Legnoodes helvolus*). The insects feed in ash seeds but overwinter in the litter.

Artificial Christmas trees made with cedar stems were distributed to several stores in Colorado and other areas and may have been infested with the Smaller Japanese Cedar Longhorn Beetle (*Callidiellum rufipenne*). This borer has been reported attacking yews in the northeastern U.S.

Kurt Allen, Jeri Lyn Harris and Dan Long - Region 2 Rapid City

Kurt Allen and Joel McMillan, entomologist, have prepared several reports on mountain pine beetle, which is at high levels in the Black Hills and in Wyoming.

Jack pine budworm populations at Halsey National Forest have collapsed, and Ips has moved in.

Armillaria, which usually kills small trees, is killing pole-size trees in the Black Hills.

Diplodia (Sphaeropsis) follows hail in the Black Hills, but Dave Leatherman said he doesn't see this in Colorado. Jeri Lyn said Elytroderma seems to be more prevalent than Diplodia. Bill Jacobi and Gregg DeNitto said their states have Elytroderma but no brooming.

Laurie Stepanek asked if anyone has seen mountain pine beetle in Nebraska. Kurt Allen and Dave Johnson have never seen it but suspect it is present (but the incidence is very low). Dave Leatherman saw a bark sample from Nebraska a few years ago that was mountain pine beetle.

Henry Burkwhat - South Dakota

Mountain pine beetle populations are expanding rapidly in the Black Hills, ash/lilac borer is causing lodging of green ash in shelterbelts, and pine tip moths are damaging young ponderosa pine in the southern hills.

Henry noted an error in the written report: Diplodia, not Dothistroma, is becoming severe in the northern hills.

Several abiotic problems have been noted including trees planted too deep, desiccation due to frozen ground and wind, and damage from deer rub ("Buckularia") in windbreaks.

Marcus Jackson - North Dakota

Tornados and high winds damaged trees in several communities in 1999.

A gall-forming eriophyid mite (*Cecidophyes* sp.) has been attacking Bailey Compact Cranberrybush in central and eastern parts of the states. Some plants have died, possibly from a viral infection. A photo of the gall was passed around, but apparently no one else at the meeting has seen this problem.

Spruce and ponderosa pine continue to be damaged by yellowheaded spruce sawfly and *Dioryctria* spp. respectively. Possibly three species of *Dioryctria* are present in the state.

Information on the Asian longhorned beetle has been distributed to foresters, nurserymen, and other professionals to help determine if any insects are present in the state.

Due to wet weather early in the growing season, leaf diseases have continued to cause extensive defoliation of many hardwoods.

Cytospora canker has been damaging spruce, particularly trees under stress.

Jim Walla - North Dakota

Slides were shown on the following problems:

Results of the region-wide study on ash yellows were published in the March 2000 volume of Plant Disease. Copies of the paper were distributed. A study is underway to examine ash yellows in graft-inoculated Patmore and Marshall's seedless ash. Ash yellows phytoplasmas and witches'-brooms have been found in seedlings in windbreaks and woodlands, which may mean poor regeneration in these areas. A bacterium-like organism has been killing ash in Iowa. Several samples from North Dakota trees were positive for this organism, but these trees are not dying.

Lilac witches'-brooms were found for the first time in 1999 and were positive for the ash yellows phytoplasma. Symptoms included deliquescent branching and scorching.

Chokecherry plants in the Bismarck Plant Materials Center germplasm collection were rated for X-disease. Twenty-one plants are in good condition, but resistance does not appear to be related to seed source. Most of the plants are in tissue culture.

Fertilizer treatments were tested in 1999 to control an unidentified juniper dieback problem. A mixture of micronutrients with or without nitrogen seemed to provide the best results. The dieback has been seen in ornamental plantings and nurseries in Bismarck.

The only natural limber pine stand in North Dakota was in poor condition in 1999. A shoot boring beetle (*Pityophthorus* sp.) was present, but white pine blister rust and Dothistroma needle blight were absent. A systemic infection of a Cyclaneusma-like fungus was causing witches'-brooms.

Written reports from absent members were distributed.

A tour of the National Seed Storage Laboratory was given at 2:00 p.m.

Friday, March 24, 2000

The meeting was called to order by Chairperson Marcus Jackson.

State, Provincial, and Organizational Reports Continued

Bill Jacobi - Colorado

Slides were shown of the following studies:

Tree growth, tree water potentials, and soil moisture were measured under three irrigation treatments. Green ash diameter and height growth were less under low irrigation (40 % evapotranspiration) than under higher irrigation (80 % and 160 %). Tree water potentials were not affected. Soil moisture was less under grass alone than under grass + trees at 40 % ET. Resistance to Thyronectria and Cytospora cankers is also under study, but there may be no differences because Bill doesn't think the trees are under much stress.

Fungal tissue of Thyronectria and Cytospora cankers were shown to survive for 32 weeks when cankered branch pieces were buried under wood chip mulches. Cankered branch pieces placed on the surface of the mulch dried out, and the fungus died.

Elm hybrids from a Wisconsin breeding program were evaluated for growth, form, and Cytospora resistance. No results were obtained in the Cytospora study, possibly because the trees were quite healthy. Bill is interested in establishing trials in the central U.S. with elms that are already available in the trade. Possible sources of support were discussed. Limitations of the Siberian elm component in hybrids were discussed. In Colorado, winter hardiness, cankers, and insects may be more important than Dutch elm disease.

Studies with Marssonina leaf spot and Septoria leaf spot suggest that one or a few fungicide applications in the spring may not be sufficient for control, especially if untreated diseased trees are nearby. Secondary infections occur over an extended period in summer and do not seem to correspond to rain. The importance of dew events was discussed.

Old Business

Disease and Insect Publication

Jim Walla said the National Agroforestry Center is reprinting the disease handbook ("Diseases of Trees of the Great Plains"). NAC has contributed $16,000 to have 2,000 copies printed, and Dave Johnson said Region 2 is contributing an additional $1,000 for more copies. NAC also plans to scan the publication and put it on the web. There may be opportunities to add additional diseases and insect information to the web site, including the GPAC publication, "Common Insect Pests of Trees in the Great Plains." Lists of possible additional insects and diseases were distributed. Additions and format for those additions were discussed. The previously formed committee (**John Ball, Mark Harrell, Bill Jacobi, Dave Johnson, Dave Leatherman, Don Reynard, Ned Tisserat, Jim Walla**) **will** check on the willingness of NAC to scan additions, decide on priority pests, and contact potential authors of new chapters. **Laurie Stepanek will** check with the authors of the Great Plains insect publication for permission to have it reprinted. **Laurie Stepanek will** also write letters to Lane Eskew and Michele Schoenberger thanking them for their help on this project.

Risk Assessment Maps

Dave Johnson gave an update of the Forest Health Risk Mapping project by the U.S. Forest Service. The whole emphasis is on mortality, and risk is defined as 25% mortality in the next 15 years. The efforts of the GPTPC to identify and map problems in the Great Plains have essentially been by-passed. A proposal for analyzing Region 2 watersheds to determine treatment was distributed, and it emphasized that the amount of mortality is dependent on scale. A meeting will be held during the last week in March in San Antonio. **Dave Johnson will** again present the concerns of the Great Plains states and will send a summary of the meeting to GPTPC members. To assist with distributing this summary and future information, **Marcus Jackson will** set up a listserv for GPTPC and serve as manager.

Lepitopteran Larval Guide

Dave Leatherman is willing to compile a slide set of larval defoliators, not just lepitopterans, that would be available for purchase. After some discussion, it was decided that anyone with good quality slides of any larval defoliators (even obscure or unidentified species) can submit them to Dave by October 1, 2000. The slides will be shown at our next meeting, and members may choose individual slides for purchase. Price will be approximately $1.00 per slide.

List of Publications

Bill Jacobi said that with the widespread use of the internet, a list of extension publications, fact sheets, bulletins, and related publications is outdated and less useful than it may have been in the past. The list of publications will be discontinued, but new publications should still be brought to the meetings for members to see, and a list of these publications should be included in the state/provincial/organizational report. Following this discussion, members distributed or mentioned new publications available from their agencies.

New Business

Elections

Marcus Jackson nominated Laurie Stepanek for Chairperson for the 2001 meeting. Bill Jacobi seconded. The nominations closed, and Laurie was elected. Marcus Jackson nominated Les Koch for Secretary. Jim Walla seconded. The nominations closed, and Les was elected.

2001 Meeting Date and Location

The next meeting is tentatively scheduled for April 4-5, 2001, in Chadron, Nebraska.

The meeting was adjourned at 11:30 a.m.

A tour of the CSU Tree and Turf Research Facility was given following lunch.

Respectfully submitted, Laurie Stepanek, Secretary

CONSTITUTION

OF THE

GREAT PLAINS TREE PEST WORKSHOP

ARTICLE I. Name

This organization shall be known as the GREAT PLAINS TREE PEST WORKSHOP.

ARTICLE II. Purpose

The purposes of this organization shall be to: (1) advance the science and practice of pest management and tree health as it applies to Great Plains forestry practices and systems, (2) provide a medium for exchange of professional thought, and (3) serve as a clearing house for technical information on pest problems and tree health issues in the Great Plains.

ARTICLE III. Membership

Section 1. Members. Membership in this organization shall include any entomologist, plant pathologist, weed scientist, forester, silviculturist, tree geneticist, or other professional interested in tree pest management in the Great Plains. Members shall be those qualified persons who attend meetings or otherwise express interest in the business of the organization.

Section 2. Privileges. All members shall have equal privileges as to discussion at meetings and voting privileges, and each member's vote shall count equally. Members shall not use the name of the organization for financial advantage.

ARTICLE IV. Officers and Duties

Section 1. Officers. The elected officers of this organization shall be the Chairperson and Secretary-Treasurer. The Past Chairperson and the elected officers shall comprise the Executive Board.

Section 2. Chairperson. The duties of the chairperson shall be to call and preside at meetings and to provide leadership in carrying out other functions of this organization.

Section 3. Past Chairperson. The Chairperson, upon completing service as Chairperson, shall serve an additional term as Past Chairperson. The duties of the Past Chairperson shall be to preside at meetings in the absence of the Chairperson and assist the Chairperson in carrying out other functions as needed. The Past Chairperson shall serve as advisor and consultant to the Chairperson in order to provide continuity in the development and implementation of activities of the organization.

Section 4. Secretary-Treasurer. The duties of the Secretary-Treasurer shall be to keep records of membership, business transacted by the organization, and funds collected and disbursed, and to distribute notices and reports. The Secretary-Treasurer is responsible for preparing the minutes of meetings held during his/her term of office.

Section 5. Election of Officers. The Chairperson and Secretary-Treasurer shall be elected at each general meeting.

Section 6. Terms of Office. Officers shall assume their duties at the conclusion of the meeting of their election and the appointment shall stand until the conclusion of the next general meeting.

Section 7. Vacancies. Vacancies that occur on the Executive Board between general meetings shall be filled by a special call for nominations and mail ballot sent to all members. The appointment shall stand until the conclusion of the next general meeting.

ARTICLE V. Committees

Special committees may be appointed by the Chairperson from time to time as deemed necessary to facilitate the functions of the organization.

ARTICLE VI. Meetings.

Section 1. The purposes of this organization may be met by holding of general meetings and such other meetings as the Chairperson, with the consent of the Executive Board, may call. The place and date of each general meeting shall be determined by the Executive Board after considering any action or recommendation of meeting attendees as a whole. The Secretary-Treasurer shall notify members of the date and place of general meetings at least two months in advance.

Section 2. Expenses. Monetary contributions to cover expenses of the annual meeting, such as for facilities and equipment rental, may be requested from attendees at the discretion of the Executive Board.

Section 3. Business sessions shall be conducted in accordance with Robert's Rules of Order Newly Revised in all cases to which the rules apply and in which they are not inconsistent with this constitution.

Section 4. Eight active members shall constitute a quorum for the transaction of business of the organization. A majority of votes cast shall be considered as deciding in all matters, unless otherwise specified in the constitution.

Section 5. Mail ballots. Matters of major importance shall be placed before the membership by mail ballot.

ARTICLE VII. Records

Records of meeting proceedings and reports by members shall be maintained and copies provided to members in such form as may be decided as appropriate and feasible by the Executive Board.

ARTICLE VIII. Amendments

Amendments to the constitution may be made by a two-thirds vote of the members attending any general meeting or by a two-thirds majority of all votes cast by the membership in a mail ballot. A proposed amendment, if adopted, shall become effective as of the date the votes are counted, unless a later date is specified in the amendment itself.

Prepared by Judith E. Pasek
Mary Ellen Dix
Rich Dorset
Mark Harrell
Robert Lavigne

April 27, 1992

03/09/00

LAKEWOOD SERVICE CENTER, FOREST HEALTH MANAGEMENT
USDA FOREST SERVICE, ROCKY MOUNTAIN REGION (R-2)

REPORT TO THE GREAT PLAINS TREE PEST COUNCIL
FT. COLLINS, COLORADO MARCH 23-24, 2000

Permanent Staff: David W. Johnson, Center Leader and Supervisory Plant Pathologist
Willis C. Schaupp, Entomologist
Erik Johnson, Aerial Survey Specialist
Bernard Benton, Computer Specialist
Lee Pederson, Biological Technician

Service Area: Colorado east of the Continental Divide and northwestern Colorado, all of Kansas, Southern Wyoming east of the Continental Divide (generally south of Casper).

Functions: Provide technical assistance on forest pest problems and forest health issues to federal land management agencies (USFS, NPS, BLM, BIA, DOD) and cooperate with state and other federal agencies to provide assistance on state and privately-owned lands.

Office: Located on the Federal Center, Building 20 in Lakewood, Colorado.

Mailing address: USDA Forest Service, P.O. Box 25127, Lakewood Service Center, Lakewood, CO 80225-0127

Phone/Fax: 303-236-9541/ 303-236-9542

SUMMARY OF SELECT INSECT AND DISEASE CONDITIONS

INSECTS

Gypsy moth, **Lymantria dispar**

Each year, detection traps are placed in campgrounds and other sites that have a high likelihood of being introduction sites for the gypsy moth. This is part of a cooperative effort led by USDA-APHIS. Several National Forest recreation sites, Fort Carson, the Air Force Academy at Colorado Springs, and the F.E. Warren Air Force Base, Cheyenne, Wyoming were trapped for gypsy moth during the summer of 1999.

No gypsy moths were captured in 1999 in Colorado in detection traps. However, one moth was captured in a delimitation trapping effort at Moraine Park Campground within Rocky Mountain National Park. This capture was made less than 1/4 mile west of the site where one moth was captured in 1998. Delimitation will continue in 2000 around this site. In addition, delimitation trapping was conducted for the third consecutive year on Warren Air Force Base in Cheyenne. No moths were captured by this delimitation effort, which is likely to be discontinued in 2000.

The trapping sites were selected on the basis of elevation, presence of hardwood species, and potential for high numbers of out-of-state visitors. The gypsy moth survey is an attempt to discover gypsy moth "hitch-hikers" which escape from vehicles used by out-of-state visitors. We continue to examine the criteria and selection of sites in coordination with personnel responsible for gypsy moth detection. Therefore, sites selected for 2000 may differ from 1999.

Douglas-fir tussock moth, **Orgyia pseudotsugata**

The infestation of the Douglas-fir tussock moth, Orgyia pseudotsugata, that was reported on the South Platte Ranger District, Pike National Forest, collapsed completely in 1996. No defoliation was detected in wildland forests in 1999. In addition, no moths were trapped in low-dose pheromone traps in 1999 used as an early warning system.

Douglas-fir beetle, **Dendroctonus pseudotsugae**

In scattered portions of the Douglas-fir tussock moth infestation mentioned above and within and adjacent to the Buffalo Creek fire of May 1996, it is clear that Douglas-fir beetle, Dendroctonus pseudotsugae, activity is increasing. This significant epidemic on the upper South Platte watershed has expanded in 1999 and intensified.

Mountain pine beetle, **Dendroctonus ponderosae**

Mountain pine beetle populations have been building in various locations in Colorado since 1996. During the 1998 aerial survey, approximately 150,000 beetle-infested trees (faders) were identified. Aerial survey data are still being compiled for the 1999 flight season, but the number of faders is expected to double. Beetle activity threatens a number of ecologically and economically valuable landscapes. Areas of most significant concern in Colorado that require immediate large-scale response include the Vail and Arkansas Valleys, the Lake Granby area, and the Front Range of Colorado.

Pine tip moths, **Rhyacionia spp.**

Ongoing control problems in plantings in Kansas have led to the idea that more than one species of tip moths is causing damage. Pheromone trapping and other surveys are needed, but first a systematist able to distinguish the candidate species must be located. Efforts are ongoing.

DISEASES

White pine blister rust, **Cronartium ribicola**

This disease was found for the first time in Colorado. The rust was causing branch and main stem cankers on scattered limber pines in several locations north of Redfeather Lakes, which is approximately 40 miles northwest of Ft. Collins, Colorado.. Incidence appeared low. The disease is known in southern Wyoming on limber pine in areas north and east of this area. Additional surveys to determine the extent of the infestation in Colorado are planned for the future.

AERIAL SURVEY MISSIONS

Aerial surveys for insect and disease detection are performed annually on lands requested by resource managers on the National Forest districts and states as well as special project areas for Forest Health Management. Approximately 28 million acres were surveyed in 1999 in Colorado, South Dakota and Wyoming. Some of the more common pests detected include bark beetles, defoliators, subalpine fir decline and areas heavily infested with dwarf mistletoe.

Once again, the most widespread damage agent detected was subalpine fir decline followed by mountain pine beetle infestations.

OTHER PROJECTS

Several landscape scale analyses are currently in various stages of development. The intent of these analyses is to portray the risks and impacts of major forest insects and diseases to resource managers. Forests involved include the Arapaho/Roosevelt and the Medicine Bow/Routt National Forests. A large-scale analysis of the spruce cover type to risk from spruce beetle is currently underway for Colorado and southern Wyoming.

LISTING OF SERVICE TRIP REPORTS BY THE LAKEWOOD SERVICE CENTER:

LSC-99-01 3420 Site Visit Report, Evaluation of Preventative Treatment (Arapaho and Roosevelt National Forest-MPB)

LSC-99-02 3410 1998 Gypsy Moth Detection Survey (Colorado and Wyoming)

LSC-99-03 3420 Jamestown Prescribed Fire and Mountain Pine Beetle on the Boulder Ranger District (Arapaho and Roosevelt National Forest)

LSC-99-04 3420 Service Trip to Air Force Academy

LSC-99-05 3410 Aerial Survey of the State of Colorado

LSC-99-06 3410 Aerial Survey of the State of Wyoming

LSC-99-07 3420 Service Trip Report, White Pine Blister Rust Survey (Arapaho and Roosevelt National Forest)

LSC-99-08 3420 Service Trip Report, Upper Blue Stewardship Project, Dillon RD (White River NF)

LSC-00-01 3420 Buffalo Jones Ecosystem Management Project (Pike and San Isabel NFs)

LSC-00-02 3420 Site Visit Report, Brush Creek/Hayden RDs Blowdown and the Haskins Creek House Log Sale (Medicine Bow and Routt NFs)

LSC-00-03 3410 1999 Gypsy Moth Detection Survey (Colorado and Wyoming)

LSC-00-04 3420 Haines Mountain Pine Beetle (Medicine Bow and Routt NFs)

RECENT PUBLICATIONS (as of March 2000)

Allen, K.K. and J.D. McMillin. 1999. Evaluation of mountain pine beetle activity in Beaver Park on the Spearfish/Nemo Ranger District of the Black Hills National Forest. USDA For. Serv., Renewable Resources, Rocky Mountain Region Biol. Eval. R2-00-01. 17 p.

Harris, J.L. 1999. White pine blister rust disease of limber pine in the Bighorn and Medicine Bow National Forests. USDA For. Serv., Renewable Resources, Rocky Mountain Region Biol. Eval. R2-00-02. 8 p.

Harris, J.L., K.K. Allen, and J. McMillin. 1998. Little Bighorn Analysis Area, Medicine Wheel and Tongue Ranger Districts, Bighorn National Forest. Insect and Disease Survey. USDA For. Serv., Renewable Resources, Rocky Mountain Region Biol. Eval. R2-99-03. 25 p.

Harris, J.L 1999. Evaluation of white pine blister rust disease on the Shoshone National Forest. USDA For. Serv., Renewable Resources, Rocky Mountain Region Tech. Rep. R2-99-05. 11 p.

Harris, J.L. 1999. Phomopsis Blight at Bessey Nursery. USDA For. Serv., Renewable Resources, Rocky Mountain Region Biol. Eval. R2-99-07. 6 p.

Johnson, D.W. 1999. Evaluation of Porcupine and Snyder Creeks dwarf mistletoe thinning studies, Routt National Forest, Colorado. USDA For. Serv., Renewable Resources, Rocky Mountain Region Tech. Rep. R2- 62. 12 p.

Johnson, D.W. 1999. Disease survey of Buckhorn Creek lodgepole pine stand forty years after establishment, Canyon Lakes Ranger District, Arapaho and Roosevelt National Forests. USDA For. Serv., Renewable Resources, Rocky Mountain Region Tech Report R2-63. 5 p.

Johnson, D.W. Picea engelmannii Parry ex Engelm. IN: Schutt, Schuck, Aas, Lang [eds.]. Enzykopedie der Holzgewachse (Encyclopedia of Woody Plants). Ecomed Verlag, Landsberg, Germany. (In press).

Johnson, D.W. and W.R. Jacobi. First report of White Pine Blister Rust, Cronartium ribicola, in Colorado. Plant Disease. (In press).

McMillin, J.D. and K.K. Allen. 1998. Evaluation of mountain pine beetle activity in the Blackhawk Timber Sale area and the Pactola and Sheridan Lake Campgrounds on the Pactola/Harney Peak Ranger District of the Black Hills. National Forest. USDA For. Serv., Renewable Resources, Rocky Mountain Region Biol.Eval. R2-99-04. 15 p.

McMillin, J.D. and K.K. Allen. 1999. Evaluation of mountain pine beetle activity in the Black Hills National Forest. USDA For. Serv., Renewable Resources, Rocky Mountain Region Biol. Eval. R2-00-03. 18 p.

Negron, J.F., W.C. Schaupp, Jr., K.E. Gibson, J. Anhold, D. Hansen, R. Thier, and P. Mocettini. 1999. Estimating extent of mortality associated with the Douglas-fir beetle in the Central and Northern Rockies. Western Journal of Applied Forestry 14(3): 121-127.

Schaupp, W.C. 1999. Evaluation of the mountain pine beetle at the site of the Jamestown Prescribed Fire of May 1999, on the Boulder Ranger District, Roosevelt National Forest, Colorado. USDA For. Serv., Renewable Resources, Rocky Mountain Region Tech. Rep. R2-99-09. 20 p.

Schaupp, W.C., Jr., M. Frank, and S. Johnson. 1999. Evaluation of the spruce beetle in 1998 within the Routt Divide Blowdown of October, 1997, on the Hahns Peak and Bears Ears Ranger Districts, Routt National Forest, Colorado. USDA For. Serv., Renewable Resources, Rocky Mountain Region Biol. Eval. R2-99- 08. 15 p.

Colorado State Forest Service Report To:
Great Plains Tree Pest Council
March 23-24, 2000 Meeting
Fort Collins, Colorado

Aerial Surveys

While concentrating on mountainous forests, CSFS surveys of 6,575,000 acres along the Colorado Front Range did include prairie ponderosa pine stands in the Black Forest east of Colorado Springs. Primary emphasis was placed on sketch-mapping pockets of pine mortality caused by Mountain Pine Beetle (*Dendroctonus ponderosae*). The combined surveys of CSFS and the USFS are expected to note at least 150,000 trees which faded in early summer 1999. This constitutes an approximate doubling of numbers noted during 1998 surveys and continues a doubling trend that has occurred since about 1996. Note that surveys are by nature one year behind in measuring true beetle numbers, meaning that if the doubling continued as a result of the 1999 flights, as many as 300,000 trees could be currently infested. It is estimated that about 1,000,000 trees were killed annually during the last Front Range ponderosa epidemic which peaked about 1978.

Of note in the Black Forest were the following maladies in ponderosa pine:

- Hail damage resulting from June storms
- Pine sawfly (*Neodiprion (fulviceps?)* defoliation
- Road salt injury to trees along state highways
- Ponderosa needleminer (*Coleotechnites ponderosae*) defoliation
- Mountain pine beetle (less than 1000 faders)

Gypsy Moth

A total of 11 moths (all singles) were caught during the 1999 trapping effort. CSFS put out a total of 972 detection traps. This is much reduced from past years because of a problem in obtaining trapping supplies in timely fashion for the third year in a row. APHIS-PPQ is well aware of the problems and is working to rectify the contractor problems responsible.

The 1999 catches were in Rocky Mountain National Park (in a delimitation trap near a 1998 catch, trapping done by the USFS Lakewood Service Center), Castle Rock (south of the Denver Metro area in the fastest growing county (Douglas) in the U.S.), and 9 scattered about the Denver Metro area in Jefferson and Arapahoe Counties. All these sites will be delimited at the approximate rate of 25 traps per square mile around the catch site in 2000. One cluster of three catches in the northwest Metro area (mostly Arvada) probably involves an egg mass and may be troublesome.

Of concern, Colorado State Agriculture received an alert in late summer about shipments from Badger Evergreen Nursery in Michigan that went to both Iowa and Colorado. Evidence of recent live gypsy moths was found in the Iowa material and the Colorado material is suspect. Only three of the five Colorado cities or towns receiving this material were trapped in 1999. Plans are to trap these areas in 2000 at slightly higher than normal detection trapping rates.

Western Spruce Budworm
This insect is once again appearing in areas from which it has been endemic since the late 1970's. Of note is the east side of the Sangre de Cristo Mountains from Salida south to Stonewall.

Spruce Beetle
The large 14,000 acre area of blowdown resulting from a freak wind in October 1997 north of Steamboat Springs is slowly producing a Spruce Beetle (*Dendroctonus rufipennis*) population. See USFS (Bill Schaupp of Region 2) reports for details. Small pockets of shaded, fallen spruce around the edges of the huge windfall areas appear to be producing the highest brood counts and are expected to result in significant adult flights in early summer 2000.

Douglas-fir Beetle (etc.)
Two major infestations totalling several thousand trees exist in conjunction with a Douglas-fir Tussock Moth outbreak west of Sedalia in the early 1990's and the Buffalo Creek Fire near the town of Buffalo Creek. These two beetle population centers, both southwest of Denver on the South Platte Ranger District of the Arapaho-Roosevelt National Forest, are beginning to coalesce. Sprinkle in a pinch of mountain pine beetle, erosion from summer storms, wildfire threat and dwarf mistletoe and you have a nice recipe for Disturbance Casserole. When this outbreak will end and how much of the Douglas-fir resource it will consume are uncertain. Fire and water issues associated with all these events are driving specific, landscape-scale efforts here. Among the land management agencies involved are USFS, Denver Water Board, and CSFS.

Miscellaneous Comments:
-Zimmerman Pine Moth (*Dioryctria zimmermani*) and relatives continue to increase on ornamental pines in Colorado, particularly Austrian pine ornamentals (Front Range).
-A pine sawfly (*Neodiprion (fulviceps?)* caused moderate to heavy defoliation of old foliage on ponderosa pine over a few thousand acres in the Black Forest, particularly near the small town of Bijou (Elbert County). Some aerial spraying occurred in 1999 and, despite general CSFS recommendations to the contrary, more is anticipated for 2000. So far, no tree mortality has been observed in this area where periodic, short-lived sawfly outbreaks are common. The cycle for this particular sawfly is: adults in late fall, overwinter as eggs in the needle, larval feeding heaviest in late summer (full grown larvae are mostly lime green with rusty heads). A good series of adults is deposited in the CSU collection (Joel can you help with identification?).
-Cynipid gall wasps on various oaks are an increasing problem and control strategies appear to be lacking. The primary host is Bur Oak and the suspected insect is the Rough Bullet Gall Wasp (*Disholcaspis quercusmamma*)
-Ash bark beetles (*Hylesinus* spp.) and the Lilac-ash Borer (*Podosesia syringae*) continue to plague ornamental ash cultivars such as "Autumn Purple"Ash. CO has yet to confirm the presence of the Banded Ash Clearwing (*P. aureocincta*), although pheromone baits have been formulated and trapping will occur in 2000 in the eastern plains of the state.
-Ash seed weevil (*Lignoodes helvolus*) was finally confirmed (thanks to Dr. Whitney Cranshaw) as the answer to the mystery larvae occasionally discovered under ash trees in the fall. They resemble bark beetle larvae and are leaving ash seeds for overwintering in the leaf litter and upper soil.

-Cedar bark beetles (genus *Phloeosinus*) greatly declined during 1999 from previous levels in planted junipers on the plains.
-Pinyon Tip Moth (*Dioryctria albovitella*) continues to be a major pest of native and ornamental pinyon pine, particularly along the Front Range and in southern Colorado.
-Conifer Seed Bug (*Leptoglossus phyllopus*) and relatives abundantly entered homes in both fall 1998 and 1999, leading to many crisis calls from homeowners. They are essentially harmless conifer and deciduous seed feeders in our area.

-Ponderosa pine needlecast, principally *Davisomycella ponderosae*, was widespread between Pueblo and Trinidad along the southern Front Range (i.e. Wet Mountains), south of Pagosa Springs and in southwestern Colorado. This is a rather unusual occurrence in Colorado.
-Juniper-hawthorn (and Cedar-apple?) *Gymnosporangium* rusts produced spectacular telial horns on *Juniperus* hosts in many plantings throughout eastern Colorado. This is attributed to our heavy late spring rains.
-Dutch Elm Disease in general did not cause major problems anywhere during 1999, although all losses are taken seriously by the respective towns or private citizens that own them. Systematic surveys are still conducted on a few CSFS Districts.
-Fungal leaf spots were not as prevalent as one might expect with the late spring rains this year but *Septoria* did occur in abundance on many of the narrowleaf (="lanceleaf") poplars, leading to decidedly early leaf drop in many areas. Yellow riparian corridors from this condition were evident during August aerial surveys
-Winter drying occurred during early spring in a limited number of mountain areas, some of them highly visible travel corridors (for example, along I-70 west of Denver). Lodgepole pine was the primary host affected.
-Eastern Fox Squirrel (*Sciurus niger*) responded to something missing in its diet this year (tree fruits?) and caused widespread bark injury and flagging on a number of trees, particularly Russian-olive, Siberian elm, American hackberry, and Honeylocust. Bark feeding by this squirrel is more expected and less noticeable in winter.

Exotics
-Colorado has yet to officially record its first Asian Longhorn Beetle (*Anoplophora glabripennis*), although unsubstantiated reports continue to surface.
-Another Asian borer, the Smaller Japanese Cedar Longhorn Beetle (*Callidiellum rufipenne*) is reported to be a threat to Colorado, entering on cedar stem poles for a certain type of artificial Christmas tree and on other decorations distributed by the Gerson International Company. These types of materials were distributed to several general merchandise type stores in Colorado and throughout the country. This insect has been found to attack live trees in the US (unlike its habit of attacking only dead material in Asia) and is possibly a threat to the following genera: *Chaemaecyparis*, *Cryptomeria*, *Cupressus*, Juniperus, *Thuja* (=*Thujopsis*), and possibly *Abies*.
-Japanese Beetle (*Popillia japonica*) continues to be trapped in significant numbers in Colorado. A thorough analysis by Fromm, Bernklau and Bjostad of CSU concluded that only the Boulder and Colorado Springs areas would be normally conducive to overwintering, with survival being possible in a few other Front Range sites during certain years. Regardless

of its real or perceived threat, quarantines in place or pending could hurt certain nurseries within the state and the beetle's true status and potential impacts need to be determined.

Forest Health Monitoring Program

On May 25th, 1999, six CSFS personnel joined the USFS field crews and regional trainers in Logan, Utah for a three and half week training period in order to assist the USFS with the National Forest Health Monitoring program. After training, the CSFS crews began their measurements of permanent plots on June 17 and concluded the season on August 17. A total of 58 Colorado plots were scheduled to be measured in the 1999 season. Four of these were first time (MT1) measurements, 14 were re-measurements (MT3) of 1998 plots, 39 were re-measurements (MT3) of 1995 plots, and access was denied to one plot. The breakdown of these plots by land use class is as follows: 34 timberland, 21 woodland, 2 reserved timberland, 1 access denied. With the measurements taken in 1999, Colorado now has two complete sets of data from its 151 forested plots. This winter, emphasis will be placed on data analysis and queries to determine status and trends. Plans for 2000 are for CSFS (Schomaker) to run two crews in CO.

Other Issues

-The loss of lindane as a control treatment for Mountain Pine Beetle will force more reliance on other direct control methods such as tarping or other solar treatments. Perhaps it will also force the development of other chemical or mechanical techniques. Lindane was not canceled by EPA but was voluntarily pulled from production by the manufacturers in lieu of paying reregistration costs which would be soon required. Existing stocks of properly labeled materials can still be used, but were largely expended in 1999.

-In a related matter, the only two materials registered for preventive treatments against Mountain Pine Beetle are carbaryl (Sevin) and permethrin (Astro). Astro has been used only in the last few years and is a Restricted Use material (i.e. homeowners can not purchase or apply it). It appears to be as effective as Sevin when properly applied but failures have been reported. It is not known if the failures were related to the chemical or to application shortcomings.

-Jose Negron (RMFRES), Tom Eager (USFS, Gunnison Service Center) and others are providing much needed data and recommendations for solar MPB treatments.

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2000 Report - GPTPC
J.A. Walla

Report for Great Plains Tree Pest Council meeting, Ft. Collins, CO, March 23-24, 2000
From Jim Walla, Plant Pathology Department, North Dakota State University

1. Ash yellows of green ash.

A paper reporting results of our region-wide (6 states, 3 provinces) sampling of green ash for ash yellows phytoplasmas was published. Main conclusions: **1)** Green ash in the region is in only fair condition, with substantial dieback and slow radial growth. **2)** AshY phytoplasmas were found at 96% of 106 sampled sites and in 50% of the sampled trees. **3)** Range among states was wide (16% in WY to 71% in SD). **4)** Incidence was highest in trees with the most crown dieback. **5)** Radial growth rate did not vary between infected and noninfected trees.

18 trees of two ash cultivars (Patmore, Marshall's seedless) were planted in spring, 1999; half were graft-inoculated with AshY phytoplasmas in August 1999 in paired comparisons. The intent of this work is to find if AshY phytoplasmas have an effect under these relatively controlled conditions and to develop methods for a more extensive ash cultivar test.

Seedlings in windbreaks and native woodlands were sampled to determine the occurrence and incidence of AshY phytoplasmas in young plants. Witches'-brooms were common on such seedlings, and AshY phytoplasmas were confirmed to be present in seedlings at each sampled site.

2. Lilac witches'-broom (LWB - caused by AshY phytoplasmas).

Infected plants had been found in 1997 and 1998, but no "typical" witches'-brooms had been found. In 1999, LWB witches'-brooms were found in a hedge planting in Fargo. The symptoms included deliquescent branching and scorching of leaves. Samples from those witches'-brooms were positive using the AshY phytoplasma-specific monoclonal antibody.

3. X-disease of chokecherry.

Chokecherry plants in the Bismarck Plant Materials Center germplasm collection were rated for X-disease severity again in 1999. As of 1999, there were still 21 plants that appear to not be substantially damaged by X-disease, while 71% of the original plants have died and most others are in very poor condition. A similar planting in SD was examined and will be evaluated for more X-disease-resistant sources in 2000 and beyond.

Most of the select plants are in tissue culture to obtain clonal plants for resistance testing and seed orchard planting. Two sources were taken through tissue culture, planted, and grown for two growing seasons, so the production system appears to be in place. Graft inoculations were made at the end of the second growing season to test grafting techniques for chokecherry and to test virulence of inoculum from severely, moderately, and slightly affected plants.

Variation among X-disease phytoplasmas from chokecherry was found by sequence analysis of the 16S/23S rRNA gene spacer region; such data will be used to help determine if there are differences in virulence/aggressiveness in the pathogen. The 23S rRNA gene was cloned and sequenced from an X-disease phytoplasma strain (first time for phytoplasmas).

4. Unknown juniper problem (dieback)

Fungicide trials were completed in 1997 to attempt to identify and control a decline problem with junipers in Bismarck. Nothing was accomplished in that trial. Another approach to address the problem was started in 1999. Various fertilizer treatments were applied in replicated trials throughout the growing season, and notes were taken regarding the condition of each plant

through August. A mixture of micronutrients (STEM) with or without a nitrogen supplement (Miracid) appeared to provide the best results compared to the water control, while manganese or iron, each with Miracid, provided the worst results. Ratings of these plants will continue in 2000.

5. Limber pine condition

North Dakota's only natural limber pine stand was found to be in poor condition in 1999 compared to past observations. A fungus similar to *Cyclaneusma* was present on one tree that appeared to be systemically infected (not previously known). A shoot boring beetle (*Pityophthorus* sp) was very common in the stand (not previously known in ND). Diseases recently reported as damaging in *P. flexilis* stands in the region (white pine blister rust, Dothistroma needle blight) were not found in this stand.

6. Other projects

Genetic diversity studies: Evaluations were made of mixed-cultivar poplar plantings for cankers found no effects of clonal mixing on canker disease incidence.

Lophodermium needle blight on ponderosa pine: A seed source provenance planting was inoculated in 1999 using needles with fruiting bodies of an undescribed *Lophodermium* species to identify sources of resistance.

Pseudomonas syringae pv *syringae* was confirmed as the cause of a blight in *Syringae amurensis* var. *japonica*, the first confirmation of this disease in ND.

Recent Publications

Guo, Y.H., Cheng, Z.-M., and Walla, J.A. 2000. Characterization of X-disease phytoplasmas in chokecherry from North Dakota by PCR-RFLP analysis of rRNA region. Plant Disease (Submitted).

Guo, Y.H., Cheng, Z.-M., and Walla, J.A. 2000. Amplification of the 23S rRNA gene and its application in differentiation and detection of phytoplasmas. Can. J. Plant Path. (Submitted).

Taylor, J. E., and Walla, J. A. 1999. First report of Dothistroma septospora on native limber and whitebark pine in Montana. Plant Disease 83:590.

Walla, J.A., and Guo, Y.H. 1998. First report of lilac witches'-broom in the Great Plains. Plant Disease 82:1404.

Walla, J. A., Jacobi, W. R., Tisserat, N. A., Harrell, M. O., Ball, J. J., Neill, G. B., Reynard, D. A., Guo, Y., and Spiegel, L. 2000. Condition of green ash, incidence of ash yellows phytoplasmas, and their association in the Great Plains and Rocky Mountain regions of North America. Plant Disease 84:268-274.

Walla, J. A., Wang, C., Schumann, C. M., and Tuskan, G. A. 1998. *Peridermium harknessii* in the north-central United States may be a complex of taxa. In: Jalkanen, R., Crane, P., Walla, J., and Aalto, T. (eds). Proceedings of the IUFRO WP 7.02.05 Rusts of Forest Trees. Saariselka, Finland, Aug. 2-7, 1998. Finnish Forest Research Institute, Research Papers 700:183-190.

1999 Forest Health Summary
North Dakota

Prepared by: Marcus Jackson

Tornados and Other High Winds

Two communities in North Dakota were hit by tornados with substantial damage to their trees. Fortunately, no people were injured. Substantial damage was also caused to native and planted trees around North Dakota by in-line winds. Winds gusted to more than 90 mph, and were sustained at 70 mph, in Fargo over the 1999 Independence Day weekend. The Fargo Forestry Department removed more than 1,200 tons of brush and wood chips during the two weeks after the windstorm. Residents removed nearly an additional 300 tons of brush during the month following the storm. Storm cleanup costs exceeded $135,000.

Insects and Mites

Mites:

Cecidophyes sp. mite on viburnum. An erinea gall-making eriophyid mite has been seen on Bailey Compact Cranberrybush (*Viburnum trilobum* 'Bailey Compact') across central and eastern North Dakota. Some plants show symptoms, which may indicate virus infections, followed by death of the plants.

Insects:

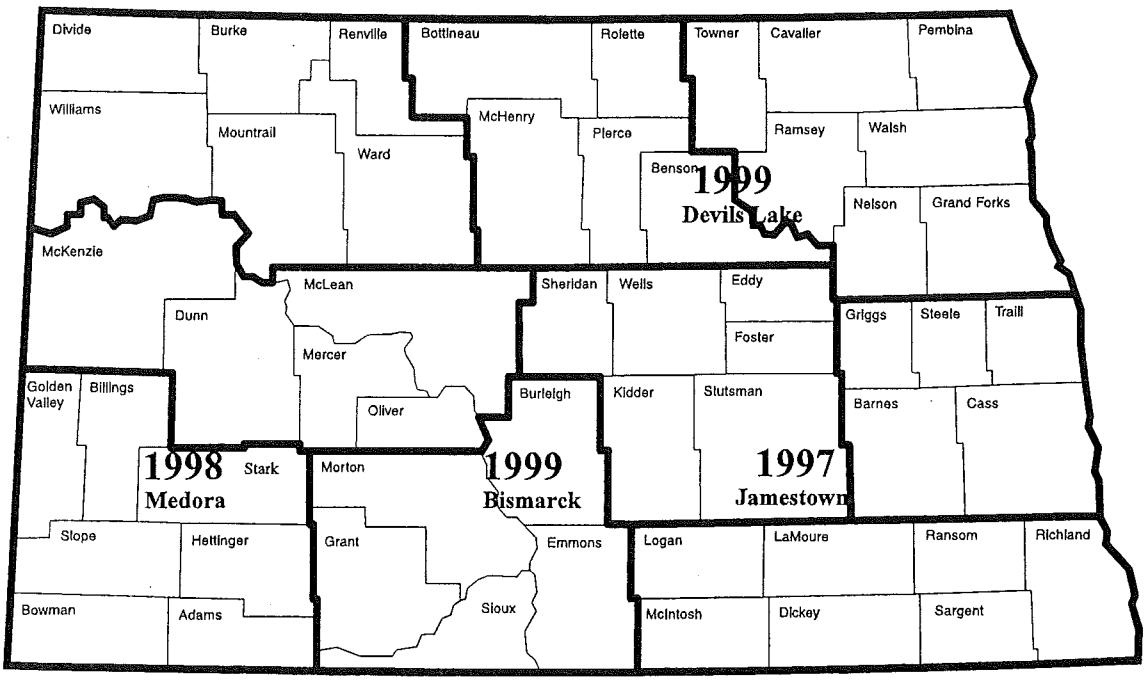
Yellowheaded Spruce Sawfly. All native and introduced species of spruce grown in North Dakota are potential hosts to yellowheaded spruce sawflies. Many small to moderately aged spruce trees in the northern half of the state are lost each year to these insects.

Dioryctria spp. Moths. There are three possible *Dioryctria* species present in North Dakota. Near Hettinger, approximately 4 acres of ponderosa pine are heavily infested (>75% of the stand). Mark Harrell, from the University of Nebraska, identified the moths near Hettinger as *D. tumicolella.* Infested ponderosa pines were also reported in northeastern areas of North Dakota. Most damage in North Dakota was in ponderosa pines, but injury did occur to scotch pines as well.

Exotic Insect Threats:

Gypsy Moth. Gypsy moths were caught during the North Dakota trapping survey for the third consecutive year. Two moths were trapped during 1999. Each moth was caught at a campground frequented by out of state visitors. An intensive survey throughout Theodore Roosevelt National Park, around the area of the 1998 moth catch, resulted in no additional catches.

Asian Longhorned Beetle. Although we do not know whether Asian Longhorned Beetles (ALBs) could survive North Dakota winters, some of their favored hosts include trees that are native to the state (ex. boxelders, poplars, and elms). To help determine if any ALBs are present in North Dakota, letters were sent to City Foresters across North Dakota with color picture identification cards of ALBs supplied by APHIS. In addition, articles were written for five newsletters reaching community foresters, arborists, nurserymen, extension agents, horticulture society members, and others.



NOTE: Each year/location represents a single male adult gypsy moth catch in a pheromone trap.

Diseases

Leaf Diseases. Moderately-cool, wet weather across much of North Dakota early in the growing season of the last two years has helped many leaf diseases thrive. Ash anthracnose caused significant defoliation of green ash in parts of eastern, central, and southwestern North Dakota over the last two years. Trees that lost up to 50% of their leaves in eastern North Dakota during 1998 lost nearly 100% of their leaves in 1999. Apple scab caused significant defoliation of crabapple trees across North Dakota during 1999. Various leaf diseases of *Populus* sp., including *Marssonina* spp., *Melampsora medusae*, and *Septoria musiva* appear to have increased in severity over the last several years.

Cytospora canker. While Colorado and Norway spruce are most susceptible, Cytospora cankers occur on all spruce species commonly planted around North Dakota. Many trees across the state lost aesthetic, wind control, and noise reduction benefits as this disease moved up trees from limb to limb. Occasionally, severely affected trees died.

Dutch Elm Disease. Since Dutch Elm Disease (DED) has spread to all of the major stands of native elms in North Dakota, efforts to slow the impact of the disease has moved primarily to community trees. DED increased in Bismarck, but decreased in Fargo and Grand Forks in 1999 compared to 1998. In many small communities and windbreaks, elms continued to be lost quickly after DED was detected in those areas.

Ash Yellows. Recent research has shown that ash yellows phytoplasmas are present in ash all over central North America, and have been found in lilac in southeastern North Dakota. Currently, we do not know if ash yellows or lilac witches'-broom cause significant damage in North Dakota.

RAPID CITY SERVICE CENTER, FOREST HEALTH MANAGEMENT
USDA FOREST SERVICE, ROCKY MOUNTAIN REGION (R-2)

Report to the Great Plains Tree Pest Council — Fort Collins, CO Mar. 23–24, 2000

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Service Area: All of South Dakota, except northwest corner; All of Nebraska; Northern Wyoming east of the Continental Divide (north of Casper and South of Pass City).

Summary of Rapid City Service Center 1999 – 2000 Work

Insects and Disease:

McMillin, J.D.; Allen, K.K.; and Harris, J.L. Evaluation of mountain pine beetle and Armillaria root disease in the Sundance sale area, Black Hills National Forest. Bio. Eval. R2-99-02.

Harris, J.L.; Allen, K.K.; and McMillin, J.D. Little Bighorn Analysis Area Medicine Wheel and Tongue Ranger Districts, Bighorn National Forest. Bio. Eval. R2-99-03.

RCSC-00-01 – Insect and disease detection at Wind Cave National Park
RCSC-00-03 – Aerial survey of insect and disease conditions, Shoshone National Forest
RCSC-00-04 – Aerial survey of insect and disease conditions, Bighorn National Forest
RCSC-99-02 – Hazard tree work at Bessey and Whitetail Campgrounds, Nebraska NF

Insects:

McMillin, J.D. and Allen, K.K. Evaluation of mountain pine beetle activity in the Blackhawk Timber sale area and the Pactola and Sheridan Lake campgrounds on the Pactola/Harney Peak Ranger District of the Black Hills National Forest. Bio. Eval. R2-99-04.

Allen, K.K. and McMillin, J.D. Evaluation of mountain pine beetle activity in Beaver Park on the Spearfish/Nemo Ranger District of the Black Hills National Forest. Bio. Eval. R2-00-01.

McMillin, J.D. and Allen, K.K. Evaluation of mountain pine beetle activity in the Black Hills National Forest. Bio. Eval. R2-00-03.

McMillin, J.D. and Allen, K.K. 2000. Impacts of Douglas-fir beetle on overstory and understory conditions of Douglas-fir stands, Shoshone National Forest, Wyoming. Tech. Rep. R2-64.

RCSC-00-01 – Bark beetles in transplanted trees, Mount Rushmore National Park
RCSC-00-02 – Douglas-fir beetle in North Fork campgrounds, Shoshone National Forest
RCSC-00-05 – Forest Health Management bark beetle sampling, Bighorn National Forest

RCSC-00-06 – Forest Health Management bark beetle sampling, Black Hills National Forest
RCSC-00-10 – Survey for mountain pine beetle, Mount Rushmore National Monument
RCSC-99-03 – Mountain pine beetle populations in Beaver Park Area, Black Hills NF
RCSC-99-06 – Pine engraver beetles in transplanted trees at Mt. Rushmore National Monument
RCSC-99-07 – Forest Health Management aerial survey, Black Hills NF

Disease:
Harris, J.L. Evaluation of white pine blister rust disease on the Shoshone National Forest. Bio. Eval. R2-99-05.

Harris, J.L. Phomopsis blight at Bessey Nursery. Bio. Eval. R2-99-07.

Harris, J.L. White pine blister rust disease of limber pine in the Bighorn and Medicine Bow National Forests. Biol. Eval. R2-00-02.

RCSC-00-07 – White pine blister rust disease on limber pine in Custer State Park, SD
RCSC-00-08 – *In vitro* fungicide tests for control of *Phomopsis* blight at Bessey Nursery
RCSC-00-09 – Hazard rating *Armillaria* root disease in Custer State Park, SD
RCSC-00-11 – 1999 Monitoring of history plots at Bessey Nursery
Memo regarding cottonwood decline at Buffalo Bill State Park, Cody, WY
RCSC-99-01 – Letter about declining trees of homeowner, Rapid City, SD
RCSC-99-04 – Needlecast disease on Kirk Hill, Black Hills NF
RCSC-99-05 – *Armillaria* survey at Sawyer Memorial Park, Black Hills, Pope & Talbot
Memo regarding dying trees along Hwy 85, Spearfish Canyon, Black Hills NF

Current Work at Rapid City Service Center

Insects and Diseases:

- Forest Insect and Disease Training in Sheridan, WY
- Sub-alpine fir decline in spruce-fir forest type of the north-central Rocky Mountains

Insects:

- Gypsy moth detection trapping in recreation sites of national forest and parks in South Dakota and Wyoming
- Bark beetle sampling *Ips*, mountain pine beetle, and western balsam bark beetle in the Black Hills and Bighorn National Forests

Diseases:

- Dwarf Mistletoe survey of the Bighorn National Forest
- Outplanting project with *Phomopsis* blighted seedlings from Bessey Nursery
- Hazard Tree Training with John Ball at Spearfish, SD
- Monitoring of comandra blister rust and white pine blister rust permanent plots in WY

South Dakota Department of Agriculture, Resource Conservation and Forestry
Report to Great Plains Tree Pest Council
March 23 & 24, 2000

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Mountain pine beetle (*Dentroctonus ponderosae*)

This pest is attacking ponderosa pine in the Black Hills area of South Dakota. The population is expanding rapidly and may be moving distances of ¼ mile or more to infest new locations. The majority of the infestation is confined to national forest lands but it is anticipated to infest more private and state lands. The Sturgis watershed area is hard hit with the beetle and water quality could be endangered. The state is working to help minimize damage to the area through proper forest management practices, fire hazard reduction, and infested tree removal.

Pine engraver beetle (*Ips pini*) are an occasional pest of ponderosa pine and there are some small outbreaks in the hills.

Ash/lilac borer (*Fraxinus pennsylvanica*)

These boring pests have caused lodging of green ash in shelterbelt plantings on private lands. Damage is heavy in spots.

Pine tip moth has been very active in at least one area of the southern hills. Nearly every sapling ponderosa pine in the area incurred some damage. Young trees that suffered this damage will have to expend energy to overcome the damage, slowing growth, and may become deformed.

Elm leaf beetle (*Pyrrhalta luteola*)
These leaf skelitonizers are severe in pockets throughout the state on residential trees.

Gypsy moth (*Porthetria dispar*)

Trapping throughout the state resulting in catching 4 male moths. One moth was on the eastern boarder and 3 were in private Black Hills camping areas. The catches are attributed to movement of tourists from infested areas.

Japanese beetle
This insect has been monitored through trapping for the past few years in South Dakota and it is still not established within the state. There was only one beetle trapped this year on the eastern boarder of the state.

Diseases:

Dothistroma
Although widespread, this disease is seldom a lethal disease on ponderosa pine in the Black Hills. This disease has become severe in the northern hills near the veteran's hospital. It was observed on an Austrian pine that was well on the way to being killed by the disease.

Western gall rust
Widely distributed in the Black Hills area contributing to the death of small ponderosa pine trees. The disease also can be found on the limbs of larger trees but normally is not a severe problem.

Dutch elm disease
This disease has progressed at an accelerated pace this year probably due to increased rainfall.

Abiotic Damage

There have been several cases of trees being planted too deep, (*Plantis toodeepes)*

Desiccation has been a problem in several locations due to frozen ground and wind.

The James River project is going well and dead trees from flooding are being removed. New tree plantings on higher ground are planned.

Deer rubbing their antlers (Buckularia) has damaged several windbreaks, and this problem may require personal involvement to help remedy the situation.

Forest and Shade Tree Disease Studies in 1999

Bill Jacobi, Res. Assoc. Michael Gebre, Ronda Koski, Graduate Students Sam Harrison, Holly Kearns
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Shade Tree Disease Studies:

1. continued a second season of monitoring tree growth, tree water potentials, soil moisture, and turf production under three irrigation treatments at the Tree and Turf Research Facility.
2. continued a second season to determine if wood chip mulch is a potential inoculum source for canker pathogens.
3. continued a second season of a canker study on trees under three irrigation treatments (40,80,160% ET) at our tree and turf research site.
4. continued to evaluate Wisconsin elm hybrids for growth, form and resistance to Cytospora canker
5. initiated a preliminary analysis of the genetic variation of Cytospora species found on local hardwoods
6. submitted the shrub and tree insect and disease guide for Colorado to Extension publishers
7. continued the water potential study of old growth cottonwoods along the Highline canal in Denver CO

Results:

1. **Tree and turf growth:**
   - Tree water potentials were not significantly affected by irrigation amounts.
   - Only green ash diameter and height growth was less on 40%ET than the higher irrigation amounts.
   - Turf grass growth was positively affected by higher irrigation amounts.
   - Soil moisture was less at the 1 & 2 ft. depth under grass alone than trees and grass at the 40% rate.
   - Soil moisture was less at the 1 ft. depth under grass alone and grass and trees at the 40% ET Vs 80 & 160% ET.
   - Soil moisture was not different between 80 and 160 % ET. Wow "where have all the waters gone"?

2. **Wood chip mulch**: We have started a study at our Tree and Turf facility to determine if uncomposted wood chips can harbor inoculum of canker pathogens (Thyronectria and Cytospora) and how long does the fungus remains viable. Low and high irrigation treatments will be used to determine if mulch moisture content affects viability. So far colonized branch pieces have contained viable fungal tissue for 32 weeks especially if the piece was buried 4 inches in mulch. Branch pieces placed on the mulch surface dry out which apparently kills the fungus. We are continuing this study and will determine how the fungi survive winter conditions.

2. **Canker susceptibility:** We are inoculating green ash with Cytospora and Honeylocusts with Thyronectria isolates to see if different irrigation treatments affect resistance to these canker pathogens.

3. **Evaluation of Wisconsin elm hybrids**: Hybrids from the Wisconsin breeding program were evaluated four years after planting for growth, form and resistance to Cytospora canker. Several selections seem to have outstanding form and growth rates. We did not get any results from the inoculation study.

4. **Cytospora Canker**: We are putting on hold our analysis Cytospora canker fungi isolates of different "species" and hosts to see if the DNA will tell us if the fungi are different

5. **Shrub and Tree Guide**: We are working on a combined insect and disease guide on shrubs and trees in the Central Rocky Mountains. We now hope to have the book published by May 2000.

CSU Shade Tree Disease Studies

W.R. Jacobi, R. D. Koski, and M. Gebre

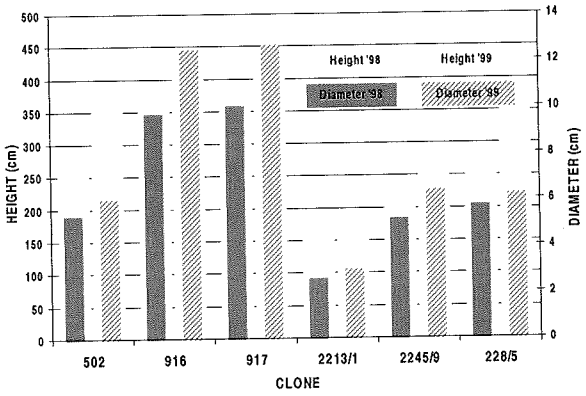
Department of Bioagricultural Sciences and Pest Management, CSU, Fort Collins, CO 80523

Elm Assessment

Objectives of Elm Assessment

- Assess elm hybrids from Wisconsin breeding program for resistance to insect, disease and abiotic damages
- We hope to expand this testing over the next 2-3 years to include all commercially available elms
- Many states have expressed interest in a coordinated assessment of elms

ARDEC ELMS / 1998 vs. 1999

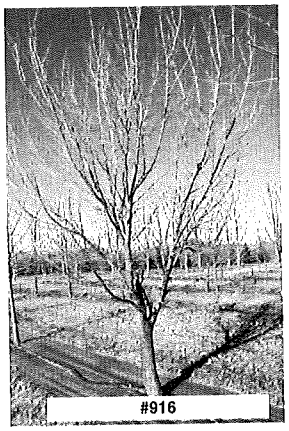


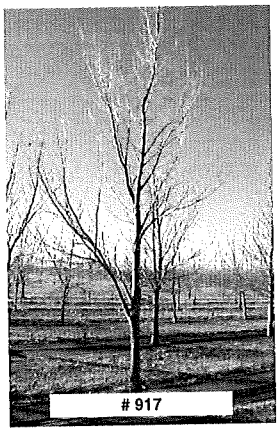
Methods and Materials

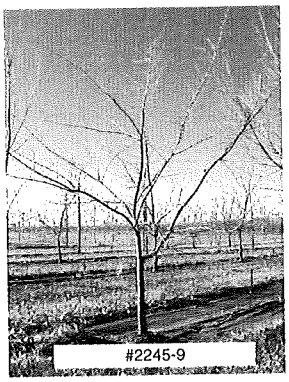
- We have 8-12 trees from 6 Wisconsin hybrids
- The trees were planted in 1996 at ARDEC in an irrigated area
- Trees were monitored for shape/form, diameter and height in 1998 and 1999
- Monitoring for insect occurrence and inoculation with canker fungi were carried out in 1999

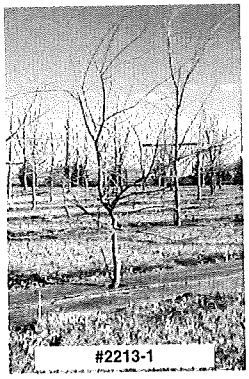
Wisconsin Elm Hybrids

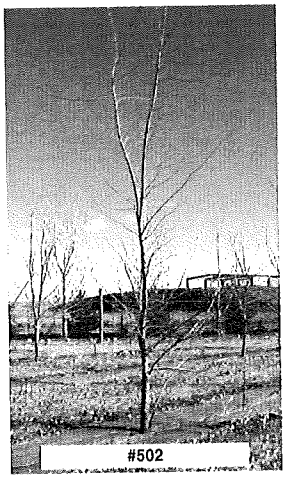
- 502: American elm X American Liberty elm
- 916: U. japonica X U. pumila
- 917: U. japonica X U. pumilar (New Horizon)
- 228-5: Regal from Dutch breeding program
- 2245-9: U. parvifolia X U. americana
- 2213-1: U. parvifolia X U. americana

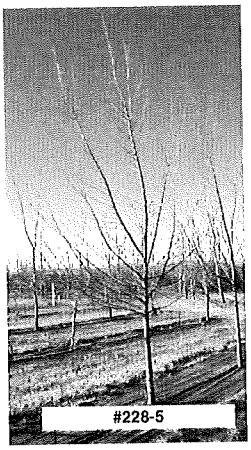










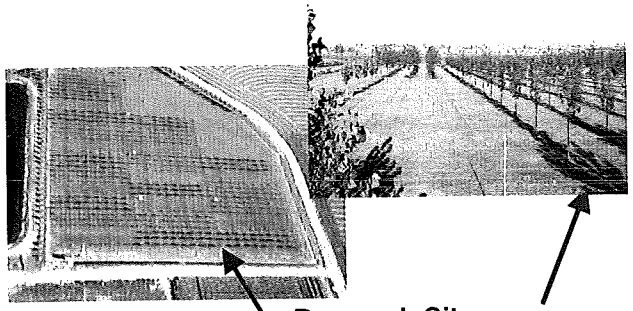


Research at the ARDEC Tree and Turf Research Facility

Research Objectives

We will determine:

- The ET coefficients and consumptive water use on tree and turf landscapes
- The effects of irrigation practices on tree physiology
- The effects of tree produced shade on growth and water requirements of turf grass
- The effects of irrigation practices on the susceptibility of trees to insect and disease damage
- The effects of irrigation practices on survival of canker pathogens in uncomposted wood chip mulch



Research Site

- Nine blocks of irrigated Kentucky bluegrass with sections of honeylocust, green ash, or turf only
- Three irrigation rates (40, 80, 160 % ET) are used with three blocks receiving one treatment
- Neutron probe data along with precipitation and irrigation amounts will allow water balance determinations

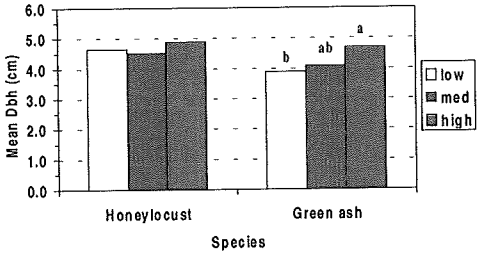
Research Methods

- Tree diameters, heights, fall coloration, turf growth are monitored
- Water potentials of trees are monitored weekly
- Insect populations are monitored
- Trees are inoculated with canker disease fungi
- Viability of canker fungi on wood in chip mulch is monitored during growing season and throughout winter

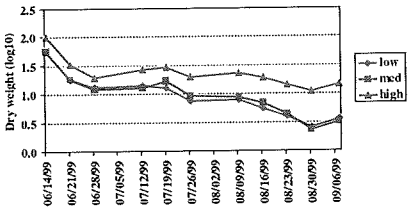
Results After Two Years

- Tree water potentials were not significantly affected by irrigation amounts
- Green ash diameter growth was less on 40% ET than on the other irrigation rates
- Turf grass growth was positively affected by irrigation amount
- Water usage data is not available yet
- Canker susceptibility data is not available
- Canker fungi survive for at least 3 months in uncomposted wood chip mulch

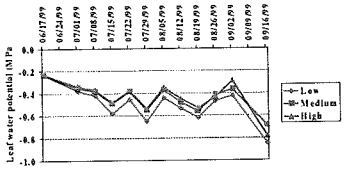
Average diameter, Sept. 1999



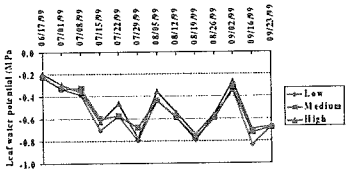
Dwt of grass clipping, green ash



Late night leaf water potential, honeylocust



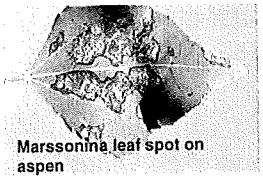
Late night leaf water potential, green ash



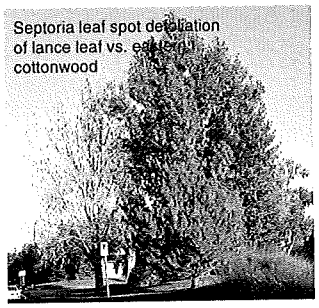
Aspen and Cottonwood Leaf Spot Research

Marssonina Leaf Spot

- **Pathogen**: *Marssonina populi*
- **Hosts**: Aspen and cottonwoods
- **Symptoms**: Spots with yellow halos early; large black blotches later in season
- **Infection**: Occurs in spring from spores produced in fruiting bodies from overwintering leaves
- Very common in landscapes and forests - can cause total defoliation



Marssonina leaf spot on aspen



Septoria leaf spot defoliation of lance leaf vs. eastern cottonwood

Septoria Leaf Spot

- **Pathogen**: *Septoria musiva*
- **Hosts:** Cottonwoods - occasionally aspen
- **Symptoms**: distinct spots and spreading irregular spots
- Can form cankers on eastern cottonwood, and many hybrids
- Fungus overwinters on fallen infected leaves

Research Objectives

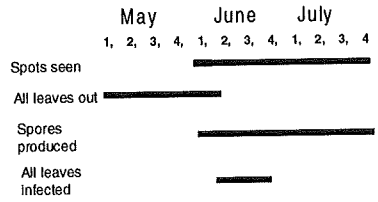
- Determine when infection of aspen and poplars occurs by Marssonina and Septoria fungi
- Determine if weather conditions can be used to predict infection periods
- Develop improved management techniques for these foliar diseases

Research Methods

- Monitored tree leaf development, leaf spot occurrence, fungal spore production and spore release in 1995-98
- Monitored 3 landscape sites in Denver, 3 in Fort Collins and 1 in Greeley for Marssonina leaf spot on aspen
- Monitored 1 nursery site in Brighton and 1 in Fort Collins for Septoria leaf spot on cottonwood

Aspen and Cottonwood Leaf Spot Research

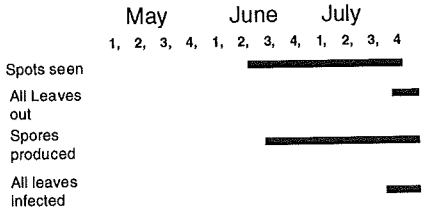
Marssonina Leaf Spot Results
Fig 1



Results For Aspen Fig 1

- End of aspen leaf formation: May 1- June 15
- Leaf spots first seen: 1st week of June
- Secondary spores form: 1st week of June
- All leaves infected: 2nd - 3rd week of June
- First wave of infections: bud break to June 7
- Secondary infections may occur
- Second wave of infection: any time after 1st week of June
- Analysis of the relationship of rain fall and spore release and infection is not complete

Septoria Leaf Spot Results Fig 2



Results For Cottonwood Fig 2

- End of leaf formation: July 30
- Leaf spots first seen: 1-2nd wks of June
- Secondary spores form: June 21 - July 7
- All leaves infected: July 30
- First wave of infections: bud break to June 21
- Second wave of infection: any time after 3rd week of June
- Leaf spot seen 2-4 wks after leaves form
- Analysis of the relationship of rain fall and spore release and infection is not complete

Leaf Spot Management Is Feasible

If you can prevent infections on **aspens** with fungicide applications from bud break to mid June and there are no nearby infected aspens (secondary infection is possible in mid to late summer)

If you can prevent infections on **cottonwoods** with fungicide applications from bud break to mid June and there are no nearby infected cottonwoods (secondary infection is possible in mid to late summer; you will need to spray every 2-3 wks until July 30)

If you use genetically resistant trees

DISEASES

Pinyon Pine Diseases and Insects no. 2.948

by C. Francis, W.R. Jacobi and W.S. Cranshaw[1]

Pinyon pines are hardy, drought-tolerant trees well-suited to many Colorado landscapes. Their dense growth habit provides good visual screening and wind protection, and they offer shelter and food for birds and other wildlife. Site selection and proper maintenance are important for tree health.

Quick Facts...

Pinyon pines are well-suited to many parts of Colorado.

They make good visual screens, windbreaks, and wildlife habitat.

Major diseases include black stain root disease, dwarf mistletoe, armillaria root disease, and pinyon decline.

Common insect pests are pinyon pitch mass borer, Ips beetles, pinyon tip moth, pinyon pitch nodule moth, pinyon needle scale, and pinyon spindlegall midge.

To ensure optimum health, avoid wounding trees, choose an appropriate site, water properly, and give trees adequate space.

Major Diseases

Black Stain Root Disease *(Leptographium wagneri)*

This vascular disease causes extensive black staining of the sapwood in the root and lower stem before killing the sapwood. Bark beetles tend to follow as secondary pathogens and eventually cause the death of the tree. Spread occurs through root grafts and root contacts, and by insects that carry the spores (reproductive structures of the disease). Affected trees usually are in a group.

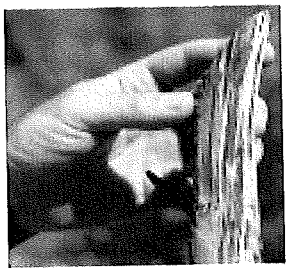


Figure 1: Vertical staining from black stain root disease.

Dwarf Mistletoe *(Arceuthobium divaricatum)*

These are small, leafless, parasitic flowering plants that grow on branches and spread only to other pinyon pines. They kill slowly by robbing the tree of its nutrients and water. Reproduction occurs when sticky seeds explosively discharge from the plant and adhere to the branches and needles of their next host. The life cycle from germination to dissemination is six years. This relatively slow rate of spread allows time for appropriate action.

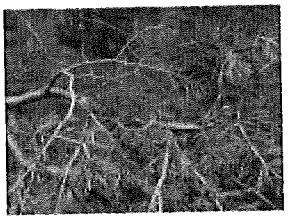


Figure 2: Dwarf mistletoe broom and plants.

Armillaria Root Disease (*Armillaria* spp.)

Armillaria spreads along roots and by rhizomorphs (fungal-root-like structures). One tree or a group can be attacked. The fungus can subsist on dead, woody material for more than 35 years. *Armillaria* prefers to infect trees that are already stressed by environmental factors or other pathogens. It prefers moist sites and moderate temperatures and is rarely found on extremely hot, cold or dry sites.

Figure 3: White fungal fans of *Armillaria* spp.

Colorado State University Cooperative Extension

Table 1: Diseases of pinyon pines.

Signs and Symptoms	Management Options
Black Stain Root Disease	
• Yellowing and browning of needles. • Old needles drop prematurely; crown appears thin. • Resin may be exuded along trunk. • Distress cone crop or abnormally small cones. • Bands of jet-black wood at root collar and roots. Color does not cross annual rings like stain fungi carried by insects.	• Plant junipers, spruce or true firs in areas with the fungus. Ponderosa pine and Douglas-fir are hosts of other forms of this fungus, so do not plant them. • Trenching between trees may stop root-to-root spread if the trees on the other side of the trench are disease free.
Dwarf Mistletoe	
• Swelling of the bark at the infection site. • Brooming of highly infected branches. • Yellow foliage, reduced foliage and death of branches of infected areas of the crown. • The parasite itself: Yellow to green or brownish-green, segmented shoots, 1/2 to 6 inches long and 1/8 inch in diameter, protrude from branches. They form one to two years after infection.	• Remove highly infected trees. • Prune lower infected branches, leaving at least one-third of the live crown. Shoots die as soon as the branches are pruned, so branch disposal is not a concern. Monitor effectiveness for 2-3 years. Repeat pruning as necessary. • If space permits, cut or plant other species in 50-foot or wider buffer zones between infected and healthy trees. • Remove the pinyon pine and plant another species in its place. • Chemical sprays such as Florel remove mistletoe shoots, reduce seed production and prevent infection of new trees. This does not kill the plant, so retreatment is necessary until infected trees are removed and new trees are planted.
Armillaria Root Disease	
• Thin crown and/or chlorotic needles. • Distress cone crop. • Resin flow at tree base. • Yellow, stringy rot at tree base. • White mycelial fans just under bark on roots and tree base. • Rhizomorphs on roots: black, shoestring-like structures with a white, nonwoody core. • Honey-colored mushrooms at tree base.	• Remove infected species and plant resistant species such as juniper. • Improve growing conditions.
Pinyon Decline	
• Red or yellow needles. • Dead branches may be on one side of the tree or scattered around the tree. • As some branches die, others may remain green and appear healthy. • Within a group of trees, some may die, some may show no symptoms, and others may have part of the crown die.	• If no precipitation occurs, water trees growing on well-drained soils once a month from November to June. • Cut trees with more than 40 percent dead branches, remove them from the site. Dying trees and firewood may attract bark beetles and are a potential fire hazard. • Chip removed trees for mulch, cut them up for firewood (stored off-site) or bury them in a landfill. Never stack firewood or fresh-cut wood next to live trees. • Other diseases and insects may damage these trees and need management.

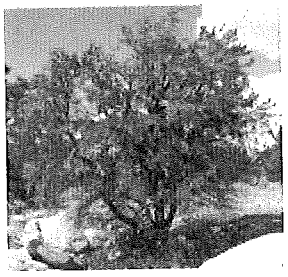


Figure 4: Erratic branch mortality of pinyon decline.

Pinyon Decline

Trees stricken with pinyon pine decline slowly die over several years. Affected trees have distinct symptoms that separate this disease from other problems commonly seen on pinyons. It is not related to bark beetles, black stain root disease or other common problems. Environmental stresses such as winter drought followed by a hot summer may trigger the decline.

Major Insects

Pinyon "Pitch Mass" Borer (*Dioryctria ponderosae*)

The larvae of this insect are pale yellow or pink with a light brown head. Larvae live underneath a pitch mass. Adult moths are active and lay eggs in tree wounds from late June through August. The larvae undergo four molts before changing to the pupal stage. Pupation takes place in the chamber of pitch

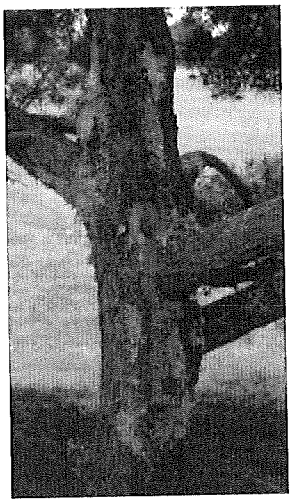


Figure 5: Pitch mass borer damage.

Figure 6: *Ips* galleries on pinyon.

and silk produced by the larvae. Larval feeding over the summer causes most of the damage. Generations take one to two years.

Ips (Engraver) Beetles (*Ips* spp.)

Adults are 1/8 to 1/4 inch long and reddish-brown to black. They have a pronounced cavity on the rear end that is lined with three to six pairs of tooth-like spines. Larvae are small, legless grubs (1/4 inch) that are white to dirty gray with dark heads. Adults lay eggs along galleries. Once the larvae hatch, they feed just inside the bark and mine away from the pupal chamber. From egg to adult takes 21 to 40 days in summer and several months in winter. The beetles are dormant from November to March. There are two to five generations per year.

Pinyon Tip Moth (PTM) (*Dioryctria albovittella*)
Pinyon Pitch Nodule Moth (PPNM) (*Retinia arizonensis*)

PTM: Adults are small grayish moths. Larvae are light golden brown with a dark brown head capsule up to 3/4 inches long. They overwinter in a small, silk cocoon on the bark. In mid- to late May, they feed by tunneling into the base of the unopened buds. They

Table 2: Insects of pinyon pines.

Signs and Symptoms	Management Options
Pinyon "Pitch Mass" Borer	
• Large gouges in the cambium of the trunk and branches exude a creamy, pinkish pitch. • Tree is disfigured and branches are weakened. • Branch and twig dieback.	• "Worm" borers out with a flexible wire, if they haven't tunneled too far in. • Preventive trunk sprays when adults are active can reduce new attacks. Thorough coverage is important, especially around active infestation sites. Two to three treatments each season, repeated over at least two years, may be needed. Pyrethroids, Cygon and Dursban are among the most effective sprays.
Ips (Engraver) Beetles	
• Yellowish or reddish-brown boring dust in bark crevices crevices or around tree base. • Y- or H-shaped galleries just beneath the bark. • Pitch tubes at entry points are about 3 inches long and 3/4 inch wide. • Needles change from green to yellow to reddish brown.	• Promote tree vigor with proper watering, spacing and nutrients. • Newly planted or stressed trees are highly susceptible. Reduce stress to reduce susceptibility. • To prevent subsequent generations, thoroughly wet bark and branches with preventive insecticides prior to egg laying in late March to early April and late July to early August. Sevin, Dursban or Astro are recommended as preventive insecticide sprays.
Pinyon Tip Moth (PTM) Pinyon Pitch Nodule Moth (PPNM)	
• Twig dieback due to terminal feeding (PTM, PPNM). • Holes in cones created by the feeding (PTM). • Large amounts of pitch around wound site (PTM). • Pitch nodules at wound site are round, smooth and light purple or red (PPNM). • Disfigured form and weakened tree (PTM, PPNM).	• Spray in midsummer when larvae are exposed on the plant and/or in May when larvae become active and begin to enter stems (PTM). • Apply preventive insecticides (e.g., Orthene, Dursban, permethrin) in late July and early August when the larvae are exposed on the exterior of the twigs (PPNM).
Pinyon Needle Scale	
• Older needles are generally attacked. Needles turn yellow, die and drop. Tree develops a "tufted" appearance because only new needles remain. • Repeated attacks can kill young trees, weaken older trees. Weakened trees are more susceptible to bark beetle attacks. • The white, cottony wax on the eggs can be quite visible in heavily infested trees.	• Drenching trunk sprays of dimethoate (Cygon) are specifically registered to control this insect.
Pinyon Spindlegall Midge	
• Spindle-shaped galls about 1/2 inch long at the base of developing needles. • Discoloration (yellow or red) of the affected area. • Premature death of attacked needles.	• Predatory and parasitic wasps keep populations low. • Insecticides are most effective during egg laying and early gall growth. Use the silk produced by the pupae to time emergence. Older needles are not affected. Treat only newly developing needles. • Dimethoate (Cygon) is the most effective insecticide. It can kill midge larvae within newly formed galls. Wait until new galls are seen in July or early August. Spinosad and permethrin are effective at egg laying.

Figure 7: Pinyon tip moth.

Figure 8: Pinyon pitch nodule moth.

mine the pith of the terminal growth, causing more damage as they grow. Large larvae move on to new tissue, cones or shoots. Pupation occurs inside the terminals and cones. Adults lay eggs from late June through August. There is one generation per year.

PPNM: Adults are a rusty brown. The larvae are reddish-yellow caterpillars with a black head and dark area behind the head. They overwinter as partially grown larvae within pitch nodules. Feeding resumes in spring and pupation follows in late spring. Adult flights typically peak in late July and early August. Eggs are laid on needle sheaths and the newly hatched larvae feed on young needles, later tunneling into shoots. There is one generation per year.

Pinyon Needle Scale *(Matsucoccus acalyptus)*

Females overwinter on the needle as a legless nymph that resembles a small black bean. Development into the mobile adult form resumes in the spring. Mating occurs in early April. Eggs are laid in masses around the collar, branch crotches and underside of larger branches. The eggs are covered by a white, cottony wax. Newly hatched nymphs settle on the previous year's needles. Second stage nymphs form in late summer and overwinter on the needles. There is one generation per year.

Figure 9: Pinyon needle scale.

Pinyon Spindlegall Midge (*Pinyonia edulicola*)

Adults are tiny flies, about 1/16 inch long, with an orange abdomen. The larvae are small, legless orange maggots found within needle galls. Adults mate and lay eggs on terminal buds from mid-June until early July. The eggs hatch and the larvae migrate down to newly formed needles. Six to 15 larvae occupy each gall, which is formed as a result of larval feeding. The larvae fully develop within the gall, then change to the pupal stage. The pupae produce a silken, frothy, white covering within the gall. This stage lasts two to three weeks. Adults pull the pupal case out with them as they emerge. There is one generation per year.

Figure 10: Spindlegall midge.

Proper Maintenance

Pinyon pines are a hardy species, but it is still important to minimize stress and wounding. They are drought-tolerant and do not grow well above 7,500 feet. To reduce stress, provide adequate space, avoid overwatering, and do not plant them in soils high in clay. Activities that can cause wounding are construction, planting, yard work and logging.

If you are building on a site with established pinyons, do not locate structures within two tree heights of the tree. This is the extent of the underground root system. Proper planting of new or transplanted pinyons can minimize problems in the short and long term. Use lawnmowers and weed trimmers carefully to avoid trunk damage. Log carefully to avoid basal scarring and accidental branch removal.

In general, closely planted and overcrowded pinyons are more susceptible to insects and diseases than trees with adequate light and space. Excessive moisture in irrigated landscapes promotes succulent growth and branch cracking. These conditions provide good entry, egg laying and feeding sites for some insect species. Pruning can also create infestation sites. Allow enough time for wounds to close before adult insects are active.

Related Fact Sheets

2.925, Dwarf Mistletoe Management.

2.926, Healthy Roots and Healthy Trees.

2.932, Environmental Disorders of Woody Plants.

7.226, Care of Young Transplanted Trees.

7.408, Trees for Mountain Communities.

7.417, How to Plant Trees and Shrubs.

7.420, Protecting Trees During Construction.

[1] *C. Francis, former student, forest sciences; W.R. Jacobi and W.S. Cranshaw, professors; bioagricultural sciences and pest management.*

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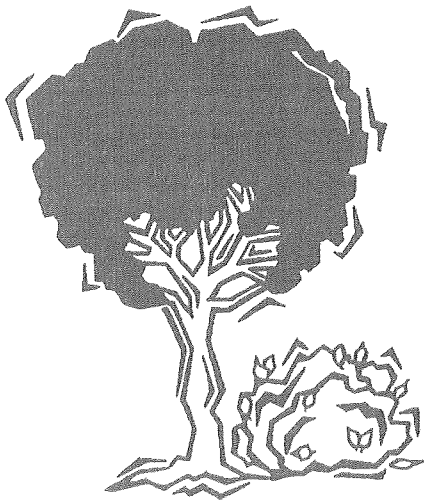

TREES & SHRUBS

Protecting Trees During Construction no. 7.420

by K.E. Bernard, C. Dennis and W.R. Jacobi [1]

Quick Facts...

Evaluate established, healthy trees to see if preservation is worthwhile and feasible.

Involve all parties in planning for tree preservation.

Establish specific guidelines to prevent tree injury.

Proper-sized barricades around trees can minimize injury.

Mechanized equipment can damage tree trunks, root systems and soil structure.

Soil compaction and grade changes limit root growth, causing dieback and death.

Tree Value, Health and Life Span

Shade trees add to the value of residential and commercial properties. During construction, established, healthy trees can be preserved with little effort or expense. Many trees are valuable enough to justify the extra concern.

Have a city forester, licensed arborist or certified tree appraiser evaluate every tree to see if preservation is worthwhile. Consider location, present size, future size, species, vigor, cost of preservation, and removal cost. Recognize that it is impossible to save every tree. Visualize the future landscape when evaluating trees for preservation. If plans call for preserving existing trees near buildings or in landscapes, the trees should be sufficiently healthy to justify preservation.

Some large, mature trees are not structurally sound or in good enough condition to warrant preservation. Older trees do not adapt to environmental changes as well as younger trees. It may be more practical to protect a 1- to 8-inch diameter tree than a larger, more mature tree. If necessary, move small trees with a tree spade or replace them. Certain species adapt better to environmental change than others (Table 1).

The Root System

Tree root systems contain large, perennial roots and small, short-lived absorbing roots. Large, woody roots grow horizontally and are mostly in the top 6 to 24 inches of the soil (Figure 1). Their main functions include water and mineral transport, food and water storage, and anchorage.

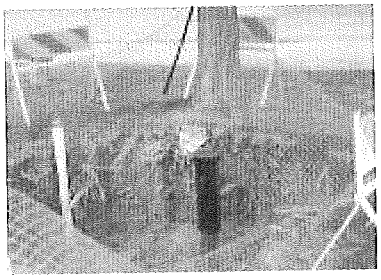

Figure 1: Roots lie in the upper 24 inches of soil and are easily damaged.

Smaller absorbing roots, averaging 1/16 inch in diameter, constitute the majority of the root system's surface area. These roots grow outward and upward from the large roots, near the soil surface where minerals, water and oxygen are abundant. Their major function is to absorb water and minerals.

The root zone extends horizontally from the tree for a distance at least equal to the tree's height. Preserve at least 50 percent of the root system to maintain a healthy tree. During summer construction, trees require adequate water, enough to saturate the soil, every one to two weeks.

The Planning Process

To avoid short- and long-term problems, early in the planning process consult all parties involved in the project: homeowner, contractor, architect, engineer, arborist, etc.

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Figure 2: Highly visible tree protection barriers.

Once trees are selected for preservation, include specific preservation methods in the project plans and contracts. All parties should be aware of and agree to the consequences for noncompliance. To ensure compliance, contractors should have tree preservation bonds to cover noncompliance fines. Fines are based on species, tree value, and the amount and type of damage done. These bonds create an additional incentive for compliance.

Before construction, conduct on-site meetings with all parties, with special emphasis on educating the project contractor. Give each worker or contractor handouts outlining the preservation activities. Post highly visible barricades and signs as a contant reminder of the protected areas (Figures 2 and 3). Preventing damage is less costly than correcting it.

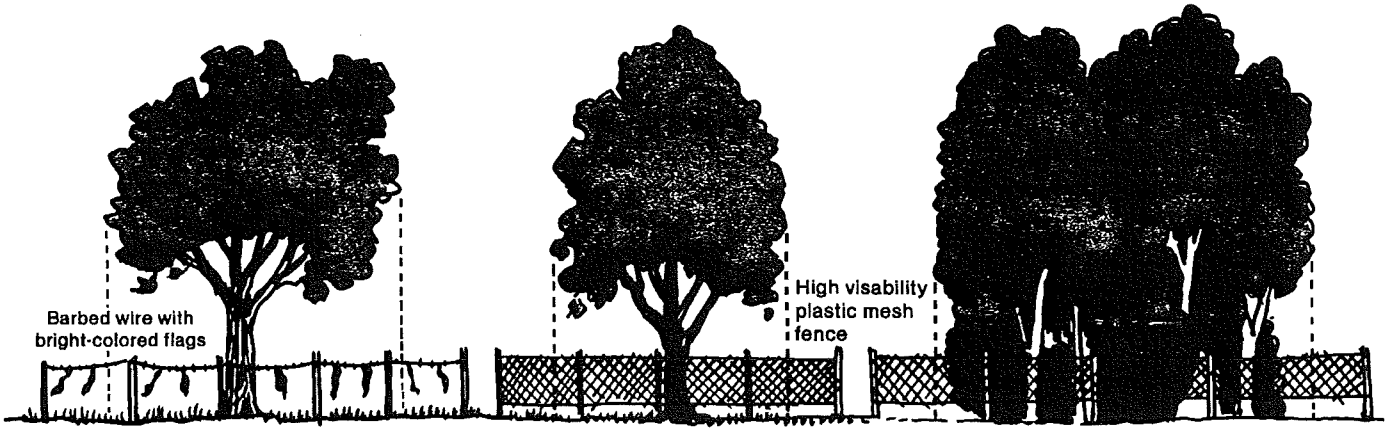

Figure 3: Ideally, the protection barrier should extend beyond the dripline. Reprinted with permission from *Tree City USA* Bulletin No. 7, National Arbor Day Foundation.

Preventing Injury

Set contractor guidelines for tree protection within contracts. Such guidelines include: prominently mark protected areas; erect barricades around designated trees; avoid vehicular traffic or parking in restricted areas; and prohibit material storage, grading, and dumping of chemicals and other materials in restricted areas.

The optimal size of barricaded areas varies by tree size, species and construction project. For recently planted trees (one to four years), the area under the branches (dripline) should be adequate. For minimal protection of trees older than four years, barricades should have a 1-foot radius per inch of diameter, with a wood chip mulch 4 to 6 inches deep extending to the dripline. If low branches will be kept, place the fence outside the dripline. Examine trees and barricades at least once a week during construction.

Figure 4: Construction vehicles can damage the existing soil structure by compressing soil particles.

Soil Compaction Problems

After a tree is established, any activity that changes the soil condition is extremely detrimental to its health. Construction traffic compacts soil most severely near the surface, the area where the majority of tree roots lie. This compaction decreases soil permeability, increases soil strength and reduces soil oxygen. These factors limit root growth, reduce tree vigor and can cause tree death. When root growth is restricted by compacted soils, less nutrients and water are available for plant growth. Soil compaction also limits other processes such as gas exchange and surface and subsurface drainage. Decline and dieback may gradually appear over a period of years.

It is easier to avoid soil compaction than to correct it. Keep construction traffic and material storage away from tree root areas. Mulch with 4 to 6 inches of wood chips around all protected trees to help reduce compaction from vehicles that inadvertently cross the barricades.

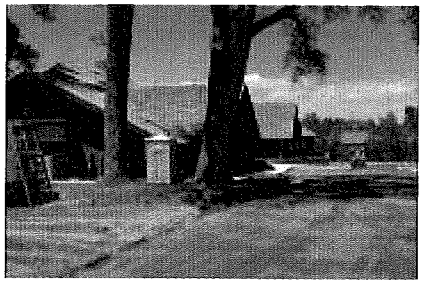

Figure 5: Surface grading severs many roots.

Direct Tree Injury by Equipment

There are four general forms of direct tree injury caused by mechanized equipment: bark removal, branch breakage, surface grading and trenching injury (Figures 5 and 6).

Bark removal or "skinning" of the trunk can be caused by any type of equipment. This can easily kill the tree, because it cannot survive without bark. Breakage of lower branches may make the tree unsightly or remove too many leaves, causing stress. Surface grading removes surface vegetation and topsoil that contains many absorbing roots. Also, injury often occurs to the tree base.

Trenching for utilities can also cause substantial root damage and should be done far away from existing trees. In new developments, this can be done easily. Where the trench must pass under or near a tree, avoid substantial injury by using a power auger to bore a tunnel under the roots. If trenching is unavoidable, place the trench as far from the trunk as possible (minimum 8 feet), cutting as few roots as possible. Cleanly prune cut roots and refill trenches as soon as possible to prevent excessive moisture loss.

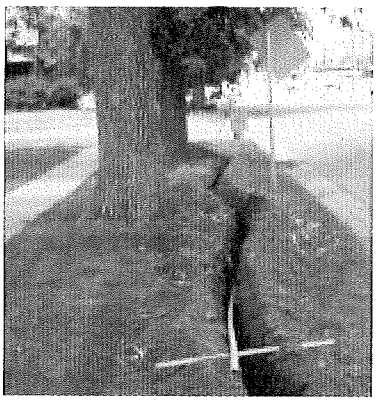

Figure 6: Trenching near trees can severely damage root systems.

Wounds make the tree highly susceptible to root pathogens and decay fungi. Decline and death can result if more than 40 percent of the stem or roots are damaged or killed. Stressed trees are also more susceptible to insects such as bark beetles and borers.

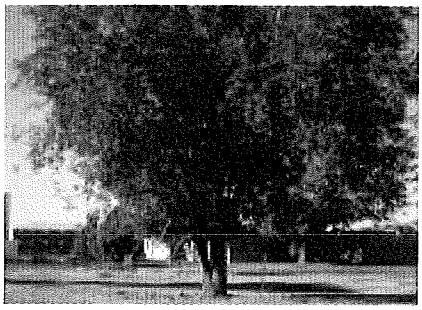

Figure 7: Within two years of adding 12 inches of soil, this tree died.

Soil Fills

When fill is added around a tree base, it acts as a blanket and prevents normal air and moisture circulation to the roots (Figure 7). It subjects roots to improper gas exchange and can lead to carbon dioxide or toxic gas buildup. Minor fills (less than 3 inches) will not harm most trees. The topsoil should be high in organic matter and have good drainage properties — it should not be clay. Major changes in grading require an air supply to the roots. This can be accomplished with a drywell.

A drywell is a system of drain tiles covered with small stones and soil fill. It is designed to allow air to circulate within the upper root area. These systems can be effective but they are expensive to install.

Early symptoms of decline from excessive fill are small leaf size and premature fall coloration. Dieback of twigs and progressive dying of larger stems in the upper crown also occurs. This dieback may not be noticed for several years, depending on tree species and initial tree health.

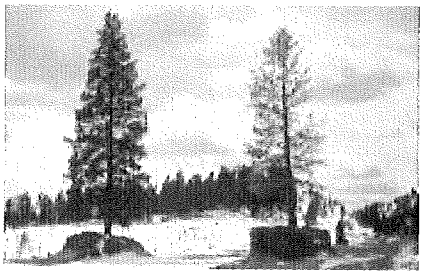

Figure 8: Lowering the grade severs roots and kills trees.

Soil Cuts

Lowering the grade usually is less complicated than fills but can be equally harmful. Where the grade has been changed near a tree, the most common damage is the complete severing of major roots in that area (Figure 8). This can cause decline, death or decreased stability to high winds.

To protect the tree, terrace the grade (Figure 9) or build a retaining wall between the tree and the lower grade. Walls should encompass an area extending at least to the drip line.

References

For more information on protecting trees during construction, call your Colorado State University Cooperative Extension county office, Colorado State Forest Service, city forester, local arborist, or forestry consultant.

The following fact sheets and publications are also available through "The Other Bookstore" (Cooperative Extension Resource Center), 115 General Services Building, Colorado State University, Fort Collins, CO 80523-4061, (970) 491-6198

2.926, Healthy Roots and Healthy Trees
5.530, Shade Tree Borers
5.566, Peach Tree Borer
6.302, Creating Wildfire-Defensible Zones
7.226, Care of Young Transplanted Trees
7.417, How to Plant Trees and Shrubs
7.419, Large Deciduous Trees
HG83, Pruning Shade Trees and Repairing Their Injuries

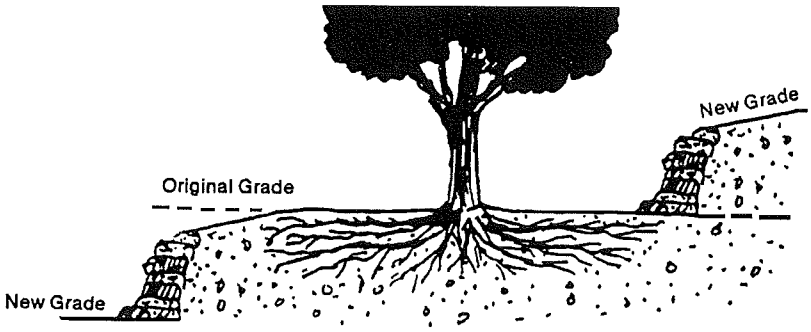

Figure 9: Terracing can substantially limit root injury. Reprinted with permission from *Tree City USA* Bulletin No. 7, National Arbor Day Foundation.

Pruning Injured Trees

Trees with injured roots may show branch dieback quickly or within a few months. Prune dying branches to reduce insect and disease damage to the rest of the tree. Also prune to reduce any hazardous conditions on preserved trees. It is better to wait until the tree dies back to see how much to prune than to arbitrarily remove parts of the crown because you assume the root system was damaged.

Wildfire regulations may require pruning to a height of 10 feet all trees around your home and outbuildings.

Table 1: Adaptability to environmental change.

Degree of Adaptability		
High	**Moderate**	**Low**
American elm	Aspen	Bolleana white poplar
Common hackberry	Black walnut	Black locust
Cottonwood (spp)	Boxelder	Colorado blue spruce
Ginkgo	Bur oak	English oak
Green ash	Linden	Lombardy poplar
Honeylocust	Norway maple	Northern red oak
London planetree	Pine (spp)	Norway spruce
Siberian elm	White oak	
Silver maple		
White ash		
Willow (spp)		

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Thursday Evening Dinner

Please choose one of the following restaurants:

1. Canino's Italian Restaurant good local "Italian" $8-14
2. The Moot House Restaurant and Pub variety of meat, fish, and pasta dishes; with a great salad bar $8-14
3. 3 Margaritas chicken, seafood, & steak "Mexican" dishes, and unique "Margarita" beverages $8-14
4. CB &Potts - Restaurant & Sports Club unique variety of food and beverages $7-14
5. Cooper Smith's Pub & Brewing unique variety of food and beverages $7-14
6. China Dragon large variety of "Chinese" dishes $8-9
7. Young's "Vietnamese" cuisine $9-14
8. Taj Mahal chicken, lamb, seafood, and vegetarian "Indian" dishes $ 12-18

USDA Forest Service, Northern Region

Insects: Native

Douglas-fir beetle, *Dendroctonus pseudotsugae*

Region 1: Idaho, Montana
Host: Douglas-fir

As expected, Douglas-fir beetle caused tree mortality increased dramatically in 1999. These trees were actually attacked by the beetle in 1998, but most crowns didn't fade until 1999. On the three northern Idaho National Forests (Idaho Panhandle, Clearwater, and Nez Perce) and adjacent state, private, and other federal lands, infested acres increased from about 47,000 in 1998 to over 136,000 in 1999. Most of the increase occurred on the Idaho Panhandle National Forests and adjacent lands which went from just over 5,000 acres infested, as detected in 1998 aerial surveys, to over 108,000 acres detected in 1999. Western Montana forests also experienced increases. Over 47,000 acres were infested on the Kootenai, Flathead, Lolo, and Bitterroot National Forests, up from about 8,300 in 1998. Region wide, over 508,000 trees were killed by Douglas-fir beetles on over 187,295 acres. This is the highest level of tree mortality caused by Douglas-fir beetles in the Region since the early 1950's. This outbreak was linked to unusually high amounts of wind-thrown and winter damaged trees available to the beetles in the spring of 1997. Most of this material was not salvaged and provided ideal conditions for a Douglas-fir beetle population build-up. Ground surveys conducted in the fall of 1999 indicate that 1998 (detected by 1999 aerial survey) was probably the peak of the outbreak. Other than a few areas with still building populations, we anticipate an overall declining trend for the next few years.

Douglas-fir tussock moth, *Orgyia pseudotsugata*

Region 1: Idaho, Montana
Host(s): Douglas-fir, spruce, true firs

Trap catches of Douglas-fir tussock moth suggest that populations may have doubled in 1999 in northern Idaho, but are still at relatively low levels across most of Montana. No aerially visible defoliation was detected; however, larvae were found at most sites sampled in northern Idaho. At approximately 95 trapping sites in

northern Idaho, about 12,000 moths were caught in 1999, compared to 6,500 moths in 1998. The Montana trap catch, from 33 sites, totaled 371 moths in 1999; up from 17 in 1998. However, 86% of these moths were found at one site near St. Ignatius, Montana. Some minor defoliation was observed on ornamental trees in residential areas, but none was noted in forest stands. Trap catches, some larval sampling and observations suggest populations should continue to increase, and defoliation is expected in northern Idaho and in a few isolated spots Montana in 2000. This trend may be part of a larger population outbreak pattern/cycle that is occurring in other parts of the northwest.

Fir engraver beetle, *Scolytus ventralis*
Region 1: Idaho, Montana
Hosts: Grand fir, subalpine fir

Fir engraver caused mortality continued to decline in 1999 after reaching a high in 1997. An estimated 10,500 trees were killed on 9,400 acres according to the 1999 aerial survey (1998 beetle activity). Fir engraver caused mortality was most evident in northern Idaho where on the Coeur d'Alene Reporting Area (Coeur d'Alene River Ranger District of the Idaho Panhandle National Forest and adjacent lands) over 5000 red trees were mapped on over 5000 acres. The St. Joe reporting area, just south of the Coeur d'Alene reporting area, had over 2000 red trees on about 2000 acres. The Nez Perce reporting area, just north of the Salmon River in Idaho, had approximately 1,200 red trees mapped on 1,100 acres. All other reporting areas had far fewer acres and trees affected.

Mountain pine beetle, *Dendroctonus ponderosae*
Region 1: Idaho, Montana
Host(s): Lodgepole, ponderosa, and other pines

Mountain pine beetle populations increased significantly in 1999. In 1998, nearly 115,000 acres were infested (up from 72,000 acres infested in 1997), on which an estimated 303,000 trees were killed. In 1999, more than 641,000 trees were killed on approximately 144,000 acres--including all host species, found on lands of all ownerships. More than ninety-five percent of those beetle-killed trees were lodgepole pine. The most expansive, as well as the most intense, outbreak in the Region exists on the Lolo NF in western Montana, where slightly more than 49,000 acres were affected, mostly in lodgepole pine stands. In 1998, an average 10 trees per acre were killed (mapped as faders in 1999). Next most seriously affected stands were on the Nez Perce NF, in northern Idaho, where

27,000 acres were infested to some extent. There, an average of only two trees per acre were killed, but populations appeared to be intensifying. An additional 37,100 acres were infested in North Idaho, most on the Idaho Panhandle NF. Beetle populations continued to increase in older lodgepole pine stands on parts of the Flathead NF, in Montana, as well. There almost 4,000 acres were infested. Overall, populations are quite active in lodgepole pine stands in several areas and are likely to increase on the Lolo and Flathead NFs in Montana, and parts of the Idaho Panhandle and Nez Perce NFs in northern Idaho. Beetle-caused mortality in ponderosa pine stands, Region-wide, is not extreme; but is of concern in some areas on the Bitterroot, Lolo, and Lewis & Clark NFs and Flathead, Rocky Boys, Fort Belknap, and Crow IRs, in Montana.

Pine engraver beetle, *Ips pini*
Region 1: Idaho, Montana, Wyoming
Hosts: Lodgepole pine, ponderosa pine

The most significant pine engraver activity noted in the 1999 aerial survey (1998 attacks) occurred on the Coeur d'Alene and Kaniksu Reporting areas in the Idaho Panhandle. In the Coeur d'Alene reporting area pine engraver was the credited mortality agent for 1,200 ponderosa pines across 750 acres; the regional totals for pine engraver in ponderosa pine was 3,062 dead trees on 1,184 acres. Pine engraver activity in lodgepole pine was also highest, region wide, in the Coeur d'Alene reporting area with 4,575 dead trees mapped across 1,058 acres and the Kaniksu reporting area with 1,005 dead trees mapped across 165 acres. Regional totals for the pine engraver in lodgepole pine were 6,260 dead trees across 1,421 acres. There was no obvious trigger for the increased pine engraver mortality mapped in 1999 in northern Idaho. Above average precipitation during the winter 1998-99 throughout typically dry and often susceptible ponderosa pine stands in western Montana and northern Idaho, should result in a reduction of engraver beetle caused damage detected in the 2000 aerial survey. In Montana pine engraver is credited with the death of 854 ponderosa pines across 144 acres, a slight increase from 1998, and 80 lodgepole pine trees on 70 acres, a decrease from 1998. These mortality levels are considered endemic. Land managers are becoming increasingly aware of the need for proper slash management during late winter and early spring logging in

ponderosa pine stands which should help reduce losses to engraver beetles.

Spruce beetle, *Dendroctonus rufipennis*
Region 1: Idaho, Montana
Host: Engelmann spruce

Spruce beetle populations remained low throughout the Region in 1999, decreasing slightly in infested area in western Montana, but making small advances in north Idaho. In northern Idaho, less than 200 infested acres were recorded. Most occurred as small and scattered groups of beetle-killed Engelmann spruce on the Idaho Panhandle NF (St. Joe and Kaniksu). In western Montana, the infested area decreased from about 2,000 acres in 1998 to just over 800 acres in 1999. Those infested acres were more commonly found on the Gallatin, Flathead and Kootenai NFs, and in Glacier NP; however the Lolo and Lewis & Clark NFs also reported small outbreaks. Slightly more than 1,500 trees were killed throughout the Region. Just over 300 acres were infested on the Flathead NF, but are not associated with the area successfully treated in 1996-97 to reduce beetle populations following the Little Wolf Fire.

Western Pine Beetle, *Dendroctonus brevicomis*
Region 1: Idaho, Montana
Host: Ponderosa Pine

Tree mortality attributed to western pine beetle declined to about 7,400 trees on 7,200 acres Region wide. This is down from nearly 18,000 acres in 1998. More than half (nearly 5,000 acres) was located in northern Idaho on private and Forest Service land in the Idaho Panhandle National Forest reporting area. Elsewhere in the Region mortality was widely scattered in fairly small groups throughout the ponderosa pine type.

Western spruce budworm, *Choristoneura occidentalis*
Region 1: Idaho, Montana

Host(s): Douglas-fir, Engelmann spruce, true firs

Defoliation from western spruce budworm on permanent plots increased in 1999 on the Deerlodge NF in Montana but remained the same on forests in Idaho. No budworm defoliation was

observed from the air anywhere in the Region. Pheromone trap counts were up significantly in some areas in 1999, but remained the same or decreased in others. Trap catches on permanent plots on the Helena NF and Lubrecht Experimental Station increased to 107 moths in 1999, up from 58 moths in 1998. Populations appear to be rebuilding slowly, but remain low. Increased defoliation may be expected in a few scattered areas where trap counts were above 4 or 5 moths per trap in 1999, such as the Deerlodge and Helena NFs. Large population increases are weather-dependent and will likely take several more years A major population increase is not expected in 2000.

Insects: Nonnative

Balsam woolly adelgid, *Adelges piceae*

Region 1: Idaho
Hosts: Grand fir, subalpine fir

Aerial survey data estimated nearly 96,070 acres infested by the balsam woolly adelgid in 1999, a significant increase from the 53,400 acres infested in 1998. Actual infested acres is higher as some infested areas are not yet displaying crown symptoms. Areas with the heaviest infestations occur on the Idaho Panhandle, Clearwater, and Nez Perce NFs and adjacent State, private, and BLM land. Subalpine fir of all ages and size classes are killed. Extensive gouting and bole infestations occur on grand fir, but only regeneration in the grand fir type has suffered mortality. Regeneration mortality of both subalpine and grand fir is high, resulting in forest type conversions in some areas. Surveys to help delimit the distribution and assess damage caused by balsam woolly adelgid were begun in 1998. Additional damage assessment surveys were conducted in 1999 and results of this work should be available in the form of a distribution survey to be published in the Western Journal of Applied Forestry. In a few low elevation sites, where adelgid populations became established in the early 1980s, subalpine firs have virtually been eliminated.

Gypsy moth, *Lymantria dispar*

Region 1: Idaho, Montana, North Dakota, Wyoming
Hosts: Hardwoods

Cooperative detection monitoring for the gypsy moth with APHIS, State Departments of Agriculture, Forestry, and Lands continued in 1999. A network of strategically located pheromone baited traps were placed throughout all states in Region 1. There were no moths trapped in Region 1 or the states of Montana and Idaho in 1999. Moths were trapped in Region 2 portions of Wyoming, North Dakota, and South Dakota. The trapping program will continue as usual in Region 1 next year. In the spring of 1999 the Idaho Department of Lands conducted an eradication project on 30 acres surrounding a trap site which had 5 moths in 1998. No moths were caught in 1999 so the effort is thought to have been successful.

Larch casebearer, *Coleophora laricella*

Region 1: Idaho, Montana

Host(s): Western larch

In 1999, visible defoliation caused by larch casebearer increased significantly in many western larch stands throughout northern Idaho and western Montana. Though a few areas in which defoliation had been recorded in 1998 decreased in intensity; in other areas, defoliation was recorded for the first time. Defoliation heavy enough to be detected during aerial surveys was found in several areas; in others, increasing defoliation was noted through ground observations. In total, more than 14,000 acres showed some level of observable defoliation in 1999. Most noticeably affected areas were on the Kaniksu NF in northern Idaho (5,600 acres) and the Kootenai and Lolo NFs (3,500 acres and 3,400 acres, respectively) in western Montana. Ground collections made during 1997, 1998 and 1999 showed low parasitism rates in casebearer populations, compared to similar surveys conducted during the 1970s, the last time populations were unusually high. Parasitism levels generally less than 15-20% in the past three years compared with rates of 40-65%--rates common in the early 1980s when casebearer populations began to decline. Surveys indicated that some areas will again experience moderate to heavy defoliation in 2000. Monitoring of population levels and parasitism rates will continue.

Diseases: Native

Annosum Root Disease, *Heterobasidion annosum*
Region 1: Idaho, Montana

Host(s): Douglas-fir, grand fir, ponderosa pine, subalpine fir, western hemlock

Annosum root disease is common in ponderosa pine stands in western Montana. Most damage is concentrated in lower elevations where ponderosa pine is the dominant tree species and past harvesting of large trees has been common. Presence of annosum root disease in ponderosa pine stands greatly decreases the potential for managing ponderosa pine. These sites are usually too dry to effectively grow alternative tree species, so preventing the introduction and subsequent increase of annosum root disease is crucial for managing ponderosa pine.

Annosum root disease is widespread at low levels on Douglas-fir and true firs in mixed conifer stands throughout western Montana and north Idaho. It is frequently found in association with other root diseases.

Armillaria root disease, *Armillaria ostoyae*
Region 1: Idaho, Montana
Host(s): Douglas-fir, other conifers

This pathogen is the most broadly distributed of the root pathogens and the most important disease agent, overall. It usually occurs in conjunction with annosum root disease, laminated root rot, or brown cubical root and butt rot. Conifers of all species can be killed by *Armillaria* when they are young, but only Douglas-fir, subalpine fir and grand fir remain highly susceptible throughout their lives. Consequently, the damage is much greater in the latter species where severe disease often renders formerly forested sites to long term shrub fields.

Brown cubical root and butt rot,*Phaeolus schweinitzii*
Region 1: Idaho, Montana
Host(s): Douglas-fir, other conifers

Brown cubical root and butt rot is common on mature Douglas-fir throughout its range. Damage is mainly due to defect and growth loss, rather than mortality, although it is often associated with endemic levels of Douglas-fir bark beetle.

Dwarf mistletoes, *Arceuthobium* spp.

Region 1: Idaho, Montana

Hosts: Douglas-fir; lodgepole, ponderosa, limber, and whitebark pines, western larch

Lodgepole pine dwarf mistletoe infests approximately 2 million acres (28 percent) of the lodgepole pine type in Region 1 and causes about 18 million cubic feet of growth reduction annually. Douglas-fir dwarf mistletoe infests about .6 million acres (13 percent) of Douglas-fir, reducing growth by approximately 13 million cubic feet annually. Western larch dwarf mistletoe occurs on about .8 million acres (38 percent) of western larch stands, and reduces annual growth by over 15 million cubic feet. Dwarf mistletoe is locally heavy in ponderosa pine stands around Coeur d'Alene, Idaho and along the Spokane River drainage in northern Idaho. Limber pine and whitebark pine are heavily infected in localized areas in Montana, with infection being most prevalent east of the Continental Divide.

Elytroderma needle blight, *Elytroderma deformans*

Region 1: Idaho, Montana

Host(s): ponderosa pine, lodgepole pine

Localized areas of heavy infection from Elytroderma needle blight were seen in Montana in 1999. Elytroderma has been heavy in several areas of western Montana for a number of years, but several new heavily infected areas were reported in 1998 and 1999. This apparent increase in Elytroderma indicates that favorable weather conditions for infection must have occurred during the summer of 1997 and 1998.

Laminated root rot, *Phellinus sulfurascens*

Region 1: Idaho, Montana

Host(s): Douglas-fir, grand fir

This disease is most severe on sites that historically may have supported mostly western white pine and western larch. These tree species have been replaced by highly susceptible Douglas-fir, grand fir and subalpine fir with consequent increases in this pathogen. Like *Armillaria*, and usually in conjunction with armillaria and/or annosum root disease, this pathogen often converts formerly forested sites to long term shrub fields.

Diseases: Nonnative

Dutch elm disease, *Ceratocystis ulmi*
Region 1: Idaho, Montana, North Dakota
Hosts: American elm

Dutch elm disease continued to spread in urban areas in North Dakota and Montana. Montana's highest losses are occurring in the cities of Billings and Great Falls. In North Dakota, heavy losses have occurred in both urban areas and in naturally-occurring American elms in riparian zones. In Idaho this disease is common in many communities along the Snake River in southern Idaho, and is slowly working its way into northern Idaho communities. It was discovered in Moscow in 1990, but an aggressive treatment program has limited losses to only a few trees per year for the past several years. It has also been discovered in several communities nearby--Genesee, in Idaho; Palouse and Pullman, in Washington.

White pine blister rust, *Cronartium ribicola*
Region 1: Idaho, Montana
Host(s): limber pine, western white pine, whitebark pine

White pine blister rust causes extensive tree mortality throughout the range of western white pine. Mortality of naturally occurring regeneration has virtually eliminated western white pine from many forests. This has resulted in major changes in historical transitions in forest types over broad areas. In moist habitat types, where white pine was historically the dominant species, it has been replaced by climax species such as grand fir, hemlock, and western redcedar. Efforts to restore white pine are concentrated on planting genetically improved stock. We are currently intensifying monitoring efforts to gain a better understanding of how well the improved stock is holding up in the field. In addition, pruning lower branches from natural regeneration is being conducted on a large scale because it can greatly improve survival in some areas.

Blister rust is also causing extensive mortality in high- elevation five-needle pines. Recent surveys in northern Idaho and western Montana high-elevation forests have found infection rates in whitebark pine regeneration of up to 90%. There is a growing concern that severe losses of large diameter whitebark pine due to insects coupled with regeneration losses due to blister rust may have significant impacts on water and wildlife in these fragile ecosystems.

Declines and Complexes

Limber pine decline

Region 1: Montana

Host: Limber pine

Limber pine mortality is continuing across scattered locations in central and eastern Montana. In some stands on the Lewis and Clark National Forest, nearly 100% mortality has been observed. Data from permanent plots indicate that the mortality is strongly associated with severe defoliation from Dothistroma needle blight (caused by *Dothistroma septospora*). Defoliation from *Dothistroma* was severe at many locations again in 1999, marking the fifth consecutive year of severe damage. Continued mortality is expected. Other factors thought to be contributing to this decline are winter damage, drought, and competition-related stress.

Subalpine fir mortality complex

Region 1: Idaho, Montana

Host: Subalpine fir

Once again in 1999, the area of subalpine fir "decline" increased in the Northern Region. Several agents, notably root diseases and secondary bark beetles, are often found to be involved in the complex of pests causing this decline. Western balsam bark beetle *(Dryocoetes confusus)* appears to be the most commonly observed organism in the "complex". Subalpine fir mortality was recorded on almost 81,000 acres in 1999, compared to 64,500 acres in 1998. This figure does not include the Beaverhead NF, typically one of the more severely affected Forests in the Region, which was not flown in 1999. Had that Forest been flown, the infested area would likely have been close to 100,000 acres. While the number of infested acres increased, in at least some areas intensity of tree killing appeared to decline. Region-wide, just over one tree per acre was killed. Of the infested area recorded, approximately 37,300 acres were in northern Idaho, principally on the Idaho Panhandle and Nez Perce NFs. The remaining 43,400 acres were found rn Montana, located on the Gallatin, Lolo, Lewis & Clark, and Kootenai NFs. Region-wide an estimated 90,200 subalpine firs were killed in 1998 and recorded as faders in 1999.

Seed Orchard Insects and Diseases

Western conifer seed bug, *Leptoglossus occidentalis*
Coneworm, *Dioryctria abietivorella*
Cone beetle, *Conophthorus ponderosae*
Region 1: Idaho, Montana
Host(s): Western White Pine and other conifers

Cone and seed insects can cause considerable damage to the seeds of western conifers, significantly reducing seed crops. Though insects are found feeding on a variety of tree species in wild stands, they are especially of concern in blister rust-resistant western white pine seed orchards. Seed collected in these orchards is used to regenerate areas where white pine, once the dominant tree species, has nearly disappeared due to white pine blister rust. The insects that cause the most damage in western white pine are western conifer seed bug, *Leptoglossus occidentalis*, cone beetle, *Conophthorus ponderosae*, and coneworm, *Dioryctria abietivorella.* One or more of these insects are often so abundant in northern Idaho white pine seed orchards to warrant an insecticidal spray treatment. These insects have also been found destroying whitebark pine seed in high elevation stands. Whitebark pine is an

important tree species for watersheds, wildlife, recreation, and aesthetics. This tree species has significantly declined in recent years due to blister rust, periodic outbreaks of mountain pine beetle, natural forest succession and fire suppression. Its seed is extremely valuable for wildlife and regeneration and may need to be protected from insect predation in the future.

Nursery Insects and Diseases

Fusarium root disease, *Fusarium* spp.

Region 1: Idaho, Montana

Host(s): Conifers

The major disease problems occurring in forest nurseries are caused by *Fusarium* spp. *Fusarium oxysporum* is the major cause of damping-off and root diseases of bareroot seedlings; *F. proliferatum* is the most important *Fusarium* spp. on container-grown conifer seedlings. Most damage occurs on Douglas-fir, western larch, western white pine, and Engelmann spruces, although all conifer species are susceptible.

Pythium root rot, *Pythium* spp. and *Phytophthora* spp.

Region 1: Idaho, Montana

Host(s): Conifers

Pythium spp. and *Phytophthora* spp. occurred at most bareroot nurseries and in some container seedlings. Efforts have been underway for the past several years to develop alternatives to pre-plant soil fumigation with methyl bromide for production of bareroot forest seedlings. Thus far, fallowing fields at least one year prior to sowing a conifer crop and using an alternative soil fumigant (dazomet) has shown promise in some nurseries. However, these alternatives have not been satisfactory in other nurseries and continuing investigations of other alternatives are underway. In particular, supplementing pre-sowing soil treatments with applications of selected biological control agents appears promising. The major goal of this work is to develop alternatives to synthetic chemicals for control of important nursery diseases.

Tip dieback, *Sirrococcus strobilinus, Sphaeropsis sapinea, Phoma eupyrena*

Region 1: Idaho, Montana

Host(s): Conifers

Tip dieback, caused by *Sirrococcus strobilinus*, *Sphaeropsis sapinea*, and *Phoma eupyrena*, occurs at some level on bareroot seedlings at several nurseries. Ponderosa pine and lodgepole pine are the most commonly affected species.

Nebraska Report to Great Plains Tree Pest Council
March 2000
Laurie Stepanek and Mark Harrell

Pest Problems

Wilt diseases

Oak wilt and Dutch elm disease were more of a problem in 1999. Several large bur oaks in Nebraska City are dying from oak wilt.

Pine wilt has been much more common over the past few years and is spreading farther north and west. Many Scotch pines, including some historic trees in Nebraska City, have been lost.

Asian longhorned beetle

Wooden crates in Omaha and Lincoln, originating from China, were found to have tunnels, frass, and exit holes like those from the Asian longhorned beetle. Live adult beetles emerged from crates from the same shipment in a warehouse in Houston, Texas. No live ALBs have been found in Nebraska. Trees surrounding these sites are being examined for evidence of the beetles.

Annosum root rot

With Jeri Lyn Harris we are investigating the death of redcedar near Tryon, NE. Whole trees are dying, and many are uprooted by the wind. Young seedlings are growing beneath dead trees -- typical of annosum root rot on redcedar. The problem was noticed many years ago and has continued to spread in the plantings. The annosum root rot pathogen is usually introduced to a stand through stumps, however in this case, no tree cutting had occurred.

Drought

Central and eastern Nebraska are experiencing serious drought conditions. This past winter was the 18th driest in the 112 years that records have been kept. Many pines are showing significant yellowing and browning.

White pine mortality

Many white pines in eastern Nebraska have died suddenly over the past several years. Trees typically die suddenly in the fall, but some die more slowly over the winter. Browning symptoms usually begin in the lower branches and progress up the tree. No cause has been identified.

Research

Isophrictis

An *Isophrictis* sp. borer that has killed many first-year transplanted redcedar seedlings over the past several years was identified as *Isophrictis similiella* (Chambers). This insect is known to infest wild sunflower. All of the infested tree seedlings were located in areas with high sunflower populations. The larvae apparently seek new shelter when their natural sunflower hosts are destroyed during ground preparation for tree planting. The insects tunnel into tree seedling stems and pupate. A paper on this research is in progress.

Report to the Great Plains Tree Pest Council

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1999 PEST REPORT

In 1999 we received over 650 inquiries relating to insects and diseases of trees and shrubs. Most enquiries were received from rural areas of Saskatchewan, with the most common enquiries regarding woolly elm aphid, ash plant bug, spruce spider mite, yellow-headed spruce sawfly, spruce budworm and bronze birch borer.

1999 RESEARCH STUDIES

Evaluation of Fungicides for Prevention of Melampsora Leaf Rust - Melampsora leaf rust is a serious leaf disease of hybrid poplar grown as stooling beds on the Shelterbelt Centre. During years of high precipitation, almost complete defoliation can occur resulting in reduced growth of poplar stools. Of the hybrid poplars produced at the Shelterbelt Centre, Manitou poplar is the most susceptible to Melampsora leaf rust.

In 1999, Benlate 50WP, Kumulus DF, Funginex 190EC, Dithane DG and a water check were evaluated for the prevention of Melampsora leaf rust on Assiniboine and Manitou poplar stooling beds located on the Shelterbelt Centre. Treatments were applied on July 21, August 4 and August 24 with a vertical boom system at a rate of 10 L of solution per 100 m^2 of plant surface area. Assessment of the trial was conducted on September 20, using a rating system designed by Ernst Schriener of the Northeastern Forest Experiment Station (Rating Poplars for Melampsora Leaf Rust Infection, Forest Research Notes, No.90, 1959). The rating of Melampsora leaf rust on both Assiniboine and Manitou poplar stooling beds was significantly reduced with all fungicides evaluated compared to the water check.

During the winter, the largest poplar stool in each treatment plot was removed and evaluated to determine if the fungicide treatments had increased the growth of the poplar stools. There was no significant increase in growth between fungicide treatments and the water check.

Choke Cherry Pest Control Studies - The third year of a three year Canada / Saskatchewan Agri-Food Innovation Fund project was completed at the PFRA Shelterbelt Centre to develop control recommendations for insect pests of choke cherry, *Prunus virginiana melanocarpa* var. (A. Nels.) Sarg.. Trials were conducted to evaluate products for control of choke cherry midge, *Contarinia virginianae* Felt, fruittree leafroller, *Archips argyrospila* (Walker), fall webworm, *Hyphantria cunea* (Drury), and ugly nest caterpillar *Archips cerasivorana* (Fitch). Based on these trials, user requested minor use label expansion (URMULE) registration requests or amendments will be made.

Ugly Nest Caterpillar
The ugly nest caterpillar is a common tent-forming defoliator of choke cherry on the Prairies. Although it does not feed directly on the fruit of choke cherry, infestations may cause reduced plant vigour. The large tents consisting of tied foliage, cast skins and feces also cause an unsightly mass.

In 1999, three rates of Dipel 2XDF and a water check were evaluated for control of ugly nest caterpillar near Indian Head, Saskatchewan. Treatments were applied on June 18 with a hand gun attached to a portable high pressure sprayer at 480 kPa at a rate of 22 L of solution per 100 m^2 of plant surface area. At the time of application the plants were fully leafed, flowering was complete and fruit development had been initiated. Assessment of ugly nest caterpillar populations were conducted on June 30, 12 days after treatment. Ugly nest caterpillar populations were reduced by 88, 80 and 92% for the low, medium and high rate of Dipel 2XDF in comparison to the water check, respectively.

Fruittree Leafroller

The fruit tree leafroller is a common defoliator of choke cherry on the Prairies. Although the fruittree leafroller does not feed directly on the fruit of choke cherry, infestations may cause severe defoliation and reduced plant vigour. Plants infested by fruitree leafroller appear unsightly, as the insect is a wasteful feeder, resulting in large amounts of foliage remnants entangled in silk webbing.

In 1999, Decis 5EC, Sevin XLR, Matador 120EC and a water check were evaluated for control of the fruittree leafroller on a choke cherry shelterbelt near Cabri, Saskatchewan. Treatments were applied on June 7 with a hand gun attached to a portable high pressure sprayer at 480 kPa at a rate of 22 L of solution per 100 m^2 of plant surface area. At the time of application the plants were fully leafed, flowering was complete and fruit development had been initiated. Assessment of the trial was conducted on June 10, three days after treatment. Fruittree leafroller populations were reduced by 93, 89 and 87% for the Decis, Sevin and Matador treatments in comparison to the water check, respectively.

Choke Cherry Midge

Choke cherry fruit infested by choke cherry midge appears as enlarged, pear-shaped galls. Damage by the midge results in unuseable fruit and non-viable seed.

In 1999, Decis 5EC, Orthene T & O, Spinosad 480SC and a water check were evaluated for control of choke cherry midge at two sites, near Indian Head and Glenavon, Saskatchewan. Treatments were applied on May 25 at Indian Head and May 26 at Glenavon, with a hand gun attached to a portable high pressure sprayer at 480 kPa at a rate of 22 L of solution per 100 m^2 of plant surface area. At the time of application the plants were fully leafed and less than 1% flowering initiated. Assessment of choke cherry midge populations were conducted on June 17 at the Indian Head and on June 28 at the Glenavon. There was no significant reduction in choke cherry midge populations when the three insecticide treatments and the water check were compared at the Indian Head. At Glenavon, Decis reduced choke cherry midge populations by 90% in comparison to the water check. There was no significant reduction in choke cherry midge populations when Orthene and Spinosad were compared to the water check at the Glenavon site.

Fall Webworm

The fall webworm is a late season tent-forming defoliator of choke cherry on the Prairies. Although it does not feed directly on the fruit of choke cherry, infestations may cause reduced plant vigour. The large tents consisting of tied foliage, cast skins and feces also cause an unsightly mass.

In 1999, three rates of Dipel 2XDF and a water check were evaluated for control of fall webworm near Indian Head, Saskatchewan. Treatments were applied on July 28 with a hand gun attached to a portable high pressure sprayer at 480 kPa at a rate of 22 L of solution per 100 m^2 of plant surface area. At the time of application the fruit was green and well developed. Assessment of fall webworm populations were conducted on August 9, 12 days after treatment. All three rates of Dipel 2XDF reduced fall webworm populations by 99% in comparison to the water check.

1999 NEBRASKA REPORT
TO THE GREAT PLAINS TREE PEST COUNCIL
BY

STEPHEN V. JOHNSON, STATE ENTOMOLOGIST
VICKI B. WOHLERS, NURSERY PROGRAMS

Summary

Nursery Stock Inspections & Certifications:

Acres of nursery stock inspected	1,903
Nursery stock grower licenses issued	309
Dealer locations inspected	352
Nursery dealer licenses issued	531
Nursery broker licenses issued	2

Phytosanitary Export Inspections & Certifications:

Federal phytosanitary certificates issued	2,427
State phytosanitary certificates issued	88
Acres of seed corn fields inspected	29,965
Number of seed corn fields inspected	450
Acres of popcorn seed fields inspected	106
Number of popcorn seed fields inspected	5
Acres of wheat seed fields inspected	15
Number of wheat seed fields inspected	1
Acres of soybean seed fields inspected	49
Number of soybean seed fields inspected	4
Acres of sorghum seed fields inspected	5
Number of sorghum seed fields inspected	3
Acres of pearl millet seed fields inspected	4
Number of pearl millet seed fields inspected	1

European Corn Borer Quarantine & Certifications:

Firms under compliance agreements	213
Shipments made	3,875

Surveys - Gypsy Moth (GM); Japanese Beetle (JB); Pine Shoot Beetle (PSB); Karnal Bunt (KB); Cereal Leaf Beetle (CLB); and Stewart's Wilt (SW):

GM - Traps used	1,078
Male moths captured	9
Total number of positive traps	6
Number of multiple trap catches of the total	2
Number of counties where positive traps occurred	3
JB - Traps used	67

Beetles captured 659

PSB -Number of pheromone traps set 10
Number of counties trapped 9
Number of growers of nursery stock surveyed 179
Number of counties of growers surveyed 54
Number of retail Christmas tree lots surveyed 132
Number of counties of Christmas tree lots surveyed 20
Number of positive counties 0

KB - Number of samples collected 40
Number of counties surveyed 29
Number of positive counties 0

CLB -Number of fields surveyed 40
Number of counties surveyed 10
Number of positive counties 0

SW - Number of fields surveyed 451
Number of counties surveyed 27
Number of positive fields 47
Number of positive counties 13

Apiary Statistics:

Number of apiaries registered 2,193
Number of colonies registered 42,345
Entry permits issued 18
Colonies entering Nebraska 23,150
Colonies certified to leave Nebraska 15,142
Number of registered beekeepers 273
Number of apiaries inspected 215
Number of colonies with American foulbrood 40
Number of colonies with European foulbrood 4
Number of colonies with chalkbrood 82

NARRATIVE

NURSERY INSPECTION & CERTIFICATION

Nursery Grower Inspections

The Nebraska Department of Agriculture (NDA) licensed 309 nursery growers in 1999, totalling 1,903 acres of nursery stock. Deer damage and Canada thistle still seem to be on the increase in our nursery growers. Zimmerman pine moth also seems to be extending its range. Origin labeling for nursery stock in grower and dealer situations is addressed in the Plant Protection and Plant Pest Act and managers are being educated as to our requirements (correct common or botanical name and the place of origin). Nursery inspectors also started keeping track of the aquatic plants that are being distributed by Nebraska growers and dealers.

A grand total of 9,929 plants were restricted (withdrawn from distribtion) during nursery grower inspections during 1999.

Nursery Dealer Inspections

The NDA licensed 531 nursery dealers and two nursery brokers in 1999. This is an increase of 4 nursery dealers and brokers from 1998.

During the spring (May and June) and fall (September) of 1999, 352 dealer inspections were conducted as compared to 433 dealer inspections conducted in 1998. These inspections resulted in 188 Withdrawal-From-Distribution orders (as compared to 219 Withdrawal-From-Distribution orders in 1998). More than 8,133 plants were withdrawn from distribution due to disease problems, insect problems, being nonviable, or having environmental, mechanical, or noxious weed problems (as compared to 10,140 plants in 1998).

Disease problems included rose mosaic virus, rose rosette virus, downy mildew, crown gall, cankers, western pine gall rust, verticillium wilt, and foliar nematodes to name a few.

Insect problems included winged euonymus scale (from Michigan, Tennessee, and Wisconsin), fletcher scale (from Connecticut, Illinois, Ohio, Oregon, and Michigan), black vine weevil (from Connecticut, Michigan, Ohio, and Oregon) , Zimmerman pine moth (from Wisconsin), borers, various scales, and a spruce weevil (*Barypeithes pelluoidus*) to name a few.

Because Nebraska is a protected state concerning Quarantine 38 (Black Stem Rust/Barberry Quarantine), NDA inspectors kept track of the barberry varieties each dealer location was carrying. No rust-susceptible barberry varieties were found.

EUROPEAN CORN BORER QUARANTINE COMPLIANCE PROGRAM

Currently, 213 firms are under compliance agreements with this department. European corn borer certificates issued during 1999 numbered 3,875.

EXPORT CERTIFICATION

Field Inspections

The Nebraska Crop Improvement Association (NCIA) cooperated with the NDA to conduct field inspections for firms exporting seeds. NDA inspectors were responsible for inspecting nursery fields, while crop improvement inspectors inspected the remaining production fields.

The following are statistics concerning 1999 field inspections for firms exporting seeds:

NUMBER OF FIELDS	CROP	TOTAL ACRES
450	Corn	29965
1	Pearl Millet	4
5	Popcorn	106
3	Sorghum	5
4	Soybeans	49
1	Wheat	15
Totals 464		30144

Export Certification

Phytosanitary certificates are issued to firms exporting plants and plant products. A total of 2,515 phytosanitary certificates (2,427 federal and 88 state) were issued during 1999. This is an increase of 229 certificates as compared to 1998.

Top Commodities Certified (Ranked By Quantity)

Commodity	Amount (metric tons)
Corn	901,470
Soybeans	628,365
Soybean Meal	65,068
Hard Red Winter Wheat	52,435
Sorghum	28,246
Wheat	25,208
Popcorn	22,092
Great Northern Beans	14,247
Corn Seed	4,967
Corn Flaking Grits	4,546

GENETICALLY ENGINEERED ORGANISM RELEASE

AgrEvo, Cargill, DuPont, Golden Harvest, Monsanto, Novartis, Ohio State University, Pioneer, Prodigene, Rhone-Poulenc, University of Nebraska, and Zeneca received biotechnology permits for testing genetically engineered organisms. There were 97 notifications, 3 release permits, and 13 interstate movement permits acknowledged for Nebraska by USDA, APHIS, PPQ. The field tests involved genetically engineered corn, cotton, potatoes, rapeseed, sunflower, and soybeans.

SURVEY AND DETECTION

Gypsy Moth Survey

A total of 1,078 gypsy moth traps (789 detection and 289 delimiting traps) were set in 90 Nebraska counties in 1999. Intense pheromone delimiting trapping programs were conducted in the cities of Omaha (Douglas County), Lincoln (Lancaster County), Minden (Kearney County), Scottsbluff (Scottsbluff County), Kearney Rest Area (Buffalo County), and York Rest Area (York County) this year.

Two of the original 13 special trapping blocks established in the Omaha area in 1994 were also delimited in 1999. These blocks were established because of gypsy moth infested spruce trees received from Vern Johnson and Sons, LeRoy, Michigan; and Zelenka Nursery, Grand Haven, Michigan, planted in 1994 and 1995. Two new delimiting blocks were established in Omaha in 1999 due to positive trap catches in 1998. The rest of the Omaha metro area was trapped at the rate of one trap per square mile.

Live 3rd to 4th instar gypsy moth larva were collected at an Omaha nursery on June 16, 1999 during a regular dealer inspection. The nursery treated all nursery stock with Sevin XLR on June 20, 1999. Gypsy moth egg masses, larval skins, and pupal skins were discovered at this same nursery on June 21 on Colorado blue spruce and green spruce shipped from Strathmeyer Forests, Dover, Pennsylvania. Many of the spruce had been planted out at various sites in Douglas County. Strathmeyer Forests had also shipped nursery stock to four other nurseries in Nebraska. Upon inspection, gypsy moth egg masses, pupal skins, and female moths were found associated with Colorado blue spruce at two of the other four nurseries. Many of the trees had been planted out at various planting sites also.

In a separate incident, gypsy moth infested Black Hills spruce were shipped into Nebraska from Badger Evergreen Nursery, Allegan, Michigan. These trees were distributed through the Earl May stores. Viable gypsy moth egg masses and spent pupal cases were found at two Earl May sites in Nebraska.

We have trapped a total of nine gypsy moths in six gypsy moth traps (one delimiting trap and five detection traps with one detection trap being a two-moth trap catch and one detection trap being a three-moth tap catch). The counties involved are Douglas, Howard, and Sarpy. This is an increase of two gypsy moths trapped from 1998 (Seven gypsy moths in six traps trapped in 1998).

Japanese Beetle Survey

A total of 67 Japanese beetle traps were placed in 16 counties in Nebraska during 1999, with emphasis on rest stops and nurseries. Five of these traps were placed at an infested rest stop on Interstate 80 and Highway 77 north (near Lincoln). Past trapping history of this rest stop (including 1999) is as follows:

Interstate 80 and Highway 77 Rest Stop:

1999	0 Japanese beeltes		
1998	0 Japanese beetles	1991	42 Japanese beetles
1997	2 Japanese beetles	1990	131 Japanese beetles
1996	13 Japanese beetles	1989	551 Japanese beetles
1995	133 Japanese beetles	1988	366 Japanese beetles
1994	51 Japanese beetles	1987	318 Japanese beetles
1993	32 Japanese beetles	1986	112 Japanese beetles
1992	28 Japanese beetles		

A portion of the rest stop which is in turfgrass and under irrigation has been treated with Merit (Miles, Inc.) and Dylox insecticides for the past four years. This site has now been declared eradicated.

Other positive Japanese beetle finds include:

COUNTY	LOCATION	NUMBER OF BEETLES
Douglas	2 Dealers 4 Growers	46 571
Lancaster	3 Dealers 2 Growers	24 13
Lincoln	1 Grower	1
Sarpy	1 Dealer	3
Seward	1 Rest Area	1
GRAND TOTAL		659

There was an increase of Japanese beetles trapped in 1999: 659 total beetles trapped in 1999, as compared to 131 total beetles trapped in 1998.

Zimmerman Pine Moth

Zimmerman pine moth species known to occur in Nebraska are *Dioryctria tumicolella, D. zimmermani* and *D. ponderosae*. A total of 56 nurseries are under a strict control program for Zimmerman pine moth. We are requiring an April and August insecticide treatment combined with roguing out trees with active infestations. During 1999, active Zimmerman pine moth infestations were found in only 29 of the 56 nurseries.

Approximately 671 trees were withdrawn from distribution due to Zimmerman pine moth in 1999. Tree species affected include Austrian pine, scotch pine, ponderosa pine, mugho pine, white pine, and Colorado blue spruce.

Other Surveys/Caps Surveys

Surveys conducted by the Nebraska Department of Agriculture this year included:

1. Karnal bunt survey - A total of 40 wheat samples were collected in 1999 from grain elevators in 29 counties. Samples were processed and identified by the Karnal Bunt Laboratory at the Kansas Department of Agriculture. Results were all negative.

2. Cereal leaf beetle survey - 40 oat and wheat fields were swept in May in 10 counties. Cereal leaf beetle larvae had been found in one field in Richardson County in 1997. This same location was negative in 1998 and 1999.

3. Stewart's wilt survey - A total of 451 fields (30,059 acres) in 27 counties were surveyed for Stewart's wilt. Stewart's wilt was positive in 47 fields in 13 counties.

4. Pine shoot beetle - Pine shoot beetle pheromone traps were set at 10 sites in 9 counties. All traps were negative. Visual surveys were conducted at 179 nursery growers in 54 counties during regular growing season inspections. All surveys were negative. A total of 132 Christmas tree lots in 20 counties were surveyed for pine shoot beetle on imported Christmas trees in November and December.

Rangeland Grasshopper

Neither NDA nor USDA, APHIS, PPQ conducted any grasshopper surveys in 1999. There are no plans for rangeland grasshopper surveys in the immediate future.

Top Ten Insects and Diseases in Nursery Growers for 1999

Insects

1. Borers (bronze birch, cottonwood, flatheaded appletree, iris, ash/lilac, honeylocust, peachtree, and uspecified)
2. Zimmerman pine moth
3. Scale (pine needle, euonymus, oystershell, unspecified, and on imported stock: scurfy, winged euonymus, and fletcher)
4. Aphids (birch, woolly hawthorn, woolly apple, coneflower/goldenglow, ash leaf curl, and unspecified)
5. Ash plant bug
6. Spider mites
7. Yellowneck caterpillar
8. Galls (poplar petiole, hairy oak, jewel oak, oak blister, oak bullet, oak midrib, woolly leaf/oak flake, woolly oak, hackberry nipple, honeylocust podgall midge, hackberry blister gall maker, and unspecified)
9. Leafhoppers
10. Mimosa webworm

Diseases

1. Quince rust
2. Micoplasm-like organisms (MLO)
3. Brown spot
4. Cankers (various species)
5. Dothistroma needle blight

6. Apple scab
7. Powdery mildew
8. Hawthorn rust
9. Anthracnose
10. Frog-eye leaf spot

Noxious Weed Problems Found

1. Musk thistle
2. Canada thistle
3. Bindweed

Other Miscellaneous Problems

1. Trunk damage
2. Nonviable
3. Deer damage
4. Trunk damage/borers
5. Dead tops/crowns
6. Herbicide damage
7. Environmental damage
8. Iron chlorosis
9. Sunscald or sunscald/borers
10. Oak leaf tatters

PROGRAM CHANGES

We once again utilized temporary summer employees to cover nursery dealer and grower inspections as well as helping with some of the survey progams such as Japanese beetle, gypsy moth, and pine shoot beetle. Jim Huser and Jennifer Geranis returned again this year and covered the Omaha area. Mary Schroer was newly hired in 1999 and covered the Lincoln area. Cellular phones were utilized so they could stay in touch with Vicki Wohlers and Steve Johnson.

We began utilizing a new locking id label (numbered) to mark restricted nursery stock at one of our nursery grower sites because of the movement of restricted stock. The locking labels will be used in conjunction with flagging tape (which can easily be removed from the trees). We will also continue to use orange spray paint to mark nursery stock which needs to be removed from the field.

We also developed a new "Rejection Notice" form (we also still utilize our "Withdrawal-From-Distribution Order" form) to use when we are rejecting nursery stock. Some of the "action to be taken" items include: return to shipper, authorize treatment, obtain permit/certificate, destroy, and other. This is a multiple-copy form so we can get copies to the receiving nursery, the shipper, the grower, the state plant regulatory official, and the broker.

The Nebraska Noxious Weed Advisory Board has recommended to our department that all species of purple loosestrife be put on the Nebraska noxious weed list. A departmental hearing was held in December with many people testifying both for and against this proposal. As of this writing, the Director of our department has forwarded his recommendation to the governor to put purple loosestrife on the Nebraska noxious weed list.

Our new Staff Assistant in the Entomology Program is Cheryl Elledge. She replaces Susie Harm who took a position with our Budget and Finance Division. Cheryl's main responsibilities will be in our export certification program.

There still remains the vital need to lobby for a permanent full time nursery inspector for the Omaha area.

INTERSTATE INSPECTION HIGHLIGHTS

The Nebraska Department of Agriculture hosted the 1999 interstate nursery inspection June 21-24. Inspections were conducted at two nursery growers in Nebraska (Mulhalls Nursery, Omaha and Bluebird Nursery, Clarkson) and one nursery grower in Iowa (Brewer's Crescent Nursery, Crescent, Iowa). A total of 13 nursery inspectors from five states (Iowa, Kansas, Minnesota, Missouri, and Nebraska) participated. This proved, once again, to be an excellent means of continuing education for field inspectors as well as improved communication between inspectors and uniform inspections of nursery stock.

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Great Plains Tree Pest Council, Ft. Collins, Colorado, March 23rd & 24th, 2000

Douglas-fir beetle: State lands, primarily Fremont county, saw an increase in Douglas-fir beetle (Dendroctonus pseudotsugae) from 1998 to 1999. There are roughly 5000 acres of state land (mostly on steep slopes) that are considered susceptible to Douglas-fir beetle. Douglas-fir beetle killed 1,680 trees on 2,383 acres along the North Fork of the Shoshone River in the Shoshone National Forest. This increased to 14,449 trees on 5,791 acres in 1999. Spots (50 trees or more) were observed along side drainages of the North Fork of the Shoshone River. Douglas-fir beetle continues to remain at endemic levels in the Bighorn National Forest.

Mountain pine beetle: There were relatively high levels of mountain pine beetle (Dendroctonus ponderosae) on ponderosa pine and lodgepole pine on the eastern slopes of the Bighorn Mountains in the Bighorn National Forest. In 1998, there were 1,793 trees killed by mountain pine beetle and this increased to 2,241 trees over 1,281 acres in 1999. Limber pine was impacted by mountain pine beetle and white pine blister rust (Cronartium ribicola) - 1,187 trees were killed on 377 acres. There were low levels of tree mortality in lodgepole pine in the Shoshone National Forest - roughly 634 whitebark or limber pines were reported killed by mountain pine beetle. Mountain pine and Ips beetles killed 1,294 trees on 1,333 acres in the Black Hills National Forest in Wyoming. An additional 44 trees were killed on 59 acres on Wyoming state and private lands adjacent the Black Hills National Forest.

Spruce beetle: Many side drainages of the North and South Forks of the Shoshone River showed spruce beetle activity - 15,011 trees were killed on 5,523 acres. Many recent avalanches were observed in these areas and spruce beetle population buildups are expected. There is an estimated 200,000 acres of mature spruce blowdown throughout the Medicine Bow National Forest - spruce beetle populations are expected to grow in these areas as well.
Spruce beetle has generated concern in Saratoga, a community of 2000 people lying on the banks of the North Platte River in southern Carbon County. The Louisiana-Pacific mill, located in Saratoga, has brought in beetle-infested Engelmann spruce logs from the Routt Divide Blowdown area. Wyoming State Forestry found live beetles in several logs in February in LP's log yard and conducted two public meetings in Saratoga. Lindgren funnel trapping may be set near the log yard in mid-May prior to beetle flight.

Subalpine fir decline: Roughly 2,951 subalpine fir located on 1,685 acres within the Bighorn National Forest are affected by subalpine fir decline. Armillaria root disease combined with the western balsam bark beetle (Dryocoetes confusus) are thought to be the primary contributors to this decline. Subalpine fir decline killed 4,602 trees on 2,805 acres in the Shoshone National Forest. Subalpine fir decline increased by 600 acres from 1998 to 1999 on state lands in southwest Wyoming.

European gypsy moth: Wyoming State Forestry placed 266 gypsy moth traps in 1999 throughout eight counties including 104 delimiting traps placed within F.E. Warren Air Force Base. Four adult male gypsy moths were captured in Washakie county. From 1996 to 1998, multiple catches were made at Warren AFB - there were no catches in 1999. Other participating agencies in Wyoming captured two moths: one in Lincoln county by APHIS and one moth in Park county by the Wyoming Department of Agriculture. Wyoming State Forestry's gypsy moth trapping plan for 2000 includes 226 detection traps throughout eight counties and an additional 36 delimiting traps centered around 1999's positive catches in Washakie county.

Armillaria root disease: Although no acreages are available, Armillaria is building up in state sections in northeast Wyoming (Crook and Weston counties).

Dwarf mistletoe: Lodgepole pine dwarf mistletoe is common in the Shoshone National Forest with the majority located at the southern end of the Wind River and Washakie Ranger Districts. This continues to be a problem on state lands in the Green Mountains of Fremont County. There are roughly 5000 acres of lodgepole pine infested with dwarf mistletoe in the Green Mountains.

White pine blister rust: Both limber and whitebark pines are being severely impacted by white pine blister rust or an unidentified needlecast disease (probably a combination of Dothistroma septospora and Lophodermella arcuata). These diseases damaged more than 14,000 acres (6,260 acres are white pine blister rust) of white pine. White pine blister rust impacted 428 acres in the Bighorn National Forest.

Wind (blowdown): There are isolated patches of downed Engelmann spruce in the Snowy Range of the Medicine Bow National Forest. These areas are suspected to be the result of severe winds and will undoubtedly be rated for spruce beetle potential during the 2000 field season.

Urban forests: Elm leaf beetle (Xanthogaleruca luteola) and oystershell scale (Lepidosaphes ulmi) continue to cause damage in Cheyenne and Casper. Bronze birch borer (Agrilus anxius) killed over 100 (city and private) birch trees in Cheyenne. Five American elms died due to Dutch elm disease (Ceratocystis ulmi) in 1999 in Cheyenne. Douglas-fir tussock moth (Orgyia pseudotsugata) is common in Cheyenne on blue spruce. The Riverton/Lander area has a high incidence of Cytospora canker on hybrid poplars. Ash borer (Podosesia syringae) is a common problem in northeast Wyoming (particularly Gillette) and is increasing in southeast Wyoming. Cottonwood leaf beetle (Chrysomela scripta) is increasing in native cottonwoods in Carbon and Uinta counties.

List of established non-native insects and diseases in Wyoming

Dutch elm disease
White pine blister rust
Elm leaf beetle
European elm bark beetle - Scolytus multistriatus
European elm scale - Gossyparia spuria
European elm sawfly - Neodiprion sertifer
Honeylocust pod gall midge - Dasineura gleditchiae