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

REPORT TO THE GREAT PLAINS TREE PEST COUNCIL
SIOUX FALLS, SD OCTOBER 26-28, 1999

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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.

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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. Several National Forest recreation sites, Fort Carson, the Air Force Academy at Colorado Springs, and the Warren Air Force Base, Cheyenne, were sampled for gypsy moth during the summer of 1998.

No gypsy moths were captured in 1998 in Colorado in Forest Service campgrounds; however, 1 moth was captured at Moraine Park Campground within Rocky Mountain National Park. In addition, delimitation trapping will be conducted for the third consecutive year on F. E. Warren Air Force Base in Cheyenne, Wyoming. The 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 in Colorado including the Colorado State Forest Service, and USDA APHIS, in Colorado and PPQ Office, Wyoming; therefore, sites selected for 1999 may differ from 1998.

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 1998. In addition, no moths were trapped in low-dose pheromone traps in 1998.

Douglas-fir beetle, **Dendroctonus pseudotsugae**

In scattered portions of the Douglas-fir tussock moth infestation mentioned above, it is clear that Douglas-fir beetle, Dendroctonus pseudotsugae, activity is increasing. Some mortality of trees can probably be attributed to the combined effects of defoliation and bark beetles. Several stands adjacent to areas impacted by Douglas-fir tussock moth were found to contain many green, beetle-infested trees in the fall of 1998. It is expected that there will be an epidemic of Douglas-fir beetle in this area that will likely subside in a few years after the defoliated trees fully recover.

In the area burned by the Buffalo Creek fire of May, 1996, many trees are currently infested by Douglas-fir beetle. Infested trees were mostly or entirely burned; very few scorched or green trees contain beetles. It is expected that scorched and green Douglas-fir in the area will be attacked in 1999 when the beetles emerge from damaged trees.

DISEASES

White pine blister rust, **Cronartium ribicola**

This disease was found for the first time in northern Colorado on limber pine. The rust was causing branch and main stem cankers on scattered trees in several locations north of Redfeather Lakes. 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 this year.

Chemical damage

With increasing population growth and development in Colorado, road maintenance is necessary for public safety. Increased number of inquiries are received concerning damage along roadsides due to the application of deicing salts and dust abatement chemicals and mechanical damage by snow plows.

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 27 million acres were surveyed in 1998 in Colorado, Nebraska, South Dakota and Wyoming. Some of the more common pests detected include bark beetles, defoliators, root disease centers, 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.

As a result of a large-scale wind event in western Colorado in October 1997, areas of blowdown were sketchmapped and photographed. More than 19,000 acres of spruce-fir type was blown down on the Routt National Forest, northeast of Steamboat Springs. It is anticipated that spruce beetles will infest these areas in the next few years and monitoring of the situation continues.

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.

LISTING OF SERVICE TRIP REPORTS BY THE LAKEWOOD SERVICE CENTER:

LSC-98-01 3410 Aerial Survey of the Pike National Forest

LSC-98-02 3420 Evaluation of Dwarf Mistletoe Projects (Pike/San Isabel NF)

LSC-98-03 3420 Evaluation of Mountain Pine Beetle Activity at the Urban/ Wildland Interface of Steamboat Springs

LSC-98-04 3410 Aerial Survey of the Medicine Bow/Routt National Forests

LSC-98-05 3410 Aerial Survey of the State of Wyoming

LSC-98-06 3410 Aerial Survey of the Roosevelt NF

LSC-98-07 3410 Aerial Survey of the Arapaho National Forest

LSC-98-08 3410 Aerial Survey of the State of Colorado

LSC-98-09 3410 1997 Gypsy Moth Survey

LSC-98-10 3420 Service Trip to Air Force Academy (re: suppression projects)

LSC-98-11 3410 Service Trip Report, Mount Alto Picnic Ground

LSC-98-12 3420 Service Trip Report, Sevenmile Project Area

LSC-98-13 3420 Service Trip Report, Brush Creek/Hayden RD

LSC-98-14 3420 Service Trip Report, South Park/South Platte RDs

RECENT PUBLICATIONS (as of June 1999)

Allen, K.K. and J.L. Harris. 1997. Evaluation of forest overstory and regeneration conditions at the Bessey and McKelvie units of the Nebraska National Forest. USDA For. Serv., Renewable Resources, Rocky Mountain Region Biol. Eval. R2-98-1. 12 p.

Allen, K.K. 1998. Evaluation of mountain pine beetle activity in the Kine Analysis Area of the Black Hills National Forest. USDA For. Serv., Renewable Resources, Rocky Mountain Region Biol. Eval. R2-98-05. 11 p.

Eager, T.J. and P.A. Angwin. 1997. Forest Health Assessment- Piney Analysis Area, Holy Cross Ranger District, White River National Forest, p. 116-120. IN: R. Teck, M. Moeur, J. Adams (comps). Proceedings: Forest Vegetation Simulator Conf., Ft. Collins, CO., February 3-7, 1997. USDA For. Serv., Intermountain Res. Sta. Gen. Tech. Rep. INT-GTR-373. 222 p.

Harris, J.L., K.K. Allen, and T. Juntti. 1997. Ramshorn Analysis Area, Wind River Ranger District, Shoshone National Forest, Insect and Disease Survey. USDA For. Serv., Renewable Resources, Rocky Mountain Region Biol. Eval. R2-98-04. 31 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.

Jacobi, W.R., E.F. Kelly, C.A. Troendle, P.A. Angwin, and C.A. Wettstein. 1998. Environmental conditions and aspen regeneration failure. USDA For. Serv., Renewable Resources, Rocky Mountain Region Tech. Rep. R2-60. 25 p.

Johnson, D.W. 1998. Evaluation of Hidden Lakes dwarf mistletoe pruning study, Routt National Forest, Colorado. USDA For. Serv., Renewable Resources, Rocky Mountain Region Tech. Rep. R2-61. 8 p.

Johnson, D.W. 1998. Evaluation of vegetation health in Big Creek Lakes Campground, Parks Ranger District, Routt National Forest, Colorado. USDA For. Serv., Renewable Resources, Rocky Mountain Region Biol. Eval. R2-98-03. 23 p.

Johnson, D.W. 1998. 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- . (Draft).

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., W.C. Schaupp, Jr., M. Hood and E. Smith. 1997. Cold Springs Analysis Area, Douglas Ranger District, Medicine Bow National Forest - Forest Health Assessment. USDA For. Serv., Renewable Resources, Rocky Mountain Region Biol. Eval. R2-98-02. 51 p. plus appendices.

Johnson, E., S.J. Johnson and D.W. Johnson. 1997. Interpretation of aerial photography of Colorado's forest health monitoring plots 1992-1995. USDA For. Serv., Renewable Resources, Rocky Mountain Region Tech. Rep. R2-59. 11 p. plus appendix.

Johnson, S.J. (Editor). 1997. Forest Insect and Disease Conditions in the Rocky Mountain Region 1996. USDA For. Serv., Renewable Resources, Rocky Mountain Region. 45 p.

Mask, R.A. and T.J. Eager. 1997. Mountain pine beetle assessment for the Vail Valley area of Colorado. USDA For. Serv., Renewable Resources, Rocky Mountain Region Biol. Eval. R2-97-04. 27 p.

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. R2-98-04. 15 p.

Pasek, J.E. and T.M. Juntti. 1997. Comparison of risk/hazard rating systems for mountain pine beetle in Black Hills ponderosa pine forests. USDA For. Serv., Renewable Resources, Rocky Mountain Region Tech. Rep. R2-58. 36 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- . 19 p. Draft.

NOTE: THE GREAT PLAINS TREE PEST COUNCIL WILL BE MEETING MARCH 23 AND 24, 2000. THE MEETING IS TENTATIVELY SCHEDULED TO BE AT FT. COLLINS, COLORADO.

Great Plains Tree Pest Council (GPTPC) Meeting

Downtown (Holiday Inn and County Extension Office)

Sioux Falls, SD

October 26 and 27, 1999

Tuesday, October 26, 1999.

Joint sessions with the Horticulture Inspectors Society (HIS)

Presentations included:

-Pests: looking at them from the tree's perspective (John Ball).
-Verticillium wilt (Cindy Ash, Director of Scientific Service, American Phytopathological Society).
-Dutch elm disease - the current state of management (Mark Stennes, Consulting arborist, Top Notch Tree Care).
-Ash yellows in the Northern Plains (Jim Walla).
-Foliar diseases of shade trees: identification and management (Marty Draper, Extension plant pathologist, South Dakota State University).
-Borers from A (Asian longhorned beetle) to Z (Zimmerman pine moth) (John Ball and Laurie Stepanek).
-Herbicide injury and trees (Henry Burkwhat).

Wednesday, October 27, 1999.

Joint sessions with the Horticulture Inspectors Society (HIS) continued

Presentations included:

-Bark beetle management (Kurt Allen).
-Common conifer diseases on the northern Great Plains (Marcus Jackson).
-Crabapple cultivars: growth characteristics and disease resistance (Jeff Illes, Extension horticulture specialist, Iowa State University).

Great Plains Tree Pest Council breakaway session

Attendees:
Kurt Allen (US Forest Service - Rapid City), John Ball (South Dakota State University), Henry Burkwhat (South Dakota Department of Agriculture), Marcus Jackson (North Dakota State University), David Johnson (US Forest Service - Lakewood), Bill Loucks (Kansas Forest Service), Donald Reynard (PFRA Shelterbelt Center), Laurie Stepanek (Nebraska Forest Service), Jim Walla (North Dakota State University).

Announcements and Additional Items:
Jim Walla suggested that the Council review the GPTPC mailing list.

John Ball apologized for the problems with the summer meeting and noted that some state reports were sent during the summer.

State and Organization Reports:
Dave Johnson -

Colorado is in the process of looking for a Lakewood biological technician GS-7/9. The other two field offices were also looking for technicians. They have seen quite a bit of interest in all three positions.

Gypsy moth traps have been placed in campgrounds on federal areas, but they haven't caught moths in these areas for years. There were single moth catches each of the last two years in the Rocky Mountains National Park. During the last few years, they have caught male moths at the Air Force Academy in Colorado Springs and the Air Force Base in Cheyenne. Dave Leatherman should be contacted for information about gypsy moths in communities.

Not picking up Douglas-fir tussock moth anymore, but seeing Douglas-fir beetle. This is about the fourth year of seeing the problem which is due to stress caused by the tussock moth and fire. There were about 20,000 acres of blowdown in the mountains a couple of years ago and beetle populations are building rapidly in these areas. Could lose many spruce in the future if similar to what was seen in the 1950's. Much of the blowdown is in wilderness areas. They are harvesting trees in some areas, but the long-term outlook is not good. A lot of time and energy has been spent on monitoring the beetle.

Dave J. completed a roadside survey with Bill Jacobi north and west of Fort Collins for white pine blister rust on limber pine. There is always a threat of introducing the disease on nursery plants, but they believe that this finding was from natural spread of the disease. A tree pest seminar is scheduled from 11:30 am to 1:00 pm on November 17, 1999 to discuss the impact of diseases on native white pines. The meeting will be at the Lory Student Center, Room 220 on the CSU campus and people are invited if they are in the area.

Dave Leatherman is assisting Erik Johnson with aerial surveys. Erik Johnson is working with Les Koch to encourage him to participate in the surveys in Wyoming. They are mostly noticing pine mountain beetle and subalpine fir decline (the most common problem with subalpine fir) during the aerial surveys.

Jim Walla asked about limber pine health and Dave J. replied that mistletoe and mountain pine beetle are important concerns and that Dothistroma has been seen at quite high levels in Wyoming and Montana. Kurt Allen noted that Dothistroma appears to currently be in the Bighorns and that they are seeing dead trees there.

Bill Loucks -

All of the major problems noted for Kansas were in conifers.

Pine wilt has been present for 30 years. Until recently, it was confined to eastern Kansas, with movement westward. This is apparently related to drought years.

Dothistroma and Sphaeropsis have resulted in the removal of many trees in the eastern half of the state. Jim Walla asked about resistance in Austrian pine to Dothistroma. Bill has used Yugoslavian seed, but this seed is not currently available. Bill noted that Nebraska has a seed orchard of Yugoslavian seed sources of Austrian pine, but it cannot meet the needs. Kansas will start a seed orchard with scion wood from those trees next spring.

Tip moths are destroying many ponderosa pine. Bill still prefers using ponderosa pine, because even though it gets diseases, it appears to hold up to them better than Austrian pine. Nantucket pine tip moth can't be treated by calender anymore. It seems to have a variety of larval stages at any one time (possibly multiple species).

They have looked at other tree species. Loblolly pine and red oaks don't do well in Kansas. Haven't seen much jack pine in the state.

Problems on junipers included cercospora (not a big problem) on eastern red-cedar in Kansas and Botryodiplodia (real severe on Rocky Mountain juniper). Botryodiplodia has been severe enough that they can't really recommend Rocky Mountain juniper.

Bagworm really exploded during the last two years.

Jim Walla asked if perhaps the ash decline might include herbicide injury. Noted what John Ball had seen in South Dakota and reports from other places. Don Reynard has been seeing a lot of major problems on green ash with glyphosate...miles of shelterbelts wiped out. Monsanto paying them to do a study on how much roundup it takes. They are seeing a fair amount of injury from 30% recommended application rate.

Laurie Stepanek -

Saw an increased incidence of wilt diseases (oak wilt and Dutch elm disease), likely due to larger vessels forming in xylem as a result of wetter springs. This permits the fungus to travel more easily throughout the tree.

Also seeing increased incidence in ash decline. White and green ash trees which are between 8" and 12" are showing slow growth and dieback. Possible causes include ash yellows, verticillium wilt, environmental conditions, and a bacterial pathogen currently being researched in Iowa.

An interesting note was of a borer (*Isophrictis similiella*) that has killed many first-year transplanted red-cedar over that past several years. This insect is known to infest wild sunflower. The insects tunnel into red-cedar for shelter to pupate when their natural sunflower hosts are destroyed during ground preparation for tree planting. John Ball noted seeing this insect in South Dakota as well.

Jim Walla -

The manuscript for ash yellows has now been accepted with a couple of changes. The overall ash population in the survey was rated fair. There was a significantly higher incidence of phytoplasmas in crowns with the most dieback, but a cause/effect relationship was not established. Now we need to determine if ash yellows is having an impact. Jim wanted to thank the US Forest Service for providing funds for this project. At the last meeting, North Dakota, South Dakota, and Colorado people were interested in getting together to initiate a study of cultivar tolerance to ash yellows. This will take a lot of work, and preliminary trials have been planted in Fargo and Bismarck, ND. One plant in each of several pairs of two ash cultivars have been inoculated. Questions to answer before a larger study begins include: What types of grafts work? What type of measurements need to be taken to identify impact? Etc. Also looking at potential for damage in seedlings. Jim was out this year collecting and measuring some seedlings. Already taking measurements on past growth. Have now found "typical" witches' brooms on lilac.

X-disease severity ratings have not been adequate recently, but 1999 data looks good, and they are hoping to get some work published on the selection of X-disease resistant chokecherries. They have a number of the selections in tissue culture. Planning to do inoculations of that material this year and next year. In addition, they will put plants out in the field and retain the best plants and remove those that don't do well. Also, they are checking different grafting methods. The intent of the chokecherry work is basically for windbreaks, but there is potential for fruit production and ornamental work. X-disease phytoplasma isolates appear to be very uniform, so hopefully they will not have to use a lot of isolates to test for disease resistance.

Two isolates of western gall rust have been identified. Researchers will need to consider the type of western gall rust while developing resistant cultivars.

Mixing of poplar cultivars within plantings greatly reduces rust and septoria (leaf diseases), but no such change was found for cankers in 1999.

There is an undescribed *Lophodermium* species that has caused problems on ponderosa pine in northern ND. A ponderosa pine seed source provenance planting was inoculated in 1999 to identify resistant seed sources. A possible systemic infection of *Cyclaneusma* was found in limber pine. The NE portion of a limber pine stand is now in poor condition, while the SW part is looking great (opposite of last time he looked at the native limber pine).

Marcus Jackson -

One gypsy moth was trapped in Bismarck, North Dakota and one gypsy moth was trapped near Devils Lake in northeastern North Dakota during 1999. Both moths were trapped in campgrounds frequented by out-of-state visitors. This is the third consecutive year that gypsy moths have been caught in North Dakota campgrounds.

An undescribed *Cecidophyes* sp. mite caused erinea (fuzzy galls) on American cranberrybush across North Dakota. There were reports of virus-type symptoms and plant death following injury by this mite. The potential for virus transmission of this mite needs to be determined.

Yellow-headed spruce sawflies are continuing to kill spruce across northern North Dakota.

There was a general increase in foliage diseases of deciduous trees in 1999. Ash anthracnose caused some green ash to lose up to 100% of there leaves early in the year. Apple scab caused much concern in community plantings.

Don Reynard -

The Shelterbelt Center has been producing trees since 1902 and was producing 12 to 14 million trees per year in the 1980's. Don Reynard described his position as the Insect and Disease Technician. His job is to ensure that the trees remain pest free. During 1998, he answered over 700 inquiries relating to insects and diseases of trees and shrubs.

They evaluated the efficacy of Spinosad for the control of spring cankerworm. They found that 21% of early instar cankerworm larvae were classed as healthy after 96 hours exposure to Siberian elm foliage which was treated 26 days before with the high rate of

Spinosad, compared to 83% of the cankerworm presented with untreated foliage. Late instar cankerworm larvae were also tested. They were exposed to Siberian elm foliage that was treated with low and high rates of Spinosad 17 days prior the evaluation. Only 5% and 1% of cankerworm larvae were classed as healthy, compared to 83% of the cankerworms presented with untreated foliage.

Tests were conducted to control four chokecherry insects: prairie tent caterpillar, ugly nest caterpillar, fruittree leafroller, and chokecherry midge.

Prairie tent caterpillars were treated at two sites when plants were fully leafed out, racemes were fully extended, and the flowers were in the early white tip stage. Decis, Sevin, and Matador insecticides provided 100% control within eight days after treatment at both sites. Dipel WP provided 52% and 84% control at each of the sites.

Ugly nest caterpillar treatments were completed when plants were fully leafed, flowering was complete and fruit development had initiated. Ugly nest caterpillar populations were reduced 85%, 88%, 4%, and 97% by Decis, Sevin, Dipel, and Matador seven days after treatment at one site. Populations were reduced 95%, 90%, 57%, and 100% by Decis, Sevin, Dipel, and Matador seventeen days after treatment at the second site.

Fruittree Leafroller treatments were completed when plants were fully leafed, flowering was complete and fruit development had been initiated. Twelve hours after treatment, fruittree leafroller populations were reduced by 78%, 74%, and 67% for Decis, Sevin, and Matador treatments. Five days after treatment, all three products had provided 100% control.

Chokecherry Midge treatments were completed when plants were fully leafed and flowering was complete. There was no reduction in chokecherry midge populations when the three insecticide treatments and the water check were compared.

John Ball -

Saw *Dioryctria* sp. on spruce in SD, but it was not a big problem.

Also saw the *Isophrictis similiella* borer that Laurie Stepanek described as occurring in Nebraska.

Appeared to be more Dutch elm disease in SD. This corresponds with the theory that larger vessels which formed during wetter springs permitted the fungus to travel more easily throughout the tree.

Insect Pest and Disease Handbook:

Jim Walla mentioned that some members thought the Tree Disease Handbook should be reprinted rather than rewritten and that we should concentrate on developing a tree insect pest handbook in a similar format. Reprinting had not been considered, so Dave Johnson and Bill Jacobi looked into it. The materials are available for reprinting, and there are two options.

One option would include putting the Handbook on the web or on compact disc (CD). May be able to get 5,000 CDs produced for $5,000. Dave Johnson noted that Colorado State University said that they would need to produce a minimum of 500 for an order. The cost would be about $1 to $2 per CD. This would be done by scanning the existing publication and wouldn't take much time. This option would allow inclusion of: 1) the Tree Disease Handbook, 2) additional tree disease chapters, and 3) a tree insect pest handbook.

The second option is to reprint the Tree Disease Handbook. [*Note: After the meeting, Dave Johnson found that this could be done for about $4 per copy and would provide much better photo quality than scanning. The membership will be polled to obtain input and preferences on these options*].

John Ball noted that in the 1998 GPTPC meeting, there appeared to be a need for a few different recommendations and additions of a few insects into the handbook. After discussion, the council determined that some changes would be helpful, but they were not necessary. Therefore, the council decided to try to reprint the publication as it was last printed.

Sources of funding were discussed. Possibilities mentioned include the US Forest Service, NRCS, State Agencies, National Agroforestry Center, and State Extension Services.

Dave Johnson agreed to work with the USFS to get approval of the project. Jim Walla and John Ball will seek funding.

Changes Suggested for the GPTPC Mailing List:

Remove Ned Klopfenstein.
Ensure Les Koch is on the list.
Stolenow should be changed to Stoltenow.
Remove Dave Wysong.
Ensure Henry Burkwhat is on the list.
Add Joel McMillin (same address as Kurt Allen).
Ensure Gregg DeNitto is on the list.

Election of New Officers:

New Chair - John Ball nominated Marcus Jackson. Kurt Allen seconded. Nominations were closed. Marcus was elected.
Secretary - John Ball nominated Laurie Stepanek. Bill Loucks seconded. Nominations were closed. Laurie was elected.

Date and Location for Next Meeting:

The next meeting is tentatively planned for Ft. Collins (work with Bill Jacobi). March 23 and 24, 2000.

Meeting was formally adjourned at 4:00 pm.

Submitted by Marcus Jackson, Secretary

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1998 Report - North Dakota
Great Plains Tree Pest Workshop, Sioux Falls, SD, October 27, 1999

Report from J.A. Walla, Plant Pathology Dept., NDSU, Fargo 58105
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1. Ash yellows of green ash.

Abstract of manuscript: 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. 1999. 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: (Accepted).
About 50% of 1057 green ash (*Fraxinus pennsylvanica*) systematically sampled in the Great Plains and Rocky Mountains regions had substantial dieback (>10% of crown branches with dieback), and the average growth ring width during the last 20 years was 2.9 mm. The overall condition of the population was rated fair. Ash yellows phytoplasmas were identified at 102 of 106 sites throughout six USA states (North Dakota, South Dakota, Wyoming, Nebraska, Colorado, Kansas) and three Canadian provinces (Alberta, Saskatchewan, Manitoba). These phytoplasmas had not previously been known in Alberta, Saskatchewan, Manitoba, Wyoming, Colorado, or Kansas. Incidence of phytoplasmal detection ranged from 16% in Wyoming to 71% in South Dakota. Incidence varied in the range 41-67% across site types and crown dieback classes. Incidence was highest in rural plantings, in trees with the most crown dieback, and in larger-diameter trees. No significant relationships were detected between presence of ash yellows phytoplasmas and radial growth rates of trees.

The changes from our last report to this group regarding this work are: addition of the tree condition portion and indication of an association between infection and crown dieback.

Eighteen green ash trees representing two ash cultivars (Patmore, Marshall's seedless) were planted in spring, 1999 and half of them 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 more controlled conditions than our survey 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. Assays are incomplete, but 1 of 3 seedlings collected in each of 3 native stands was positive, and witches'-brooms were present on some seedlings in each of two windbreaks.

2. Lilac witches'-broom (LWB). (With Guo)

LWB is caused by the same phytoplasma as AshY. Infected plants had been found in 1997 and 1998, but no "typical" witches'-brooms had been found. In 1999, growths that are similar to the witches'-broom symptoms shown to me in Illinois were seen 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. (with Guo and Cheng, NDSU Plant Sciences, and Knudson, PMC)

Ratings of the chokecherry plants in the Bismarck Plant Materials Center germplasm

collection were rated for X-disease severity again in 1998 and 1999. Ratings in 1997 and 1998 were considered inaccurate due to rating too late in the season (1997) and presence of drought conditions (1998), both of which resulted in symptoms that could be confused with X-disease symptoms. As of 1999, there were still 21 plants that appear to not be substantially damaged by X-disease.

We have most of these plants in tissue culture to obtain clonal plants for resistance testing and seed orchard planting. Two sources were taken through tissue culture, planted into pots, 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.

Collections of X-disease phytoplasmas from the Great Plains appear to have relatively little genetic variation based on PCR, RFLP, and gene sequencing analyses.

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 September. There were no striking differences among treatments receiving the various macro and micronutrients compared to the control. Ratings of these plants will continue in 2000.

5. Western gall rust

A series of projects with several cooperators has led to an indication that there is more than one autoecious fungus causing galls on pines in North Dakota. Basically, in the north-central United States, *P. harknessii* populations appear to be from two geographic origins, one east and the other west of the Great Plains region. Phenotypic and molecular genetic markers and inoculated host symptoms differ substantially between these populations. The level of differences found between these *P. harknessii* populations are comparable to those between species of other fungi. It is not yet known whether the differences correspond with taxonomic rank, and, if so, at what level, e.g., race, *forma specialis*, species.

6. Other projects

Aspen stunt: Reciprocal graft inoculations did not result in symptoms in the control rootstock or scionwood. Genetic diversity studies: Evaluations of part of the mixed-cultivar poplar plantings for cankers did not identify effects of clonal mixing on disease incidence. Lophodermium needle blight on ponderosa pine: A seed source provenance planting was inoculated in 1999 with using needles with fruiting bodies of an undescribed Lophodermium species. Limber pine condition: The small stand in ND was examined in 1999. White pine blister rust was not found. One tree that appeared to be a witches'-broom was found to be very heavily infected with something that looked like *Cyclaneusma*. A shoot boring beetle was very common in the stand.

Completed Citations and Publications Since Last Report:

Guo, Y.H., Cheng, Z.-M., and Walla, J.A. 1998. Amplification and RFLP analysis of 23S ribosomal DNA from phytoplasmas. (Abstr.) Phytopathology 88 (Supplement):S35.

Guo, Y.H., Cheng, Z.-M., Walla, J.A., and Zhang, Z. 1998. Large-scale screening for X-disease phytoplasma infection in chokecherry. HortScience 33:293-295.

Jalkanen, R., Crane, P.E., Walla, J.A. and Aalto, T. (eds.). 1998. Proceedings of the First IUFRO Rusts of Forest Trees Working Party Conference, 2–7 Aug, 1998, Saariselkä, Finland. Finnish Forest Research Institute, Research Papers 712.

Walla, J.A. 1998. Underground witches'-brooms on green ash with ash yellows. (Abstr.) Phytopathology 88: (Supplement):S93.

Walla, J. A. 1998. Variation in morphology of *Lirula* on *Picea* in North America. pp. 6-12, In Foliage, Shoot and Stem Diseases of Trees. Proc. IUFRO WP7.02.02 meeting, Eds. G. Laflamme, J. A. Berube, and R. C. Hamelin, Quebec City, Quebec, Canada, May 25-31, 1997. Canadian Forest Service Information Report LAU-X-122.

Walla, J. 1998. Ash yellows. Tree News, ND Urban and Community Forestry Association newsletter 3 (1):2.

Walla, J. 1998. Update on tree diseases in ND. Tree News, ND Urban and Community Forestry Association newsletter; Fall 1998, page 2.

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., and Reynard, D.A. 1998. Studies of ash yellows in the Great Plains region of North America. (Abstr.) European J. For. Path. 28:83.

Walla, J.A., Jacobi, W.R., Tisserat, N.A., Harrell, M.O., Ball, J.J., Neill, G.B., Reynard, D.A., Guo, Y.H., and Speigle, L. 1998. Detection of the ash yellows phytoplasma in the Great Plains and eastern Rocky Mountain regions of North America. (Abstr.) Phytopathology 88 (Supplement):S93.

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. 1999?. 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: (Accepted).

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.

Nebraska Report to Great Plains Tree Pest Council
October 1999
Laurie Stepanek and Mark Harrell

Pest Problems

Wilt diseases	Oak wilt and Dutch elm disease incidence increasing--likely due to wetter springs that allow larger vessels to form in the xylem, which permits the fungus to travel more easily throughout the tree. We are investigating the decline of several oaks at the Arbor Day Farm in Nebraska City--suspect oak wilt.
Ash decline	Increased incidence of "ash decline." Symptoms often include slow growth and dieback. Both green and white ash affected. Possible causes include ash yellows, verticillium wilt, environmental conditions. Current research in Iowa on declining ash suggests a bacterial pathogen.
Annosum root rot	Investigating death of redcedar near Tryon, NE. Whole trees dying, and many are uprooted by the wind. Young seedlings 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.
Pinewood nematode	Reports of pinewood nematode in extreme southeastern Nebraska are up. May be partially due to increased awareness of the problem and ability to detect the nematode.

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.

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

Report to the Great Plains Tree Pest Council
Sioux Falls, SD October 26-28, 1999

Staff: Kurt Allen, Service Center Leader/Entomologist
Jeri Lyn Harris, Plant Pathologist
Joel McMillin, Entomologist

Service Area: All of South Dakota, except northwest corner
All of Nebraska
Northern Wyoming east of the continental divide (north of Casper and South Pass City)

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Summary of insect and disease conditions

Recent and Current

Mountain pine beetle: There is an increasing mountain pine beetle outbreak in the Black Hills of South Dakota and Wyoming. Tree mortality has been increasing at a fourfold rate per year over the last 3-4 years, with some areas reaching outbreak status. One of the areas of greatest concern include the Beaver Park area, which includes the Sturgis Municipal Watershed, Ft. Meade Watershed, the Sturgis Experimental Watershed and nearby national forest and private forestlands.

Mountain pine beetle is also active along the east face of the Bighorn Mountains of Wyoming. Areas of concern include along the highway west of Sheridan and forestlands surrounding Story.

Gypsy moth: Detection traps were placed in high use recreation sites throughout the national forests and parks in South Dakota and Wyoming. No moths were caught in these campgrounds, however, moths were caught in private campgrounds in areas surrounding these forests.

Douglas-fir beetle: Douglas-fir beetle activity increased this year, after 2 years of decrease, on the Shoshone National Forest in Wyoming. The highest levels of activity were detected

along the North Fork of the Shoshone River and side drainages, with lesser amounts of activity in the Sunlight Basin and the Clarks Fork. There are concerns with beetle infestations in high profile campgrounds along the corridor to Yellowstone National Park. A number of alternatives are being considered to deal with these infestations.

Aerial Surveys: Aerial surveys were conducted on the 1)Shoshone, 2)Bighorn, and 3)Black Hills National Forests in 1999. 1)Areas of the Shoshone NF were flown to observe the Douglas-fir beetle outbreak that has occurred on the Shoshone for 9+ years. There were new attacks in the Sunlight Basin and the Clarks Fork areas, however there were significant pockets of mortality on the North Fork of the Shoshone River and its side drainages. 2)Mountain pine beetle mortality in ponderosa pine was seen on the eastern edge of the Bighorn NF. Approximately 2/3's of the mortality occurs on the national forest and the rest of the damage is on Wyoming State and private lands. 3)A mountain pine beetle outbreak on the northern Black Hills NF continued to expand. The mortality continued to dramatically increase to more than four times of what was seen in '98 aerial survey flights.

Evaluation of Mountain Pine Beetle Activity in the Black Hills National Forest: Increasing populations of the mountain pine beetle were detected and evaluated in areas on the Spearfish/Nemo District of the Black Hills National Forest. Beetle caused mortality of ponderosa pine increased from 1998 to 1999, with much of the tree death being in concentrated areas. It appears that beetle populations are reaching epidemic levels and that mortality will continue to increase in this area in the coming years. Strategies for dealing with this situation include: do nothing, silvicultural treatments, sanitation/salvage harvesting, infested tree treatment and individual tree protection. The recommendation at this time is for using sanitation harvests to try and lessen beetle caused impacts.

Phomopsis Blight at Bessey Nursery: Phomopsis blight disease *(Phomopsis juniperovora)* destroyed several hundred-thousand eastern redcedar and Rocky Mountain juniper seedlings at Bessey Nursery during the 1998 growing season. The Spring seasons of 1997 and 1998 were cool, with above average rainfall and humidity, and this promoted the outbreak. Nursery workers applied fungicides and rouged infected trees from the beds. However, approximately 75% of the 1998 crop was lost to the disease. The Rapid City Service Center surveyed and identified the disease in seed beds and in all surrounding shelterbelts of the nursery. The fungus occurs throughout most of the nursery and the nearby forest lands at low, endemic levels, but climate conditions of 1998 promoted a dramatic increase in the disease. Recommendations were to use weekly systemic fungicide applications as soon as new growth appears and throughout the season. Monitor and remove infected seedlings and shelterbelt trees to help reduce the inoculum levels. Evaluate seed sources and outplanting results for possible genetic disease resistance.

White Pine Blister Rust Disease in Wyoming, East of the Continental Divide : White pine blister rust is a disease has infected many whitebark and limber pine stands in Wyoming, east of the Continental Divide. Whitebark pine has been described as a "keystone" species and its seed is used by several animals, especially by grizzlies, as a source for fat and protein. Limber pine has little timber market value, yet is an important tree species for forestation and biodiversity reasons. The Rapid City Service Center surveyed for the disease on the Bighorn, Medicine Bow, and Shoshone National Forests and then later installed 20 permanent plots for long term monitoring of the sites. Low and moderate infection levels of

the disease were found on each national forest during the survey. In some of these areas, the disease is causing considerable decline that may concern several land managers and owners of these forest stands. The Rapid City Service Center will continue to monitor the permanent plots for the next 20 years.

Little Bighorn Analysis Area, Bighorn National Forest, Insect and Disease Survey: Bighorn National Forest managers are planning to use prescribed fire to protect and enhance forest conditions in an 102,705 acre area delineated as the Little Bighorn Analysis Area. Prominent insect and disease activities may impact forest management objectives; the Rapid City Service Center surveyed 12.5 miles of chain-wide survey transect lines throughout the area to assess the current insect and disease damages in the Little Bighorn Analysis Area. Dying or recently dead trees along the lines were examined for beetle or/and root disease activity. Variable-radius plots were used every 10 chains to rate dwarf mistletoe and rust diseases in the pines. Most of the damage in the spruce-fir forest type was caused by western balsam bark beetle and spruce beetle. Activity levels for the subalpine fir were 2.3 trees per acre killed; this is considered near outbreak level. Mountain pine beetle activity was at an endemic level with less than 1 tree killed per acre. Comandra blister rust and dwarf mistletoe diseases have infected 40% of the lodgepole pine in the area. Sixteen percent of all the lodgepole pines surveyed have both diseases. Twelve percent have only comandra blister rust disease and another 12% were infected with dwarf mistletoe disease only. The comandra blister rust incidence is high; an average severity rating for these trees indicates that most are topkilled and dying. Dwarf mistletoe incidence has dropped from 36.5% reported in 1986 to 30% in this survey. This may be due to the large number of spruce-fir stands in the area and lack of continuous lodgepole pine forest needed for spread. Armillaria root disease was found and low infection levels of white pine blister rust have also been found on the limber pine of the area. Recommendations were to use prescribed fires, thinnings, and some overstory removal depending on forest cover types. This should promote more pine and aspen regeneration and help protect the sites from harmful insect and disease outbreaks.

Stand level impact of Douglas-fir beetle infestations in the Greater Yellowstone Area: Funding from the Forest Health Monitoring/Evaluation Monitoring project was used to complete a study answering the question, "What is the impact to a Douglas-fir forest after an uncontrolled Douglas-fir beetle outbreak following a wildfire?" We addressed this question by conducting intensive plot sampling on the Shoshone National Forest in areas adjacent to the Clover Mist fires of 1988. More than 20 miles of transect sampling were traversed and 25 pairs of infested and non-infested plots were installed to detect changes in forest stand and forest understory conditions following the Douglas-fir beetle outbreak. Preliminary results of this work are included in this report. Major findings of the study included Douglas fir basal area was reduced by more than 40 % and an overall decrease in tree diameter, a nearly fourfold increase in Douglas fir regeneration was found in infested plots and 90 % of the regeneration was Douglas fir, and a three-fold increase of understory vegetation (forbs, grass, and shrubs) was recorded in the infested plots compared with non-infested plots. Information from this study will be transferred in a timely manner to the Shoshone National Forest, and other national forests both inside and outside the region, and the Yellowstone National Park. Several media will be used to transfer this information, including: posters and scientific presentations at national and regional meetings, a biological evaluation given to the forests and national park service, and possibly a general technical report or a manuscript submitted to a scientific journal that will be available to all interested parties

Technology Development Projects:

1. Establishing Permanent Plots for Monitoring and Modeling (Pest Trend Impact Plots System - PTIPS): In 1997 and 1998, 22 plots were established in limber and whitebark pine stands to monitor the spread of white pine blister rust disease in Wyoming and South Dakota. Armillaria root disease plots on the Black Hills NF were remeasured in 1998.

2. GIS-based Landscape Scale Root Disease Incidence Model: Existing data on Armillaria root disease occurrence, supplemented with new field data, were coupled with SCS soil classification, stand inventory, site disturbance, habitat type, and meteorological data in a GIS database. Utilizing spatial statistical analysis, an Armillaria root disease hazard rating system was being developed for the Black Hills National Forest. Significant relations have been found with Armillaria occurrence and soil characteristics of permeability and allowable water-holding capacity. This project was presented to Black Hills forest managers in 1999. Methods used for this GIS database and spatial analysis may be used for other projects with pest outbreaks or forest decline.

3. Alternative to Methyl Bromide: In cooperation with other USDA Forest Service nurseries, Bessey Nursery tested soilbed treatments that may be used alternatively to methyl bromide. The four treatments tested were 1) fumigation with methyl bromide, 2) fumigation with basamid, 3) fallow with a biweekly till, and 4) solarization. Five replication blocks for each of the treatments were used in a random block design within the nursery. Prior to the treatments, and after each growing season for three years, each block is assayed to evaluate populations of pathogenic nematodes and fungi.

4. Fir Decline on the Shoshone and Bighorn NFs: Over the past few years, areas of sub-alpine fir decline have been noted throughout the Rocky Mountains of Colorado and Wyoming. From recent aerial survey work, it appears that these areas are increasing in size. The exact causes of the decline are not well understood but it is thought to be a complex of bark beetles, root diseases, and perhaps environmental factors. Pheromone trapping was done on the Bighorn NF, peak beetle flight was in mid July. Western balsam bark beetle is present in sub-alpine fir stands on the Bighorn NF and maybe partially responsible for the decline of the stands. More work is planned for '98 in sub-alpine fir stands with study plots and root disease identification.

Other Site Visits and Surveys:

Hazard Tree surveys in campgrounds for the Nebraska and Shoshone National Forests.
Hazard Tree training for campground managers of the Shoshone National Forest.

Armillaria Root Disease surveys on Bearlodge District (Black Hills NF) and Sawyer Memorial Park (Pope and Talbot, Inc.).

Severe hail damage and possible needlecast disease identified on Kirk Hill of the Black Hills National Forest.

Disease and tree decline identified at Badlands National Park.

Recent RCSC Publications:

Allen, K.K. and McMillin, J.D. 1998. Evaluation of mountain pine beetle activity in the Steamboat Rock and Beaver Park areas on the Spearfish/Nemo Ranger District of the Black Hills National Forest. USDA FS, Bio. Eval. R2-99-01.

Harris, J.L; K.K. Allen, and McMillin, J.D. 1998. Little Bighorn analysis area, Medicine Wheel and Tongue Ranger Districts, Bighorn National Forest. Insect and Disease Survey. USDA FS Bio. Eval. R2-99-03.

Harris, J.L. 1999. Evaluation of white pine blister rust disease on the Shoshone National Forest. USDA FS Bio. Eval. R2-99-05.

Harris, J.L. 1999. Phomopsis Blight at Bessey Nursery. USDA FS Bio. Eval. R2-99-07.

McMillin, J.D., Allen, K.K., and Harris, J.L. 1998. Evaluation of mountain pine beetle and Armillaria root disease in the Sundance Sale Area, Black Hills National Forest. USDA FS Bio. Eval. R2-99-02.

McMillin, J.D., Allen, K.K. 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 FS Bio. Eval. R2-99-04.

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 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:** We have not analyzed any of our data yet.

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 11 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.

3. **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.

4. **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. Data not available yet.

5. **Cytospora Canker**: We are starting to analyze Cytospora canker fungi isolates of different "species" and hosts to see if the DNA will tell us if the fungi are different. We are using the PCR base experiments to analyze the ITS region. We do not have any results to share yet.

6. **Shrub and Tree Guide**: We are working on a combined insect and disease guide on shrubs and trees in Colorado. We hope to have the book published by January 2000.

7. **Old Growth Cottonwoods:** We are studying the water status of old cottonwoods via pressure bombs, soil moisture from neutron probes and observation wells, along a 100 yr.-old irrigation canal that runs through metropolitan Denver. The water may be shut off from the canal and we trying to find how long the trees can handle reduced water etc. We hope to use the study to also look at cottonwood's susceptibility to Cytospora under various drought stress scenarios.

Plans for 2000:

1. Continue mulch/inoculum, canker resistance, elm and tree and turf growth studies at the tree and turf research site.
2. Publish Cytospora pathogenicity study.
3. Complete nursery IPM studies and poplar leaf spot biology and publish
4. Continue cottonwood -canal drought stress study.
5. Continue genetic analysis of Cytospora fungi.
5. Complete analysis of hybrid elm growth, form and disease resistance study.
6. Find funding to maintain and expand studies at tree and turf research site.
7. Conduct physiological studies related to tree growth and health at the Tree and Turf research site.

Forest Tree Disease Studies in 1999

1. continued to analyze the spatial relationships of **Armillaria root disease** and site features in the Black Hills of SD.

2. in cooperation with Forest Health Management, Rocky Mt Research Station, US Forest Service, BIA, continued a study to see if aerial IR photos would pick up **black stain root disease** and Ips beetle damage in pinyon, and determine if there are any site or stand conditions related to the incidence of these damages. We are also looking at the impact of black stain root disease on the pinyon pine ecosystem based on analysis of vegetation cover and pinyon mortality rates.

In 2000 our plans are to:

1. In cooperation with Forest Health Management, US Forest Service, finish analysis of the influence of meteorological, site and soil factors on the spatial small (1/2 mile) and landscape scale distribution of Armillaria root disease on ponderosa pine in the Black Hills.

2. Continue a research project on black stain root disease of pinyon pines in southwest Colorado. We will be looking at spatial relationships with site, soil and management activities. Funding is not secure yet.

Publications:

K.E. Bernard, C. Dennis and W. R. Jacobi. 1999. Protecting tree during construction. Colorado State University, Cooperative Extension, Gardening Series, No. 7.420 4pp.

C. Francis, W. R. Jacobi and W, S. Cranshaw. 1999. Pinyon pine diseases and insects. Colorado State University, Cooperative Extension, Gardening Series, No. 2.948 7pp.

These publications can be found on the CSU web page under extension.

1998 Forest Health Summary
North Dakota

Prepared by: Marcus Jackson

Precipitation and Flooding

Much of the northern and eastern parts of North Dakota received precipitation in excess of 150% of normal during May and June of 1998. This high amount of precipitation spread over several days during the early, cool part of the season may have been significant in the high level of foliage diseases noted during the 1998 season.

Floodwaters have been accumulating around Devils Lake in northeastern North Dakota since 1994. An estimated 1,000,000 trees have been damaged or killed. The costs for clean up and replanting are expected to exceed $2 million dollars. A recent report by the State Forester and Forest Resource Management Specialist showed that flooding, resulting from a proposed emergency flood outlet from Devils Lake to Stump Lake, could have adversely affected 427 acres of woodland. This could have killed over 120,000 trees.

Insects and Diseases

Insects:

Forest Tent Caterpillar. A forest tent caterpillar (FTC) infestation was reported in the Sheyenne State Forest in southeastern North Dakota during June of 1997. Basswood were heavily defoliated, aspen were moderately defoliated and bur oak, boxelder, and green ash were lightly defoliated.

The communities of Lisbon and Ft. Ransom began to see heavy FTC infestations during mid-May of 1998. On May 24, 1998 the FTC population at the Sheyenne State Forest looked as though it would be greater than the previous year. Ten caterpillars were collected at that time to determine if they were parasitized. Only one of the caterpillars matured into an adult moth. From the ten caterpillars, four parasitic flies were retrieved.

The FTC population appeared to collapse in early June of 1998. This was early as most estimates predict FTC populations to collapse after 3 to 5 years. The parasitic flies were apparently important in the collapse of the FTC population. Trees which were defoliated, recovered by late summer.

Fall Webworm. Fall webworms were present throughout North Dakota during the summer of 1997, but this insect was most serious in western areas of the state. Many hardwood species were damaged by fall webworms, with the greatest damage found in chokecherries. Infested ornamental trees were creating the greatest concern due to the unsightly nests, but the insects were rarely a threat to the health of trees. Fall webworms remained present across North Dakota in 1998, but they appeared to decline in number compared to 1997.

Yellowheaded Spruce Sawfly. All native and introduced species of spruce grown in North Dakota are potential hosts to yellowheaded spruce sawflies. These insects are often discovered as late-instar larvae feeding on older needles, at which time much of the damage has been done and chemical control becomes less beneficial.

Spruce trees in the northern half of the state tend to be infested more often than spruce trees in southern areas. The first year of minor defoliation should be taken as a forewarning to monitor and treat, when necessary, for the insect in subsequent years. Early-instar larvae were seen in early- to mid-June of 1998. Monitoring for the yellowheaded spruce sawfly should continue through June in North Dakota. Serious damage was seen near the end of June in 1998.

Glenn Roloff, of the U.S. Forest Service in Missoula, Montana, suggested that the removal of the duff beneath infested trees may reduce the impact of this insect. Since most yellowheaded spruce sawflies are believed to pupate in the top 0.1 cm of the soil, this practice sounds feasible and should be tested in North Dakota.

Dioryctria Moths. Often referred to as Zimmerman moths, *Dioryctria* sp. moths cause serious damage to pine trees. There are three possible Dioryctria species present in North Dakota. Near Hettinger, approximately 4 acres of ponderosa pine were heavily infested (>75% of the stand) during 1998. 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 during 1998.

Most damage in North Dakota was in ponderosa pines, but injury did occur to scotch pines as well. The moths infested pines of various sizes, but trees from 5 to 15 feet tall suffered the most damage. Younger trees tended to be infested less and older trees were more tolerant of the insects.

Diseases:

Ash Anthracnose. The ash anthracnose fungus caused significant defoliation of ash trees during the spring of 1998 in eastern, central, and southwestern parts of the state. Trees in eastern North Dakota, which lost up to 50% of their leaves, did recover by mid-summer.

Rhizosphaera needlecast. Rhizosphaera needlecast has historically been a greater problem in eastern North Dakota than western areas of the state. During 1997 and 1998, the disease appeared to cause increased defoliation in eastern parts of the state and was starting to appear in north-central/north-western North Dakota.

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 to community and conservation trees.

Large elms injected with fungicides, to prevent DED infections in eastern North Dakota, have been lost during the last two years. Research shows that trees are protected from DED if they are injected with the correct fungicide every third year in North Dakota. Due to the number of trees that must be injected in a limited amount of time, many trees are injected every second year. Trees are often unable to replace damaged sapwood in two years, but may often replace adequate amounts of sapwood in three years. Its possible that over-injection weakened the trees, causing them to become

susceptible to secondary organisms or killing the trees outright by girdling them at the points of injection.

Dutch elm disease increased in Bismarck, Dickinson, and Fargo during 1998, with an 85% increase in elm removals in Fargo compared to 1997 removals. Other cities, including Grand Forks, reported a drop in American elm losses in 1998 compared to previous years. In many small communities and windbreaks, elms continued to be lost quickly after DED was detected in those areas.

One event that piqued a lot of interest during 1998 was Bismarck City Forestry's identification of DED in four Siberian elm trees. Two of these trees were confirmed to have DED by the NDSU Plant Pest Diagnostic Lab. Although Asian elms are more tolerant to DED than American elm, it has been consistently noted that Siberian elms are not immune to DED. This information, coupled with the fact that elm bark beetles (vectors of DED) utilize Siberian elm as a host, has prompted elm sanitation programs in North Dakota to include all species of elm.

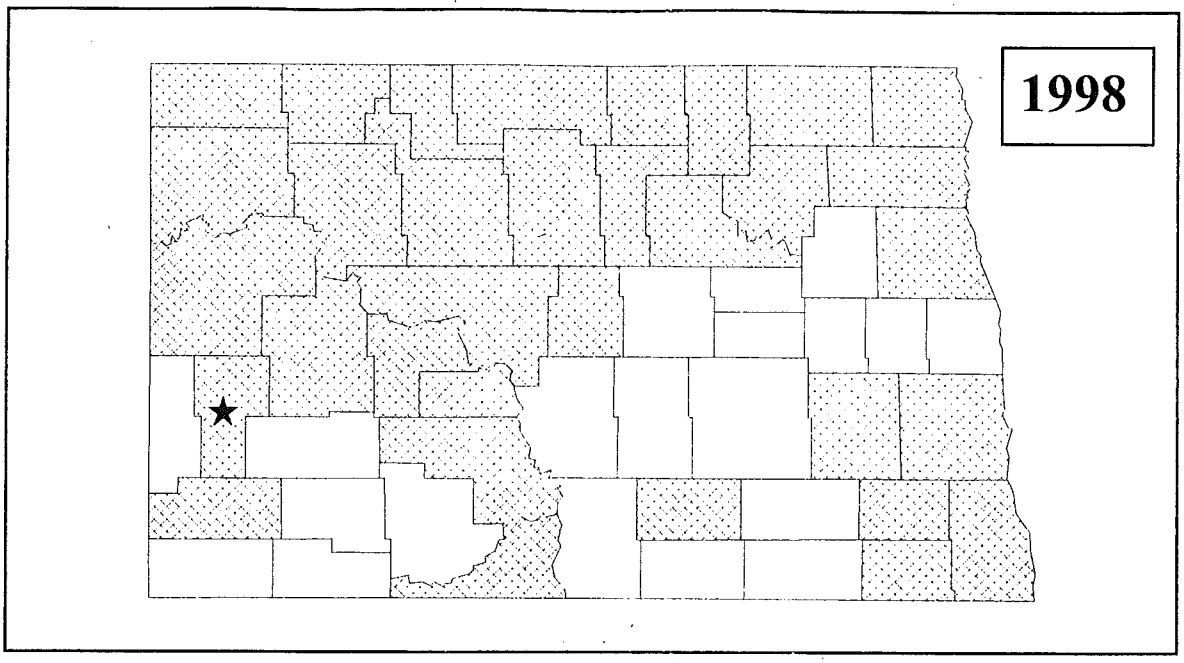
Ash Yellows. Ash yellows is a disease caused by phloem-inhabiting phytoplasmas of ash trees and lilac. The ash yellows phytoplasma was first confirmed to be present in North Dakota green ash in 1993 and in lilac in 1997. Beginning in 1996, NDSU Plant Pathologist Dr. Jim Walla coordinated a regional project with people from five other states and three Canadian provinces to determine the incidence and impact that ash yellows has and will have on Great Plains and Rocky Mountain green ash. Community forests, rural plantings, and native woodlands were all sampled during the project. Two major findings of this project were that "the ash yellows phytoplasma...is basically everywhere in central North America" and "we do not know if it is causing damage" because "no effect of infection was identified." Walla is currently investigating the effect that ash yellows has on landscape plantings and on natural regeneration of green ash. In addition, he will soon be screening cultivars to identify tolerance. If found, tolerant trees may be used as parents for future windbreak trees.

X-Disease. X-disease is a serious problem of chokecherry in North Dakota. This disease causes discolored and deformed foliage and fruit, stunted leaves and shoots, gradual decline and ultimately death of infected native and planted chokecherry and some other *Prunus* species across the state.

Drs. Jim Walla and Zong Ming Cheng of NDSU, and Mike Knudson of the Bismarck Plant Materials Center, have identified chokecherry plants that appear to be highly resistant to X-disease in Plant Materials Center experimental plots near Bismarck. Those plants are being developed for release to the public.

Exotic Threats:

Gypsy Moth. The North Dakota Gypsy Moth Committee developed the trapping schedule used for the North Dakota Gypsy Moth Detection Program. This committee was coordinated by Dave Hirsch, USDA, APHIS, PPQ and consists of representatives from USDA APHIS, USDA Forest Service, North Dakota Department of Agriculture, North Dakota City Foresters, North Dakota State University Extension Service, and the North Dakota Forest Service.



NOTE: Shaded counties were trapped during 1998. Star represents approximate location of a single adult gypsy moth catch in a pheromone trap. Map was provided by Dr. Phillip Mason of the North Dakota Department of Agriculture.

One gypsy moth specimen was detected from a total of 348 traps placed in 33 of the 53 North Dakota counties during 1998. The moth was discovered at the Cottonwood campground of the Theodore Roosevelt National Park in Billings county. This was not the first time that a moth had been captured at the campground. A single moth was caught there during a detection survey in 1990. In the October 9, 1998 issue of the "Forest Insect & Disease Newsletter," the Minnesota Department of Natural Resources reported that "preliminary reports from the Minnesota Department of Agriculture indicate that male gypsy moth trap catches are on the rise from last year." They noted that considerable increases occurred along the Mississippi River and near eastern and southern borders of Minnesota. Gypsy moth catches in Minnesota were over 900 for 1998. This may not seem like a high number until you look at gypsy moth catches in Wisconsin over a dozen years. That state trapped only 13 gypsy moths in 1986, but trapped more than 92,000 gypsy moths during 1997.

Asian Longhorned Beetle. During the summer of 1998, North Dakota State Entomologist, David Nelson, found larval tunnels consistent with those made by Asian longhorned beetles (ALBs) in wood pallets at a sporting goods store in North Dakota. Although we do not know whether this insect could survive North Dakota winters, some of its favored hosts include trees that are native to the state (ex. boxelders, poplars, and elms).

To confirm that no 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, an article was included in the North Dakota Forest Service's newsletter (distribution ~4,000) and an insert added to the North Dakota Nursery and Greenhouse Association's Newsletter.

Report to the Great Plains Tree Pest Council

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1998 PEST REPORT

In 1998 we received over 700 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.

1998 RESEARCH STUDIES

Evaluation of Spinosad for Control of Spring Cankerworm - The spring cankerworm, *Paleacrita vernata* (Peck) is a major defoliator of shelterbelt, boulevard and ornamental trees throughout the Prairies. Host species include American elm, *Ulmus americana* L., Siberian elm, *Ulmus pumila* L., green ash, *Franinus pennsylvanica* Marsh., and Manitoba maple, *Acer negundo* L.. This project was funded by Dow Agrosciences to determine the efficacy of Spinosad for control of spring cankerworm. Spinosad is a naturally derived product which has demonstrated excellent control of many pests. In 1998, trials were conducted to determine the efficacy of various rates of Spinosad on newly hatched and late instar spring cankerworm larvae and to determine the residual impact of Spinosad.

Efficacy of Spinosad for Control of Early Instar Spring Cankerworm
Three rates of Spinosad and Dipel WP was evaluated for the control of early instar spring cankerworm on a Siberian elm shelterbelt located near Indian Head, Saskatchewan. Treatments were applied with a hand gun attached to a high pressure sprayer at 700 kPa at a rate of 30 L of solution per 100 m^2. Spinosad was tested at 58.5, 117.3 and 214.8 mls product per 1000 L of water and Dipel WP at 625 g product per 1000 L of water. Treatments were applied on May 20, when spring cankerworm larvae averaged 4.3 mm in length. Assessment of the trial was conducted three and seven days after treatment. Three days after treatment, spring cankerworm populations were reduced by 99.6, 99.9 and 99.3 % with the low, mid and high rates of Spinosad, respectively. Dipel WP provided 84.5% control of cankerworm larvae within three days of treatment and 99% control seven days after treatment.

The residual impact of Spinosad was assessed by exposing late instar spring cankerworm larvae to treated and untreated Siberian elm foliage. On June 15 (26 days after application), foliage was removed from plots treated with the high rate of Spinosad. Check foliage was obtained from an untreated Siberian elm shelterbelt. Late instar spring cankerworm averaging 20 mm in length were collected from an untreated Siberian elm shelterbelt. Assessment of larvae exposed to treated and untreated foliage was conducted at 24, 48, 72 and 96 hours. Only 21% of cankerworm larvae were classed as healthy after 96 hours exposure to Siberian elm foliage treated 26 days before with the high rate of Spinosad, compared to 83% of the cankerworm presented with untreated foliage.

Efficacy of Spinosad for Control of Late Instar Spring Cankerworm

Two rates of Spinosad was evaluated for the control of late instar spring cankerworm on a Siberian elm shelterbelt located near Indian Head, Saskatchewan. Treatments were applied with a hand gun attached to a high pressure sprayer at 700 kPa at a rate of 30 L of solution per 100 m^2. Spinosad was tested at 58.5 and 117.3 mls product per 1000 L of water. Treatments were applied on May 29, when spring cankerworm larvae averaged 14.5 mm in length. Assessment was conducted three, seven and 14 days after treatment. Three days after treatment, spring cankerworm populations were reduced by 100 and 97.7 % with the low and high rates of Spinosad, respectively. Seven days after treatment, spring cankerworm populations within the Spinosad plots were eliminated.

The residual impact of Spinosad was assessed by exposing late instar spring cankerworm larvae to treated and untreated Siberian elm foliage. On June 15 (17 days after application), foliage was removed from plots treated with the low and high rate of Spinosad. Check foliage was obtained from an untreated Siberian elm shelterbelt. Late instar spring cankerworm averaging 20 mm in length were collected from an untreated Siberian elm shelterbelt. Assessment of larvae exposed to treated and untreated foliage was conducted at 24, 48, 72 and 96 hours. Within 48 hours of exposure to Siberian elm foliage treated 17 days before with the low and high rate of Spinosad, only 26% and 1% of cankerworm larvae were classed as healthy, compared to 95% of the cankerworm presented with untreated foliage. By 96 hours of exposure to Siberian elm foliage treated 17 days before with the low and high rate of Spinosad, only 5% and 1% of cankerworm larvae were classed as healthy, compared to 83% of the cankerworm presented with untreated foliage.

Choke Cherry Pest Control Studies - The second 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), prairie tent caterpillar, *Malacosoma californicum lutescens* (Neumoegn & Dyar), 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.

Prairie Tent Caterpillar

The prairie tent caterpillar is a common tent-forming defoliator of choke cherry on the Prairies. Although they do not feed directly on the fruit of choke cherry, infestations may cause reduced plant vigour. The large tents of webbing, feces and cast skins created by these insects also cause an unsightly mass.

In 1998, Decis 5EC, Sevin XLR, Dipel WP, Matador 120EC and a water check were evaluated for control of prairie tent caterpillar at two sites near Indian Head, Saskatchewan. Treatments were applied on May 17 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 out, racemes were fully extended and the flowers were in the early white tip stage. Assessment of the trial was conducted on May 25, eight days after treatment. The Decis, Sevin and Matador provided 100% control within eight days after treatment at both sites. The Dipel WP treatment provided 52 and 84% control at each of the sites.

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 faeces also cause an unsightly mass

In 1998, Decis 5EC, Sevin XLR, Dipel WP, Matador 120EC and a water check were evaluated for control of ugly nest caterpillar at two sites near Indian Head, Saskatchewan. Treatments were applied on June 5 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 initiated. Assessment was conducted at site one on June 12, seven days after treatment and at site two on June 22, 17 days after treatment. At site one, ugly nest caterpillar populations were reduced by 85, 88, 4 and 97% for the Decis, Sevin, Dipel and Matador treatments, respectively. At site two, ugly nest caterpillar populations were reduced by 95, 90, 57 and 100% for the Decis, Sevin, Dipel and Matador treatments, 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 1998, 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 May 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 plants were fully leafed, flowering was complete and fruit development had been initiated. Assessment of the trial was conducted on May 29, 12 hours after treatment and on June 2, five days after treatment. Twelve hours after treatment, fruittree leafroller populations were reduced by 78, 74 and 67% for the Decis, Sevin and Matador treatments. Five days after treatment, all three products had provided 100% control.

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 1998, Decis 5EC, Sevin XLR, Dipel WP, Matador 120EC 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 31 at Indian Head and June 2 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 flowering was complete. Assessment of choke cherry midge populations were conducted on July 3 at the Indian Head and on July 7 at the Glenavon. There was no reduction in choke cherry midge populations when the three insecticide treatments and the water check were compared.

KANSAS FOREST SERVICE
INSECT AND DISEASE CONDITIONS REPORT
1999

INSECTS

Asian longhorned beetle (*Anoplophora glabripennis*)- No living specimen have been found in Kansas; however, USDA reported that a number of wooden pallets were shipped to Kansas from a China source. They found some pallets in Kansas with a number of tunnels and three dead larva. The pallets were burned. A Wichita citizen reported having seen an adult, but the sighting was not confirmed.

Bagworm (*Thyridopteryx ephemeraeformis*)- After three years of exceptionally heavy damage, the bagworm population moderated.

Eastern five-spined IPS (*Ips grandicollis*)- There was a large increase in this pest's population this year in Scotch pine possibly due to the trees being stressed last year by high temperatures and wind.

Gypsy Moth (*Porthetria dispar*)- Several hundred traps were placed at locations across the state each year as a cooperative effort of state and federal agencies. Only occasional moths have been trapped.

Nantucket Pine Tip Moth (*Rhyacionia frustrana)*- Timing of chemical control is complicated by over-lapping generations. We are wondering whether we have two or more species present in the state, but no one has been able to confirm or disprove this question. Some are finding it necessary to spray bi-weekly to gain control. Economically this is our worst insect pest. Even with traps to gauge timing of applications, it appears that growers will have to apply control measures every couple of weeks at least through early summer to get good control of this pest.

Pine Needleminer- The identity of this pest has not been determined. Some entomologists believe that it's a pine needleminer (species not known) and others lean towards believing that the mining is being done by southwestern pine tip moth or perhaps by western pine tip moth. In Christmas tree plantations, late shearing removes much of the damaged foliage. However, some damage has been done after the shearing season and it rendered trees unfit for sale in the current season.

Pine Shoot Beetle (*Tomicul piniperda*)- This pest has not been reported in Kansas. A federal and state quarantine is still in affect to prevent the spread of the insect into Kansas. Kansas Department of Agriculture did not catch any in pheromone traps.

Pine Tortoise Scale (Toumeyella parvicornis)- Populations have increased the past year or two. Heavy population in Butler County. This scale insect is very common in northeast Kansas and probably occurs in much of the state.

Zimmerman Pine Tip Moth (*Dioryctria ponderosae*)- Damage to a few windbreaks in northwest Kansas continues to be reported.

DISEASE

Anthracnose- Damage has been heavy for the past several years. Climatic conditions were ideal for its development this year.

Ash Decline- A decline of ash (both green and white) has been observed in residential areas in Kansas City. The trees (approximately 30 years old) initially show stunted foliage and a branch die back. The cause of the decline is not known. Previous surveys indicate that the phytoplasma disease called ash yellows is present in Kansas, but there is no indication it is associated with this decline. Studies are underway to determine if Verticillium wilt is associated with the decline.

Brown Spot (*Scirrhia ociola*)- Brown spot continued to be a serious threat to Christmas tree plantations. Christmas tree growers continue to remove and destroy many trees destroyed by this disease. This pest is manageable. We encourage growers to (1) increase spacing between trees to enhance air circulation, (2) remove over-size trees, (3) and to use timely applications of appropriate pesticides.

Cercospora Blight (*Cercospera sequoiae*)- This is a severe problem on Rocky Mountain juniper in eastern Kansas. Plantings with poor air circulation are very susceptible to cercospora infection. It is recommended that Rocky Mountain juniper not be planted in the eastern part of the state.

Dothistroma needle blight (*Dothistroma pini*)- Damage is quite common in the eastern half of the state. It resulted in the removal of many trees. A Bosnia seed source for Austrian pine has shown resistance to this disease. Unfortunately, the seed is very difficult to obtain. Most of the Austrian pine offered by the nursery industry is highly susceptible to Dothistroma.

Dutch Elm Disease (*Ceratocystis ulmi*)- Dutch elm disease continues to kill many trees. It is still a serious problem in many Kansas urban areas, the reports of the disease have been on the increase for the past several years.

Juniper Botryodiplodia (*Botryodiplodia spp.*)- This disease appears to have declined in severity in the last few years, but it still restricts the use of Rocky Mountain and other blue type junipers from being be planted in the eastern three-fourths of Kansas.

Oak Wilt (*Ceratocystis fagacaerum*)- Oak wilt continues to be a problem in isolated areas.

Pine Wilt (*Bursaphelenchus xylophilus*)- This pest is a serious problem in the eastern two tiers of counties and in the Wichita area. Its movement west appears to be related to

drought years. It is a serious pest in some urban plantings, windbreaks and Christmas tree plantations.

Pine Tip Blight (*Sphaeropsis elisii*)- This disease is of major concern to pine lovers. It is a major threat to Austrian pine in the eastern two-thirds of the state. Ponderosa pine is as susceptible as Austrian, however, it appears to tolerate it better. The continued use of Austrian pine may depend upon finding a resistant seed source. Ponderosa pine may become the preferred species.

Rusts- Rusts are a serious economic pest in some apple orchards. They often create unsightly plants in the landscape on apples and hawthorns.

Thyronectria Canker (*Thyronectria arstro-americana*)- The appearance of this pest seems to be increasing statewide. It is found on windbreaks and landscape trees. Research is needed to locate resistant seed sources.

Western Gall Rust- This disease has appeared in several locations across Kansas. The Kansas Department of Agriculture destroyed infected pine which were purchased by local nurseries and imported from out of state.

ABIOTIC

Herbicide Damage- Herbicide damage to windbreaks and other tree plantings continues to be a serious problem, especially in the central part of the state. The incidence of this problem is related to the extent of weed growth in crops. Pesticide drift off of target areas in crop weed control programs is a major problem in some areas of Kansas. This practice greatly discourages planting trees for conservation purposes.