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Department of
Agriculture

Timber,
Forest Pest,
& Cooperative
Forestry
Management

Denver, Colorado

FOREST PEST CONDITIONS IN THE ROCKY MOUNTAIN REGION for 1982

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FOREST INSECT AND DISEASE CONDITIONS IN THE ROCKY MOUNTAIN REGION 1982

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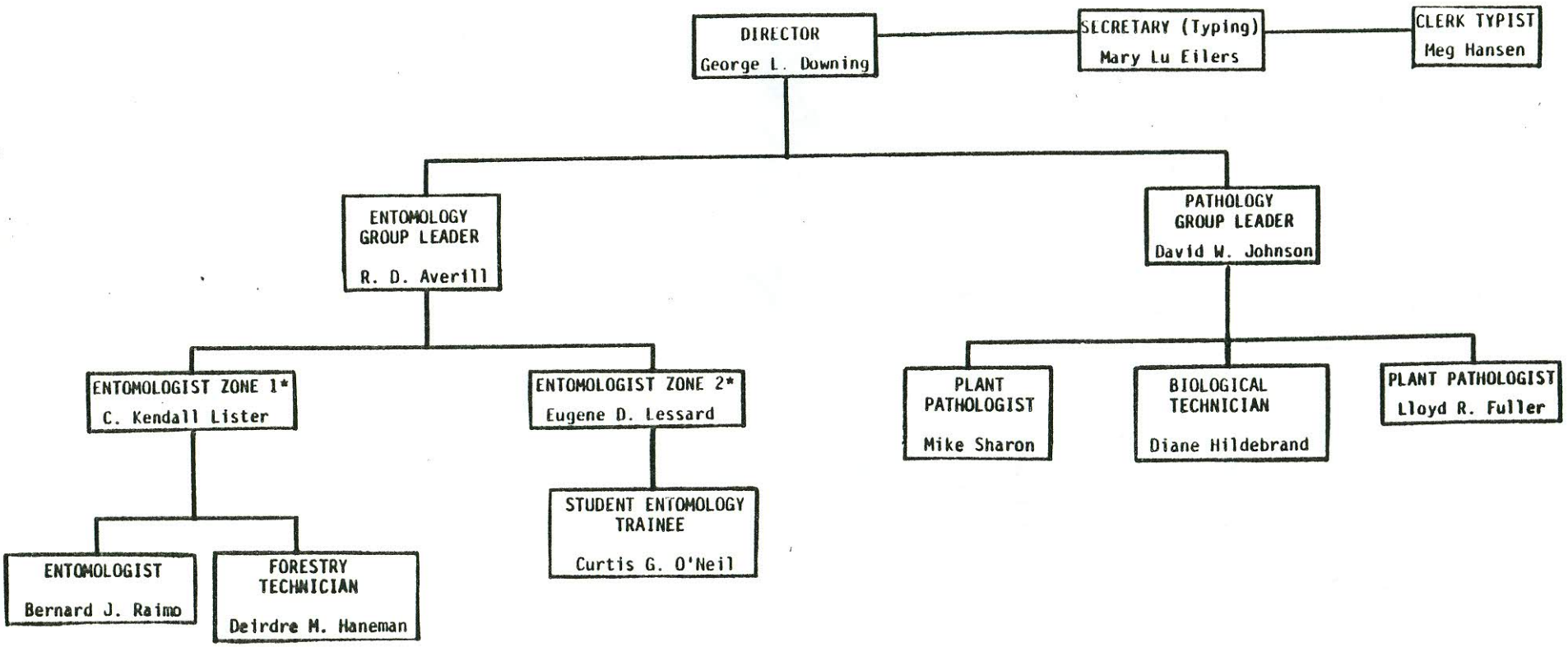
FOREST PEST MANAGEMENT

ORGANIZATION CHART



* Zone 1 - Colorado; Zone 2 - Kansas, Nebraska, South Dakota and Wyoming

CONDITIONS IN BRIEF

Lodgepole pine dwarf mistletoe and comandra blister rust continue as the most damaging disease agents in the Rocky Mountain Region. This past year Forest Pest Management funds were used to conduct presuppression surveys on 52,000 acres for lodgepole pine dwarf mistletoe. Suppression activities were conducted on 6,900 acres. There is a continuing need to maintain these activities at or above the current level to increase productivity of lodgepole pine stands throughout the Region.

A survey on the Wind River Ranger District, Shoshone National Forest indicates comandra blister rust is widespread over the entire commercial lodgepole pine type and is the primary cause of mortality in at least 50 percent of the standing dead saplings and pole size trees sampled.

A mortality survey of subalpine fir on the San Juan National Forest indicated that 64% of surveyed trees were associated with both bark beetle attacks and root diseases. About 24 percent of the surveyed area was occupied by root diseases.

Dutch elm disease has continued to spread in South Dakota, with Lawrence County added to the list of DED infected counties.

The pine wilt nematode is now recognized as a native pest and incidence surveys are being curtailed. Nine counties scattered in Kansas, Nebraska, and South Dakota are known to have infested trees. Scots pine is the most common host.

Foliage diseases were prevalent in the Plains states and are attributed to the cool, wet spring weather.

An early wet snowstorm accompanied by high winds was responsible for considerable damage to ponderosa pine stands in the northern third of the Black Hills National Forest. Nearly 30 million board feet of timber was uprooted or broken. Salvage sales are planned to harvest as much of the damaged timber as possible.

Mountain pine beetle (MPB) continues to cause significant amounts of mortality within the Rocky Mountain Region. Beetle populations are high on the west half of the Black Hills, especially the Bearlodge Ranger District of the Black Hills National Forest. Populations in Wyoming are increasing on the Roaring Fork and North Fork of the Little Snake River as well as the Shirley Mountains and Muddy and Casper Mountains. On Green Mountain and the Lander area, populations remain static at high and moderate levels respectively. In Colorado, MPB populations remain low in the ponderosa pine type. However, the lodgepole pine type continues to experience increasing losses from this insect in Summit, Eagle and Grand counties.

Spruce beetle continues to spread in Wyoming and Colorado in high risk stands. Killing of trees in groups of four to six continues. The Rio Grande and Routt National Forests outbreaks continue to expand with significant mortality being recorded.

Spruce budworm remains widespread in the Region. Visible defoliation was recorded on two million acres which is a reduction of nine percent from 2.2 million acres last year. The highest populations are in Wyoming. The outbreak along the Front Range of Colorado exhibited some population decline from 1981.

The western tent caterpillar continues to expand on the east side of the San Juan National Forest. Biological factors which could reduce the population appear to be operating at a very low level.

INTRODUCTION

Forest Pest Management (FPM) is responsible for detection, evaluation, prevention and suppression of insects and diseases on forested Federal lands. Additionally, FPM administers assistance programs, both financial and technical, which are available to state and private landowners of forested lands through the Cooperative Forestry Assistance Act of 1978 (Public Law 95-313).

In 1982, ground and aerial surveys were performed to detect insect and disease infestations throughout the Rocky Mountain Region, many in cooperation with State Pest Specialists in Colorado, Kansas, Nebraska, South Dakota, and Wyoming.

STATUS OF DISEASES

LODGEPOLE PINE DWARF MISTLETOE: *Arceuthobium americanum* Nutt.

Action plans for survey and suppression of lodgepole pine dwarf mistletoe have been continued throughout the Region. Presuppression surveys were conducted on 52,000 acres on the Arapaho and Roosevelt, Medicine Bow, Pike and San Isabel, Shoshone, and White River National Forests and state-owned sections in Wyoming. Silvicultural control was conducted on over 6,900 acres of infested lodgepole pine stands on the Arapaho and Roosevelt, Grand Mesa, Uncompahgre and Gunnison, Pike and San Isabel, Shoshone, and White River National Forests and state-owned sections in Wyoming.

An intensive survey of the Turquoise Lake Recreation Area, located 3 miles west of Leadville, Colorado, was completed on 760 acres. Lodgepole pine dwarf mistletoe infested 22 percent of the total area. Large disease centers within and adjacent to campsites, as well as the potential for mountain pine beetle (MPB) outbreaks, are a concern to local land managers. A vegetation management plan has been completed to provide the manager with direction for a long range program and to provide a continuing yield of recreational benefits for future generations. Resource specialists representing several disciplines (including forestry, recreation, landscape architecture, silviculture, wildlife biology, entomology and pathology), were involved in the planning process.

Forest fire scientists at Colorado State University in cooperation with the Rocky Mountain Forest and Range Experiment Station (RMS), are investigating the ecological interactions of fire and dwarf mistletoe in lodgepole pine forests. Studies of the effects of smoke and heat on dwarf mistletoe has been undertaken to evaluate the feasibility of prescribed fire as a control method.

To assess the effects of smoke on lodgepole pine dwarf mistletoe seed germination, premeasured amounts of coniferous forest needles and branchwood were burned in a small incinerator with smoke passing through a closed chamber containing the seeds. Following three different smoke treatment experiments, seed germination was evalauted. Reduced germination resulted after exposure to smoke for at least 60 minutes in all experiments. Thirty minutes of exposure to smoke from fuels having an 8 percent moisture content enhanced germination while exposure to an equal duration of smoke from fuels with higher moisture contents had no effect. Thus, depending on the exposure duration and fuel moisture content, smoke exposure effects represent beneficial as well as adverse influences of fire on dwarf mistletoe development in lodgepole pine forests.

Additional studies are underway to investigate the effects of high temperatures on seed germination and to evaluate the lethal time-temperature relationships on dwarf mistletoe plants and fruits.

The study of the use of prescribed burning as a means of destroying and regenerating lodgepole pine stands heavily infested with dwarf mistletoe was initiated by CSU and RMS during the summer of 1982 with aid of FPM and Forest personnel. Five treatment units were located on the Taylor River Ranger District, Gunnison National Forest, and ranged in size from 15 to 35 acres. Stands selected represented a variety of size classes and densities with downed woody fuel accumulations varying from less than 10 to over 100 tons per acre. All stands were heavily infested by dwarf mistletoe and DMR levels generally exceeded 3. Prior to burning, researchers measured numerous stand and individual tree characteristics. During the actual burning, measurements were taken in an effort to characterize the weather conditions and behavior of the fires. Postfire analysis of fuel reduction, tree mortality, and dwarf mistletoe survival is planned during the 1983 field season. It is hoped that this examination will provide useful information to aid in future dwarf mistletoe treatment programs.

COMANDRA BLISTER RUST: *Cronartium comandrae* Peck

In a cooperative (FPM, RMS, Shoshone National Forest, and CSU) study, a random survey of the commercial forest on the Wind River Ranger District, Shoshone National Forest was conducted in 1981-82. The purpose of the study was to determine the incidence of comandra blister rust in lodgepole pine. Twenty-seven stands, which contained 6 percent of the total commercial area on the District, were inventoried. The survey indicates the rust is widespread over the entire commercial forest and is a primary cause of mortality factor in at least 50 percent of the standing dead saplings and poles. The cankers on 85 percent of infected trees had girdled the stem and killed the distal third of the crown. Non-girdling stem cankers were found on 18 percent of infected pole size trees. Branch cankers were difficult to observe and were rarely discovered. The location and appearance of cankers in older trees and the lack of infections in young trees suggests rust-caused damage in the Wind River District is the result of infections several decades old. Because infection sources were found adjacent to young stands, these trees remain threatened with future losses.

Colorado State University recently completed a study on the effects of comandra blister rust and dwarf mistletoe on cone and seed production of lodgepole pine. This study indicates that the reduction of live crown size in trees heavily infected with the rust results in significantly fewer cones and seeds than are found in healthy trees. Trees heavily infected with dwarf mistletoe have significantly smaller cones and seeds, which may be attributed to reduced tree vigor caused by the parasite. Therefore, if lodgepole pine stands are being regenerated by a shelterwood method, selection of seed trees should be based on live crown length and tree vigor.

ROOT DISEASES

During the summer of 1982 a mortality survey was conducted within the spruce-fir type on the San Juan National Forest. The survey covered 363,200 acres and consisted of aerial photography and ground verification. Results indicate that 137,800 (± 23,800) dead, red-colored subalpine firs representing 2,286,200 (± 319,400) cu. ft. are currently standing. Of the 137,800 dead trees, 88,470 (64.2%) were associated with bark beetle attacks and root diseases (*Armillariella mellea* and *Fomes annosus*). Root diseases occupied an estimated 86,590 (± 19.6%) acres, or 23.8% of the survey area.

A cooperative study between the Rocky Mountain Forest and Range Experiment Station (RMS) and FPM was conducted in the fall of 1982 to determine the relationship between the presence of root diseases, MPB infestation, and ponderosa pine mortality in the Black Hills National Forest. A total of 115 trees were examined on 40 plots. A significant association was found between tree mortality attributed to the mountain pine beetle and the presence of Armillaria root rot in sample trees. There was no difference between plots on the limestone and crystalline soil types. Also there was no apparent relationship between stand structure and root infection. It appears that *A. mellea* infected pine serve as foci for MPB attacks during endemic beetle cycles.

DUTCH ELM DISEASE: *Ceratocystis ulmi* (Buism.) C. Mor.

During 1978-1981, the states of California, Colorado, Georgia, Minnesota, and Wisconsin participated in a federally funded Dutch elm disease management and utilization program. The major objectives of this program were to make information on the disease available nationwide, to utilize diseased elms, and to establish and maintain demonstration sites in selected communities to show application and results of effective disease management programs. The program accomplished several goals including a reduction of disease losses, integration of disease management practices into existing community programs, increased public awareness of the disease and community support for local disease control efforts, and nationwide distribution of educational materials, news releases, technical reports, and training workshops. This information has been recently summarized in the publication entitled "The National Dutch Elm Disease Demonstration Program. State Summary Report 1978-1981". USDA Forest Service and Cooperative Extension Service, 1982.

During 1982, the South Dakota Division of Forestry assisted 67 communities with identification of American elms infected with Dutch elm disease (DED). Over 2,445 diseased elms were found and marked for removal. In addition seven major cities conducted their own identification and removal programs locating an additional 2,133 infected trees.

Historically, the intensity of DED has been holding steady or declining in the eastern portion of the South Dakota and increasing slowly in the west. The disease is now present in 57 of a total of 66 counties in the state (Fig. 1). Lawrence County, in the extreme western part of the state, was added to this list in 1982. Over 28,000 elms have been lost in the past four years just from within communities with DED control programs.

DIPLODIA TIP BLIGHT: *Diplodia pinea* (Desm.) Kickx

Diplodia tip blight was first reported on ponderosa pine in the Black Hills of South Dakota in July 1979. This was the first known report of extensive infection of native stands of ponderosa pine. During 1980-82, additional surveys were conducted to determine the distribution of the disease in the Black Hills and to evaluate the potential impact of the disease on tree growth and survival. Figure 2 shows the current distribution of the disease, which occurs primarily along the eastern edge of the Hills east of Custer extending from Sturgis to Hot Springs.

The scattered nature of the disease suggests the fungus is not a recent introduction, but may be native. Unusually high rainfall in the spring prior to the first report of the disease (1979) appears to have enhanced the disease.

At this time the disease does not appear to be increasing in severity on trees observed over a 3 year period or spreading into new areas. In fact, symptoms have declined since 1979. This situation may change in the future if conditions favorable for the disease reappear.

Diplodia tip blight damage was reported on *Pinus nigra, P. ponderosa, P. sylvestris,* and *P. mugo* in eastern Nebraska. The disease was more severe than in the previous 20 years.

High moisture during the period of high susceptibility resulted in extensive infection of new shoots. Extensive damage resulted because infection of new shoots was followed by infection of second-year and older branch tissues.

DOTHISTROMA NEEDLE BLIGHT: *Dothistroma pini* Hulbary

Infection of *P. ponderosa* and *P. nigra* by *D. pini* was at a very high level in eastern Nebraska. Infection of these two species in experimental plantings on the Horning State Farm near Plattsmouth, Nebraska was at a higher level than in the previous three years. These areas received above normal rainfall in the 1982 growing season.

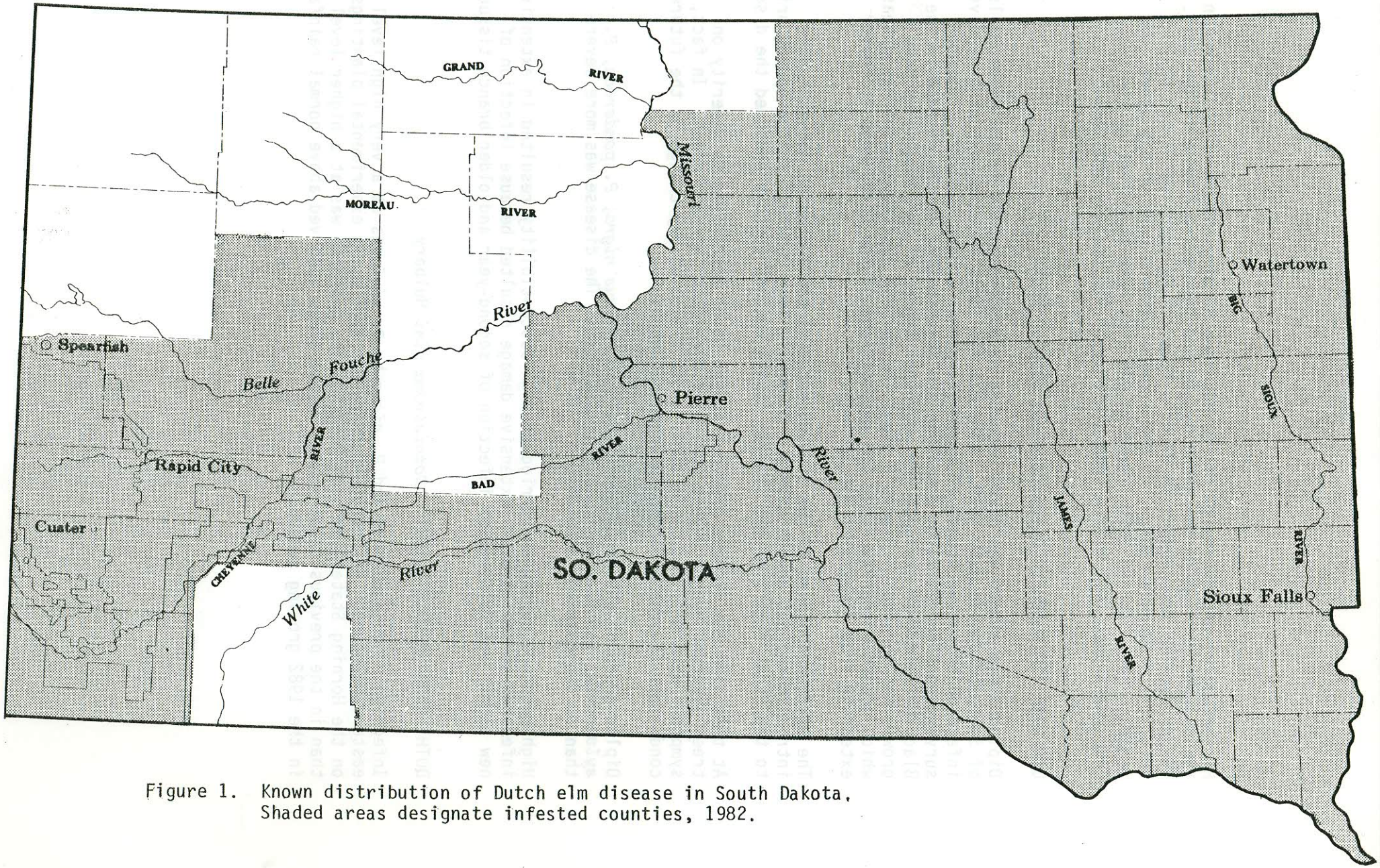


Figure 1. Known distribution of Dutch elm disease in South Dakota. Shaded areas designate infested counties, 1982.

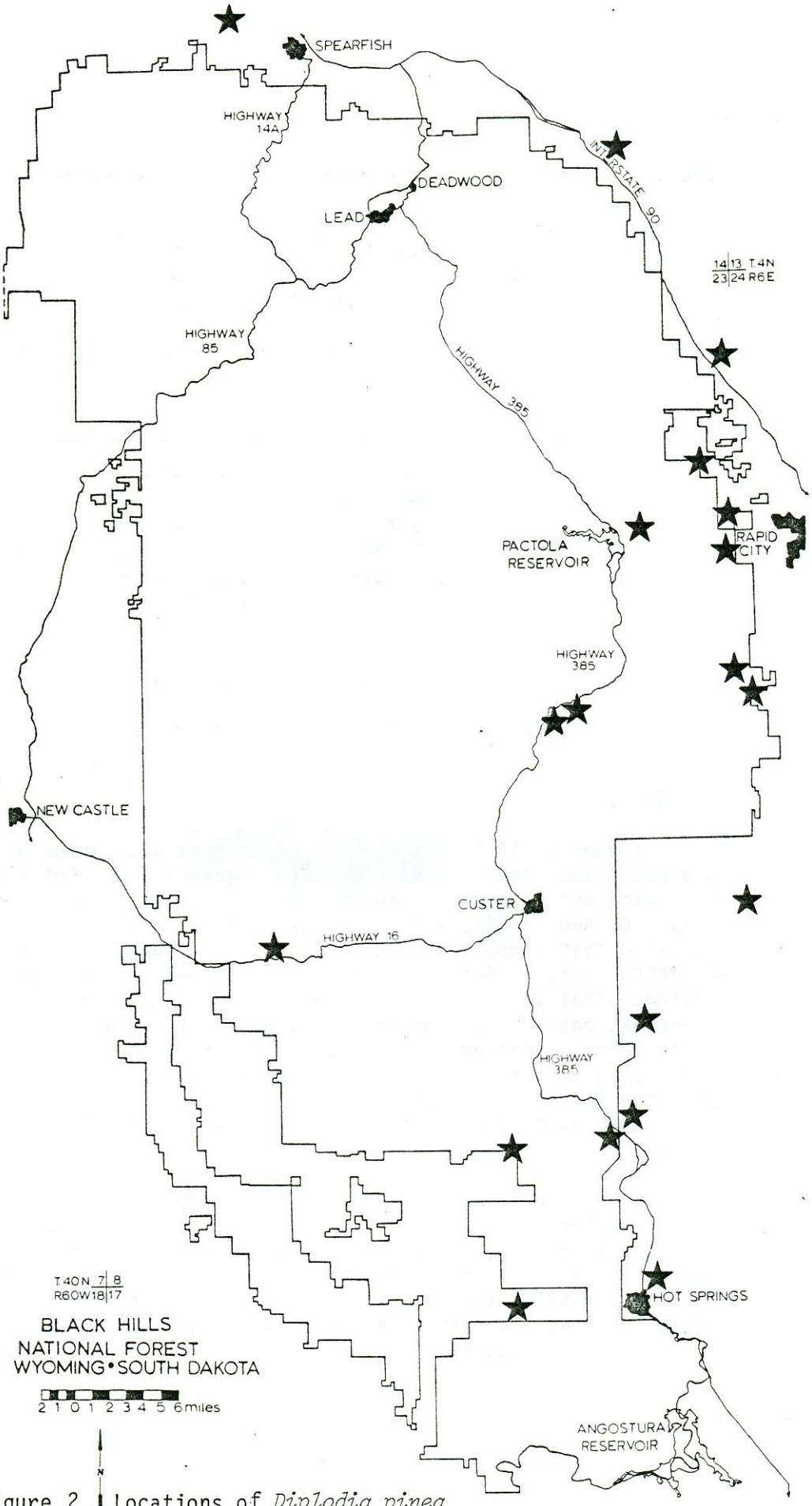


Figure 2. Locations of *Diplodia pinea* infected ponderosa pine in the Black Hills, South Dakota (1979-82).

PINE WILT NEMATODE: *Bursaphelenchus xylophilus* (Steiner & Buhrer) Nickle

This pest is now recognized as native to the U.S., therefore, incidence surveys are being phased out by the U.S. Forest Service. A compilation of states and counties where the nematode has been identified was recently published by the FPM Unit, Northeastern Area.

The known locations as of December 1982 in the Rocky Mountain Region by state, county and host follow:

STATE	COUNTY	HOST
Kansas	Brown	*Pinus nigra*
	Cherokee	*P. sylvestris*
	Crawford	*P. nigra*
	Doniphan	*P. nigra, P. sylvestris*
	La Bette	*P. sylvestris*
	Montgomery	*P. sylvestris*
	Wilson	*P. sylvestris*
Nebraska	Lancaster	*P. strobus*
South Dakota	Yankton	*P. nigra*

NURSERY DISEASES

In the summer of 1982, a solar pasteurization evaluation was begun at the Colorado State Forest Service Nursery, Fort Collins, Colorado. Six soil plots were established: three tarped with clear polyethylene for 56 days (July 1 to August 25), and three untarped as controls. Buried thermographs indicated that temperatures under the tarps averaged 9°C higher than those of control plots. Soil samples were collected for analyses before and after tarping. Statistical analyses showed significant reductions in tarped plots in populations of the damping-off fungi, *Pythium* spp. and *Fusarium* spp., and in weeds. Whether residual populations of the pathogenic fungi are still too high will be determined by tree seedling measurements six weeks after the Spring 1983 planting. Soil samples will again be collected and assayed for damping-off fungi and weeds just before and six weeks after planting.

The effects of hydrogen peroxide (H_2O_2) and cold stratification treatments on germination rates and seedcoat sterilization of three Rocky Mountain conifer species were evaluated. Results indicate that stratification and soaking in 3% H_2O_2 for 24 or 48 hours was the best treatment for ponderosa pine; no stratification and soaking for 8 hours in 3% H_2O_2 was best for lodgepole pine; and neither stratification nor use of H_2O_2 is recommended for treatment of Englemann spruce seed.

Mesurol® 75% Seed Treater (3,5-dimethyl-4-[methylthio] phenol methylcarbamate) was tested as a seedcoat treatment to repel birds. The pesticide was applied as a 1% a.i. (active ingredient) slurry to seeds of ponderosa pine, lodgepole pine, and Engelmann spruce. Field tests indicated bird predation was nearly eliminated on treated seeds when compared to non-treated seeds. Laboratory tests showed no phytotoxic properties associated with chemical slurries up to 4% a.i..

COTTONWOOD MORTALITY

Dying cottonwoods have been noticed for several years along the eastern plains of Colorado. In the summer of 1982, cottonwoods along the Arkansas and North Platte Rivers were surveyed in cooperation with the Colorado State Forest Service to determine the number of dead and declining trees. Trees were sampled in four southeastern counties and two northeastern counties in Colorado. A total of 356 trees were rated on amount of live crown present.

Only four percent of the trees sampled were dead. However, 51 percent of the live trees had 1 to 50% crown decline. Old infections of *Cytospora* sp. were found on only two trees. Water stress did not appear to be likely since the rivers were high, but water levels for previous years have not been determined. Further study may be warranted.

AIR POLLUTION SURVEY

In 1979, five permanent evaluation plots were established along the Front Range between Boulder and Colorado Springs to monitor the development of air pollution injury to ponderosa pine over time. Pines on these plots have been examined twice yearly, in the spring and fall, since 1979. As of the Spring of 1982, very few examined trees had typical symptoms of ozone injury. Chlorotic mottle, a typical symptom of oxidant damage in California and along the eastern seaboard, has been observed on only one tree west of Denver. Other associated symptoms, such as shortened needles, reduced needle complement and chlorotic banding have not been observed. Experiments conducted by the Pacific Southwest Forest Experiment Station have indicated that the Rocky Mountain variety of ponderosa pine is not damaged as much as the southern California variety when exposed to ozone.

SNOW DAMAGE

On October 8-10, 1982, the northern third of the Black Hills National Forest was hit by a savage wind and snowstorm. Winds of 50 mph were common and snow depths totaled 5 feet or more. Damage to the timber resource was substantial. It has been estimated that nearly 30 million board feet of timber was uprooted or broken. A number of active timber sales sustained damage. Other resources impacted included damage to 100 miles of fenceline and 170 miles of road. Fuel treatment to reduce the threat of fire is

needed on 3,500 acres. As a result of the windthrow and reduced vigor of damaged trees, the potential for increased bark beetle activity exists. Evaluations by the FPM staff are planned during the 1983 field season.

HAZARD TREES IN FORESTED RECREATION SITES

A region-wide survey was initiated this past year to determine the hazard tree status in developed recreation sites. Twenty percent of fee campgrounds (55 sites) were randomly selected for sampling. The sample was stratified by tree species with emphasis on those species that have had high failure frequencies in the past. A minimum of ten percent, but not less than three campsites per campground, are being sampled intensively following procedures established in the Region.

OTHER DISEASES - REGION 2

Disease	Host	Location	Remarks
STEM AND BRANCH DISEASES			
Dwarf mistletoes *Arceuthobium americanum* Nutt. Engelm.	Lodgepole pine	Colorado, Wyoming	Continues as the most important disease problem in the Region. It is estimated that 51% of the type is infested with an annual merchantable loss of 10 million cubic feet on National Forests alone. Suppression activities have increased substantially in the past few years. Preliminary studies by the Rocky Mountain Forest and Range Experiment Station show that several birds and mammals carry dwarf mistletoe seeds. The importance of animal vectors in long-distance seed dispersal is being investigated.
Arceuthobium cyanocarpum Nels. Gill	Limber pine	Colorado	Moffat County, Colorado, is a new report for this mistletoe.
Arceuthobium vaginatum subsp. *cryptopodum* (Engelm.) Hawks. and Wiens	Ponderosa pine	Colorado	From an extensive roadside survey of ponderosa pine stands on National Forests, it is estimated to infest 20% of the type. An evaluation of the roadside survey technique showed a very high correlation between dwarf mistletoe intensity along the roadside, and conditions 2-chains from the road. Cooperative studies with Colorado State University showed that frequency and intensity of infestation varies with habitat type. For example the *Pinus ponderosa/Cerocarpus montanus* habitat type has more mistletoe than other ponderosa pine habitat types.

Disease	Host	Location	Remarks
Juniper mistletoe *Phoradendron juniperinum*	Utah juniper	Colorado	A widespread but generally minor disease of several species of junipers occurs along the west slope from New Mexico to the Colorado River. The mistletoe was found near Ridgeway, the first report in Ouray County.
Mistletoe blister rust *Peridermium bethelii* Hedge. & Long.	Lodgepole pine	Wyoming	This rust, which is only associated with *Arceuthobium americanum,* was found in many new locations on the Shoshone National Forest. In the past, this rust was confused with the similar comandra blister rust.
Pinyon blister rust *Cronartium occidentale* Mein.	Pinyon	Western Colorado	A single report from LaPlata County.
Thyronectria canker *Thyronectria austro-americana* (Speg.) Seeler	Honeylocust	Colorado, Kansas	Continuing to cause lethal cankers on honeylocusts throughout urban areas east of the Continental Divide in Colorado. Incidence is less than 1% annually. Reported throughout the Denver metro area, El Paso, Pueblo and Larimer Counties. A very severe problem in windbreaks in western Kansas. It appears that wounding is involved including sunscald, borers, pruning and other natural wounding.
Cytospora canker *Cytospora kunzei* Sacc.	Spruce	Eastern South Dakota	A problem on ornamentals planted outside their natural range.

Disease	Host	Location	Remarks
Cytospora canker *Cytospora* spp.	Hardwoods	Colorado	Reported on many hosts.
Botryodiplodia canker *Botryodiplodia* sp.	Red oak	Southeastern Nebraska	A canker caused by this fungus caused extensive branch dieback and some tree mortality in pockets of native oak stands. These areas were heavily infested with the periodical cicada in 1981 and cankered branches were heavily damaged by cicada oviposition.
Gummosis *Phomopsis elaeagni* Arnold & Carter	Russian olive	Eastern Colorado	Reported for the first time in Denver. Previous damage attributed to *Phytophthora cactorum*.
VASCULAR WILTS			
Dutch elm disease *Ceratocystis ulmi* (Buism.) C. Mor.	Elm species	Colorado	890 newly diseased trees diagnosed in 53 cities. Canon City and LaJunta were the only cities from the Federal program that reported an increase in DED losses.
Verticillium wilt *Verticillium* sp.	Norway, Schwedler and silver maples, and Russian olives	Eastern Colorado	Number of reports up from previous years.

Disease	Host	Location	Remarks
ROOT DISEASES			
Shoestring root rot *Armillariella mellea* (Vahl.:Fr.) Karst.	All conifers	Colorado, Wyoming, South Dakota	Cause of mortality of white fir Christmas trees near Rye, Colorado adjacent to the Pike-San Isabel National Forests.
			Mortality of subalpine fir at two Colorado ski areas stimulated interest in the formulation of long term vegetation management plans. *Armillariella mellea* and several bark beetles are involved, including *Scolytus* spp. and *Dryocoetes confusus*.
Annosus root rot *Heterobasidion annosum* (Fr.) Bref.	Jack pine	Nebraska	Found on the Bessey Ranger District, Nebraska National Forest. Last confirmed in 1965. The present area of infection is about 1/4 acre where some earlier thinning had taken place. Poses no management problem at this time.
Black-stain root disease *Ceratocystis wageneri* Goheen & Cobb	Pinyon	Western Colorado	The primary root disease in pinyon west of the Continental Divide. The soil fumigant Vapam®, trenching and silvicultural treatments are being tested in Mesa Verde National Park to limit vegetative spread of the disease.
	Douglas-fir	Front Range Colorado	First report on Douglas-fir in Colorado and first confirmation of black stain east of the Continental Divide.
Violet root rot *Rhizoctonia* sp.	Norway maple	Eastern Colorado	Number of reports up from previous years.

Disease	Host	Location	Remarks
FOLIAGE DISEASES			
Anthracnose *Gloeosporium* spp.	Maples, walnut, sycamore	Kansas, Nebraska, Eastern Colorado	Reported on maples, walnut and sycamore. Walnut anthracnose reports increased in number and earlier than normal. Reported in the Denver metro area and Fremont County.
Gloeosporium aridum Ell. & Holw.	Green ash	Eastern South Dakota	Commonly observed throughout the eastern part of the State. A cool, wet spring responsible.
Ash leaf rust *Puccinia peridermiospora* (Ell. & Tr.) Arth.	Green ash	Eastern South Dakota	See remarks for *Gloeosporium aridum*.
Poplar leaf rust *Melampsora medusae* Thuem.	Cottonwood	Central South Dakota, Nebraska	Approximately 96 acres in a recreation area at Oahe Dam, South Dakota, suffered heavy to severe infestation resulting in up to 90% early defoliation. Moderate to heavy infestations scattered throughout the State. Considerable defoliation of native stands in Nebraska.
Diplodia tip blight *Diplodia pinea* (Desm.) Kickx.	Ponderosa pine, Austrian pine	Kansas, Nebraska	Increase in number of reports on landscape trees in both States. Both Austrian and ponderosa pines severely infected. Reported in all areas of Kansas on shelterbelt trees, particularly Austrian pines.
Brown spot needle blight *Scirrhia acicola* (Dearn.) Sigg.	Conifers	Kansas	Numerous reports of the disease in Christmas tree plantations. Abundant rainfall and high humidity implicated.

Disease	Host	Location	Remarks
Needlecasts *Lophodermium* sp.	Ponderosa pine	Black Hills	Continues to be evident throughout the eastern Black Hills. No mortality reported. Often infected trees were infected also with *Diplodia pinea*.
Douglas-fir needlecast *Rhabdogloeum pseudotsugae* Syd.	Douglas-fir	Eastern Colorado	Reported from Boulder and Larimer Counties.
NURSERY DISEASES			
Damping-off	Conifers	Colorado	*Fusarium* spp. caused considerable losses of pines and spruce on old agricultural lands recently used as a conifer bareroot nursery.
Phoma spp.	Conifers	Nebraska	*Phoma* sp. has caused dieback and mortality of conifers following root-wrenching.
Phomopsis blight *Phomopsis juniperovora* Hahn	Eastern redcedar, Rocky Mountain juniper	Nebraska	Tip dieback was evident in 1-0 eastern redcedar stock. Very common in windbreaks and young plantings.

Disease	Host	Location	Remarks
ABIOTIC			
Low temperature	Eastern redcedar	Nebraska	A sudden, hard freeze before stock was dormant resulted in the loss of about 1 million nursery trees.
Low temperature	Hardwoods	Southeastern South Dakota	An early snowstorm caused moderate to heavy damage to hardwoods that had not shed their leaves.
Leaf scorch	Hardwood species	Nebraska	Common on many species in mid-to late summer causing branch dieback, especially in the upper crowns and southwest-facing sides.
Leaf scorch	Hardwoods, Conifers	Eastern Colorado	Very common on many species in most eastern plains cities due to the wet spring followed by a long, dry hot spell in July.

Disease	Host	Location	Remarks
OTHER			
Hackberry decline	Hackberry	Kansas	Continues to be a problem in shelterbelts. Herbicide damage and defoliation by cankerworms are suspected as the main factors contributing to the decline.
Spruce decline	Spruce species	Eastern half South Dakota	For the past 4 years, an unknown decline of ornamental spruce has been noted that results in early casting of needles at first on a few branches then eventually over the entire tree. No mortality noted.
Dieback and wilt of Russian olive	Russian olive	Colorado	Causal agent unknown. No estimate of loss available. Suspected to be a complex with soil moisture and root and vascular wilt pathogens.

STATUS OF INSECTS

BARK BEETLES

MOUNTAIN PINE BEETLE: *Dendroctonus ponderosae* Hopkins

This beetle continues to cause the most mortality of the "tree killer" genus *Dendroctonus*. As the reader may recall, mountain pine beetle (MPB) populations were high in the '70's along the Front Range of Colorado. In 1982, only 15,200 faded trees were detected from the air. An estimated additional 35-50,000 infested or faded trees were removed by firewood gatherers and localized prevention and suppression activities.

Elsewhere in Colorado, in ponderosa pine, MPB in association with western and roundheaded pine beetles are causing moderate losses in portions of the San Juan and Uncompahgre National Forests. The infestation on San Juan National Forest involves portions of the Mancos and Dolores Ranger Districts on the mesa's along the Dolores River. The loss level was static in 1982 and is expected to remain static in 1983. The infestation on the Uncompahgre National Forest involves the Ouray Ranger District on the southern portion of the Uncompahgre Plateau. Tree mortality although substantial in 1981 decreased in 1982 and is expected to continue to decline in 1983. Sanitation salvage efforts are underway on both forests to minimize the infestation impact.

Lodgepole pine stands in north central Colorado continue to exhibit an increasing loss from MPB. Aerial surveys detected 451,200 faded trees. An additional 67,668 infested trees were removed during suppression and prevention activities on National Forest lands. A significant number of infested and faded trees were also removed by firewood gatherers. A joint effort between the Colorado State Forest Service and the White River National Forest in the Summit and Eagle counties got underway. Entitled, Summit-Upper Eagle Integrated Forest Management Project (S.U.E.)-actions were centered around the Dillon Reservoir and Minturn. Nearly 47,000 trees were chemically treated at a cost of $15.78 per tree. Almost 21,000 infested trees were removed at a cost of $2.59 per tree. In recreation sites, 10,619 trees were treated with a preventive spray at a cost of $5.57 per tree. In addition 56,400 acres were examined (Stage II), 1,465 acres planned for harvest, 610 acres prepared for harvest, 285 acres offered and sold, 75 acres harvested via free use firewood, and 500 acres pre-commercially thinned. A significant additional amount of similar activities were conducted on private lands. The Colorado State Forest Service treated 32,638 trees on private land within the State. Within treated areas, treatment exceeded 80% of the infested trees. However, treatment omission along with beetles flying into the treated areas neccessitates treatment again in 1983. A significant start has been made on the identification of silvicultural treatment areas in the future. Manipulation of high risk stands to a lower risk category will become noticeable in 1983 and future years. It will take about 30 years to create a mosaic of lower risk stands over the project area.

Beetle populations are on the rise in ponderosa pine on the western half of the Black Hills. Populations remain low in the eastern half. The Bearlodge Ranger District in the north west Black Hills remains at a high static level. Populations in this area may be at a peak. The MPB prevention project being done on State lands near Sylvan Lake and on private lands near Deer Mountain is nearly complete. Only 72 acres remain to be treated. This will bring the total size of the project to 512 acres on the two sites, 37 more than originally planned, all for the original cost. The two areas will be monitored closely in the future to be certain that the management actions taken provide the long term prevention from MPB as anticipated. In addition, the two areas will be used to show other land owners the benefits of good pest prevention through forest management.

In Wyoming, MPB populations are on the increase within the Roaring Fork and North Fork drainages of the Little Snake River. A significant proportion of the lodgepole stands are in the high risk category. A significant outbreak is possible. Populations are on the rise in the Shirley Mountains, Muddy and Casper Mountains. On Green Mountain and in the Lander area populations are at a high and moderate level, respectively.

SPRUCE BEETLE: *Dendroctonus rufipennis* Kirby

Spruce beetle populations are on the rise in Wyoming and Colorado. In general 4-6 trees per group occurs. Salvage harvesting is being conducted on the Routt and Rio Grande National Forests.

An aggressive program is underway on the Rio Grande National Forest to slow the outbreak. Suppression and detection/evaluation activities are being conducted in the Beaver Creek, Pinos Creek, Park Creek and Pass Creek areas. Green infested and high risk trees have been marked for removal as well as marking trap trees for felling and later removal. Four sales were marked to remove 11.3 MMBF on 1215 acres. Six hundred trap trees and early felling of 1200 trees in the Bug Trap 1 sale area attracted significant beetles. These were removed prior to winter. An additional 3200 acres is under increasing beetle pressure. Sales are being planned. A significant portion of the allowable cut on the Forest is being shifted to this area to meet this serious beetle threat. Hopefully a strong demand for spruce logs will allow rapid removal of infested and high risk trees.

DEFOLIATORS

WESTERN SPRUCE BUDWORM: *Choristoneura occidentalis* Freeman

Western spruce budworm remains widespread within the Region. Approximately 1.8 million acres of forested land in Colorado and 200,000 acres in Wyoming were visibly defoliated. Defoliation severity in Wyoming was moderate to heavy whereas in most of Colorado it was light. Local areas in Colorado were moderate to severe. Figure 3 shows the distribution of western spruce budworm defoliation in 1982.

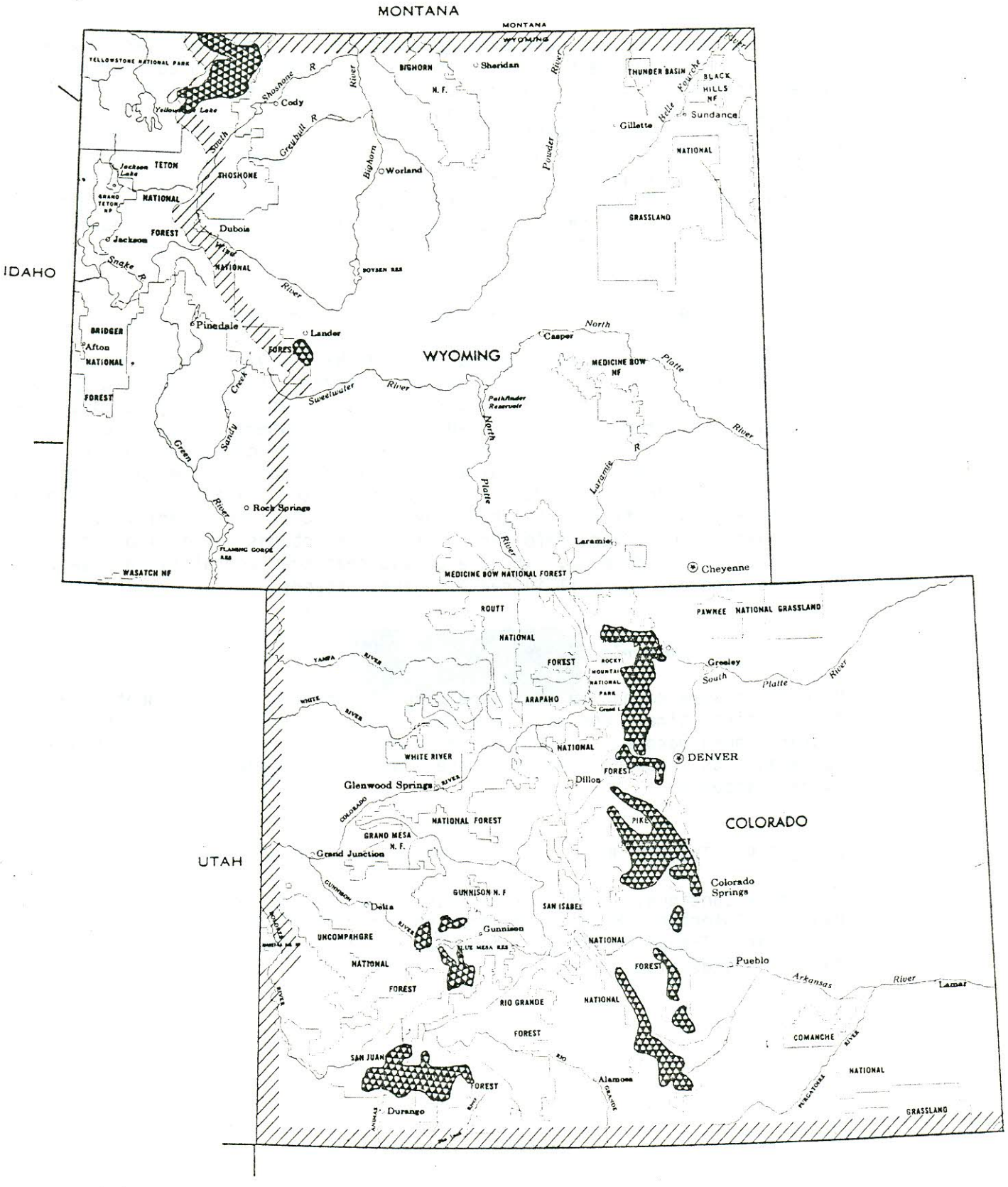


Figure 3. 1982 western spruce budworm defoliation in the Rocky Mountain Region.

Budworm egg mass surveys were expanded this year to include infested areas in Wyoming and areas west of the Continental Divide in Colorado. Egg mass surveys indicate light to moderate defoliation is expected in Colorado in 1983 possibly indicating a continuing decline in visible defoliation. In Wyoming, on the Shoshone National Forest, the average egg mass density per square meter of foliage is 60, indicating probable moderate to heavy defoliation and expansion of acres visibly defoliated in 1983. Parasitism of late instar and pupal life stages is being evaluated to determine if any significant shifts in parasite species composition is occurring since evaluated in the late 1970's.

WESTERN TENT CATERPILLAR: *Malacosoma californicum* Packard

Defoliation of aspen, *Populus tremuloides* Michx, by western tent caterpillar continues to spread. In 1982, 36,000 acres were visibly defoliated on the San Juan National Forest, a 9,000 acre increase over 1981 (Figure 4). The infestation is spreading in the Blanco Basin area where an increase in public concern is being expressed. Egg mass surveys conducted in August indicate a continual expansion of the population and an increase in the acres visibly defoliated. Parasitism, disease, and predation, while present, has not had a significant effect on the population. The majority of the stands exhibiting severe defoliation are mature stands which also contain various levels of disease. It is expected that tree mortality to insects, diseases, and old age will increase in these stands.

GYPSY MOTH: *Lymantria dispar* (L.)

Male moths were caught in pheromone traps located in Bourbon County, Kansas for the first time. One male moth was caught in a campground north of Custer, South Dakota. No moths were caught in Colorado. APHIS continues to expand its trapping program in areas where the highest probability of success appears.

DOUGLAS-FIR TUSSOCK MOTH: *Orgyia pseudotsugata* (McDunnogh)

This moth continues to be a significant pest in urban areas along the Front Range of Colorado. Moths were recovered from the Sedalia area southwest of Denver. Trapping will be conducted in 1983 to determine its presence on forested lands along portions of the Front Range.

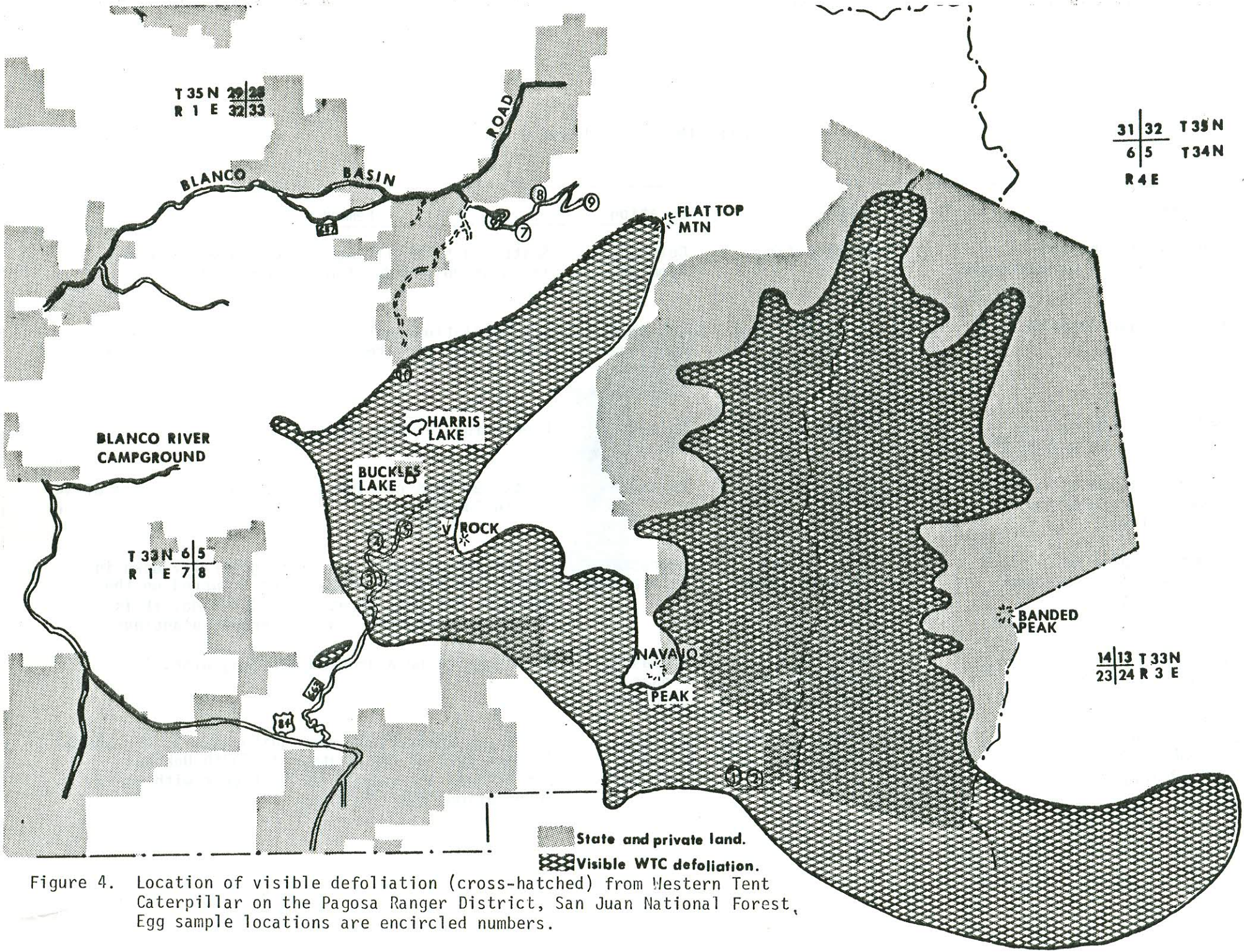


Figure 4. Location of visible defoliation (cross-hatched) from Western Tent Caterpillar on the Pagosa Ranger District, San Juan National Forest. Egg sample locations are encircled numbers.

OTHER INSECTS - REGION 2

Insect	Host	Location	Remarks
Douglas-fir beetle *Dendroctonus pseudotsugae* (Hopk.)	Douglas-fir	Colorado, Wyoming	Scattered tree killing by this insect continues in Colorado and Wyoming at endemic levels.
Pine engraver beetles *Ips* spp.	Ponderosa pine, pinyon and lodgepole pine	South Dakota, Wyoming, Colorado, Kansas	*Ips* populations were prevalent in local areas in fresh slash and trees weakened from other sources.
Red turpentine beetle *Dendroctonus valens* (LeC.)	Ponderosa pine	Colorado, South Dakota	Populations at low levels.
Western balsam bark beetle *Dryocoetes confusus* (Swaine)	True fir	Colorado	Scattered loss continues throughout the range of fir in Colorado.
Zimmerman pine moth *Dioryctria zimmermani* (Grote)	Austrian and ponderosa pine	Nebraska, Colorado	In Nebraska, populations were generally down in 1982. The highest populations occurred on the Nebraska National Forest. In Colorado, it is found in ornamental and shelterbelt plantings.
Pine tip moth *Rhyacionia* sp.	Austrian, ponderosa and Scots pine	Nebraska, Kansas, Colorado	Continues to be a problem on young pine.
Fall webworm *Hyphantria cunea* (Drury)	Cottonwood and poplar	Kansas, Colorado, South Dakota	In Kansas populations were quite high in the southeastern part of the State. In South Dakota, populations increased over last year with heavy infestations near Aberdeen.

Insect	Host	Location	Remarks
Bronze birch borer *Agrilus anxius* Gary	Birch	Colorado, South Dakota	A serious problem of ornamentals, particularly in Colorado.
Green ash (lilac) borer *Podosesia syringiae syringiae* (Harris)	Green ash	Eastern South Dakota	Causing major problems in many shelterbelts, especially in younger trees. Mortality, tree form damage and stem weakening have been reported.
Poplar vagabond aphid *Mordwilkoja vagabunda* Walsh	Aspen	Colorado	Scattered damage.
Poplar gall *Saperda inornata* Say	Cottonwoods	South Dakota	Especially in shelterbelts. Several belts examined around Aberdeen, Shade Hills and Sioux Falls sustained heavy damage.
Hackberry lace bug *Corythuca celtidis* O&D	Hackberry	Nebraska	Caused considerable defoliation in Douglas, Sarpy, and Cass Counties of eastern Nebraska.
Cankerworms *Alsophila pometaria* (Harris) and *Paleacrita vernata* (Peck)	Hackberry, honeylocust, ash, and elm	Kansas	Defoliation occurred in the northeast and south central part of the State.
Flatheaded borer *Chrysobothris texana* LeConte	Cedar	Kansas	Found in several cedar windbreaks.
Carpenterworm *Prionoxystus robiniae* (Peck)	Ash	Kansas	Reported in southcentral and northwestern areas of the State.
Juniper bark beetle *Phloeosinus* sp.	Juniper	Kansas, Colorado	Only a few reports in Kansas and on nursery stock in Colorado.

Insect	Host	Location	Remarks
Walnut caterpillar *Datana integerrima* G.&R.	Walnut	Kansas	Populations were very high in the northeastern part of the State.
Pine needle sheathminer *Zelleria haimbachi* Busck	Ponderosa pine	Colorado, Nebraska	Scattered infestations in LaPlata, Archuleta, and Jefferson Counties, Colorado, and Nebraska National Forest.
Pine budworm *Choristoneura lambertiana* (Busck)	Ponderosa pine	Colorado	Light infestations detected in Archuleta County.
Pitch nodule moth *Petrova* sp.	Ponderosa pine	Nebraska	Scattered infestations detected on young pines in Nebraska National Forest.
Pine needleminer *Coleotechnites* sp.	Ponderosa pine	Colorado	Primarily detected along the Front Range. Populations appeared to be lower in 1982 than in 1981.
Chrysomela sp.	Willow	Colorado	Five acres severely infested near Crested Butte, Colorado.
Archips negundana	Boxelder	Colorado	Defoliation occurred along creeks and on ornamentals in Jefferson County.
Nephrotoma sodalis	Blue spruce seedlings	Nebraska	Scattered seedling mortality occurred at the USDA Forest Service Bessey tree nursery.
Spruce spider mites *Oligonychus ununguis* (Jacobi)	Spruce	South Dakota	An increasing problem on ornamentals and shelterbelts.
Pinyon pitch borer *Dioryctria* sp.	Pinyon	Colorado	A serious problem of ornamentals.

Insect	Host	Location	Remarks
Pine tiger moth *Halisidota ingens* Hy. Ed.	Ponderosa pine and white fir	Colorado	Minor defoliation was reported from the foothills west of Pueblo to Trinidad.
Pandora moth *Coloradia pandora* Blake	Austrian pine	Colorado	Viable eggs were collected near Cortez, CO. This area will be monitored for pandora moth in 1983.
Cooley spruce gall aphid *Adelges cooleyi* (Gillette)	Blue spruce, Engelmann spruce and Douglas-fir	Colorado	A ubiquitous pest of ornamentals.
Elm leaf beetle *Pyrrhalta luteola* (Muller)	Elm	Colorado	A chronic pest of ornamentals in the metropolitan areas.
Oyster shell scale *Lepidosaphes ulmi* (L.)	Hardwoods	Colorado	A chronic pest on ornamentals.
Pine needle scale *Chionaspis pinifoliae* (Fitch)	All pines	Colorado, Nebraska	A chronic pest of ornamentals in the metropolitan areas of Colorado. Very high populations exist on ponderosa pine on the Bessey division of the Nebraska National Forest.

FOREST PEST MANAGEMENT WORKSHOPS

The Forest Pest Management Staff conducted a workshop in May entitled "Safety and Health Inspection of Developed Recreation Sites". The subject matter dealt with the identification and reduction of hazardous trees in developed sites. The purpose of the workshop was to train individuals who, in turn, would train people on their respective Forests. The workshop included a slide tape presentation (copies of which were supplied to each Forest representative for training purposes) and discussion the first day followed by visits for a day and a half to developed sites to gain experience in the recognition of various indicators of defect of local tree species. Use of the tree inspection form, R2-2300-11a, and tree failure form, R2-2300-11b, were emphasized.

During the past year the Forest Pest Management Staff offered classroom and field training in the recognition and suppression of major forest diseases and insects in the Region. Training consisted of two-day workshops held in Laramie, Wyoming and Dillon, Colorado. These sessions were attended by resource managers from the Wyoming and Colorado State Forest Service, the Bureau of Land Management, Jefferson County, Colorado, and National Forest Service as well as consulting foresters. The newly revised Forest Pest Management Training Manual was distributed to attendees.

On November 16 and 17, 1982 FPM coordinated, in conjunction with Carl Edminster (RMS), Ralph Johnson (R-1) and representatives of AGNET (Washington State University), a training session on the use of the computer program Rocky Mountain Yield (RMYLD). Thirty-nine participants representing Federal, state and private organizations attended the two-day session. The session included the theory of RMYLD, recent enhancements to RMYLD-2, and "hands-on" practice.

FOREST PEST MANAGEMENT ACTIVITY REVIEW

During July 12-23, 1982 a review of FPM activities in the Region was conducted by Washington Office FPM Staff members. The major objective of the review was to determine the adequacy of all administrative and technical aspects of the FPM program in Region 2. The specific activities discussed included technical assistance including training, at the Region, Supervisor and Ranger District level, and to state and Federal cooperators; program planning, budgeting, and execution process; coordination with Research, including determination of priorities, mutual assistance, and technology transfer activities; pesticide-use activities; organizational structure and professional staff needs; and pilot control project activities.

Selected National Forests and Ranger Districts, State Foresters, federal cooperators including Forest Service Research units, National Park Service, Bureau of Land Management, Bureau of Indian Affairs, Fish and Wildlife Service, as well as Regional Timber, Range, Recreation and Planning staff groups were contacted.

PESTICIDE USE IN REGION 2 - FY 82

TYPE OF PESTICIDE	CHEMICAL USED	TARGET PEST	UNITS TREATED[1/]	APPLICATION METHOD[2/]	USER[3/]
Fumigant	Methyl bromide	Nematodes, root disease fungi, and weeds in nursery beds	14	G	I
Fungicide	Benomyl	Phomopsis blight in eastern redcedar nursery beds.	100	G	I
	Chlorothalonil	*Phoma* spp. in nursery beds	2	G	I
	Zineb	Shothole disease in nursery beds	9	G	I
Herbicide	Bromacil	Weeds and grass control around well heads, meter runs, cattleguards, compressor sites, tank batteries, salt water tanks, etc.	85 sites	G	III
	Bromacil and Diuron		130 sites	G	III
	Bromacil, Diuron, and Simazine		40 sites	G	III
	Copper sulfate	Algae control in fishing lakes	---	G	I

1/ Units are in acres unless otherwise indicated.

2 A = Aerial application
G = Ground application

3/ Users: I = USFS
II = Other federal or public agencies
III = Permittees, licensees, and grantees

PESTICIDE USE IN REGION 2 - FY 82 (continued)

TYPE OF PESTICIDE	CHEMICAL USED	TARGET PEST	UNITS TREATED	APPLICATION METHOD	USER
Herbicide	DCPA	Annual and perennial broadleaf weeds and grasses	27	G	I
	Dicamba	Canada thistle, leafy spurge, noxious weeds	122	G	I, II
	Dicamba & 2,4-D	Canada thistle, forbs, toadflax	169	G	I
	Diquat	*Elodea canadensis* control in fishing lakes	10	G	II
	Glyphosate	Canada thistle, leafy spurge, yellow toadflax, noxious weeds	242	G	I, III
	Picloram	Leafy spurge, larkspur, thistle, noxious weeds	3,161	G	I, II, III
	Picloram & 2,4-D	Canada thistle and toadflax	10	G	I
	Simazine	Annual weeds	20	G	I
	2,4-D	Aspen regeneration/ experimental	6	A	I
	2,4-D	Big sagebrush	887	A	I

PESTICIDE USE IN Region 2 - FY 82 (continued)

TYPE OF PESTICIDE	CHEMICAL USED	TARGET PEST	UNITS TREATED	APPLICATION METHOD	USER
Herbicide	2,4-D	Sand sagebrush	14,000	A	III
	2,4-D	Wyethia	759	A	I
	2,4-D	Canada thistle, leafy spurge, snakeweed, noxious weeds, range improvement	560	G	I, II III
	2,4-D & Amine	Noxious weeds	25	G	I
Insecticide	Carbaryl	Cottonwood leaf beetle, grasshoppers in nursery beds	9	G	I
	Carbaryl	Mountain pine beetle protection	20,000 trees	G	I, III
	Coumaphous	Cattleflies	900 head	G	III
	Dimethoate	Pine tip moth in nursery beds	11	G	I
	Ethylene dibromide	Mountain pine beetle control	43,170 trees	G	I, III
	Lindane	Mountain pine beetle control	22,378 trees	G	I
	Toxaphene	Lice, ticks, flies	6,000 head	G	III

PESTICIDE USE IN Region 2 - FY 82 (continued)

TYPE OF PESTICIDE	CHEMICAL USED	TARGET PEST	UNITS TREATED	APPLICATION METHOD	USER
Piscicide	Rotenone	Green sunfish, white sucker control in fishing lakes	154	G	II
Rodenticide	Strychnine	Pocket gophers	32	G	I
	Zinc phosphide	Black-tailed prairie dogs	13,607	G	I, III
	Zinc phosphide	Pocket gophers	200	G	I

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