*Approved as written 2006

Great Plains Tree Pest Council

Ramkota Hotel
Bismarck, ND

April 13-14, 2005

The meeting was called to order by Chairperson Michael Kangas.

Attendees:

Jim Blodgett (USFS - Rapid City, SD)
Bob Cain (USFS - Lakewood, CO)
Tom Claeys (North Dakota Forest Service)
Gregg DeNitto (USFS - Missoula, MT)
Mark Harrell (Nebraska Forest Service)
Bill Jacobi (Colorado State University)
Michael Kangas (North Dakota Forest Service)
Jennifer Klutsch (Colorado State Univesity)
Justin Knott (North Dakota Department of Ag)
Larry Kotchman (North Dakota Forest Service)
Ronda Koski (Colorado State University)
Carrie Larson (North Dakota Department of Ag)
Melissa Powers (Kansas Forest Service)
Laurie Stepanek (Nebraska Forest Service)
Amanda VanderMeer (Colorado State University)
Jim Walla (North Dakota State University)
Jeff Witcosky (USFS - Lakewood, CO)

Business Items

Dave Leatherman Retirement

Dave Leatherman is retiring from Colorado State University after 31 years of service. A letter/card of appreciation will be sent to Dave thanking him for his support of and active participation in the Great Plains Tree Pest Council.

Communication with NASF

Michael Kangas distributed copies of the letter to Burnell Fischer, President of the National Association of State Foresters, expressing the concern of GPTPC members regarding the inadequate representation of riparian forests and agroforests in the Forest Health Monitoring Program (letter dated April 10, 2004). Larry Kotchman said the NASF wants to hear the concerns of GPTPC, and he encouraged the Council to continue communications with NASF. The Forest Health Committee is undergoing changes in leadership, and future communications will need to be addressed to the appropriate person.

Minutes and Internal Communication

Minutes from the 2004 meeting were distributed; 2003 minutes are forthcoming. Discussion followed regarding maintaining an archive of minutes, letters, and other GPTPC documents. Each state/organization will e-mail copies of their report to Laurie Stepanek for inclusion in the archive. The practicality of maintaining a website was discussed.

Efforts will be made to invite the southern Great Plains states to the next meeting. Bob Cain will contact New Mexico, and Michael Kangas will contact other states.

State and Organization Reports

Mark Harrell and Laurie Stepanek - Nebraska

Scott Josiah became the new state forester in February. Pine wilt continued to kill large numbers of Scotch pine, and seemed to move farther westward in the state. No emerald ash borers were found in a survey conducted last summer, but trees with suspicious symptoms will be inspected this spring by the Nebraska Department of Agriculture. Banded elm bark beetles were detected in new locations in the state. Bur oak continued to decline, most likely caused by changes in site conditions from human activities. Several cases of people being bitten by itch mites (*Pyemotes* sp.) were reported last summer. The mites normally feed on the larval stage of pin oak leaf gall midges.

Gregg DeNitto - USFS, Missoula

Most of the state has been in "severe" to "exceptional" drought for several years. Growing conditions improved in 2004; however, bark beetle infestations continued to increase, including mountain pine beetle and douglas-fir beetle. Banded elm bark beetle was found for the first time in Montana, but surveys and trapping for emerald ash borer were negative.

Jim Walla - North Dakota

Jim summarized current research progress and results with chokecherry X-disease resistance. Results from seed provenance field tests show that trees should be rated for at least 5 years in order to detect potential disease tolerant lines. Select chokecherry germplasm is being clonally propagated, and field plots are being established with this material for disease resistance evaluation. Greenhouse tests provided proof that the phytoplasma inoculation methods being used are successful. Crossing of chokecherry is proving difficult.

Tissue culture of green ash seeds and seedlings, and rooting of these tissues, was successful. If this method works with mature tissues, it may allow the development of a standard rootstock for use in ash yellows tolerance tests.

A cool, wet summer likely contributed to the extensive development of foliar diseases, including a number of new or uncommon diseases: Septoria leafspot of birch, Phyllosticta leafspot of cotoneaster, anthracnose of bur oak, and oak leaf blister. Diplodia caused tip dieback in Colorado blue spruce seedlings. The pathogen is once again classified as *Diplodia* sp. rather than *Sphaeropsis*.

Michael Kangas - North Dakota

The North Dakota Invasive Tree Pest Committee was formed to facilitate interagency coordination of invasive tree pest management. Emerald ash borer is a top concern of the committee.

Aspen forests of central North Dakota are overmature and being replaced by shade tolerant species, particularly beaked hazel. Wildfires burned 800 acres of ponderosa pine in the southwest, and diplodia shoot blight has been on the increase throughout the state, including the ponderosa pine windbreaks of Towner Nursery.

Black ash (particularly the cultivar 'Fallgold') has continued to decline and die over the past five years. Symptoms include necrosis of the phloem and outer xylem, dieback, bark splits, and epicormic sprouts. Causes of the decline may include drought, herbicide, and lack of cold hardiness. The warm temperatures in the winter of 2001 may have played a role in the decline; trees younger than five years are not affected.

Melissa Powers - Kansas

Pine wilt is believed to be present across Kansas and is epidemic in some areas. Bagworm continues to be a problem in windbreaks. Multiple years of drought is likely causing increased pest problems. Melissa distributed reports by Jon Appel and Glenn Salsbury (Kansas Department of Agriculture) on Russian-olive cankers, plant parasitic soil nematodes in windbreaks, and insect trapping.

Jeff Witcosky - USFS, Lakewood

White pine blister rust was found for the first time on bristlecone pine, but incidence appeared to be low. A map was distributed showing the locations of white pine blister rust in the central Rockies.

Studies with Bill Jacobi, Ronda Koski, and Tom Harrington showed that banded elm bark beetle (*Scolytus schevyrewi*) can carry the Dutch elm disease pathogen (more information on BEBB is given under "Invasive Pests" below). Jeff circulated a newspaper article about the death and removal of the Princeton elm, the tree from which lines of DED-resistant trees had been developed.

Bill Jacobi - Colorado State University

Bill provided an update of the national elm trial: Fourteen states will be planting several commercially available elm cultivars. He proposes 5 trees per cultivar and one site per state. Funding of the project is still lacking.

Oak borers infesting nursery stock in 2003 appear to have come from freeze-damaged native Gambel oak. Much less nursery infestation was reported in 2004, although there are many dead Gambel oak in native stands.

Other problems noted in the past year included increased incidence of foliar diseases due to a very wet summer, squirrel damage, spring frost damage, "droopy aspen" (an undetermined fatal problem

occurring in urban areas), fireblight on mountainash, mountain pine beetle, and scorch symptoms on trees in medians. Reports of herbicide damage increased in 2004. Discussion of possible causes for drying and browning of eastern redcedar tops in the Colorado State Forest Nursery included root damage and winter dessication.

Jennifer Klutsch - Colorado State University

Jennifer presented research plans for determining the effect of dwarf mistletoe and mountain pine beetle on fuel complexes in ponderosa pine.

Amanda VanderMeer - Colorado State University

Amanda presented research plans for determining the method of technology transfer that results in the best adoption of forest pathology research by tree health decision-makers.

Jim Blodgett - Region 2 Rapid City

Jim distributed the Rapid City Service Center report to the Council. High populations of bark beetles persisted in 2004 including mountain pine, spruce, Douglas-fir, and western balsam bark beetles. Areas affected include Wyoming, the Black Hills, Halsey Forest, and the Pine Ridge Indian Reservation. Sphaeropsis shoot blight and canker disease continued to be a problem in the Black Hills and the Nebraska National Forests. Wounding by hail has been associated with Sphaeropsis branch dieback and tree mortality.

Aerial surveys of forested areas of Colorado, Nebraska, South Dakota, and Wyoming were done in 2004. Results are available online. An aerial survey of the Missouri River corridor was continued in 2004. Damage from oak wilt, pine wilt, cottonwood dieback, Sphaeropsis, and Dutch elm disease was detected.

Written reports from absent members were distributed.

Risk Mapping

Mike Kangas gave an update of the national risk mapping project. Mike is co-chair for the intermountain region. An updated draft of the national risk map is expected in July 2005. Risk is defined as >25% mortality in 15 years, but different regions interpret this definition in different ways. Models for some forest types do not exist. For the Great Plains, some models that should be incorporated include the aspen defoliator complex, Dutch elm disease, and oak decline. Mike commented that state people developed the map for the eastern part of the country, but federal people were involved in developing the western part with little input from the states.

Road Salt / Invasive Pests

Bill Jacobi provided an update on the magnesium chloride studies, and indicated that the salt can move at least 10 feet off the roads. The salt appears to cause an ionic imbalance in the soil or it is being picked up by the roots, as opposed to settling on foliage. It was noted that chemicals picked up by conifer roots often cause a spiral pattern of damage in the crown.
Ronda Koski presented her research with *Scolytus schevyrewi* (banded elm bark beetle), which showed that this species carries *Ophiostoma novo-ulmi*, the causal agent of Dutch elm disease. The infection of healthy elm trees by fungi carried by this insect is assumed to occur, but further studies would be needed to prove this. Jeff Witcosky distributed the results of a related study by Tom Harrington that also showed the ability of banded elm bark beetle to carry *O. novo-ulmi*. Pheromones in bark beetles are hard to extract and identify; a pheromone for banded elm bark beetle is not yet available. However methyl-buten-ol from Phero Tech appears to preferentially attract BEBB over *S. multistriatus* (European elm bark beetle). It was noted that during the drought, Siberian elms were killed by mass attacks of banded elm bark beetle, and when the drought abated, attacks and mortality declined. The aggressiveness of this beetle may be lower than originally reported. The report of Russian-olive as a host was questioned. Discussion of sanitation and funding of Dutch elm disease prevention followed.

Emerald ash borer detection and prevention were discussed. The possibility of a region-wide survey was suggested. It was noted that CAPS proposals are more likely to be funded if they are region-wide.

Tours

A tour of the National Seed Storage Laboratory was given on April 13, and a tour of the USDA ARS Northern Great Plains Research Laboratory in Mandan was given on April 14.

Elections for 2006 Meeting

Chairperson: Laurie Stepanek
Secretary: Melissa Powers

2006 Meeting Date and Location

The next meeting is tentatively scheduled for April 26-27, 2006, in Lincoln, Nebraska.

Respectfully submitted, Laurie Stepanek, Secretary

Report to the Great Plains Tree Pest Council

April 13-14, 2005
Bismarck, North Dakota

Mark Harrell and Laurie Stepanek
Nebraska Forest Service, University of Nebraska-Lincoln

New State Forester

Dr. Scott Josiah became Nebraska State Forester in February following the retirement of Dr. Gary Hergenrader. Scott was previously the Extension Forester in the School of Natural Resources, University of Nebraska-Lincoln, and had worked closely with Nebraska Forest Service personnel for many years.

Pine wilt

Scotch pines in large numbers were killed again by pine wilt in 2004. The southeastern corner of the state, generally south and east of Lincoln, is still the area where mortality is the greatest. The disease seems to be spreading more quickly to the west than the north. The spread northward might be slowed by the cooler climate. The advancing edge seems now to be around Grand Island to the west and around Fremont to the north.

Emerald ash borer

Ten green ash plantings across Nebraska were surveyed for emerald ash borer activity. Sites were selected based on their close proximity (within two blocks) to a garden center retailer that stocked landscape trees at least during the spring and summer (potential source for imported emerald ash borer). No evidence of emerald ash borer was found in the surveyed trees; however in Ord, NE, a D-shaped exit hole was found in a tree that was not part of the survey. The suspect tree and surrounding trees will be inspected by the Nebraska Department of Agriculture this spring.

Many of the surveyed trees exhibited branch dieback, epicormic sprouts and other decline symptoms associated with emerald ash borer. Lilac borer or carpenterworm activity was apparent at most sites, and mower injury and poor root conditions (too deep, too wet) likely contributed to the decline symptoms as well. White-mottled heart rot was present in older trees.

Banded elm bark beetle

A survey was conducted in August to determine the extent and severity of banded elm bark beetle in Nebraska. Trapping was done in Siberian elm plantings at ten locations across the state using native elm bark beetle lure from Phero Tech Inc. Banded elm bark beetles were collected in Scottsbluff, North Platte, and Curtis; and although total beetle numbers were low, more than 50% of the bark beetles collected at each of these locations were banded elm bark beetle. No banded elm bark beetles were collected in Crawford or Alliance--cities located in counties where banded elm bark beetles were previously found.

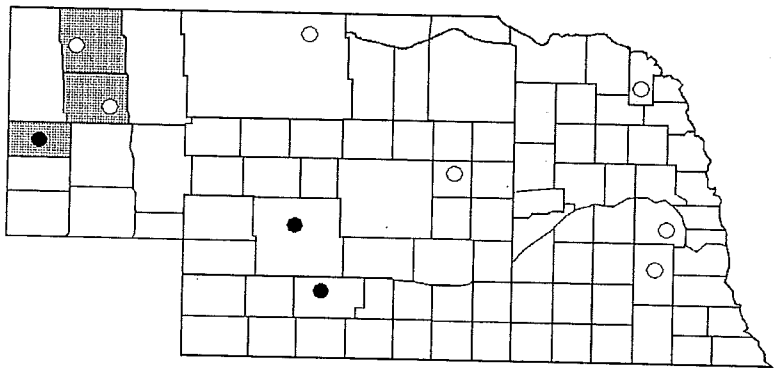

Figure 1. Banded elm bark beetle survey sites in Nebraska, August 2004.
Open circle = No banded elm bark beetles collected.
Closed circle = Banded elm bark beetles collected.
Shaded counties = Banded elm bark beetle previously collected.

Pest Conditions

Pine wilt: Continues to kill many Scotch pines and some Austrian pines annually in southeastern Nebraska. It also appears to be killing large numbers of jack pine at Horning Tree Farm near Plattsmouth --an area where disease pressure is high.

Oak decline: Bur oaks in eastern and north-central Nebraska over the past several years have shown symptoms that have often looked like oak wilt. The symptoms include foliage that dies completely or has large necrotic areas, branch dieback, general decline in the tree, and occasionally some streaking in the wood. It appears the trees are declining from changes in site conditions from human activities combined with oak wilt along the eastern edge of the state and grazing in the north-central area.

White pine decline: White pines at a number of locations in southeastern Nebraska have died suddenly in recent years without any clear indication of the cause. Possibly poor soil conditions for white pine in combination with root diseases are responsible.

Pine tussock moth: An area of native ponderosa pine in the Wildcat Hills southeast of Scottsbluff was heavily defoliated by pine tussock moth in 2004. This appears to have been the third year of the outbreak. Drought stress in addition to the defoliation may cause some of the trees to die.

Cercospora blight of juniper: Continues to severely defoliate and kill junipers and redcedars in windbreaks in central and eastern Nebraska.

Sphaeropsis (Diplodia) blight: Continues to be a serious problem on Austrian and ponderosa pines in windbreaks and landscape plantings in eastern Nebraska.

Bagworm: Populations continue to be high on eastern redcedar in some areas in eastern Nebraska and are causing some tree mortality.

Dioryctria pine moths: *Dioryctria ponderosae* and *D. tumicolella* in central and western Nebraska and *D. zimmermani* in eastern Nebraska continue to damage and kill trees.

04/14/2005

WINDBREAK TREE RESEARCH

Dr. Richard A. Cunningham, Research Geneticist (retired)
USDA - Agricultural Research Service
Northern Great Plains Research Laboratory

Bur oak Provenance Test

- 90 seed sources in Mandan plantation
- Cooperative with Great Plains Tree Improvement Committee
- Study initiated in 1991
- Total number of seed sources - 229
- Seed collections from ND, SD, NE, KS, OK, TX, MN, IA, MO
- Also Saskatchewan and Manitoba, Canada
- Test sites planted in each state sampled
- Acorn collection started fall 1991
- Seedlings were grown by test site cooperators in 1992 & 1993
- Test plantings established in 1993 & 1994
- USDA-NRCS-PMC helping maintain & collect data
- 5th -year collected
- Data will be collected at least 20 years
- Should identify best seed sources for each state

Populus Clonal Tests

- 239 clones of cottonwood and hybrid poplars
- Being selected for disease resistance, cold
- Hardiness and drought tolerance
- Greenhouse and field screening for disease resistance
- Dr. Joe Krupinsky
- Septoria leaf spot and stem cankers
- Cytospora stem cankers
- Field tests established in ND, SD & MN
- Results show native trees survived drought best
- CANAM poplar released in cooperation with PFRA Shelterbelt Centre, Indian Head, Sask.

Juniper Provenance Test

- Cooperative with GP-13 Technical Committee
- Rocky Mountain juniper (*Juniperus scopulorum* Sarg.) and
- Eastern redcedar (*Juniperus virginiana* L.)
- 144 origins from throughout Great Plains
- Test plantings at Mandan and seven other states
- Planted in 1980
- Tenth-year data was collected fall 1989
- Best seed sources for North Dakota are Nebraska and South Dakota
- manuscript published - "Juniper Seed Sources in the Great Plains" Gen. Tech. Rpt. RMRS-GTR 51.

Scots Pine Progeny Test

- Planted in cooperation with U.S. Forest Service,
- Full-sib progeny test
- 30 selected parent trees in provenance test at Denbigh Exp. Station
- Planted in 1979 at Bottineau, ND, Mandan, ND, Watertown, SD and Alliance, NE
- Trees used to evaluate parental selections
- Test will provide gene pool for next generation of selection
- 16th -year data collected fall of 1994
- manuscript in preparation

Lodgepole Pine Provenance Test

- 25 origins - B.C. Alb., MT, WY, CO
- Test planting at Mandan
- Planted 1980
- Fifteenth-year data collected fall 1994
- Low elevation seed sources from Canada performed best

Hackberry Provenance Test

- Cooperative with GP-13 Technical Committee
- Initiated in summer 1982
- Seed collections sampled northern and western portion of native range
- States sampled - ND, SD, MN, NE, IA, MO, KS, OK, WY, AR and Manitoba, Canada
- At least one test site in each state sampled
- 15 outplantings established in 1990
- 5th-year data collected fall, 1994

Siberian Elm Provenance Test

- Seed provided by Dr. H. Mattis, VNIALMI, Volgograd, Russia
- 20 seed sources, single-tree plots and ten replications
- Spacing 10' in the row and 15' between the rows
- Planted in the spring of 1992

Green Ash Provenance Test

- Planted in cooperation with U.S. Forest Service
- 33 origins from MT, WY, ND, SD, NE
- Test plantings in Bottineau, Mandan, Watertown, SD, Alliance, NE
- tenth-year data collected fall 1988 - manuscript in preparation
- North Dakota seed sources survived drought best

Forest Insect and Disease Conditions in Montana – 2004
Summary

Most of Montana, and especially the eastern portions, have been under drought conditions for the past 7 years. However, growing conditions for most bark beetle hosts improved markedly throughout the state in 2004. Despite improved conditions, long-term drought effects are not easily overcome. Too, many bark beetle species are at extremely high levels and will not respond to improved host conditions for a year or so. Those latter two factors combined to result in an increase in infested area by most bark beetle species across the state. While some areas appeared to be less impacted, both aerial and ground-collected data showed still-increasing bark beetle infestations for most species.

Mountain pine beetle-infested areas increased in many locations surveyed; however, in some locations, intensity of beetle-caused mortality is declining due to loss of hosts. In total, considerably more infested acres were recorded in 2004 than in 2003. Much of that total infested area was recorded in whitebark pine stands, where outbreak extent and intensity increased significantly. It is likely that total infested area throughout the state is actually much higher than recorded.

Douglas-fir beetle-infested acres decreased in parts of northwestern Montana, but increased in southwestern and central Montana. Overall, infested acres increased in 2004, and beetle activity remained high in many areas. Grand fir mortality attributable to fir engraver once again increased to all-time high levels; and western balsam bark beetle-killed subalpine fir was mapped on more acres than ever recorded. A relatively warm and dry winter, followed by another unusually dry spring, would likely result in expansion of most bark beetle-infestations through the coming year.

Due to unpredictable and inclement weather conditions during peak survey times for our aerial surveyors this year, actual total acreage with defoliator damage is underestimated. Ground surveys of a majority of areas not flown were moderately to heavily infested with western spruce budworm (WSB) – the most prevalent defoliator in Montana. Acres that were flown and mapped with defoliation are about 187,000 – of which 177,000 was solely western spruce budworm. On-going Douglas-fir tussock moth monitoring efforts conducted by Montana DNRC, correctly forecasted a population surge. Over 5,800 acres were damaged by tussock moth this year in the Flathead Indian Reservation alone. Tree mortality figures caused by tussock moth were not available.

Other defoliators were more localized, with minimal acres of defoliation detected. Pine tussock moth, larch bud moth, and larch sawfly damage were all recorded on a combined total of less than 85 acres across Montana. Defoliation totals of pine needle sheath miner and western false hemlock looper made up less than one thousand acres. No gypsy moths were found in monitoring traps in the state of Montana.

Mortality and growth losses from root disease continue to be high throughout the state. Root disease-caused mortality is more common west of the Continental Divide, causing mortality on

over one million acres. Large areas of root disease can be found east of the Divide but they are found in more discrete patches, rather than ubiquitous throughout an area.

Douglas-fir, western larch, and lodgepole pine are the tree species most severely affected by dwarf mistletoes. Fire greatly influences the distribution of dwarf mistletoes across the landscape. In general, any fire event that kills infected trees will reduce the population of dwarf mistletoe, at least in the short term. Large, complete burns will greatly reduce dwarf mistletoe populations across the landscape and may even eliminate small, localized populations. Small, patchy burns will temporarily reduce the amount of mistletoe, but infected residuals provide a ready source of dwarf mistletoe seeds for infection of the new regeneration.

White pine blister rust continues to be present throughout the range of five-needle pines in the state. Rust severity is highest in the northwestern part of the state where the disease continues to cause extensive mortality in western white pine. The effects of blister rust on whitebark pine ecosystems took longer to appear than in western white pine forest type, but it is apparently proving to be equally devastating. Blister rust has been implicated in dieback and mortality of limber pine in many locations.

Acres of host type infested by bark beetles in Montana, 1999-2004

	1999	2000[1]	2001	2002[2]	2003[1,2]	2004[1]
DFB[3]	38,259	34,401	82,273	60,203	76,035	92,395
ESB	830	213	637	6,232	9,539	311
IPS	214	11	17	498	4,784	16,283
WPB	1,324	368	670	739	834	369
FE	134	159	1,047	8,929	20,647	34,352
WBBB	43,472	28,010	27,622	112,024	76,035	133,780
MPB	77,347	40,758	111,626	261,348	305,911	453,292
Total	161,580	103,920	223,892	450,134	493,785	730,782

[1]Not all areas were flown due to fires or weather conditions.

[2]Includes Yellowstone NP acres in MT, ID and WY.

[3]DFB=Douglas-fir beetle; ESB= Spruce beetle; IPS=Pine engraver; WPB=Western pine beetle; FE=Fir engraver; WBBB=Western balsam bark beetle; MPB=Mountain pine beetle

Forest Health Update – North Dakota

2005 Great Plains Tree Pest Council

Submitted by:
Michael Kangas, Forest Health Specialist
North Dakota Forest Service

Forest Health "News" in North Dakota

North Dakota Invasive Tree Pest Committee

The threat of the Emerald ash borer has generated great concern among community forestry, state forestry, university, state department of agriculture, and federal personnel within North Dakota. Successful prevention, detection, and response to invasive tree pests require proper coordination among these entities. As a result, state, university, and federal agencies within North Dakota recognized the need to facilitate inter-agency coordination in regards to invasive tree pests and have formed the North Dakota Invasive Tree Pest Committee (NDITPC).

The purpose of this committee is to facilitate interagency coordination of activities targeted to prevent, detect, and respond to invasive insects and pathogens that threaten native forests, planted forest resources, and woody horticultural crops in North Dakota. This committee currently consists of scientists, managers, and specialists representing the following agencies.

North Dakota Department of Agriculture (NDDA)
USDA Animal and Plant Health Inspection Service (APHIS)
North Dakota Forest Service (NDFS)
USDA US Forest Service – Region 1 (USFS)
NDSU Plant Diagnostic Lab / National Plant Diagnostic Network (NDSU / NPDN)
North Dakota State University (NDSU)

Intermountain Risk Map Team

The USFS Forest Health Monitoring Program is in the process of developing another National Risk Map. Michael Kangas (ND) is currently the Co-Chair of the Intermountain Risk Map Team. His primary responsibility is to contact state representatives within the Intermountain region and facilitate their involvement. States within the Intermountain Region include: ND, SD, NE, KS, MT, Northern ID, CO, WY, UT, NV, NM, and AZ.

Forest Health Issues and Pest Conditions

Native Forests and Woodlands

Riparian Forests

Bottomland forests consisting of American elm (*Ulmus americana*) and green ash (*Fraxinus pennsylvannica*) in eastern North Dakota and cottonwood (*Populus deltoides*) forests in the west represent a large portion of North Dakota's native forests.

Eastern bottomland forests have been severely impacted by Dutch elm disease. This disease has eliminated many of the once abundant American elms that naturally occurred in these forests and has shifted the species composition toward green ash (*Fraxinus pennsylvannica*) and box elder (*Acer negundo*). This disease is of particular concern because of the American elm's status as the state tree.

The decline of cottonwood forests along the Missouri River can be attributed to the absence of

regeneration and the gradual senescence of mature over story trees. Additionally, encroachment of species such as Russian olive (*Elaeagnus angustifolia*), Buckthorn (*Rhammus* sp.) and brome grass (*Bromus* sp.) has altered these forest communities.

Aspen Health

Aspen forests in north central North Dakota are in a general state of poor health. The current condition is characterized by extensive stem decay caused by *Phellinus tremulae* and large stem mortality caused by Hypoxylon canker (*Hypoxylon mammatum*). In addition, periodic defoliation by the Forest tent caterpillar (*Malacosoma disstria*) contributes to the overall senescence of these forests. An estimated 17,800 acres were defoliated by the forest tent caterpillar in 2003. FTC defoliation was predicted to increase for 2004 based on egg mass surveys however a sudden late spring frost killed many emerging larvae and caused the population to collapse. These pests drive the decline and senescence of the aspen overstory that allows dense thickets of beaked hazel (*Corylus* spp) to become established in the understory.

The damage caused by these forest pests is not an imbalance of nature but rather a natural process in the succession of pioneer species such as aspen. Typically, the overmaturity and decline of aspen leads to replacement by shade tolerant species unless a disturbance resets the forest to aspen. However, unlike aspen forests of the eastern and western North America, shade tolerant conifers are not a component of these forests. As a result, the declining aspen over story is likely to succeed to hazel (*Corylus* sp) shrub land in the absence of disturbance, a common successional scenario of aspen forests of the prairie ecosystem.

Additionally, a substantial acreage of the forest has been converted to pasture on privately owned lands. This conversion has been driven in part by the lack of wood utilization opportunities, the low value of the aspen (in part due to decay and market value), and insufficient information regarding the pathological rotation age.

Ponderosa Pine – Deep Creek Fire

Wildfires burned through portions of the native Ponderosa pine stands of southwestern North Dakota (Slope County) in September of 2004. Approximately 800 acres of privately-owned pine were damaged by the fire. Mortality may reach 100% in areas where the fire intensity was high and caused extensive needle scorching and stem charring. Where the fire intensity was intermediate, estimations of tree mortality are subjective at this time. The dense stocking and general low vigor of these stands suggests that delayed tree mortality may be significant. Additionally, the standing dead trees may allow the *Ips pini* population to reach a threshold that causes additional mortality for the following 2 years. Surveys are scheduled for 2005 to assess mortality in areas where the flames produced intermediate fire effects. Salvage logging is planned for areas severely burned by the fire.

Rural Plantings

Yellow-headed spruce sawfly - *Pikonema alaskensis*

All species of spruce (*Picea* sp.) planted in North Dakota are susceptible to the yellow-headed spruce sawfly. Outbreaks of this insect occur periodically on 5 to 7 year intervals. Small and medium-sized spruce trees (trees less than 20 years old) can be completely defoliated and killed by this insect. This insect is particularly troublesome in rural plantings (field windbreaks, living snow fences, etc..) where open growing conditions provide favorable egg-laying sites. Sawfly damage has been most significant in the north-central and northeast parts of the state over the past two years. Damage was most severe in Benson and Ramsey counties for 2004.

Diplodia Shoot blight – *Diplodia pinea*

Diplodia shoot blight is prevalent in ponderosa pine windbreaks of Towner State Nursery. Towner State Nursery annually produces 200,000 conservation stock ponderosa pine seedlings and there is concern that this disease could reduce the supply of pine seedlings the nursery will provide in the future.

A plan has been implemented to prevent damage to nursery crops by monitoring the disease, systematically removing ponderosa pine tree rows and replacing with non-host species, applying preventive fungicides to nursery crops, and relocating ponderosa pine nursery crops to fields with minimum exposure to inoculum sources. Forest Health Protection Funds were used to remove windbreaks in 2002, 2003, and 2004 and will continue into the future. This will reduce the potential for nursery stock losses, possible spread of the disease, and infection of pine provenance tests on adjacent federal lands.

Additionally, asymptomatic ponderosa pine seedlings were sent to Glen Stanosz (University of Wisconsin – Madison) for testing of latent infections. Only 2 out of 200 seedlings tested positive for *D. pinea.*

This disease appears to be on the rise throughout the state. Shoot blight and twig canker has been observed in many ponderosa pine windbreaks, provenance plantings, and pine seed orchards.

Community Forestry

Black Ash Decline

Mortality and decline of Black ash and the cultivated variety 'Fallgold" has been observed in Eastern North Dakota over the past 5 years. No consensus has been reached in regards to the factors contributing to the decline. Some damaging agents implicated as causes of the decline include: drought, herbicide, and lack of cold hardiness.

A street tree survey was conducted in Fargo to assess the extent of decline and identify potential causes of mortality. Over 50% of all trees surveyed expressed dieback symptoms (25 to 100% crown dieback). Upon bark removal, necrosis of the phloem and outer xylem was found in association with the dieback of sampled trees. The appearance of the necrosis is similar to those reported for some *Phytophthora* spp however the causal agent of this necrosis is unknown at this point. Until the causal agent of the necrosis is identified, it cannot be said whether it is an inciting factor in the decline complex or a contributing factor resulting from predisposing stresses. Samples will be collected this spring for isolation on selective media.

The decline of this species has been observed in several communities of eastern North Dakota but it is not known whether the decline has occurred in other parts of North Dakota (or in other states).

Dutch Elm Disease - *Ophiostoma ulmi*

Dutch Elm Disease has been detected in nearly all native woodlands, rural plantings, and communities throughout the state. Dutch elm disease has caused substantial damage in the riparian forests of the Red, Sheyenne, and James River Valleys. Recently, wooded draws of Western North Dakota have been impacted by this pathogen.

Dutch elm disease has been very damaging to community forests. In particular, small rural communities of western North Dakota are now feeling the impacts of this disease. Many communities have reported above average disease levels for 2004.

Larger cities conduct annual street surveys and implement pruning and sanitation to reduce the impacts of this disease. Unfortunately, smaller communities that do not posses the means to administer a forestry program continue to experience extensive losses from Dutch elm disease.

Ice Storm

A late spring ice storm damaged community and forest trees in the northeastern part of the state. Many small communities within Cavalier and Pembina counties reported boulevard trees that were windthrown or had large branches ripped off. In addition, many rural plantings and trees adjacent to forest edges were damaged.

Invasive Pest Surveys

Gypsy Moth - *Lymantria dispar*

The North Dakota Forest Service, North Dakota Department of Agriculture, and APHIS conduct statewide gypsy moth detection trapping surveys annually. There were 363 gypsy moth detection traps placed in 2004. These traps were distributed throughout the state to encompass major forest types and risk of gypsy moth introductions. Two gypsy moths were detected in 2004. One was found near Jamestown (Stutsman County) and the other was caught at the Grand Forks Air Force base (Grand Forks County). Trapping efforts will continue in the future and include new areas of potential risk.

Banded Elm Bark Beetle - *Scolytus schevyrewi*

A preliminary trapping effort was begun for the banded elm bark beetle in 2004. Lindgren traps placed in Fargo and Bismarck did not yield any positive detections of the beetle. More thorough surveys will be conducted in 2005.

Phytophthora Blight (AKA Sudden Oak Death) – *P. ramorum*

The North Dakota Department of Agriculture, APHIS, and NDSU Plant Diagnostic Lab coordinated and conducted a survey for *P. ramorum* in 2004 as part of the National Sudden Oak Death Detection Survey. Surveys were conducted in 17 North Dakota nurseries that listed the California-based nursery (Monrovia) as a vendor. From these nurseries, 135 samples were collected and screened for *P. ramorum* with molecular laboratory tests. None were positive for the pathogen.

Emerald Ash Borer – *Agrilus planipennis*

The North Dakota Department of Agriculture, Fargo City Forestry Department, and North Dakota Forest Service assessed the use of the EAB sentinel trap tree detection method in 2004. Ash trees were selected in 4 locations to determine the time and effort involved with using the detection method. The effectiveness of this method for detection appears questionable however the trap trees may be useful for identifying native wood boring pests of ash.

2004 Reports

Forest Health Highlights
Kangas, Michael. 2004. North Dakota Forest Health Highlights, 2004. St. Paul, MN. U.S. Department of Agriculture, Forest Service, St. Paul Field Office.
Available at: www.na.fs.fed.us/spfo/fhm/fhh/fhmusamap.htm

North Central FIA Report
Haugen, David; Brand, Gary; Rymal, Travis; Kangas Michael. 2005. North Dakota's Forest Resources in 2003. Resour Bull. NC-248. St. Paul, MN. U.S. Department of Agriculture, Forest Service, North Central Research Station. 21 p.

Spruce Disease Fact Sheet
Kangas, Michael. 2004. Spruce Diseases in North Dakota. NDSU Extension Service, Fargo, ND. PP-1276.

Kansas Forest Pest Conditions – Great Plains Forest Pest Council - April, 2005

Primary concerns:

Pine wilt/pinewood nematode – Scots pine, Austrian pine in windbreaks. Widespread, epidemic proportions in some areas, problem increased during recent years of drought.

Maintenance, the removal and destruction of dead/dying material is imperative in control efforts.

Bagworm – Eastern redcedar, rocky mountain juniper primarily noted in windbreaks. Infestations continue to be widespread across the state, with varying levels of damage in the different regions.

Presence of this pest has been noted through a continuous, multi-county study since 1954.

Pine tip moths – Austrian, Ponderosa, Scotch & Virginia pines. Populations nearly eradicated in northwest Kansas during 2002. New infestation in southeast Kansas during the same year that will be nearly impossible to eradicate due to steady populations in both Missouri and Oklahoma.

Christmas tree grower concerns:

European pine sawfly – Scotch pine; frequent reports of damage

Pine needle scale – Austrian, Ponderosa, Scotch pines; increasing amounts of damage from light to heavy in Christmas tree plantations.

Brown spot needle blight – Scotch pine; growers continue to remove and destroy many heavily infected trees due to this disease.

Non-native concerns and potential threats:

Dutch elm disease – American & Siberian elms; still a concern along riparian corridors, where elms are prevalent.

Gypsy moth – two moths were trapped during 2004, one near Kansas City, the other on the west side of Topeka. Trapping efforts will continue.

Emerald Ash Borer – no signs of this insect have been observed, but ash is a large component of the riparian corridors, and an infestation would be devastating.

Sudden Oak Death – hosts include multiple oak species, as well as rhododendron, bay laurel, azalea, camellia and other herbaceous shrubs. A survey will be conducted this year in areas where infected plants may have been purchased from California before the quarantine was in place.

Other points of interest in the past year were the canker complex of Russian olive (primarily Western KS), the soil nematode complex in windbreaks, and some new trapping methods for collecting bark and longhorned beetles, as well as flatheaded borers.

Special Issues

Listed below are damaging forest insects, diseases, and abiotic agents of concern in Kansas.

Gypsy moth - *Lymantria dispar* (non-native)
This is monitored every year in recreational areas and near large cities. There were no gypsy moth issues in Kansas in 2002.

Bagworm - *Oiketicus spp., Thyridopteryx spp.* - Hosts: Eastern redcedar, Rocky mountain juniper Populations of bagworm fluctuated around Kansas. The north-central part of Kansas had heavy damage due to this insect while eastern areas had low population levels.

Cankerworms - *Alsophila pometaria, Paleacrita vernata* - Hosts: Bur oak, Elm, Green ash, Hackberry, Honeylocust - Average damage occurred in Kansas this year.

European pine sawfly - *Neodiprion sertifer* - Host: Scotch pine Reports of damage were quite common from Christmas tree growers in north central Kansas.

Fall webworm - *Hyphantria cunea* - Hosts: Cottonwood, Walnut, Hickory, Mulberry This year saw moderate activity of this insect in Kansas.

Pine needle scale - *Chionaspis pinifolia* - Hosts: Austrian pine, ponderosa pine, Scotch pine Damage increased to an overall moderate level ranging from light to heavy in Christmas Tree Plantations in Kansas.

Ash/lilac borer - *Podosesia syringae* - Host: Green ash These boring pests have caused lodging of green ash in shelterbelt plantings on private lands. Sporadic reports from Kansas were average. This very common pest limits the use of green ash in windbreaks to very fertile, moist sites.

Pine tip moths - *Rhyacionia bushnelli, R. neomexicana, Dioryctria albovitella, D. ponderosae, D. zimmermani, D. fumicolella* - Hosts: Austrian pine, Ponderosa pine, Scotch pine, Virginia pine Populations of these branch-destroying insects were almost eradicated in North West Kansas. However, a new infestation occurred in South East Kansas in 2002. Fumicolella was the species identified in North West Kansas.

Southern pine engraver - *Ips grandicollis* - Host: Scotch pine Only a small population occurred in 2002 in Kansas.

Oak wilt - *Ceratocystis fagacaerum* - Hosts: Bur oak, red oak Oak wilt continues to be a problem in forests along the eastern edge of the state. Only a few cases of oak wilt were reported in northeast Kansas. The damages occurred in woodlots and housing developments established in previous oak stands.

Dutch elm disease - *Ceratocystis ulmi (Non-native)* - Hosts: American Elm, Siberian Elm Dutch elm disease can be a significant problem in riparian areas and cities throughout Kansas. The disease was moderate in level during 2002 in Kansas.

Russian Olive canker - *Phomopsis arnoldiae, Tubercularia spp. Lasiodiplodia spp.* - Host: Russian olive This disease continues to be a very serious problem in the eastern half of Kansas; Russian Olive is no longer recommended for use in conservation plantings.

Pine wilt and Pinewood nematode - *Bursaphelenchus zylophilus* - Hosts: Scotch pine, Austrian pine Kansas has experienced epidemic proportions of damage due to this disease the last 3-5 years. Heavy mortality linked to this nematode was found frequently throughout Kansas, mostly affecting Scotch Pine. The drought exacerbated the problem and it is now moving into Austrian pines in South East Kansas.

Brown spot needle blight -*Scirrhia acicola, Mycosphaerella dearnessii* - Host: Scotch pine Christmas tree growers in Kansas continue to remove and destroy many heavily infected trees due to this disease. In 2002, the disease appeared to be at moderate levels.

Dothistroma needle blight - *Dothistroma* spp., *Mycosphaerella pini* - Hosts: Austrian and ponderosa pines.
Damage was reported as light to moderate in the eastern half of Kansas and timely pesticide applications are used to control the disease.

Sphaeropsis (Diplodia) blight - *Sphaeropsis sapinea* - Hosts: Austrian and ponderosa pines Levels for this disease were moderate in Kansas in 2002.

Abiotic Damages

Drought - Severe drought conditions throughout much of the state continue to weaken trees and make them more susceptible to attack of insect and disease agents.

Chemical Damages - Herbicide damage to windbreaks and other tree plantings continues to be a problem in the central portion of Kansas. Pesticide drift from crop weed control programs causes noticeable decline to agro-forestry tree plantings in parts of Kansas.

Kansas Forest Health Monitoring Project
Preliminary Report: Pathological problems in windbreaks in 2004
Jon A. Appel
Kansas Department of Agriculture
October 22, 2004

The 2004 survey of windbreaks was conducted at thirty seven sites primarily in central and western Kansas. Of those sites, eight were rated as being excellent for windbreak effectiveness, nineteen as good, and nine as fair. Windbreaks with the exception of a couple were estimated to be older than twenty one years of age and nineteen exceeding forty years of age.

Survey of 2004 was directed to two major areas of investigation. The first one was the complex of cankers on Russian olive. In the 2003 survey of windbreaks and park land, Russian olive was found to have considerable dieback and cankers. *Tubercularia* canker was identified from a couple of sites but enough was known from the literature to suspect other organisms as also being present. The second area of investigation was directed to plant parasitic nematodes in the soil. Windbreaks are stable non-disturbed soil environments which have had limited scientific investigation into the diversity and distribution of nematode species and the association with plant health.

CANKER COMPLEX of RUSSIAN OLIVE (*Elaeagnus angustifolia*)

Thirty two samples from windbreaks, wild stands, and parks were collected in the spring of 2004 for investigation and found to be associated with five different causal organisms. Of these, nine samples were found to have *Tubercularia* canker. The samples originated from south central counties of Kingman, Sedgwick (2), and Kiowa, from west central Kansas county of Logan, and from the east central and northeast counties of Geary, Douglas (2), and Jackson. *Botryosphaeria* canker was the second most prevalent canker disease with reports in central Kansas in McPherson, south central counties of Barber and Pawnee, and west central and northwest counties of Trego, Graham, Logan (2), and Sherman. *Cytospora/Valsa* canker was found in Sedgwick County in south central Kansas and Graham County (2) in northwest Kansas. *Phomopsis* canker was identified from one site which was in the central Kansas county of McPherson. *Botryodiplodea* canker was found at one site which was located in south central county of Harper. Physical or weather dieback without any causal organism, were found in nine samples from regions across the state.

SOIL NEMATODE COMPLEX of WINDBREAKS

Seventy six samples were collected from about twenty three locations across central and western Kansas with the exception of a couple sites in northeast Kansas. Eighteen of these samples have been collected recently and have not been analyzed. Nine different genus of plant parasitic nematodes were identified (Tim Todd, KSU nematologist) in the samples. Samples were collected from primarily from eastern red cedar, pines ponderosa or Austrian, hackberry, Russian olive, green ash, and Siberian elm. Other species samples were collected from were black locust, honey locust, mulberry, pecan, and Osage orange.

Dagger (*Xiphenema*) nematodes are recognized plant pathogens of woody plants and were the main target of the investigation. Of the fifty eight samples processed, twenty two samples had dagger nematodes from a few to 60 nemas per 100 cc of soil. These levels were not believed to be high and similar to agricultural systems where disturbance of soil negatively affects populations (Tim Todd). Woody plants that nematodes were associated with included eastern red cedar, pines, hackberry, Russian olive, green ash, Osage orange, black locust, and Kentucky coffee tree. Distribution of the dagger nematode was found to be all regions of the state where samples were collected.

Possibly, the second most important nematode genera associated with windbreak plantings were the lesion (*Pratylenchus*) nematodes. These pathogens are endo-root parasites primarily. Damage generally from endo-nematodes is greater than external ecto-feeding parasitic nematodes. Seventeen samples contained lesion nematodes. Like dagger nematodes, lesion nematodes were associated with all the primary woody species sampled and from nearly all the geographic regions sampled. In some cases, moderate amounts of nematode species of 80 to 200 individuals in the soil were found. Since the counts only represent soil and not root counts, the nematode population was probably substantially higher than what was recorded. The four counts of moderate amounts came from northern counties of Sherman, Sheridan, Thomas, and Smith and three of the four from eastern red cedar.

Other genera of nematodes included spiral (*Helicotylenchus*), Lance (*Hoplolaimus*), root-knot (*Meloidogyne*), ring (*Criconemoides*), pin (*Paratylenchus*), stunt (*Tylenchorhynchus*), and stubby root (*Trichodorus*). The spiral and pin nematodes were found in over half the samples. Pin nematodes although not believed to be of any serious consequence to woody plant health were found in the highest numbers sometimes exceeding several hundred per 100 cc of soil. Root knot nematodes are generally considered important pathogens. One sample from an eastern red cedar planting in Sedgwick County was identified with this nematode.

Investigation of the data has just recently begun with the entry of information into a database. This database information will then be used to look at any possible effects on plant health by nematode populations, geographic distribution of nematode species, site and host diversification, and other possible relationships.

SUMMARY

In general, information has been attained concerning two disease complexes which were present in Kansas windbreaks. Further investigation this year will be continued with collection of fall samples of cankers of Russian olive and nematode data analysis. Some conclusions will then be made regarding the nature of these complexes after this information is finalized. Recently, the Kansas Department of Agriculture has added web/microscopes to the laboratory and these should prove useful in identifying samples and taking images of causal organisms.

Kansas Forest Health Monitoring Project
Summary of Windbreak Survey for Insects in 2004
Glenn A. Salsbury
Survey Entomologist
Kansas Department of Agriculture
October 22, 2004

This is the second year of trapping for exotic and endemic insect pests in windbreaks and forested areas of the state. Counties trapped include the following: Geary, Shawnee, Wabaunsee, Johnson, Jackson, Kingman, Sedgwick, Morton, Clark, Comanche, Barber, Pawnee, Rooks, Thomas, Graham, Crawford, Bourbon, Anderson, Miami, Franklin, Douglas, Leavenworth, Wyandotte, Jefferson, Riley and Linn. Six additional bark beetles were found although none of any economic importance. The five new state records are: *Pityophthorus scriptor*, *Hylesinus fasciatus*, *Scolytus fagi*, *Hylocurcus langstoni* and *Hypothenemus* sp. The most important thing to come out of this years trapping was finding a trap that works better than other traps used in the past. The new trap is a canopy intercept trap also known as a canopy trap. This trap is hoisted into the tree canopy and worked extremely well for collecting bark beetles, longhorned beetles and flatheaded borers. The main drawback is that the bottom collecting bottle is prone to being plugged by falling leaves requiring the trap to be checked more often. This trap is easy to set up and maintain. Also used this year was the standard malaise trap. This trap was useless for trapping most of the woodboring beetles. It did work very well at trapping flies and parasitic wasps and was very effective at collecting sawflies. Lindgren trapping used about 40 traps and was useful for trapping bark beetles when used in conjunction with a lure. All of the flatheaded borers have been sent off for identification. No new longhorn beetles of importance were collected.

Early in the spring Jon Appel brought to my attention the large number of cedars that were dying at Wilson Reservoir. It was first thought the problem might be from a bark beetle/fungus association. Subsequent trapping revealed the pest to be a flatheaded borer, *Chrysobothris texanus*. Only those cedars planted in windbreaks were affected. It is believed that because the trees are planted close together coupled with drought conditions made them more susceptible to attack. Large cedars at Fort Dodge were also being killed by this same insect.

Eradication efforts are continuing on the pine pitch moth in Northwest Kansas. There was a minor setback this year when the pheromone lure that had been developed failed to work. Fortunately there was some lure left from last year that did work which allowed us to monitor the moth flight and time the spray application. Since this same lure worked last year and the only thing that was changed was the medium used as a carrier it is thought that there may have been a reaction between the lure and the rubber. Last year the lure was placed on silicone discs. There is also an infestation of pine pitch moths in Southeast Kansas. Some of the old working lure was placed there and failed to catch any moths. This seems strange since the moths from both locations have been identified as the same species. Either the identifications are wrong or there are other unidentified factors at work. Eradication of the Southeastern population will be impossible since the moth occurs just across the border in both Missouri and Oklahoma.

Two gypsy moths were caught this year. One in a nursery in Johnson County and one in a residential neighborhood on the west side of town in Topeka.

The trapping effort was greatly enhanced this year with the addition of two temporary trappers. Many more traps were put out this year than in previous years. Efforts by these trappers were concentrated on gypsy moth, Japanese beetle, and bark beetles. Rest stops, reservoirs and random trapping in cities were the main focus of this years trapping effort by the temporary trappers.

The final report will include an identification manual for bark beetles known to occur in Kansas.

North Dakota - Woody Plant Disease Research - Jim Walla, NDSU Plant Pathology
Report for Great Plains Tree Pest Council meeting, Bismarck, ND, April 13-14, 2005

1.Chokecherry X-disease (Primary current research) (cooperators include Dai, Knudson):

Situation: Chokecherry is our most important native shrub used for conservation plantings. X-disease is the limiting factor in the use of chokecherry in the northern Great Plains; no controls are available. Disease tolerance/resistance would be the best control. Regional chokecherry seed source provenance plantings established in 1983 by the USDA Plant Materials Center in ND and SD are being examined for tolerance to X-disease; more than 20 promising plants have been identified in the ND planting. Research to confirm the existence of tolerance in those select plants is underway, and we are searching for more select plants. Genetics of the pathosystem is also being explored for possible use in developing (vs. selecting) disease resistant lines that could provide a superior disease management option.

RESULTS:

A) Characterization of disease development and selection of additional disease tolerance sources:

1) North Dakota seed provenance field site: A disease rating, using a scale of 0 (dead) to 5 (no disease symptoms, very good plant vigor), was assigned to each of the original 3,236 plants during evaluations from 1993 to 2004. Plants with at least moderate disease severity in 1993 or 1994 were considered to be infected based on symptoms alone, and the rest were confirmed by serology to contain X-disease phytoplasmas in 1994. Plants with a rating ≥3.5 (slight disease severity, good plant vigor) in any given year were considered to be potentially disease tolerant. Of the 1,866 live plants present in 1993, 219 received a rating of ≥3.5 in at least one year. Most of these plants did not maintain their high rating through 2004, but 35 maintained a rating ≥3.5 for multiple years and appear most likely to have useful disease tolerance. Two plants had no symptoms during the study, five had no symptoms for several years, and some maintained their initial rating of 3.5 or 4 during all or most of the study. Disease severity decreased over time in 6 plants. In selecting potentially X-disease tolerant plants, observations made for at least 5 years were most informative. Plants thus selected are under evaluation via challenge inoculations and will be further examined at genetic and molecular levels.

Only 76 (2%) of the original 3,236 plants remained alive in 2004, compared to 25% in 2000 and 58% in 1993 when the study began (X-disease was already epidemic in the planting in 1993). The 2004 observations indicated that the majority of the plants still alive were those that were in relatively good condition before a severe hail storm in 2001 damaged them. The implication is that X-disease tolerance can result in improved performance when exposed to other stresses (more vigorous plants survive stress better; we knew that, but here is an example).

2) South Dakota seed provenance field site: A third rating was made of all plants in the South Dakota planting. Survival of all plants and survival of possibly tolerant plants were substantially lower in 2004 than in 2003. Survival of the 2828 plants in the original 1983 planting was 19% compared to 25% in 2003 and 41% in 2000. The number of plants without symptoms (rating of 5) fell to 84 (3%) in 2004, down from 116 (4.1%) in 2003 and 183 (6.5%) in 2000, but all were about 16% of the remaining live plants in the respective years. Plants with X-disease symptoms but in very good condition (rating of 4) fell to 120 (4.2%) in 2004, down from 195 (6.9%) in 2003 and 309 (10.9%) in 2000. This was about 23% of the remaining live plants in 2004 compared to about 27% in the other years. **The percentage of possibly tolerant plants dropped at or faster than the rate of overall mortality.** The question is if those possibly tolerant plants that are being lost were indeed tolerant, but the tolerance only slows the onset of X-disease effects, or if they were infected later than other plants that developed severe X-disease symptoms earlier. The above data could indicate either possibility. However, there were 20 clones in 2004 with greater than 66% of the living plants that were select, compared to 23 in 2003 and 22 in 2000. Select plants comprised 100% of the surviving plants in six clones in 2004 compared to five in 2003 and two in 2000. As in 2003, these

comparisons favor the conclusion that the possibly tolerant plants do have an advantage over the other germplasm.

B) Development and characterization of select clones (ca. 85% of my time in 2004):

1) Select chokecherry germplasm is being clonally propagated for X-disease tolerance evaluation. Plants are propagated by tissue culture and then grown in the greenhouse. Propagation of chokecherry clones in tissue culture continued to go well after problems of mid-2003 were solved. However, one highly tolerant clone that was lost from tissue culture will need to be re-established in 2005, and nine others of interest were identified during data summarization. After tissue culture propagation, explants are rooted and grown in the greenhouse. Three treatments (two phytoplasma sources and one non-inoculated control) are applied when the stem is large enough (≥4 mm diameter).

2) Of 72 plots (each consisting of 3 plants of a clone) planted in a Bismarck field trial in 2003, 41 (57%) had some dead plants in 2004, making them useless. 17 of the 41 lost plots were replaced and 14 new plots were planted in 2004. All of these 62 plots were intact at the end of 2004, making 34% of the 180 plots needed.

3) Clones from three seedlings originating from resistant or susceptible trees were inoculated in the greenhouse in 2004, using the same experimental design and methods as the Bismarck field trial. Survival of the inoculum scions was excellent compared to the field trial.

4) Inoculations of chokecherry seedlings in the greenhouse in 2003 using inoculum from Bismarck and Fargo (the same sources as the field trials) resulted in the first confirmation that X-disease phytoplasmas could be transmitted to chokecherry by the methods being used. Inoculations were in July, 2003, and symptoms consisting of yellow deformed leaves were present early in the 2004 growing season. At the end of the 2004 growing season, growth of the symptomatic inoculated plants was less than half that of asymptomatic inoculated plants. Only the Fargo inoculum resulted in symptoms in 2004.

C) Bulk segregant analysis to identify X-disease resistance genes:

A new research project was started with Dr. Dai, NDSU Plant Sciences, to obtain segregating populations of chokecherry germplasm for bulk segregant analysis that could be used to identify X-disease resistance genes. Male and female parents previously rated as resistant or susceptible were selected for a set of crosses in 2004. Crosses were made at or near the North Dakota chokecherry germplasm planting. They essentially failed. The reason for the losses by the end of the season are not known. The bottom line is that a higher number of crosses will need to be made to obtain the needed seeds, or embryo rescue will have to be done with the immature fruit. Male and female parents at both the North Dakota and South Dakota plantings were selected and will be used for "massive" 2005 crosses.

Future: 1) Work will continue toward implementing tests to confirm that the select plants are tolerant and appropriate for release as "disease tolerant" germplasm. Those are a) field and greenhouse evaluation of clonal materials for tolerance and other traits, and b) evaluation of heritability of tolerance in open-pollinated progeny. 2) Controlled crosses will be made to obtain segregating populations for X-disease resistance for bulk segregant analysis to identify resistance genes. 3) Ratings at the Fort Sully planting will be repeated in 2005 to provide further data for selection of male and female plants for controlled crosses for production of segregating populations to be used to identify X-disease resistance genes. 4) Previously inoculated plants will be evaluated and new trials started to find a method to characterize aggressiveness of X-disease phytoplasma isolates.

Ash yellows (AshY) of green ash (cooperators include Dai):

Situation: Green ash is the most important tree species in North Dakota. AshY phytoplasmas are widespread across the Great Plains and adjacent Rocky Mountains, occurring in 50% of randomly sampled trees and 96% of systematically sampled sites. Because of the serious potential that this disease has to damage our forestry resources, research is needed to characterize incidence, current or potential impact, and management. 19 ash cultivars that are recommended for use in this region are being propagated to evaluate their relative AshY tolerance. Highly aggressive and moderately aggressive isolates have been identified for use as standards in evaluating AshY tolerance of green ash. Identification of moderately and highly tolerant germplasm for use as standard rootstocks in AshY tolerance evaluations is underway. Clonal propagation of ash to produce these materials was the only active project involving ash yellows in 2004.

RESULTS:

1) Propagation of ash cultivars on nurse roots yielded poor graft success in 2004 and substantial numbers of previously grafted plants died during the 2004 season, leaving 10 of the 19 cultivars with less plants than needed for ash yellows tolerance trials.
2) In 2004, various media were evaluated for green ash tissue culture from seeds and seedlings. Success was excellent, and rooting of the tissues from culture was also excellent. The next challenge is to get obtain mature tissues into culture so cultivars can be propagated.

Impacts: The tissue culture research was the first to obtain explant establishment into tissue culture from green ash shoots. If this accomplishment can be extended to establishment from mature tissues, it will allow tissue culture propagation of specific genotypes of green ash for research and for the nursery trade. Production of ash cultivars on their own roots would have dramatic effects on disease resistance, plant quality, plant hardiness, and production time. Successful tissue culture of green ash will also allow genetic engineering research to commence.

Future: 1) Additional nurse-root grafting will be done, and scions on nurse roots from 2001-2004 will continue to be grown out to attempt to induce rooting from the scions. 2) Determine if shoots from mature ash trees can be established in tissue culture using the media used for shoots from immature plants. 3) When host rootstock standards are available, the 19 ash cultivars will be top-grafted, inoculated, and planted in field trials. 4) Evaluation of seed source tolerance of green ash seedlings produced at Lincoln-Oakes Nursery for rootstocks will be developed to identify select sources.

"New" diseases and disease outbreaks

Foliage diseases that had not been common in ND in the past were observed in 2004, probably due to a relatively cold summer with several periods when foliage did not dry for at least three days. Septoria leafspot of birch, Phyllosticta leafspot of Cotoneaster, anthracnose of bur oak, and oak leaf blister (*Taphrina*) of bur oak were observed causing substantial defoliation. Apple scab was also common, but that is not new. Under the given conditions, ash anthracnose seemed likely to be severe, but did not cause substantial defoliation. Septoria leafspot of birch and Phyllosticta leafspot of Cotoneaster have not been reported in North Dakota. The Septoria on birch was observed causing leaf discoloration and defoliation at one location in Fargo. The Phyllosticta was observed causing leaf discoloration and defoliation at several locations in the Fargo area in both North Dakota and Minnesota. Diseased leaf samples were preserved for future reference.

Diplodia was isolated from Colorado blue spruce seedlings with tip dieback. Apparently, about 10% of the seedlings in some nursery beds were affected. Diplodia on spruce has been reported occasionally in other regions. The seedlings originating from Towner Nursery in North Dakota had been damaged by hail, but they indicated that a lower percentage of seedlings have similar dieback in most years.

New projects beginning in 2005:

1) Entomosporium leafspot of Juneberry (Amelanchier): Fungicides will be evaluated in 2005 and 2006 for efficacy for management of Entomosporium leafspot of juneberry.

2) National elm trials: Two plots of the National Elm Trial will be established in North Dakota, one in Bismarck and one in Fargo.

Presentations and Publications published or accepted since last report

Dai, W., Johnson, C., Jacques, V., and Walla, J.A. 2004. *Agrobacterium*-mediated transformation of chokecherry (*Prunus virginiana* L.). (Abstr.) HortScience 39:755.

Dai, W., Walla, J.A., and Zeleznik, J.D. 2004. A genetic engineering approach to solve chlorosis problems of trees. Poster presentation, 2004 Consortium for Plant Biotechnology Research annual meeting.

Paradis, F., Joly, D., Walla, J.A., Hamelin, R.A., 2004. Speciation in two pine rusts. (Abstr.) Poster presentation, Proc., Society of American Foresters 2004 National Convention.

Song, Xiaodong, Walla, J.A., Xu G.-J., et al. 2004. Comparative studies on the morphology of *Sphaeropsis sapinea* spores and mycelia. Forest Pest and Disease July, 2004:5-9. (In Chinese, English abstract and data)

Walla, J.A., Cheng, Z.-M., Guo, Y., Knudson, M.J., and Dai, W. 2005. Monitoring for X-disease tolerance in chokecherry (*Prunus virginiana*). (Abstr.) Phytopathology 95: (In Press).

Walla, J.A., and Dai, W. 2005. Developing X-disease tolerance in chokecherry. Prairie Fruit Journal (In Press).

Zeleznik, J.D., Jackson, M.B., Glogoza, P.A., Knodel, J.J., Ruby, C.L., and Walla, J.A. 2005. Insect and disease management guide for woody plants in North Dakota. (Revised) NDSU Extension Service F-1192 (Submitted).

Forest and Shade Tree Disease Studies-Spring 2005

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Shade Tree Disease Studies:

1. **Tree and turf growth:** No new findings but we have a Hort PhD student is working on this project this year and we plan to write up what we have learned so far.
2. **High line Canal Cottonwoods:** Ronda and I are writing up our results from this study into a manuscript.
3. **$MgCl_2$ study:** Preliminary results will be presented elsewhere.
4. **Banded Elm Bark Beetle:** The Dutch elm disease pathogen was successfully isolated from the banded elm bark beetle and we are writing a manuscript on these results. Results will be presented later.
5. **National Elm Trial:** We have 14 states involved in a trial of a sample of commercially available elm cultivars. NCR- 193 members and other cooperators are involved.
6. **CAPS:** We surveyed the northern infestation of white pine blister rust and have defined the area in Colorado

Forest Tree Insect/Disease Studies

1. **Armillaria Root Disease:** Melanie Kallas and I am making slow progress on a manuscript on the survey of Armillaria in the Black Hills of SD.

2. **Black stain root disease on pinyon pine:** Kearns and Jacobi have two manuscripts that have been accepted. I am trying to write up a short paper on Sam Harrison's survey of Pinyon in the Cortez CO area prior to the Ips epidemic.

3. **White Pine Blister Rust:**
   - Holly Kearns is developing a hazard-rating model for white pine blister rust on white pine populations in the Central Rocky Mountain Region. Holly will finish up her work this by this summer.
   - We are continuing our small-scale meteorological analysis of the risk of various locations in the Rocky Mts to blister rust.
   - Coordination will continue of white pine health work via the Central Rocky Mountains White Pine Health Working Group.
   - Screening of limber and bristlecone pine for resistance to White Pine Blister Rust grown at our State Forest Service Nursery. Seedlings inoculated at Dorena Genetic Center.

4. **Ponderosa Pine Wood Borers:** Sheryl Costello (MS candidate) has finished a study of the best trap design and attractants to monitor wood borers in fire damaged ponderosa pine in the Black Hills.

5. **Technology Transfer of Forest Pathology:** Amanda Vander Meer (MS candidate) will be looking at the movement of science from research to the end users within the Forest Service and related agencies such as State Forest Services.

6. **Fire, Dwarf mistletoe and Mt Pine Beetles in Front Range Ponderosa Pine:** Jennifer Klutsch and Russell Beam (MS candidates) will start a study of the interactions of these three disturbance agents this summer. We will be looking at fuel production, stand structure and fire and relationships between dwarf mistletoe and bark beetles.

Publications:

H.S.J. Kearns and W.R. Jacobi. 2005. Impacts of black stain root disease in recently formed mortality centers in the piñon-juniper woodlands of southwestern Colorado. Can. J. For. Res. 35:461-471.

H. S. J. Kearns, W. R. Jacobi and D. W. Johnson. 2005. Persistence of Pinyon Pine Snags and Logs in Southwestern Colorado. Western Journal of Applied Forestry, Accepted.

Omdal, D. W. Shaw, C. G. III, and Jacobi, W. R. 2004. Symptom expression in conifers infected with *Armillaria ostoyae* and *Heterobasidion annosum*. Can. J. For. Res. 34: 1210-1219

Koski, R. and Jacobi, W. R. 2004. Tree pathogen survival in chipped wood mulch. J. Arboriculture 30:165-171

Report to the Great Plains Tree Pest Council
April 13, 2005; Bismarck, ND

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

Lakewood Service Area: Northern Colorado, Kansas, and southeastern Wyoming

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GIS Specialist	Jennifer Ross	jross@fs.fed.us	(719) 488-1242

Function: We provide technical assistance on forest pest problems and forest health issues to federal land management agencies. We cooperate with state agencies to provide assistance on state and private lands.

Websites: R-2, Forest Health Management: www.fs.fed.us/r2/fhm
This site, created by Jim Worrall, Plant Pathologist at our Gunnison Service Center, includes a bulletin board, reports, staff listings, links, and much more.

National Office, Forest Health Protection: www.fs.fed.us/foresthealth
This site provides national program descriptions, forest insect and disease leaflets on line, publications, the national mortality risk map, and much more.

Staff Changes:

- Sheryl Costello has accepted our Student Career Experience Program (SCEP) Entomologist position in Region 2. She started working with Forest Health Management in October 2004.

Some Items of Significance for the Great Plains

(1) White Pine Blister Rust

The White Pine Forest Health group prepared and released a brochure entitled "White Pine Blister Rust. What you can do to slow the spread". The brochure is intended to increase awareness regarding identification of the fungus on host plants and procedures to limit its spread into the central Rocky Mountains and the Great Plains.

Isolated infestations of white pine blister rust in limber pine were discovered in the Wet Mountains (Custer County) and the Sangre de Cristo Mountains (Huerfano and Alamosa Counties) areas of Colorado in 2003. White pine blister rust was discovered for the first time on a single Rocky Mountain bristlecone pine in the Sangre de Cristo Mountains. Kelly Burns, Brian Howell, Meg Halford, Michele Laskowski, and Russell Beam conducted surveys and established permanent plots in these areas during 2004.

(2) Scoyltus schevyrewi – Banded Elm Bark Beetle (proposed common name)

In 2004, we worked with Bill Jacobi and Ronda Koski (Colorado State University) and Tom Harrington (Iowa State University) to determine if S. schevyrewi adults emerging from Dutch elm diseased-trees carried the fungal pathogen, Ophiostoma novo-ulmi. Branch sections were obtained from American elms removed due to Dutch elm disease in Colorado Springs and Denver. Beetles were allowed to attack and infest the bolts. Brood beetles were reared outdoors under ambient temperatures. After 6 weeks, bolts were brought indoors and placed in rearing containers. As beetles emerged, they were identified to species, crushed with forceps, and shipped overnight to ISU. CSU received bolts and reared beetles separately for their isolations.

Beetles were placed on a selective media and incubated. Isolates of O. novo-ulmi were obtained from 30%, 63% and 44% (CSU) and 8%, 84%, and 91% (ISU) of the beetles from the three elms. These results indicate that S. schevyrewi brood emerging from elm trees infected with Dutch elm disease can become infested with spores of this pathogen. CSU and ISU plan to prepare a manuscript describing their results and submit it for publication in an appropriate journal.

From the work conducted to date and the literature on this insect from China, S. schevyrewi: (1) is associated with Dutch elm-diseased trees (personal observations); (2) may carry innoculum of O. novo-ulmi (CSU and ISU findings); and (3) feeds on healthy crowns of elms (the Chinese literature indicates this occurs). To prove that S. schevyrewi is a vector of O. novo-ulmi, it would have to be demonstrated that the beetle can transmit the pathogen to healthy elms under laboratory conditions.

Regarding attractants for surveys for S. schevyrewi, methyl-buten-ol proved to be an inexpensive attractant for this insect. This lure was not as attractive as the multilure attractant (used for S. multistriatus) but has a significant benefit in that it attracts mostly S. schevyrewi (99%). The multilure bait, by contrast, attracts large numbers of both species, thereby requiring the expenditure of a considerable time sorting the specimens to species.

Jose Negron (Rocky Mountain Research Station) and Steve Seybold (Pacific Southwest Research Station) have received 3-year funding support for their Special Technology Development Program project on the biology and chemical ecology of S. schevyrewi. Jose and Steve are beginning the second year of this project.

Recent Publications

Worrall, J.J., Sullivan, K.F., Harrington, T.C., and Steimel, J.P. 2004. Incidence, host relations and population structure of Armillaria ostoyae isolates in Colorado campgrounds. Forest Ecology and Management 192 – 206.

Blodgett, J.T., and Sullivan, K.F. 2004. First report of white pine blister rust on Rocky Mountain bristlecone pine. Plant Disease 88: 311.

Recent Biological Evaluations

Burns, K.S. 2005. Biological evaluation of potential hazard trees in Tie City Campground. USDA Forest Service, Rocky Mountain Region, Biological Evaluation R2-05-06. 16 p.

Burns, K.S. 2005. Biological evaluation of potential hazard trees in campgrounds of the Brush Creek-Hayden Ranger District. USDA Forest Service, Rocky Mountain Region, Biological Evaluation R2-05-07. 32 p.

Cain, R.J., and Howell, B. 2005. Biological evaluation of mountain pine beetle activity on the Rock Creek analysis area of the Yampa Ranger District, Medicine Bow-Routt National Forests and Thunder Basin National Grassland, 2005. USDA Forest Service, Rocky Mountain Region, Biological Evaluation R2-05-02. 37 p.

Cain, R.J., and Howell, B. 2005. Biological evaluation of mountain pine beetle activity on the upper Fraser analysis area of the Sulphur Ranger District, Arapaho-Roosevelt National Forests and Pawnee National Grassland, 2005. USDA Forest Service, Rocky Mountain Region, Biological Evaluation R2-05-03. 37 p.

Cain, R.J., and Howell, B. 2005. Biological evaluation of mountain pine beetle activity on the Black Trout Analysis Area of the South Park Ranger District, Pike-San Isabel National Forests and Cimarron and Comanche National Grasslands, 2005. USDA Forest Service, Rocky Mountain Region, Biological Evaluation R2-05-04. (in preparation).

Cain, R.J., and Howell, B. 2005. Biological evaluation of spruce beetle and mountain pine beetle activity on the French Creek Analysis Area of the Brush Creek/Hayden Ranger District, Medicine Bow-Routt National Forests and Thunder Basin National Grassland, 2005. USDA Forest Service, Rocky Mountain Region, Biological Evaluation R2-05-05. 50 p.

Recent Service Trip Reports

LSC-05-01 Forest health site visit to the Air Force Academy.

LSC-05-02 Status of mountain pine beetle populations in the Rock Creek analysis area on the Yampa Ranger District.

LSC-05-03 Status of mountain pine beetle populations in the upper Fraser analysis area of the Sulphur Ranger District.

LSC-05-04 Laramie Ranger District forest health site visit.

LSC-05-05 Forest health site visit to the Pikes Peak Ranger District.

LSC-05-06 Spruce beetle infestations in the Devils Gate timber sale area on the Laramie Ranger District.

LSC-05-07 Status of spruce beetle and mountain pine beetle populations in the French Creek analysis area on the Brush Creek/Hayden Ranger District.

LSC-05-08 Hazard tree evaluation of Mizpah Campground, Arapaho-Roosevelt National Forest.

Great Plains Tree Pest Council, April 13-14, 2005

Kelly Sullivan Burns
Lakewood Service Center
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- International Tree Failure Database is up and running!
  - Training is necessary in order to get a user name and password. If you have been through our training, you can obtain a username and password by contacting Judy Adams, FHTET (jadams04@fs.fed.us, (970) 295-5846).
  - Take a look at it on the web: http://ftcweb.fs.fed.us/natfdb/index.aspx .

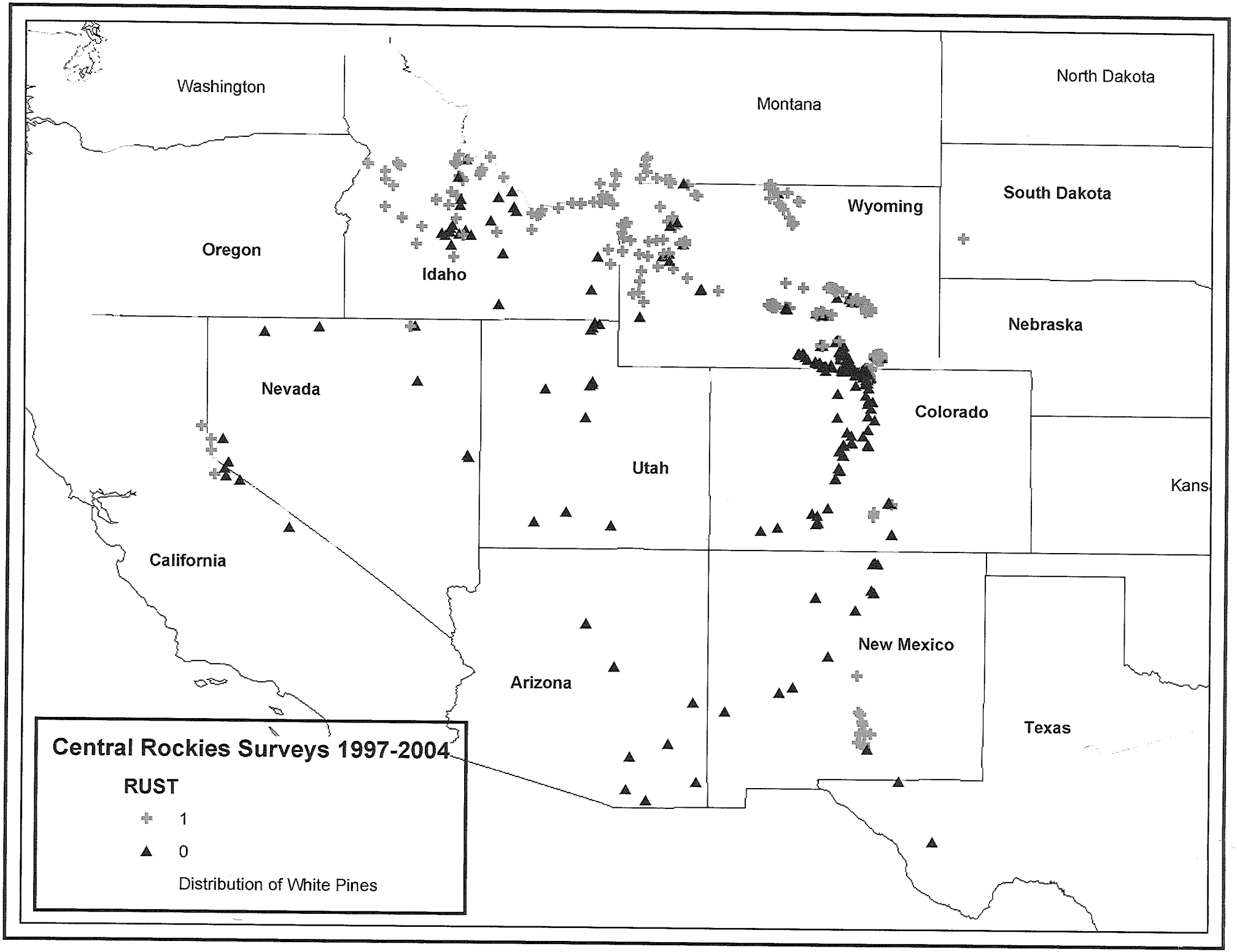
- Evaluation Monitoring Project: Monitoring the Distribution and Spread of WPBR in the Sangre de Cristo and Wet Mountains of Southern Colorado. I am currently summarizing data and writing up the report. Here are some preliminary findings:
  - Sangres: WPBR is concentrated around Mosca Pass. We did not observe the disease further than 7 miles north and 5 miles south of Mosca Pass. The incidence of the disease is highest on the west side of the pass along the Mosca Creek Trail in the Great Sand Dunes National Park and Preserve. Only 5-10 infected bristlecone pines were observed all summer.
  - Wets: WPBR is scattered throughout the east side of the range with the highest concentration about 25 miles SW of Pueblo, Colorado. No infected RM bristlecone pines were observed in this range; however, they are common and are often intermixed with limber pine.
  - We established 28 long-term monitoring plots within the Sangre de Cristo Mountains. These will be remeasured every 3 years.
  - Incidence on BCP appears to be very low at this time.

- The EM program has funded Anna Schoettle's project looking at geographic variation in rust resistance in Rocky Mountain bristlecone pine. She transported thousands of seedlings to the Doreena nursery last year. A subset was inoculated last fall and the full experiment will be inoculated this year. Symptoms will be evaluated over the next several years. We will help with evaluations.

- Great Sand Dunes NPP received money through the suppression program to initiate a pruning project to increase the longevity of limber pine along the Mosca Creek Trail. We will look at the efficiency and effectiveness of pathological pruning as a management strategy. This will be a cooperative effort between Colorado State University, GSDNPP, and LSC. We will begin this work this summer and will monitor the effectiveness over time.

- PTIPS---We remeasured our dwarf mistletoe permanent plots on the Southern Ute Indian Reservation, Fraser Experimental Forest, and the Norwood District of the Uncompahgre National Forest. We will be analyzing these data and writing up a report in the near future. We are currently working with FHTET to get the plot data into FSveg.

- Anna Schoettle, RMRS Plant Ecophysiologist, received some funds for developing an informational website on high elevation white pines. Thoughts, comments, and suggestions can be directed to aschoettle@fs.fed.us . Goals are:
  - To increase regional understanding and awareness of high elevation pines and the threats to the species and their ecosystems.
  - To provide perspective on the state of the knowledge of the species and outline areas needing further investigation.
  - To lay the foundation to simulate interaction and dialog among all of us with other professionals and publics.
  - To establish a clearinghouse of information on high elevation pines and links.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Distribution of White Pines