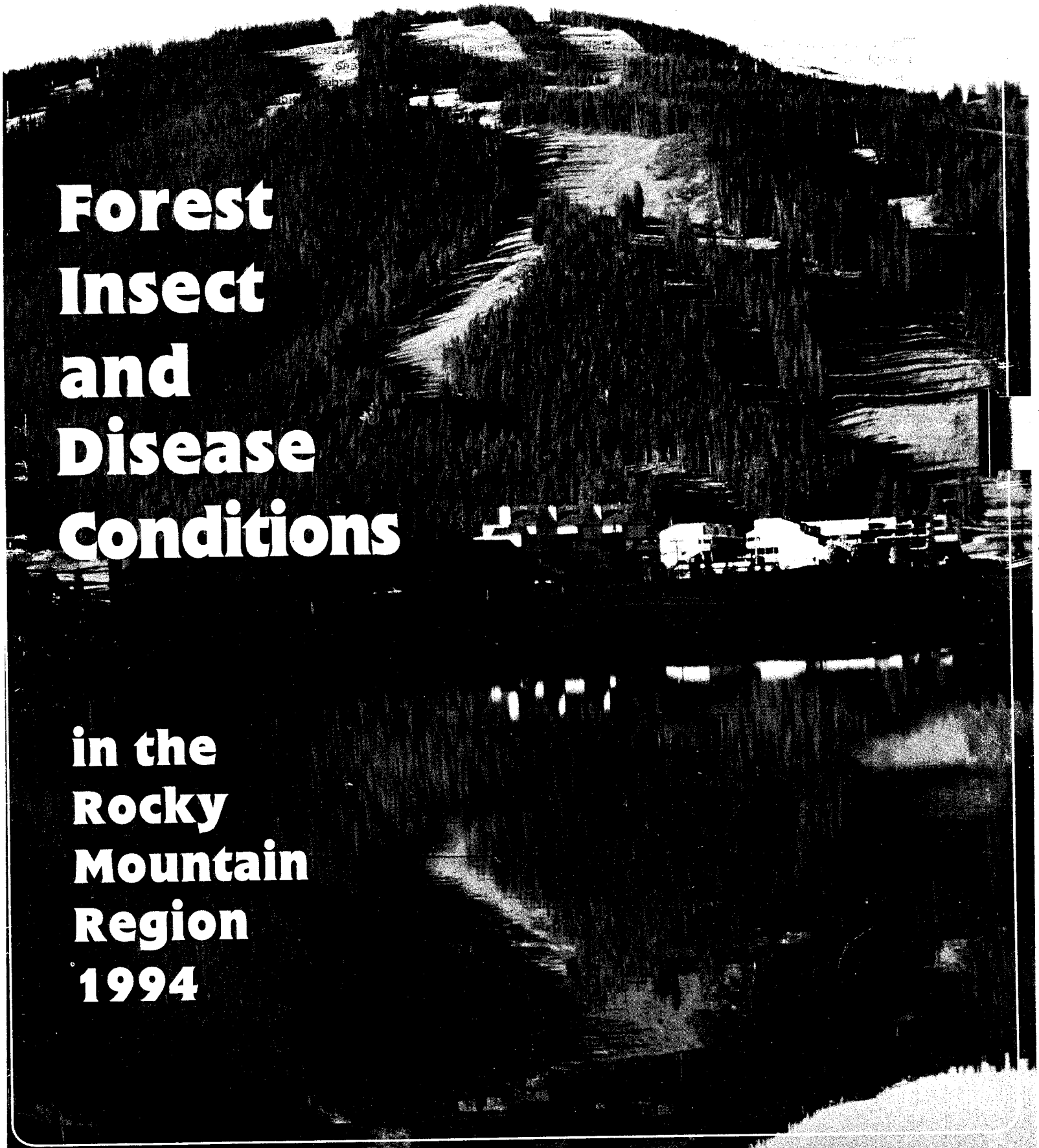


Forest Insect and Disease Conditions

in the Rocky Mountain Region 1994

United States Department of Agriculture

Renewable Resources
Forest Health Management

Rocky Mountain Region

FOREST INSECT AND DISEASE CONDITIONS

IN THE

ROCKY MOUNTAIN REGION

1994

By

Forest Health Management Group

Susan J. Johnson, Biologist, Ed.

July 1995

Renewable Resources, Forest Health Management
Rocky Mountain Region
USDA Forest Service
P.O. Box 25127
Lakewood, Colorado 80225-5127

MAILING LIST UPDATE - Annual Report 1994

Annually, we update our mailing list. If you have had an address change or would like to receive publications other than what you currently receive, please note the change and return this sheet to the P.O. Box Mailing Address listed below.

Current Name and Address:

_____

_____

_____

Changed/New Name and Address:

_____

_____

_____

Check which mailing(s) you wish to receive:

- ☐ Entomology (Evaluations and Technical Reports)
- ☐ Pathology (Evaluations and Technical Reports)
- ☐ Annual Reports (only)
- ☐ All FHM Reports

NOTE:

P.O. Box Mailing Address:

Renewable Resources - FHM
Rocky Mountain Region
USDA Forest Service
P.O. Box 25127
Lakewood, Colorado 80225-5127

Building Address:

Renewable Resources - FHM
Rocky Mountain Region
USDA Forest Service
740 Simms Street
Golden, Colorado 80401

ACKNOWLEDGMENTS

The Forest Health Management (FHM) Staff of the Renewable Resources Unit extends appreciation to all cooperators who contributed to this report.

Information on specific pest problems may be obtained from the Regional Office (303/275-5061), Lakewood Service Center (303/236-9541), Gunnison Service Center (719/641-0471), or Rapid City Service Center (605/394-1960), as well as from the following State Foresters:

COLORADO	Jim Hubbard, State Forester Colorado State Forest Service Forestry Building Colorado State University Fort Collins, Colorado 80523 Phone: 303/491-6303 FAX: 303/491-7736
KANSAS	Raymond G. Aslin, State Forester Kansas State Division of Forestry 2610 Claflin Road Manhattan, Kansas 66502 Phone: 913/537-7050 FAX: 913/539-958
NEBRASKA	Dr. Gary L. Hergenrader, State Forester Department of Forestry, Fisheries, and Wildlife Institute of Agriculture and Natural Resources Room 101, Plant Industry Building East Campus, University of Nebraska Lincoln, Nebraska 68583-0814 Phone: 402/472-2944 FAX: 402/472-2964
SOUTH DAKOTA	Ray Sowers, State Forester Division of Resource Conservation and Forestry Foss Bldg., 523 E. Capitol Ave. Pierre, South Dakota 57501 Phone: 605/773-4260 FAX: 605/773-5926
WYOMING	Mike Gagen, State Forester Wyoming State Forestry Division 1100 West 22nd Street Cheyenne, Wyoming 82002 Phone: 307/777-7586 FAX: 307/637-8726

PHOTOGRAPHER: Bill Blunt - Denver, Colorado

TABLE OF CONTENTS

INTRODUCTION

Forest Health Management (FHM) is responsible for the detection, evaluation, and suppression of insects and diseases on forested Federal lands. FHM also administers financial and technical assistance programs with the State Foresters of Colorado, Kansas, Nebraska, South Dakota, and Wyoming. In addition, the management of gypsy moth is a shared responsibility with the Animal and Plant Health Inspection Service (APHIS). APHIS also has the responsibility for the range pest management programs on Federal lands. Close coordination and cooperation of the Federal and State agencies responsible for pest management is necessary for effective program execution.

FOREST HEALTH MANAGEMENT ORGANIZATION-1995
Rocky Mountain Region

DAVE ANDERSON
ACTING DIRECTOR
RENEWABLE RESOURCES

ROY MASK
SERVICE CENTER LEADER
GUNNISON SERVICE CENTER

TOM EAGER
ENTOMOLOGIST
GUNNISON SERVICE CENTER

PETE ANGWIN
PLANT PATHOLOGIST
GUNNISON SERVICE CENTER

DAVE JOHNSON
CENTER LEADER
LAKEWOOD SERVICE CENTER

JERI LYN HARRIS
PLANT PATHOLOGIST
RAPID CITY SERVICE CENTER

BILL SCHAUPP
ENTOMOLOGIST
LAKEWOOD SERVICE CENTER

ROBERT AVERILL
FHM GROUP LEADER
REGIONAL OFFICE

VACANT
ENTOMOLOGIST
RAPID CITY SERVICE CENTER

VACANT
AERIAL SURVEY SPECIALIST
LAKEWOOD SERVICE CENTER

JUDY PASEK
SERVICE CENTER LEADER
RAPID CITY SERVICE CENTER

SUSAN J. JOHNSON
BIOLOGIST
REGIONAL OFFICE

BERNARD BENTON
COMPUTER SPEICALIST
REGIONAL OFFICE

VACANT
FH MONITORING COORDIN.
REGIONAL OFFICE

LAURA DISBROW
SYSTEMS ANALYST
REGIONAL OFFICE

FOREST HEALTH MANAGEMENT SERVICE CENTERS

Three Service Centers serve the Rocky Mountain Region. These were established to provide timely and effective pest management services to their customers. Questions concerning Center operations and requests for service can be directed to the Forest Health Management (FHM) Group Leader in the Regional Office or the respective Service Center Leaders.

The **Lakewood Service Center (LSC)** in Building 20 on the Denver Federal Center provides assistance to Kansas, eastern and northwestern Colorado, and southern Wyoming. This includes the following National Forests and cooperators in adjacent areas:

Pike and San Isabel (except Leadville, Salida, and San Carlos Ranger Districts)
Arapaho and Roosevelt
Routt
Medicine Bow
White River (Dillon Ranger District only)

Dave Johnson, Supervisory Plant Pathologist, is the Service Center Leader. Ken Lister and Mike Sharon, the Center's Entomologist and Plant Pathologist, respectively, have retired. Willis Schaupp has transferred to the LSC as the Entomologist.

The **Gunnison Service Center (GSC)** is located at 216 North Colorado, Gunnison, Colorado, 81230. It provides assistance to the following National Forests and cooperators west of the Continental Divide in Colorado:

Rio Grande
Pike and San Isabel (Leadville, Salida, and San Carlos Ranger Districts)
San Juan
Grand Mesa, Uncompahgre, and Gunnison
White River (except the Dillon Ranger District)

Roy Mask is the Supervisory Entomologist and Service Center Leader. Pete Angwin is the Plant Pathologist and and Tom Eager is the Center's Entomologist.

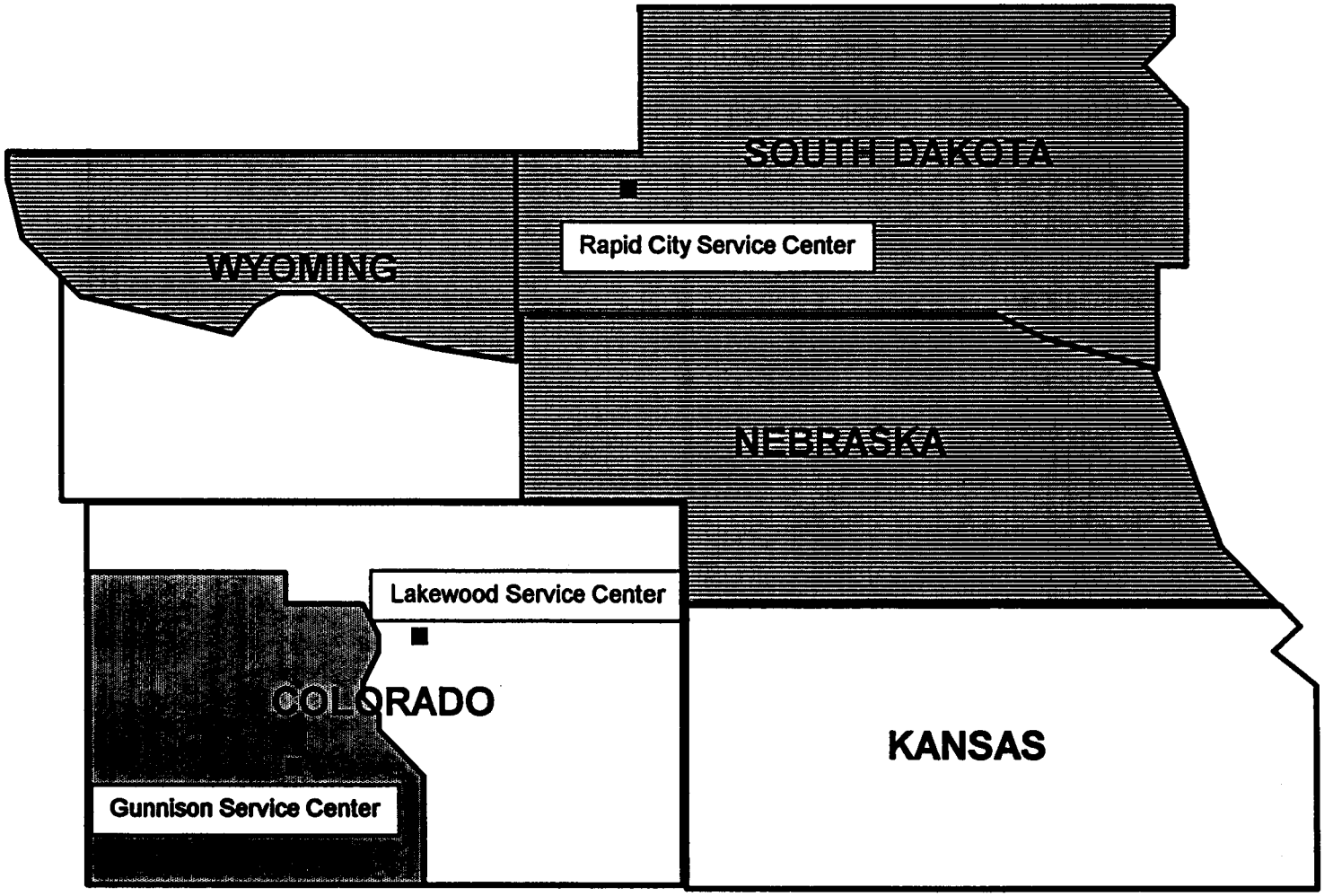
The **Rapid City Service Center (RSCS)** is co-located with the Rocky Mountain Forest and Range Experiment Station at the Forestry Sciences Lab, South Dakota School of Mines and Technology, 501 E. St. Joe, Rapid City, South Dakota, 57701. The Service Center provides assistance to the following National Forests and cooperators east of the Continental Divide in northern Wyoming, and in South Dakota and Nebraska within Region 2:

Black Hills
Bighorn
Shoshone
Nebraska

Judy Pasek is Supervisory Entomologist and Service Center Leader. Jeri Lyn Harris is the Plant Pathologist and the Center's Pest Management Specialist position is currently vacant.

The Forest Health Management (FHM) staff in the Regional Office, located at 740 Simms Street, Golden, Colorado, 80401, provides assistance to the three Service Centers. Robert Averill is the Group Leader; Laura Disbrow is the Systems Analyst; Susan Johnson, Biologist, handles special projects such as Cinara, reports, and is Acting Pesticide Specialist; Bernard Benton, Computer Specialist, provides assistance with data entry and testing; Bill Blunt, the Forest Health Monitoring Coordinator, retired in 1994. Currently, the Forest Health Monitoring Coordinator for the Rocky Mountain Region is vacant. This position will be filled in 1995.

ROCKY MOUNTAIN REGION
Forest Health Management Zones



FY94 FOREST HEALTH MANAGEMENT WORKSHOP AND TRAINING EVENTS

A 3-day Forest Pest Management training session, held in Custer, South Dakota, was attended by 15 people interested in insects and diseases common to the Rocky Mountain Region. The instructors included Forest Health Management specialists from the Rapid City Service Center and the South Dakota Division of Forestry pest specialist, Rich Dorset. Attendees came from three National Forests, the South Dakota Department of Agriculture-Divisions of Forestry and Regulatory Services, Wyoming State Forestry Division, and USDI Bureau of Land Management. Topics included recognition of insects and diseases, life cycles and damage characteristics, management options, hazard tree recognition, risk rating systems for bark beetles, damage rating systems for diseases, developing technologies for IPM, and insect and disease considerations in ecosystem management. The June course also included a field trip and a session to examine lab specimens.

Rapid City Service Center personnel visited a total of 38 schools and scout groups within the Rapid City school system during fall 1993, and winter 1994. Judy Pasek and Bill Schaupp provided information about the importance of insects in our forest systems to over 800 students ranging from kindergarten to seventh grade. In addition, Judy gave a presentation via interactive television to a group of 20 "at-risk" eighth to tenth graders gathered for an "Expanding Your Horizons" conference at the University of South Dakota.

During a Rapid City school system summer enrichment program, Judy Pasek involved children in the fine art of sweep netting for insects along a creekside. The children collected, observed, and talked about the insects contained within their zip-lock bags.

The Gunnison and Lakewood Service Centers provided a 1-day training session on insect and disease recognition and marking considerations at the Del Notre Ranger District, Rio Grande National Forest. The session was attended by 15 permanent and seasonal Forest employees.

FOREST HEALTH MANAGEMENT SPECIAL PROJECTS

Douglas-fir beetle Risk Rating Project
Classification of forested areas according to susceptibility of insect infestation is called risk-rating. Risk-rating tools allow land managers to predict, in the event of an insect epidemic, where an infestation's impacts will be concentrated. Such predictions assist with planning and can help prioritize where mitigation should be attempted. At this time, no scientifically based risk-rating tool exists for Douglas-fir beetle, an insect that periodically attains epidemic status and kills large numbers of healthy Douglas-fir trees. Bill Schaupp, entomologist at the Rapid City Service Center, is leading a large-scale effort to develop such a predictive tool with funding from Forest Pest Management's Technology Development Program. Data on mortality from 12 National Forests in four states will be used to produce a susceptibility classification for use by the end of 1996. The project covers the Rocky Mountains from southern Colorado to the Canadian border in order to survey a wide variety of conditions.

Regional Monitoring for Gypsy Moth
Each year, detection traps are placed in campgrounds and other sites that meet the criteria for being potential introduction sites. There are basically three site selection criteria for the placement of traps: (1) the site must have a vegetation component that is a suitable host; (2) the site is at or below 10,000 ft. in elevation; and (3) there exists the potential for high numbers of out-of-state visitors. In 1994, a total of 220 traps were placed regionwide in areas that met the criteria. Based on gypsy moth catches of the previous year, two delimitation surveys were conducted by the Rapid City Service Center, one south of Rapid City in South Dakota and the other on the Wapiti District on the Shoshone NF in Wyoming. As a result of the gypsy moth trapping by the FHM zone offices, zero catches were reported on lands managed by the National Forest Systems. Gypsy moth trapping will be continued in cooperation with other federal, state, local, and private agencies.

Westwide Permanent Plot Project

Since 1989, Region 2 has been involved with the west-wide technology development project, "Pest Trend Impact Plots in the West." The objective of the project is to establish a series of permanent plots to provide data for the validation and calibration of various insect and disease computer simulation models. To date, installation of 32 ponderosa pine, white spruce, mixed conifer, lodgepole pine, spruce/fir, and pinyon pine/juniper plots to monitor the spread of Armilliaria, annosus, and blackstain root disease has been completed. In addition to the installation of the permanent plots, Region 2 FHM participated in the beta-testing of the PTIPS (Pest Trend-Impact Plot System) data entry programs. In the spring of 1994, the PTIPS database was installed on the Data General System at Region 2's Regional Office along with remeasurement data from six data sets. Using this data, the PTIPS data error and data reporting systems were tested. The recommendations from the beta test are currently being used to fine-tune the PTIPS database system.

Ski Area Vegetation Management Projects

Forest health in developed recreation acres is becoming a major focus of the Forest Health Management staff along with the usual vegetation management concerns in campgrounds, picnic areas and scenic byway corridors. In 1993, the Gunnison Service Center received a request from the Aspen and Taylor River/Cebolla Ranger Districts to participate in the development of vegetation management plans for the Aspen Mountain and Crested Butte Mountain Resort ski areas. In August 1993, forest health assessments for both areas began with the acquisition of color infra-red photography taken by Dick Myhre of the Forest Pest Management Methods Application Group in Ft. Collins, CO. Using the photography, areas of dead and dying trees were identified, then visited in October 1993 and August 1994 by specialists making disease and insect pest assessments. Armillaria root disease (Armillaria sp.) and western balsam bark beetle (Dryocoetes confusus) were identified as major causes of mortality in the spruce/fir stands of both ski areas. Lodgepole pine dwarf mistletoe (Arceuthobium americanum) was identified to be affecting lodgepole pine in one large area at Crested Butte. Most of the aspen stands at both ski areas were in good condition, although cankers and stem decays were identified in some of Crested Butte's older stands. Root samples from 16 spruce/fir stands were sent to the Forest Health Management diagnostic lab in Lakewood, CO, for isolation and analysis of the root disease fungus. Management recommendations that will lead to healthy, resilient, and aesthetically pleasing forest stands are presently being incorporated into the vegetation management plans for both ski areas. In the future, similar assessments will be done at Snowmass, Tiehack, and Aspen Highlands ski areas.

Montezuma County Ponderosa Pine Assessment

Montezuma County was awarded a rural development grant to study the ponderosa pine vegetation cover type on the Dolores and Mancos Ranger Districts, San Juan NF. As part of the analysis, Gunnison Service Center staff members were asked to perform an assessment of the health of the ponderosa pine cover type over an area of 116,000 acres. Cursory review of stand examination data revealed that the greatest threat to these stands was from mountain pine beetle (Dendroctonus ponderosae), ponderosa pine dwarf mistletoe (Arceuthobium vaginatum subsp. cryptopodium), and Armillaria root disease (Armillaria sp.). Once these major impacts were identified, additional data was gathered by aerial survey, ground-truthing and on-site stand examinations. Evaluation of the conditions within the project area revealed that (1) 41% of the area is at moderate to high risk for mountain pine beetle outbreak; (2) ponderosa pine dwarf mistletoe is widespread; and (3) though Armillaria root disease information is scarce, the disease was identified in a few stands. The recommendation was to address the effects of mountain pine beetle and dwarf mistletoe as the major stand-stressors within the Ponderosa Pine Assessment.

FOREST HEALTH ASSESSMENT

PINEY ANALYSIS AREA
HOLY CROSS RANGER DISTRICT
WHITE RIVER NATIONAL FOREST

At the request of the White River National Forest and the Holy Cross Ranger District, the forest health of the Piney River/Red Sandstone Area was examined. Because of the history of mountain pine beetle activity in the lodgepole pine cover type, that forest component was chosen for detailed evaluation. However, some attention was also given to the impacts of spruce beetle, Dendroctonus rufipennis, in the spruce-fir cover type.

Analysis of existing stand exam data revealed that the greatest potential threat to the stands of the lodgepole pine cover type was from three different mortality agents: mountain pine beetle, Dendroctonus ponderosae, lodgepole pine dwarf mistletoe, Arceuthobium americanum, and Armillaria root disease, Armillaria spp.. Once these major impacts upon the forest ecosystem were identified, a systematic survey was performed, in which 20% of the lodgepole pine stands in the analysis area were examined. Although the new survey data yielded information similar to that which was gleaned from the old data, a higher degree of confidence is given to the new data. In addition, the new survey contained information on root disease intensity and occurrence, whereas the old data did not. Data from both the old and new stand examinations, together with information gleaned from computer projections of future insect and disease trends, have been incorporated into this document which covers the biology of the three major pests, addresses their impacts on the Piney Analysis Area, and presents a number of management options to mitigate their effects.

Through this analysis, the following conclusions were reached:

- **The potential impacts of insects and diseases should be considered in all silvicultural decisions that are made in the Analysis Area.**

- **Currently, most major forest vegetation types in the Analysis Area differ markedly in structure from the desired forest condition as defined in the Land and Resource Management Plan for the White River National Forest. Most of these vegetation types have more than 50% of their structural stages in mature/over-mature classes that are conducive to outbreaks of most of the important insect and disease agents.**

- **The Analysis Area is at risk for a substantial mountain pine beetle outbreak. Approximately 96% of the lodgepole pine cover type is at moderate to high risk for a beetle outbreak. Controlling tree density over large acreages is the only feasible way to reduce the beetle risk. Initiated in 1984, treatment efforts to reduce risk levels have failed to keep pace with what is needed. At present, it is no longer a matter of if a major outbreak will occur, but when it will occur.**

- **At least 80% of the acreage in the Piney Analysis Area is at moderate to high beetle risk to spruce beetle loss. The opportunistic nature of the spruce beetle requires that managers be vigilant regarding potential outbreaks of this insect. Areas of windthrow, where extensive spruce slash is created, as well as areas of large spruce in well drained creek bottoms, should be monitored for sign of the insect. Aerial surveys can aid in this effort. Once incipient populations are detected, prompt action will be required to remove beetle infested trees by sanitation salvage.**

- While lodgepole pine dwarf mistletoe is widespread throughout the Analysis Area, it is less prevalent than on the White River National Forest as a whole. Many stands, however, should be scheduled for treatment. Patch-cutting, clearcutting, shelterwood or seed tree cutting remain the only viable treatment alternatives where stand dwarf mistletoe ratings (DMR's) are moderate to high. Below this level, sanitation thinning may be considered. The particular treatment to be applied must be determined on a case-by-case basis, according to the individual stand conditions and the intensity and distribution of the dwarf mistletoe infestation. The acres that were surveyed were rated for dwarf mistletoe infection (DMI) levels, which are always higher than DMR levels. Thirteen percent of the acres surveyed had moderate to high DMI's; but since DMI ratings are always higher, this figure should be considered as the absolute maximum of acres on which treatments other than sanitation thinning may apply.

- Approximately 18% of the acres have both dwarf mistletoe (low, moderate or high levels) and mountain pine beetle (moderate to high risk levels) management concerns. DMI ratings are moderate to high in only 13% of the acres. Because bark beetle risk may be elevated in mistletoe-infested stands, treatment of moderate to high mountain pine beetle (MPB) risk stands with dwarf mistletoe is thus a higher priority than treatment of moderate-high MPB risk stands without mistletoe. In many of these areas, thinning aimed at reducing bark beetle risk and measures to mitigate the effects of dwarf mistletoe may be combined into a single integrated treatment.

- Armillaria root disease may be found in over half of the lodgepole pine stands in the Piney Analysis Area. Active treatment options, such as patch-cutting, the installation of buffer strips, and the favoring of more tolerant tree species do exist. However, in most cases, the potential impacts of the disease in lodgepole pine will likely not justify the costs of treatment (in the spruce-fir cover type, the situation is quite different). Monitoring of areas known to contain the root disease fungus is recommended, particularly in areas with high bark beetle risk.

- Although approximately 54% of the acres in the Analysis Area have both Armillaria root disease (high, moderate or low levels) and moderate to high bark beetle risk, only 20% have moderate to high ratings for both. Because root disease centers often serve as foci for bark beetle attacks, thinning to address mountain pine beetle risk should be given higher priority in root disease infected stands.

- Approximately 10% of the surveyed acres had both dwarf mistletoe and root disease, but only 2% had moderate or high levels for both pathogens. Unless the root disease is causing unacceptable losses, dwarf mistletoe management should be the driving force for management in these areas.

- With our limited ability to treat large landscapes and various constraints affecting forest management activities, we will likely have to accept many of the changes that will occur across most areas of the Forest. Small scale disturbance events may result in greater biodiversity and may help in achieving long term forest management goals, whereas large scale events may be catastrophic and unacceptable. While management efforts must be directed toward the avoidance of these catastrophic events, opportunities to improve the health of the forest should be taken wherever possible.

Forest Planning and Desired Future Condition

The Land and Resource Management Plan for the White River National Forest and the Final Environmental Assessment for the Plan determined a desired condition in terms of successional/structural stage distribution for forest types on the White River National Forest. This distribution is considered optimum for the Forest to provide a sustained yield of wildlife habitats, visual quality, dispersed recreation experiences, wood products, and resistance to insects and disease. Table 1, Graph 1 compares desired conditions with existing conditions in the Piney Analysis Area.

The current structural stages for spruce-fir, lodgepole pine, and Douglas-fir are predominately in late and old growth classifications [spruce-fir - 84%, lodgepole pine - 84%, Douglas-fir - 99%], and do not meet desired levels. To remedy this situation will take many years as stands grow into the next older structural stage and harvesting of late seral stages affords an opportunity to create younger seral stages. A balance needs to be found between the harvest of late seral stages and a decision to allow them to grow into old growth classes.

Where spruce beetle, mountain pine beetle, and dwarf mistletoe are present or the stand has the characteristic of high risk to these agents, it might be best to concentrate harvest activities in these stands. Stands that have been identified to be at high risk to more than one agent should receive highest priority for management. Stands that are in late seral stages that are relatively healthy have the greatest chance of surviving infestations; however, if epidemics of spruce beetle or mountain pine beetle develop, these stands will be at high risk to loss as well.

General Conclusions

Future Forest Plans should be based on similar landscape level analyses to determine where to concentrate management activities and to assure full consideration of the important functions of insects and diseases. Only those insects and diseases which we judged likely to have significant effects on succession and disturbance processes have been analyzed.

Existing hazard rating systems for spruce beetle, mountain pine beetle, and dwarf mistletoe provide excellent planning tools that, in combination with stand exam data, can be applied over landscapes to determine where management activities should be directed. Prioritization of stands to be treated is an important component of an efficient risk-reduction strategy.

The current and projected future conditions on the Forest ensure that insects and diseases will continue to play significant roles in the development, successional processes, and both the small and large scale level disturbance processes at work on the Forest. Most major forest vegetation types (Table 1, Graph 1) have greater than 50 percent of their structural stages in mature/overmature classes that are conducive to outbreaks of the most important insect and disease agents. Growth loss and mortality will continue to occur, particularly where access, topography or other resources restraints preclude silvicultural treatment of stands.

Manipulation of the vegetation can influence the outcome of insect and disease outbreaks at the stand level on a project level basis. The use of risk-rating systems exist for most of the important insect and disease organisms and both forest stand and pest models can be helpful in projecting future scenarios and determining management options.

Table 1. Comparison of the White River National Forest desired forest condition with forest conditions at the Piney Analysis Area.

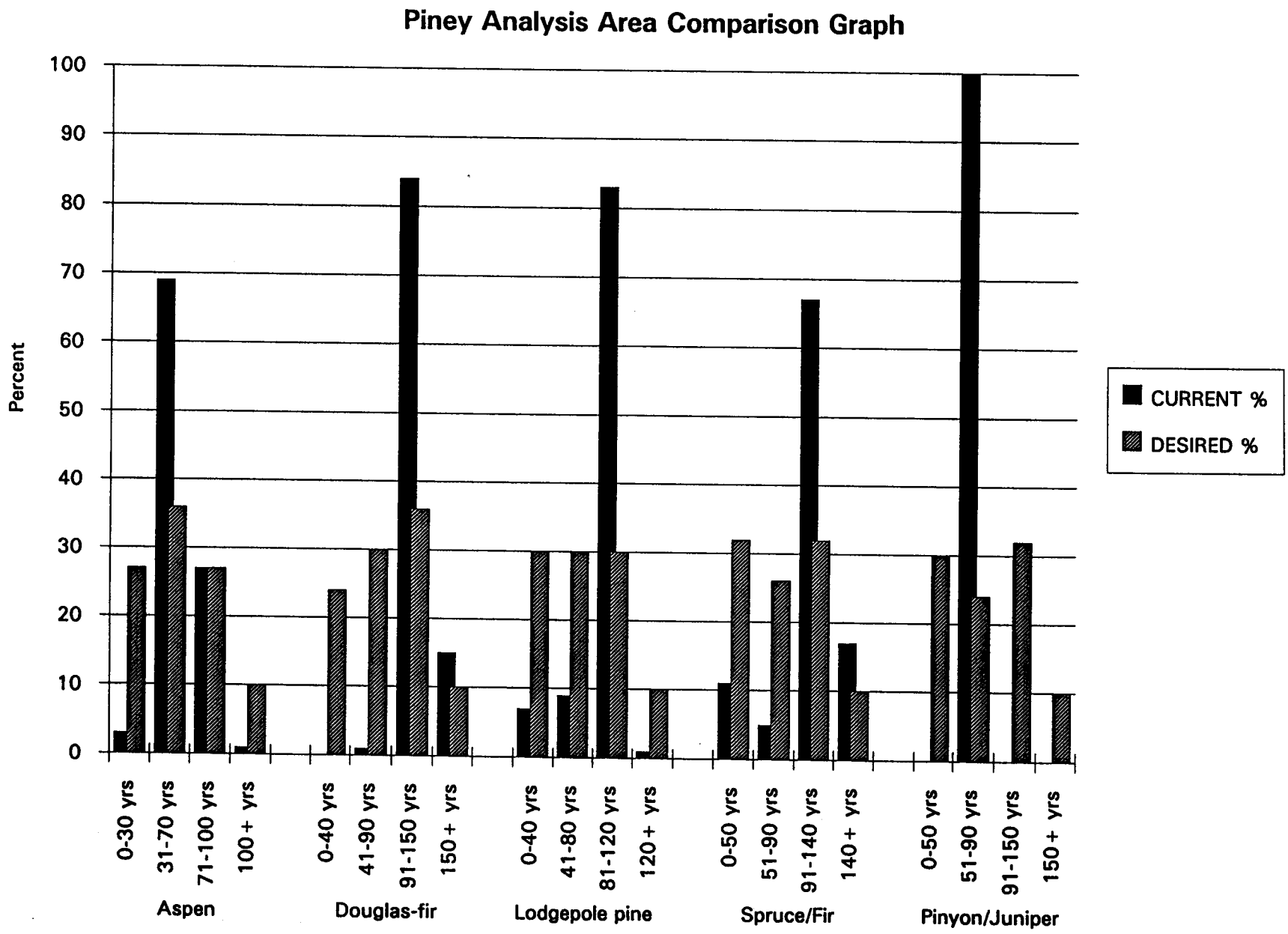
VEGETATION SITE TYPE	SUCCESSIONAL/STRUCTURAL STAGE 2/											
	EARLY 3/			INTERMEDIATE 3/			LATE 3/			OLD GROWTH		
Forested Types	Age	Current Percent	Desired 1/ Percent	Age	Current Percent	Desired 1/ Percent	Age	Current Percent	Desired 1/ Percent	Age	Current Percent	Desired 1/ Percent
Aspen	0-30	3%	27%	31-70	69%	36%	71-100	27%	27%	100+	1%	10%
Douglas-fir	0-40	0%	24%	41-90	1%	30%	91-150	84%	36%	150+	15%	10%
Lodgepole pine	0-40	7%	30%	41-80	9%	30%	81-120	83%	30%	120+	1%	10%
Spruce/Fir	0-50	11%	32%	51-90	5%	26%	91-140	67%	32%	140+	17%	10%
Pinyon/Juniper	0-50	0%	30%	51-90	100%	24%	91-150	0%	36%	150	0%	10%

1/ The assumptions used in developing the "Desired" situation are shown in Appendix L of the EIS for the White River National Forest Plan.

2/ Successional/Structural Stage = Breakdown by age class (inventory for forested types - estimate for non-forest types).
NOTE: Non-forested types (oak/mountain brush) are not found in the Piney Biological Evaluation area.

3/ Timber Vegetation Classification

EARLY	Seedling - Sapling (trees 0" - 4.9" DBH)
INTERMEDIATE	Pole Stand (trees 5" - 8.9" DBH)
LATE	Sawtimber (trees 9.0" or greater DBH)


Piney Analysis Area Comparison Graph
Percent
100
90
80
70
60
50
40
30
20
10
0
CURRENT %
DESIRED %
0-30 yrs
31-70 yrs
71-100 yrs
100+ yrs
Aspen
0-40 yrs
41-90 yrs
91-150 yrs
150+ yrs
Douglas-fir
0-40 yrs
41-80 yrs
81-120 yrs
120+ yrs
Lodgepole pine
0-50 yrs
51-90 yrs
91-140 yrs
140+ yrs
Spruce/Fir
0-50 yrs
51-90 yrs
91-150 yrs
150+ yrs
Pinyon/Juniper

Graph 1

THE ROCKY MOUNTAIN REGION SUMMARY OF INSECT AND DISEASE CONDITIONS

INSECTS

DEFOLIATORS

Douglas-fir tussock moth
Orgyia pseudotsugata

Hosts: Douglas-fir, Engelmann spruce

The outbreak detected in 1993 at West Creek, Pike NF, expanded greatly in 1994, as predicted, from 250 acres to 6,134 acres of heavy defoliation. Egg deposition was high in many areas indicating the population may expand and fill in the areas between more heavily defoliated sites. The current infestation is the largest on record for Colorado. The reasons for this event are somewhat speculative; however, since the exclusion of fire from the Front Range pine ecosystem, Douglas-fir has invaded sites historically occupied by ponderosa pine. This recent outbreak of the Douglas-fir tussock moth is the most intense and largest on record in the Region.

Western spruce budworm
Choristoneura occidentalis

Hosts: Douglas-fir, Engelmann spruce, Subalpine fir, White fir

Aerial surveys on the Pike NF detected 101,761 acres of older tree mortality. New defoliation was negligible. Defoliation of mixed conifer and subalpine fir continued in the Gunnison zone in 1994. Most of the defoliation appeared on the Salida District of the San Isabel NF, on the Creede and Del Norte Districts of the Gunnison NF, and on the Rifle District of the White River NF. Aerial survey of the San Isabel NF revealed 9,690 acres of old heavy mortality. Moderate levels of defoliation were visible on more than 1,000 acres in the northern Bighorn Mountains of Wyoming.

Pine tussock moth
Dasyschira grisefacta

Hosts: Ponderosa pine

An infestation completely collapsed near Edgerton, Wyoming, after having severely defoliated over 5,000 acres in 1993. A survey done in the fall of 1993 indicated a large population was present in the egg stage; yet, by summer, caterpillars were virtually absent in the same area. No defoliation was observed in 1994. Similar collapses of pine tussock moth infestations in Montana, Nebraska, and South Dakota have occurred within the past 2 years. Such sudden changes in population size are typical of this and other insect species within the family Lymantriidae, which includes the gypsy moth.

Gypsy moth - European
Lymantria dispar

Hosts: Hardwoods

In 1994, no gypsy moths were caught in traps deployed in National Forest, National Park Service, and BLM campgrounds within the Rocky Mountain Region of Colorado, South Dakota, and Wyoming, or at the Air Force Base in Colorado Springs. Multiple trap catches were reported in Aurora and Lakewood (Denver metro area). In Nebraska, 73 moths were caught in detection traps on private lands in Buffalo, Douglas, Lancaster, Lincoln, Platte, Sarpy, and Washington Counties. Moths may have been introduced in 1994 on four separate shipments of infested nursery stock from Michigan. Moths, egg masses, larvae, and pupae were also found in Bellevue, Nebraska, perhaps resulting from a 1992 military move-in from Michigan. In South Dakota, 11 moths were caught in delimitation and detection traps located on private lands in Pennington, Meade, and Union Counties. Gypsy moths likely arrived on tourist vehicles and infested nursery stock. In Wyoming, two moths were caught within the Rocky Mountain Region on private lands in Albany and Park Counties.
(Note : Moths were also caught in Wyoming in Teton County and in Yellowstone National Park: Region 4 and Region 1, respectively.)

BARK BEETLES

Douglas-fir beetle
Dendroctonus pseudotsugae

Hosts: Douglas-fir

Mortality along the Colorado Front Range continued to occur in small, widely scattered groups, often associated with older western spruce budworm defoliated trees. Aerial surveys for the Pike NF estimated 2,474 acres infested and 4,124 fading trees. In the Gunnison zone, populations remained static at a low level. Aerial surveys of the San Isabel NF found 4,349 acres of infested trees; aerial survey of the San Juan NF found 414 acres of scattered infestations. On the Clarks Fork District, Shoshone NF in Wyoming, tree mortality increased in 1994 by about 19% over 1993 figures. Nearly 5,000 Douglas-fir trees died in 1994 between Sunlight Basin and Crandall Ranger Station. Areas with large increases of Douglas-fir mortality occurred on the east and south edges of the outbreak.

Mountain pine beetle
Dendroctonus ponderosae

Hosts: Limber pine, Lodgepole pine, Ponderosa pine

The infestation at Laramie Peak, Wyoming, is now at endemic levels. The small infestation reported in 1992 in lodgepole pine near Lake Granby, Colorado, on the Arapaho NF remains endemic. Only 264 acres were detected during aerial surveys on the Pike NF. No major outbreaks were reported in the Gunnison zone. Aerial surveys of the San Juan and San Isabel NF's revealed 763 and 4 acres, respectively, of infested stands. Tree mortality declined by 48% from the previous year in the central Black Hills of South Dakota. The epidemic near Bear Mountain continued to collapse. About 3,000 ponderosa pines were killed by bark beetles in the Black Hills of South Dakota and Wyoming; this was the lowest level of damage reported in years. On the Bighorn NF, Wyoming, mortality of limber pine appeared to decline in Tensleep Canyon, as well.

DISEASES

STEM AND BRANCH DISEASES

Dwarf Mistletoe
Arceuthobium americanum

Hosts: Lodgepole pine

Dwarf mistletoes cause the greatest disease losses in Region 2. In Colorado, nearly 50% of the lodgepole pine type is infected. In Wyoming, it is widespread on the Bighorn and Shoshone National Forests.

Dwarf Mistletoe
Arceuthobium douglasii

Hosts: Douglas-fir

Moderate to high levels have been detected in stands near North Cochetopa Pass in south central Colorado.

Dwarf Mistletoe
Arceuthobium vaginatum subsp.cryptopodium

Hosts: Ponderosa pine

Losses amount to 885,000 cu. ft. annually in Colorado. This disease continues to be a factor affecting management of ponderosa pine on the San Isabel, San Juan, and Uncompahgre National Forests, as well as on the Southern Ute Reservation in southern Colorado.

CANKER DISEASES

Cytospora canker
Cytospora spp.

Hosts: Aspen, Poplar, Cottonwood, Willow

This disease is common on aspen throughout Colorado where it is a management concern in the recreation, riparian, and regeneration areas. In urban communities, lombardy poplars continue to die from this disease 10-20 years after planting. This canker is widespread on stressed trees in the Black Hills of South Dakota and Wyoming.

ROOT DISEASES

Armillaria root disease
Armillaria spp.

Hosts: Conifers and Hardwoods

Armillaria root disease is the most common root disease in Colorado. Presence of the disease affects the management of mixed conifer stands on the Southern Ute Reservation and is a major problem of spruce/fir leave strips in ski areas around Aspen and Crested Butte, Colorado. In South Dakota, where the disease is also very common, there is a high incidence of the disease on the Spearfish and Harney Districts, Black Hills NF: 11% and 13% of total acreage sampled on the Districts, respectively.
A survey of the biological species of Armillaria present in Region 2 was initiated in 1993. Diseased wood samples containing Armillaria were collected from sites regionwide and sent to the Lakewood Service Center for diagnosis. Of the fungi isolated from the host material, 57 collections have been identified as A. ostoyae. Fungal isolates, coupled with site information, will be retained at the lab as part of the Regional Armillaria reference collection.

FOLIAGE DISEASES

Lophodermium needle blight
Lophodermella montivaga

Hosts: Lodgepole pine

The extensive discoloration of lodgepole pine caused by the disease in the southern Bighorn Mountains of Wyoming during 1993 remained apparent on older foliage in 1994. However, the new foliage of 1994 did not appear to be infected, which suggests that this foliage disease has declined.

Diplodia blight
Sphaeropsis sapinea = Diplodia pinea

Hosts: Lodgepole pine, Ponderosa pine

During the 1994 field season, mortality of 2-0 lodgepole pine seedlings was observed at the USFS Bessey Nursery in Halsey, Nebraska. Lodgepole pine seed sources from the Shoshone National Forest appeared to be more affected than seed sources from the Routt and White River National Forests. Also, adjacent Scotch pine and jack pine seedlings appeared healthy in comparison to the Shoshone seed sources. An infected ponderosa pine windbreak tree was noted adjacent to the nursery beds and may have been the source of infection of nursery stock.
A review of the weather records for the nursery indicated that low night temperatures in April followed by hot, windy weather in May might have stressed the lodgepole pine seedlings and made them susceptible to infection. Rainfall in July was favorable for spore production and disease intensification. This fungus has not been previously reported on lodgepole pine seedlings in Region 2. However, it was reported on 2-0 Austrian pine at this nursery in September 1978. Since this is a new disease of lodgepole pine seedlings in this nursery, it will be important to carefully inspect future crops for the disease and take appropriate measures to reduce its spread.

Melampsora leaf rusts
Melampsora spp.

Hosts: Aspen, Cottonwood, Willow

The native leaf rusts belonging to the genus Melampsora are commonly seen in the summer and early fall throughout Colorado. In the summer of 1994, a general survey of leaf rusts of native Populus and Salix species began along the Front Range. Leaves exhibiting heavy urediniospore infection were collected from all Populus and Salix species encountered over the survey period. Urediniospores collected from P. tremuloides, P. sargentii, P. deltoides var. wislizenii and P. angustifolia were determined to be from a single species, M. medusae. A single species of rust, M. epitea, was found on all Salix species examined. At this time, the entire complex of Melampsora rusts on Salix species in North America has been grouped under M. epitea. Additionally, native Populus species and hybrids were sent to investigators at Washington State University, Puyallup, by Dr. William Jacobi, CSU, to determine their relative susceptibility to a native rust.
See Technical Report R2-57.

FISCAL YEAR 1994

ROCKY MOUNTAIN INSECT AND DISEASE

STATUS REPORT

Rocky Mountain Region - Status of Insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

INSECT	HOST	LOCATION	REMARKS
A willow sawfly *Nematus* sp.	Willow	South Dakota, Wyoming	In South Dakota, minor population increases occurred across the state causing minor defoliation to forest, shelterbelt, and ornamental trees. No significant activity reported in 1994 for Wyoming.
Ash plant bug *Tropidosteptes amoneus*	Green ash	South Dakota	Extremely heavy statewide causing pre-mature leaf drop to many ornamental, shelterbelt, and forest trees. The insect and the effects have increased public attention and concern.
Aspen leaf beetle *Chrysomela crotchi*	Aspen	South Dakota	No significant activity reported in 1994.
Balsam twig aphid *Mindarus abietinus*	Balsam fir	South Dakota	No significant activity reported in 1994.
Birch skeletonizer *Bucculatrix canadensisella*	Birch	South Dakota	No significant activity reported in 1994.
Black-headed ash sawfly *Tethida cordigera*	Green ash	South Dakota	No significant activity reported in 1994.
Bronze birch borer *Agrilus anxius*	Paper birch	South Dakota	No significant activity reported in 1994.
Brown-headed ash sawfly *Tomostethus multicinctus*	Green ash	Colorado	This increasingly common pest of green ash has now spread as far north as Ft. Collins, and is being moved around the state via nursery stock. The strong hold of this sawfly continues to be in Colorado Springs.

Rocky Mountain Region - Status of Insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

INSECT	HOST	LOCATION	REMARKS
Bull pine sawflies *Zadiprion townsendi*	Ponderosa pine	Colorado	Recent local defoliation of individual trees along the Front Range from Colorado Springs to Fort Collins appears to have subsided in 1994.
Cankerworms *Alsophila pometaria* *Paleacrita vernata*	Bur oak, Elm, Green ash, Hackberry, Honeylocust	Kansas, South Dakota, Wyoming	Kansas reported low damage for 1994. South Dakota and Wyoming reported no significant activity in 1994.
Chafer *Diplotuxis obscura*	Ponderosa pine	Colorado	Approximately 1,000 acres were heavily defoliated north of Peyton, Colorado (the southern end of the Black Forest area), due to a massive beetle emergence the week of April 25, 1994. The defoliation damage of old needles by the adult June beetles (chafers) is similar in appearance to damage caused by pine sawflies or pine butterflies. A repeat emergence is not expected in 1995.
Common European pine shoot beetle *Tomicus piniperda*	Scotch pine, White pine	Kansas	The beetle has not been reported in the state. A federal and state quarantine has been issued to prevent the spread of the insect in Kansas because of the adverse affect the establishment of the beetle would have on the Christmas tree industry.
Common falsepit scale *Lecanodiaspis prosopidis*	Green ash, Hackberry, Red mulberry	Colorado	No significant activity reported in 1994.
Cottonwood borer *Plectrodera scalator*	Cottonwood	South Dakota	No significant activity reported in 1994.
Cottonwood leaf beetle *Chrysomela scripta*	Poplars	Colorado, South Dakota	Common in 1994 on eastern plains of Colorado and in South Dakota statewide.

Rocky Mountain Region - Status of Insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

INSECT	HOST	LOCATION	REMARKS
Dioryctria pine moths *Dioryctria* sp.	Austrian pine, Pinyon pine, Ponderosa pine, Scotch pine	Colorado, Nebraska, South Dakota	Scattered outbreaks of this stem-infesting insect continued to plague pinyon pine throughout southwestern Colorado. These scattered outbreaks are expected to continue into 1995. In the Denver metro area, an increase in activity was apparent on ornamental Austrian and Scotch pines. The insect continued to be a problem in young pine windbreaks and Christmas tree plantations throughout most of central and western Nebraska in 1994. Populations in South Dakota are declining from the previous year's high insect numbers.
Douglas-fir beetle *Dendroctonus pseudotsugae*	Douglas-fir	Colorado, Wyoming	On the Clarks Fork Ranger District of the Shoshone NF in Wyoming, tree mortality increased in 1994 approximately 19% over 1993 figures. Nearly 5,000 Douglas-fir trees died in 1994 between Sunlight Basin and Crandell Ranger Station. Mortality along the Colorado Front Range continued to occur in small, widely scattered groups. Most mortality was on steep inaccessible slopes where western spruce budworm had defoliated trees over the past decade.
Douglas-fir tussock moth *Orgyia pseudotsugata*	Douglas-fir	Colorado	Heavy defoliation expanded from 250 acres in 1993 to 6,134 acres in 1994 on the Pike NF. Egg deposition was high in many areas surrounding the infestation indicating the population may increase in 1995 and fill in areas between the heavy defoliation.
Elm calligrapha *Calligrapha scalaris*	Siberian elm	South Dakota	No significant activity reported in 1994.
Elm leaf beetle *Xanthogaleruca luteola*	American elm, Siberian elm	Colorado, Kansas, Nebraska, South Dakota	All states reported light to moderate damage levels for 1994.

Rocky Mountain Region - Status of Insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

INSECT	HOST	LOCATION	REMARKS
European pine sawfly *Neodiprion sertifer*	Scotch pine	Kansas, Nebraska	Kansas and Nebraska report normal levels of damage in the eastern part of both states. Very common insect.
Fall webworm *Hyphantria cunea*	Cottonwood	Colorado, Kansas, South Dakota, Wyoming	Light to moderate damage reported again for the eastern part of Kansas. In South Dakota, populations appeared to be increasing statewide. No significant activity reported for Colorado or Wyoming in 1994.
Flea beetle *Altica* sp.	Cottonwood	Colorado	No significant activity reported in 1994.
Grape mealybug *Pseudococcus maritimus*	Catalpa, Honeylocust	Colorado	No significant activity reported in 1994.
Greenstriped mapleworm *Dryocampa rubicunda*	Silver maple	Kansas	Moderate to heavy defoliation was reported in the eastern part of the state.
Gypsy moth *Lymantria dispar*	Hardwoods	Colorado, Kansas, Nebraska, South Dakota, Wyoming	No gypsy moths were caught in traps deployed on federal lands in all states. In Colorado, 16 moths were caught on private lands; 1 in Loveland, 1 in Fountain, 1 in El Paso County near Colorado Springs, 1 in Boulder, 6 in Aurora, and 4 in Lakewood. The 6 moths found in Aurora came from a nursery that imported >100 Christmas tree-sized spruce from Michigan (via MN). Colorado State Forest Service will continue monitoring efforts in 1995. In 1994, Kansas deployed 1,050 traps statewide. One gypsy moth was trapped at a campsite in Saline County, Kansas. In Nebraska, 73 moths were caught in detection traps on private lands in several counties. In South Dakota, detection and delimitation trapping caught 11 gypsy moths on private lands in several counties. In Wyoming, two moths were caught on private lands in Albany and Park Counties.

Rocky Mountain Region - Status of Insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

INSECT	HOST	LOCATION	REMARKS
Hackberry caterpillar *Asterocampa celtis*	Hackberry	Kansas	In general, insect populations were low in 1994; however, small areas of defoliation occurred in the eastern part of the state.
Hackberry galls *Pachypsylla celtidismamma* *Pachypsylla celtidisversicula*	Hackberry	Colorado, South Dakota	No significant activity reported in 1994 for both states.
Honeysuckle aphid *Hyadaphis tataricae*	Honeysuckle	Kansas	A recurring pest that continues to increase each year and is becoming a very serious pest throughout the state. Alternative shrubs for windbreak plantings are being suggested, given the difficulty of control.
Juniper sawfly *Monoctenus fulvus*	Eastern redcedar, Rocky Mountain juniper	Kansas	No significant activity reported in 1994.
Lilac borer *Podosesia syringae*	Green ash, Lilac	Colorado, Kansas, Nebraska, South Dakota	In Colorado, lilac borer continued to be a serious pest to the horticultural varieties of the green and white ash species. Kansas, Nebraska, and eastern South Dakota report moderate to severe damage to ornamentals and windbreaks with a green ash component.
Mountain pine beetle *Dendroctonus ponderosae*	Limber pine, Lodgepole pine, Ponderosa pine	Colorado, South Dakota, Wyoming	In Colorado, MPB populations are at endemic levels. Small infestations and isolated activities were reported west of Buena Vista, near Red Feather Lakes, in Boulder Mountain Parks, and at the southern part of the Front Range. Additionally, a few new minor infestations have been reported in lodgepole pine from north central Colorado. In South Dakota, populations were very low throughout the Black Hills. The epidemic located near Bear Mountain continued to decline. In Wyoming, the populations were at or near endemic levels, except for an area near Cold Springs where small (3-5 tree) infestations in 100 to 220 year old lodgepole pine are of concern. On the Bighorn NF, mortality of limber pine appeared to be on the decline in Tensleep Canyon.

Rocky Mountain Region - Status of Insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

INSECT	HOST	LOCATION	REMARKS
Pine engraver beetle *Ips* spp.	Lodgepole pine, Ponderosa pine	Colorado, South Dakota, Wyoming	Several species occurred at low to moderate levels in Colorado on the pines and spruce, in particular ponderosa and pinyon pine. Along the Front Range, especially in the Denver metro area, ornamental pine and spruce were killed. Small pockets of top killing and tree mortality continued throughout the Black Hills in South Dakota. Pockets of mortality can be found on the Black Hills in Wyoming in encroachment areas containing vigorous 8' to 20' tall stands. Ips spp. activity has been noted in the Bighorn Mountains on windthrow, but did not appear to be moving to adjacent green trees.
Pine sawfly *Neodiprion autumnalis* *Neodiprion fulviceps*	Ponderosa pine	Colorado, South Dakota, Wyoming	Throughout the eastern part of Colorado, at least two species are defoliating ponderosa pine in native stands and in conservation plantings. The Black Forest, between Fondis and Calhan, was particularly hard hit in 1994. The outbreak population in the Black Hills of South Dakota appeared to be declining. Wyoming State Forestry continued monitoring efforts in localized areas north of Casper on private lands.
Pine tip moths *Rhyacionia bushnelli* *Rhyacionia frustrana* *Rhyacionia neomexicana*	Austrian pine, Ponderosa pine, Scotch pine, Virginia pine	Colorado, Nebraska, Kansas, South Dakota, Wyoming	Continued at chronic levels statewide in Colorado ornamentals, conservation plantings, and in some native stands. In Nebraska, young pines in windbreaks and plantations continued to be damaged. In South Dakota and Wyoming, very little damage could be attributed to the pine tip moth in areas of regeneration in the central and southern Black Hills in 1994.
Pine tussock moth *Dasychira grisefacta*	Ponderosa pine	Colorado, Nebraska, South Dakota, Wyoming	All states reporting little to no defoliation for 1994. Wyoming State continued to monitor local areas north of Casper on private lands.

Rocky Mountain Region - Status of Insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

INSECT	HOST	LOCATION	REMARKS
Pinyon needle scale *Matsucoccus acalyptus*	Pinyon pine	Colorado	In 1993, a scale infestation occurred within the area between Trout Creek Pass and Poncha Pass. This area has a history of similar infestations. The result of the scale infestation was conspicuous red needles, which became inconspicuous with the new year's foliage growth in late spring 1994.
Pinyon pitch-nodule moth *Retinia arizonensis*	Pinon pine	Colorado	Increasingly apparent in ornamentals due largely to pinyon pine transplants on the Front Range originating from infested native stands in southern Colorado.
Red turpentine beetle *Dendroctonus valens*	Jack pine, Ponderosa pine	Nebraska, South Dakota, Wyoming	Beetle attacks remained common on stressed trees throughout the Black Hills of South Dakota and Wyoming. Nebraska reported no significant activity of this beetle commonly associated with Leptographium root disease infecting jack pine.
Smaller European elm bark beetle *Scolytus multistriatus*	Elm	Colorado	Activity associated with Dutch Elm Disease in 1994. See Disease conditions for status.
Spruce beetle *Dendroctonus rufipennis*	Engelmann spruce	Colorado, Wyoming	Spruce beetle activity was negligible despite large quantities of suitable blowdown host material in the Bighorn Mountains of Wyoming in 1994.
Tent caterpillars *Malacosoma americanum* *Malacosoma californicum* *Malacosoma disstria*	American plum, Aspen, Chokecherry, Hardwoods	Colorado, Kansas, South Dakota, Wyoming	All states, except South Dakota, report normal levels of activity for 1994. In South Dakota, M.americanum appeared to be on the increase.
Twig beetles *Pityophthorus* spp. *Pityogenes* spp	Pinyon pine, Ponderosa pine	Colorado	These bark beetles of ponderosa pine branch tips were noted at increased levels in 1994 throughout much of the host type. High temperatures and fire damage in 1994 are expected to result in an increase of populations in 1995.

Rocky Mountain Region - Status of Insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

INSECT	HOST	LOCATION	REMARKS
Ugly nest caterpillar *Archips cerasivorana*	Chokecherry	South Dakota	No significant activity reported in 1994.
Walnut caterpillar *Datana integerrima*	Black walnut, Bur oak, Hickory, Pecan	Kansas, Nebraska	Damage reports were below normal in1994 for Kansas. Nebraska reported no significant activity in 1994.
Walnut trunk-webbing caterpillar *Gretchena concitatricana*	Walnut	Kansas, Nebraska	In Kansas, the populations were very low. Although some leaf damage and larvae were observed, the population size limited the extent of webbing on tree trunks. Nebraska reported no activity in 1994.
Web-spinning sawflies *Acantholyda* spp. *Cephalcia* spp.	Colorado blue spruce, Ponderosa pine	Colorado	This sawfly is found in substantial numbers along and east of the Front Range. This sawfly is responsible for localized problems in 1994.
Western balsam bark beetle *Dryocoetes confusus*	Subalpine fir	Wyoming	Subalpine fir mortality was widespread across the Bighorn Mountains, especially on the northern end. An estimated 2,000 trees have died in this area; however, other factors in concert with beetle activity likely produced the mortality.
Western pine beetle *Dendroctonus brevicomis*	Ponderosa pine	Colorado	No significant activity reported in 1994.
Western spruce budworm *Choristoneura occidentalis*	Douglas-fir, Engelmann spruce,	Colorado, Wyoming	In Colorado, WSBW continued at undetectable levels throughout most of the subalpine fir in the state. The exceptions were small areas on the Salida RD, San Isabel NF; Creede and Del Norte RD's, Gunnison NF; Rifle RD, White River NF; and on private lands in the Salida-Trout Creek area, the San Luis Valley (north of Poncha Pass) and in the Lake City-Blue Mesa Reservoir area. In Wyoming, moderate levels of visible defoliation on 1,000 acres occurred in the northern Bighorn Mountains in 1994.

Rocky Mountain Region - Status of Insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

INSECT	HOST	LOCATION	REMARKS
White pine weevil *Pissodes strobi*	Colorado blue spruce	Colorado	Continued to kill leaders of native and ornamental spruce statewide.
Yellow-necked caterpillar *Datana ministra*	Basswood, Elm, Fragrant sumac, Maple, Oak	Kansas	Damage was below normal, and populations were not large enough to cause complete defoliation of trees.

Rocky Mountain Region - Status of Disease in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

DISEASE	HOST	LOCATION	REMARKS
STEM AND BRANCH DISEASES			
Black knot *Apiosporina morbosum*	Chokecherry	Colorado, South Dakota	Chokecherry in riparian zones throughout Colorado and western South Dakota is commonly affected by this disease.
Comandra blister rust *Cronartium comandrae*	Lodgepole pine, Ponderosa pine	Colorado, South Dakota, Wyoming	Heavily infested stands were found in the Cherokee Park area, Roosevelt NF, Colorado, on newly acquired lands from the Union Pacific Railroad. This disease was also identified in several regenerating lodgepole pine stands near Horseshoe Campground on the Middle Park Ranger District, Routt National Forest. It continues as one of the major diseases of lodgepole pine on the Bighorn NF, Wyoming. Damage continued to be heavy in certain locales of older lodgepole stands on the Shoshone NF. In western South Dakota, the disease was present but caused no significant damage.
Elytroderma needle cast *Elytroderma deformans*	Ponderosa pine	South Dakota	Continued to be found in low levels in the Black Hills NF.
Fir broom rust *Melampsorella caryophyllacearum*	Subalpine fir	Colorado, Wyoming	This disease is common throughout the spruce/fir cover type in Colorado, causing only minor damage. Brooms are scattered on older subalpine fir in the Bighorn NF, Wyoming.
Fire blight *Erwinia amylovora*	Apple species, Cotoneaster, Crabapple	Colorado, South Dakota, Wyoming	In central South Dakota, cotoneaster windbreaks were severely damaged in 1994. Colorado and Wyoming have some level of activity every year.

Rocky Mountain Region - Status of Disease in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

DISEASE	HOST	LOCATION	REMARKS
STEM AND BRANCH DISEASES			
Kabatina tip blight *Kabatina juniperi*	Eastern redcedar, Rocky Mountain juniper	Kansas	In general, Kabatina tip blight was not the problem it was 1993. However, it was common in some windbreaks in northwest Kansas.
Pine tip blight *Sphaeropsis elisii*	Austrian pine, Ponderosa pine	Kansas	Damage continued to increase during 1994 in urban areas while normal to increased activity levels continued in windbreaks.
Poplar shoot blight *Venturia macularis*	Aspen	Colorado	Common on aspen regeneration in many locations in Colorado. In 1994, the disease was identified as a management concern in several regenerating aspen stands on the Uncompahgre Plateau.
Spruce broom rust *Chyrysomyxa arctostaphyli*	Blue spruce, Engelmann spruce, White spruce	Colorado, South Dakota	Common throughout the spruce/fir cover type in Colorado, causing only minor damage. However, unusually high levels of this disease caused management concern at the BLM Coyote Park Timber Sale area, west of Gunnison, Colorado. Brooms are scattered throughout spruce on the Black Hills NF.
Western gall rust *Endocronartium harknessii*	Lodgepole pine, Ponderosa pine	Colorado, Nebraska, South Dakota, Wyoming	No significant increase of activity reported for Colorado, South Dakota, or Wyoming, in1994. Continues as moderate to severe problem in central and eastern Nebraska.
White pine blister rust *Cronartium ribicola*	Limber pine, White pine	South Dakota, Wyoming	Branch and tree mortality continued in 1994 at several locations in the Bighorn and Shoshone NF's. The disease has been identified in a remote stand in the Black Hills, South Dakota.

Rocky Mountain Region - Status of Disease in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

DISEASE	HOST	LOCATION	REMARKS
CANKER DISEASES			
Botryodiplodia *Botryodiploda* spp.	Juniper	Kansas	The canker was very severe on Rocky Mountain juniper in 1994.
Botryosphaeria stevensii	Eastern redcedar, Rocky Mountain juniper	Kansas, Nebraska	No significant activity reported in 1994.
Cryptosphaeria canker *Cryptosphaeria populina*	Aspen	Colorado, South Dakota	This canker is common in many aspen stands throughout Colorado. In the Black Hills NF, in South Dakota, this organism continued to cause patch mortality of aspen.
Cytospora canker *Cytospora* spp. *Leucocytospora* spp.	Aspen, Cottonwood, Poplar, Spruce, Willow	Colorado, Nebraska, South Dakota, Wyoming	This disease is common on aspen throughout Colorado where it is a management concern in recreation, riparian and regeneration areas. Widespread on aspen in the Black Hills of South Dakota as well, it is generally on trees weakened by other diseases and/or insects. In urban communities, lombardy poplars continue to die from this disease 10-20 years after planting. It is widespread on many other hosts, probably as a result of the October 1991 freeze and other stresses such as the mild, dry winter of 1991-1992. In Nebraska, the disease continued as a problem throughout the entire state in 1994.
Grovesiella canker *Grovesiella abietina*	Subalpine fir	Wyoming	No significant activity reported in 1994. This canker causes mortality of leaders and branches of young understory subalpine fir.
Russian olive canker *Phomopsis arnoldiae.* *Tubercularia* sp *Lasiodiplodia* sp.	Russian olive	Kansas, Nebraska, South Dakota, Wyoming	No significant activity reported in 1994, except in Kansas, where it continues to be a very serious problem in the eastern half of the state.

Rocky Mountain Region - Status of Disease in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

DISEASE	HOST	LOCATION	REMARKS
CANKER DISEASES			
Siberian elm canker *Botryodiplodia hypoderma* *Tubercularia ulmea*	Siberian elm	Colorado, Nebraska, South Dakota, Wyoming	No significant activity reported in 1994.
Sooty bark canker *Encoelia pruinosa*	Aspen	Colorado	Sooty bark canker is a common disease in aspen stands throughout Colorado.
Thyronectria canker *Thyronectria austro-americana*	Honeylocust	Colorado, Kansas, Nebraska	No significant activity reported for Colorado in 1994. Windbreaks in western Kansas continue to be infected annually, while the entire state of Nebraska has recurring levels of activity.

Rocky Mountain Region - Status of Disease in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

DISEASE	HOST	LOCATION	REMARKS
DWARF MISTLETOE			
Arceuthobium americanum	Lodgepole pine	Colorado, Wyoming	Dwarf mistletoes cause the greatest disease losses in Region 2. Losses equal at least 10 million cu. ft. annually. In Colorado, 50% of the lodgepole pine type is infected. Forest Health Management funded presuppression surveys on 16,741 acres on five National Forests. Sanitation thinning was also completed in 11 campgrounds on the Gunnison and San Isabel NF's. Dwarf mistletoe incidence is widespread on the Bighorn and Shoshone NF's in Wyoming.
Arceuthobium cyanocarpum	Limber pine	Colorado	Limber pine dwarf mistletoe continued as as minor problem in 1994.
Arceuthobium divaricatum	Pinon pine	Colorado	Pinyon pine dwarf mistletoe continued as a minor problem in western Colorado in 1994.
Arceuthobium douglasii	Douglas-fir	Colorado	Occurs mostly in the southern two-thirds of Colorado. Moderate to high levels of the disease were detected in forest stands near North Cochetopa Pass. In 1994, Forest Health Management provided funds for silvicultural control on 10 acres on the Salida RD, San Isabel NF.
Arceuthobium vaginatum subsp. *cryptopodium*	Ponderosa pine	Colorado	Losses amount to 885,000 cu.ft. annually. Suppression projects emphasized tree removal and pruning of infected trees in developed recreation sites. Sanitation-thinning has been completed over the past few years on 1,000 acres on the South Platte RD, Pike NF; on 350 acres on the Salida RD, San Isabel NF; and in 1994, on 215 acres on the Southern Ute Reservation in southern Colorado. An extensive survey of the ponderosa pine vegetation type on the Dolores and Mancos RD's, San Juan NF, showed that dwarf mistletoe is present on 31% of the 79,628 acres that were rated for infestation. A detailed assessment of the effects of uneven-aged management on ponderosa pine dwarf mistletoe was initiated at the Craig Point Sale area of the Uncompahgre Plateau, Norwood RD, Uncompahgre NF.

Rocky Mountain Region - Status of Disease in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

DISEASE	HOST	LOCATION	REMARKS
DECAY DISEASES			
Ash heartrot *Perennipora fraxinophilus*	Green ash	South Dakota	No significant activity reported in 1994.
Aspen trunk rot *Phellinus tremulae*	Aspen	Colorado, South Dakota	Aspen trunk rot is common throughout the aspen cover type in Colorado. In recreation areas, trees with this disease are removed to reduce hazard potential. Heart rot decay due to this rot is widespread throughout aspen stands in the Black Hills NF.
Fir trunk rot *Phellinus pini*	Subalpine fir	Wyoming	Decay and possible mortality due to this pathogen are present in old-growth subalpine fir on the Bighorn NF, Wyoming.
Red ray rot *Dichomitus squalens*	Ponderosa pine	South Dakota	Heartwood decay is widespread in mature ponderosa pine on the Black Hills NF.
Red ring rot *Phellinus pini*	Subalpine fir	Wyoming	Heartwood decay due to this fungus appears to be common in mature fir stands on the Bighorn NF.
White mottled rot *Ganoderma applanatum*	Aspen	Colorado	The disease is common in aspen throughout Colorado, and is a source of potential hazard in campgrounds and recreation areas.

Rocky Mountain Region - Status of Disease in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

DISEASE	HOST	LOCATION	REMARKS
ROOT DISEASES			
Annosus root disease *Heterobasidion annosum*	Jack pine, Ponderosa pine, White fir	Colorado, Nebraska	The disease was identified in the Cade Mountain Timber Sale area on the Pagosa RD, San Juan NF, Colorado, in 1994. No significant activity reported for Nebraska in 1994.
Armillaria root disease *Armillaria* spp.	Engelmann spruce, Hardwoods, Lodgepole pine, Ponderosa pine, Subalpine fir, White fir	Colorado, South Dakota, Wyoming	Fifty-seven collections of Armillaria sp. from widely scattered infected trees, including nine host species in seven national forests throughout Colorado, South Dakota, and Wyoming, have been identified as the biological species A. ostoyae. Work is continuing on the identification of additional collections made in1994. An extensive survey of the ponderosa pine vegetation type on the Dolores and Mancos RD's, San Juan NF, showed that Armillaria root disease is uncommon and of minor management importance. In contrast, the disease is a major problem in spruce/fir leave strips in the ski areas near Aspen, CO. Very common in the Black Hills.
Black stain root disease *Leptographium wagerneri*	Pinon pine, Ponderosa pine	Colorado	Continues to occur on ponderosa pine in interior portions of Colorado and on pinon pine in the southwestern corner of the state.
Leptographium root disease *Leptographium terebrantis*	Jack pine, Ponderosa pine	Nebraska, South Dakota	This disease is the cause of high mortality of young jack pine regeneration in patch clearcuts and mature trees on the Bessey RD, Nebraska NF. The disease is known to be vectored by Dendroctonus valens (red turpentine beetle) and Hylastes sp. root feeding beetles. This pathogen also occurs in a thinned stand of ponderosa pine regeneration on the Black Hills NF, South Dakota.

Rocky Mountain Region - Status of Disease in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

DISEASE	HOST	LOCATION	REMARKS
FOLIAGE DISEASES			
Anthracnose *Gnomonia leptostyla*	Walnut	Kansas	No significant activity reported in 1994.
Apiognomonia veneta = *Gnomonia platani* *Discula* sp.	Ash, Maple, Sycamore	Colorado, Kansas, Wyoming	Anthracnose was quite severe in 1994 in eastern Kansas because favorable weather conditions promoted disease development. No significant activity reported in 1994 for Colorado or Wyoming.
Gnomoniella fraxini	Green ash	South Dakota	Incidence was lower in 1994 than the previous year despite weather conditions favorable for disease growth.
Ash leaf rust *Puccinia sparganioides*	Green ash	Colorado, Kansas, Nebraska, South Dakota	No significant activity reported in 1994 for all states.
Brown spot needle blight *Scirrhia acicola* *Mycosphaerella dearnessii*	Scotch pine	Kansas, Nebraska	Reports of brown spot activity were lower than 1993, but it continued to be a problem in the eastern part of Kansas. Damage was widespread throughout eastern Nebraska, and was more serious in 1994 than in previous years.
Cedar apple rust *Gymnosporangium juniperi-virginiana*	Apple species, Eastern redcedar	Colorado, Kansas, Nebraska, South Dakota, Wyoming	No significant activity reported in 1994 for all states.
Gymnosporangium nelsonnii	Rocky Mountain juniper, Serviceberry	Colorado	Locally common along recreation sites adjacent to the Poudre River in the northern part of state.

Rocky Mountain Region - Status of Disease in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

DISEASE	HOST	LOCATION	REMARKS
FOLIAGE DISEASES			
Cercospora blight of juniper *Cercospora sequoiae*	Eastern redcedar, Rocky Mountain juniper	Kansas, Nebraska, South Dakota	Cercospora continued to be a problem on Rocky Mountain juniper in the eastern part of Kansas. However, reports in 1994 were down from the previous year. In the eastern half of Nebraska and on some windbreaks in South Dakota, damage is an annual occurrence.
Conifer-aspen rust *Melampsora medusae*	Aspen, Douglas-fir, Lodgepole pine, Ponderosa pine	Colorado, Nebraska, South Dakota	Conifer-aspen rust caused great aesthetic concern but little permanent damage to the host trees. In 1994, disease levels were average in all states.
Diplodia blight *Sphaeropsis sapinea* = *Diplodia pinea*	Lodgepole pine	Nebraska, South Dakota, Wyoming	This fungus was found for the first time on 2-0 lodgepole pine seedlings at the USFS Bessey Nursery, Nebraska. Mortality was restricted primarily to seed sources from the Shoshone NF. Diseased seedlings were rogued and sprayed with fungicides to prevent spread. Continued monitoring is planned for the future at the Bessey Nursery. Damage from an outbreak in 1993 in native ponderosa pine on the Pine Ridge of western Nebraska caused continued mortality in trees infected that year. The 1993 outbreak appears to have occurred from infections following foliage damage sustained in early summer hail storms. The 1994 damaged areas did not appear to be any larger than in 1993. Damage levels for 1994 did not appear to increase in the Black Hills of South Dakota. Diplodia blight is fairly common in and around the Black Hills, especially after hail storms; however, it rarely causes tree mortality.
Dothistroma needle blight *Dothistroma pini* *Mycosphaerella pini*	Austrian pine, Ponderosa pine	Kansas, Nebraska	Dothistroma needle blight was very severe during 1994 in eastern Kansas and eastern Nebraska. Damage in Nebraska was more serious in 1994 than previous years of reporting.

Rocky Mountain Region - Status of Disease in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

DISEASE	HOST	LOCATION	REMARKS
FOLIAGE DISEASES			
Ink spot *Ciborina whetzelii*	Aspen	Colorado	Found throughout the aspen type, the disease created great aesthetic concern. In 1994, incidence of the disease was moderate throughout Colorado.
Leaf shothole *Cylindrosporium* sp.	Black cherry, Chokecherry	Nebraska, South Dakota	No significant activity reported in 1994.
Marssonina blight *Marssonina populi*	Aspen	Colorado, South Dakota	Like ink spot, this disease causes great aesthetic concern, but little permanent damage. In 1994, moderate levels of this disease were noted throughout Colorado. No significant activity reported for South Dakota for 1994.
Melampsora leaf rusts *Melampsora* spp.	Aspen, Cottonwood, Willow	Colorado, Kansas	A survey of Melampsora leaf rusts of Populus and Salix species along the Colorado Front Range from Golden to Ft. Collins, revealed several species : M. medusae on P. tremuloides, P. deltoides var. occidentalis and P. deltoides var. wislizenii; M. occidentalis on P. augustifolia and M. epitea on Salix spp. In 1994, Kansas had low levels of activity.
Needle casts *Lophodermella concolor* *Lophodermella montivaga*	Lodgepole pine	Colorado, Wyoming	Noted in north central Colorado in 1994. The extensive discoloration of lodgepole pine occurring in 1993 was still visible in 1994 in the southern part of the Bighorn Mountains, Wyoming. However, the new foliage appeared to be generally healthy.
Phomopsis blight *Phomopsis juniperovora*	Eastern redcedar, Rocky Mountain juniper	Nebraska, South Dakota	Was a scattered problem throughout South Dakota in 1994, but not to the extent expected given the high moisture levels. No significant activity reported for Nebraska in 1994.
Septoria leaf spot *Septoria caraganae*	Caragana	Kansas, South Dakota	No significant activity reported in 1994 for both states.

Rocky Mountain Region - Status of Disease in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

DISEASE	HOST	LOCATION	REMARKS
VASCULAR WILTS AND DECLINES			
Ash decline	Green ash	Colorado	No significant activity reported in 1994.
Dutch elm disease *Ceratocyocystis ulmi* *Ophiostoma ulmi*	Elm species	Colorado, Kansas, Nebraska, South Dakota	Continued as a problem statewide in Nebraska and South Dakota. In Kansas, the disease is a serious problem in many urban areas; however, the 1994 reports were lower than the previous 2 years. Colorado reports smaller European elm bark beetle activity in association with the occurrence of the disease. Large populations of the beetle have developed from abundant host material as a result of an early fall freeze in 1991. Sanitation and salvage efforts to reduce the beetles breeding source has proven inadequate. The large populations of beetles in combination with small numbers of unsanitized DED-infected American elms are present along the Front Range of Colorado. The combination has resulted in seemingly healthy American elms being densely trunk-attacked by the bark beetle and infected with DED.
Oak wilt *Ceratocystis fagacaerum*	Oak species	Kansas, Nebraska	The Kansas State University lab received more than normal oak wilt samples during 1994. The majority of the samples came from the northeast corner of Kansas. Weather conditions during the past 2 years have been conducive for the development of the disease. No significant activity was reported in Nebraska in 1994.
Pinewood nematode *Bursaphelenchus xylophilus*	Austrian pine, Scotch pine, White pine	Kansas, Nebraska	Reports of pinewood nematode were down from 1993 levels this year in Kansas. No significant activity reported for Nebraska.
Verticillium wilt *Verticillium* spp.	Catalpa, Maple, Redbud, Russian Olive	Kansas	Normal levels of wilt were reported in 1994 for the state.

Rocky Mountain Region - Status of Disease in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

DISEASE	HOST	LOCATION	REMARKS
ABIOTIC			
Chemical damage	Many hardwood species	Colorado, Kansas, Nebraska, South Dakota, Wyoming	Herbicide damage to windbreaks and other tree plantings continued to be serious problem in all states.
Cottonwood mortality	Cottonwood	Colorado	No significant activity reported in 1994.
Drought, other unknown agents	Black walnut, Blue spruce, Buffaloberry, Dogwood, Green ash, Pear, Ponderosa pine, Poplar, Russian olive, Siberian elm, Silver maple	Colorado, Nebraska, Kansas, South Dakota, Wyoming	No significant activity reported in 1994.
Flooding/Heavy Rains/ Saturated Soils	Colorado spruce, Cottonwood, Ponderosa pine,	Colorado, Kansas, Nebraska, Wyoming	Pockets of large diameter spruce mortality occurred along the I-70 corridor from Idaho Springs to Georgetown, CO. Flooding caused by beavers and dirt/salt road run-off are thought to be responsible for the mortality. Many of the dead and dying trees were infested by spruce beetles. Eastern and northwestern South Dakota have experienced excessive spring rains the past 2 years. Damage is expected to continue for several years. Many pines in eastern Nebraska died suddenly of sustained extensive damage in early 1994 due to damage to the roots from saturated soils caused by heavy rains of 1993. Many pine trees were damaged by saturated soils during 1993 in Kansas. The excessive rains created anaerobic conditions resulting in death of branches or the entire tree.

Rocky Mountain Region - Status of Disease in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

DISEASE	HOST	LOCATION	REMARKS
ABIOTIC			
Frost damage	Hardwoods	Colorado, Kansas, Nebraska, South Dakota, Wyoming	Unusually warm winter and early spring climate throughout much of Colorado in 1994 resulted in an early flush of leaves. Hard frosts on April 25 caused widespread foliage loss, particularly in ornamental green ash and honeylocust; however, recovery is expected. In the central part of South Dakota, a late of 1994 frost in the spring caused minor damage to many trees.
Winter injury	Hardwoods	Colorado, South Dakota, Wyoming	The effects of the Halloween 1991 freeze are still being observed in eastern Colorado and southern Wyoming. Siberian elm was particularly affected, as well as willows, poplars, and cherry trees. In 1994, South Dakota reported normal levels of winter burn foliage damage on conifers and winter killed twigs on a variety of species.

Rocky Mountain Region - Status of Disease in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

DISEASE	HOST	LOCATION	REMARKS
OTHER			
Pinyon/Juniper dieback	Pinyon pine, Rocky Mountain juniper,	Colorado	A dieback of unknown cause (possibly due to drought and shallow soils) was observed in the Dry Park and Horsefly Canyon areas of the Uncompahgre Plateau, Norwood Ranger District, Uncompahgre NF.
Porcupine feeding	Limber pine, Ponderosa pine	South Dakota, Wyoming	Porcupine feeding damage was observed in association with comandra blister rust stem cankers on ponderosa pine in the Black Hills NF. Feeding damage was also present in patches of pine regeneration. In Wyoming, feeding damage was severe in association with white pine blister rust on limber pine in 1994.
Sprout dieback	Aspen	Colorado	Examples of regeneration failure and dieback were found on the Grand Mesa, Uncompahgre, Gunnison , San Juan and Routt NF's. Snow damage, dry sites, wet sites, herbivore pressure, competing understory, soil evolution, and disease may have been involved.
Squirrel damage	Hackberry, Honeylocust, Maples, Ponderosa pine, Russian olive, Siberian elm	Colorado, South Dakota	No significant activity was reported in Colorado or South Dakota in 1994. Damage consists of gnawing of the cambium layer and dieback of branches.

PESTICIDE USE IN REGION 2 IN FISCAL YEAR 1994

Type of Pesticide	*Chemical Used* [1/]	*Primary Mgmt. Activity*	*Units Treated in Acres*
Fumigant	Dazomet	Nursery bed sterilization Mgmt.	6.50 acres
	Methyl Bromide	Nursery bed sterilization Mgmt.	7.55 acres
Fungicide	Benomyl	Phomopsis Mgmt. Scleroderris Mgmt	7.25 acres
	Chlorothalonil	Fungi Mgmt.	12.75 acres
	Dodine	Fungi Mgmt.	10.14 acres
	Thiophanotemethyl	Fungi Mgmt.	34.80 acres
Herbicide	Chlorosulfron	Noxious Weed Mgmt.	21.00 acres
	Clopyralid	Noxious Weed Mgmt.	395.00 acres
	Curtail	Noxious Weed Mgmt.	78.00 acres
	Dicamba	Noxious Weed Mgmt.	802.00 acres
	Glyphosate	Noxious Weed Mgmt.	430.00 acres
	Glyphosate (aquatic)	Noxious Weed Mgmt.	15.00 acres
	Metsulfuron methyl	Noxious Weed Mgmt.	70.00 acres
	Pathway	Noxious Weed Mgmt.	66.75 acres
	Picloram	Noxious Weed Mgmt.	2,386.79 acres
	Transline	Noxious Weed Mgmt.	93.00 acres
	2,4-D	Noxious Weed Mgmt.	1,111.00 acres
	2,4-D/Amine	Noxious Weed Mgmt.	868.00 acres

PESTICIDE USE IN REGION 2 IN FISCAL YEAR 1994

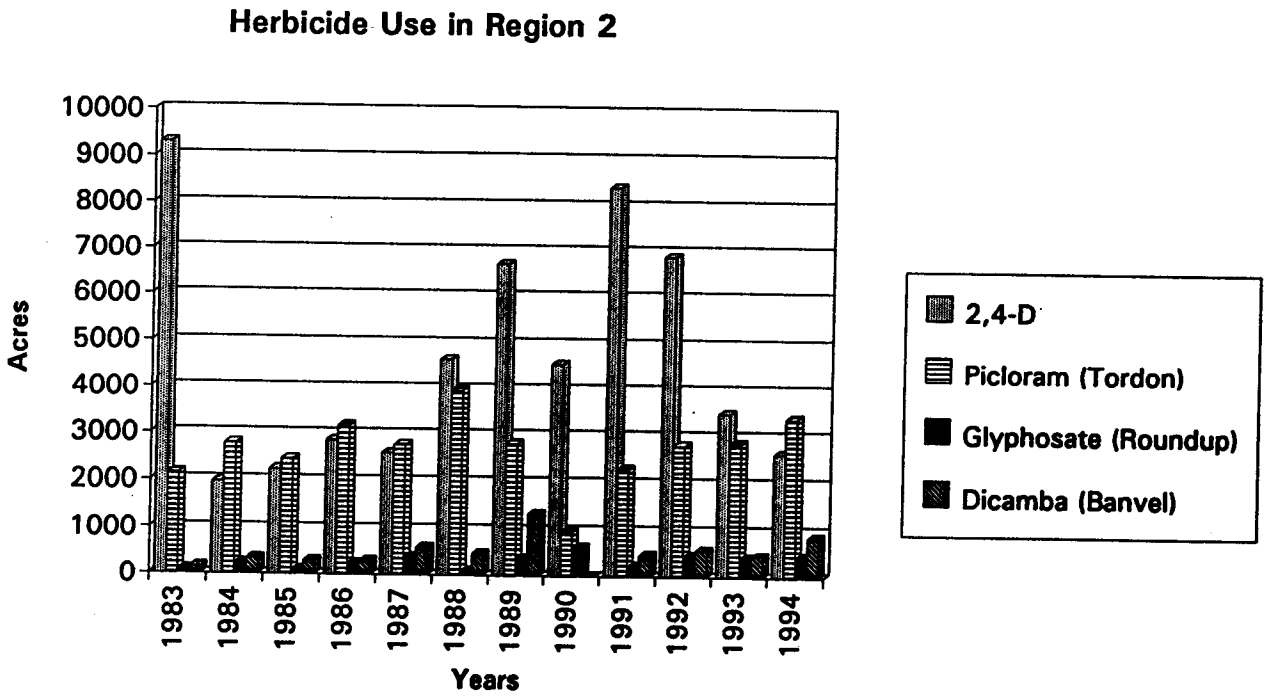
Type of Pesticide	*Chemical Used* [1/]	*Primary Mgmt. Activity*	*Units Treates in Acres*
Herbicide	2,4-D/Clopyralid	Noxious Weed Mgmt.	8.00 acres
	2,4-D/Curtail	Noxious Weed Mgmt.	61.00 acres
	2,4-D/Dicamba	Noxious Weed Mgmt.	107.50 acres
	2,4-D/Picloram	Noxious Weed Mgmt.	1,976.10 acres
Insecticide	Carbaryl	Insect Mgmt.	1.50 acres
	Coumaphos	Insect Mgmt./cattle	12,000.00 [2/]
	Dimethoate	Insect Mgmt.	21.60 acres
Rodenticide	Diuron/Imazapyr	Campground mice control	18.00 acres
	Zinc phosphide	Prairie dog control	4,080.00 acres

1/ Includes use by the USDA Forest Service, other federal agencies, permittees, licensees, and grantees.

2/ Number of animals treated

HERBICIDE USE IN REGION 2

While our knowledge of biological control is developing, the use of herbicides continues as an essential part of Forest Health Management. Herbicides are valuable tools in management of noxious weeds and undesirable vegetation in range management and in forest tree nursery management. The following graph shows herbicide use trends for the past 12 years. The major target species in the graph are the sagebrushes, thistles, leafy spruge, and various broadleaf weeds for range improvement and roadside management projects.



USDA FOREST SERVICE FEDERAL CERTIFIED APPLICATOR REPORT (REFS. FSM 2150 AND FSH 2109.11) (INSTRUCTIONS ON REVERSE SIDE) (REPORT FS-2100-L)			ADMINISTRATIVE UNIT NATIONAL FOREST LANDS REGION 2	
			FY-94	DATE 10/31/94
CATEGORY	(1) TOTAL NUMBER CERTIFIED LAST REPORT	(2) NUMBER CERTIFIED THIS FY	(3) REVOKED/ SUSPENDED CERTIFICATIONS THIS FY	(4) TOTAL CERTIFIED END OF THIS FY
(4) AGRICULTURAL	71	12	3 + 1*	71
(5) FOREST	9	3	0	10
(6) ORNAMENTAL AND TURF	4	3	0	4
(7) SEED TREATMENT	0	0	0	0
(8) AQUATIC	2	0	0	2
(9) RIGHT-OF-WAY	49	7	0	51
(10) INDUSTRIAL	10	2	0	11
(11) RESEARCH	1	0	0	1
(12) NUMBER OF EMPLOYEES CERTIFIED	78	20	4	77
PREVIOUS EDITION IS OBSOLETE				FS-2100-4 (9/84)

* EMPLOYEE RETIRED, CERTIFICATION NOT REVOKED

RECENT PUBLICATIONS (as of July 1995)

Angwin, P.A. 1995. Pest Conditions at Aspen Mountain Ski Resort, Aspen Ranger District, White River National Forest, Colorado. USDA Forest Service, Renewable Resources, Rocky Moutnain Region Biological Evaluation. R2-95-3. 15p.

Angwin, P.A. 1995. Pest Conditions at Crested Butte Mountain Resort, Taylor River/Cebolla Ranger District, Gunnison National Forest, Colorado. USDA Forest Service. Renewable Resources, Rocky Mountain Region Biological Evaluation. R2-95-1. 19 p.

Angwin, P.A., and B.J. Raimo. 1994. Ponderosa pine rural development project-forest health assessment. USDA Forest Service, Renewable Resources, Rocky Mountain Region Biological Evaluation. R2-95-01. 27 p.

Angwin, P.A., D.W. Johnson, T.J. Eager, E. Smith and W. Bailey. 1995. Piney Analysis Area, Holy Cross Ranger District, White River National Forest - Forest Health assessment.. USDA Forest Service, Renewable Resources, Rocky Mountain Region Biological Evaluation. R2-95-02. 71 p. (In preparation).

Berisford, C.W., T.J. Eager, and D.C. Allen. 1994. Meeting tomorrow's challenges in forest entomology. Journal of Forestry. Vol. 92, 11:10-15.

Johnson, D.W. 1994. Catalog of specimens located in the herbarium, Lakewood Service Center, Rocky Mountain Region USDA Forest Service. USDA Forest Service, Renewable Resources, Rocky Mountain Region Technical Report R2-56. 14p.

Johnson, D.W. 1994. Effects of application rate and timing of ethephon treatments on abscission of ponderosa pine dwarf mistletoe. USDA Forest Service, Renewable Resources, Rocky Mountain Region, Forest Health Management Technical Report R2-55a. 12p.

Johnson, D.W. 1995. Picea engelmannii Parry ex Engelm. In: Enzyklopedie der Holzgewachse (Encyclopedia of Woody Plants). (In press).

Johnson, D.W. 1995. Picea pungens Engelm. In: Enzyklopedie der Holzgewachse (Encyclopedia of Woody Plants). (In press).

Johnson, D.W. 1995. Quercus gambelii Nutt. In: Enzyklopedie der Holzgewachse (Encyclopedia of Woody Plants). (In press).

Johnson, D.W., J.S. Beatty and T.E. Hinds. 1995. Cankers on Western Quaking Aspen. USDA Forest Service, Forest Insect and Disease Leaflet 152. 8 p.

Johnson, D.W. and Y. Wu. 1995. A survey for Melampsora rusts along the Colorado Front Range. USDA Forest Service, Renewable Resources, Rocky Mountain Region Technical Report R2-57. 7 p.

Pasek, Judith E. 1995. Rocky Mountain Region aerial survey program, pp. 22-23. In: McConnell, Timothy J. [ed.]. Proceedings: Aerial Pest Detection and Monitoring Workshop. [Las Vegas, NV, April 26-29, 1994]. USDA Forest Service Northern Region, Forest Pest Management Report 95-4, 103 p.

Pasek, Judith E., J.C.Holah, and W.C. Schaupp, Jr. 1993. Specialist report--effects on insects and diseases and other invertebrates, 1993 Black Hills Forest Plan Revision. USDA Forest Service. Rocky Mountain Region, Rapid City Service Center, 41 p. (Internal Report).

RECENT PUBLICATIONS (as of July 1995)

Schaupp, W.C., Jr. 1994. Biological control of forest pests in the Great Plains: regulatory, industrial, and extension status, needs and issues, pp. 28-35. In: Proceedings of the Great Plains Agricultural Council, June 7-9, 1994, Bismark, ND.

Sharon, E.M. 1994. Spotting potential failures. Arbor Age 14 (10) :10-12.

Wu, Y., D.W. Johnson, and P.A. Angwin. 1995. Identification of Armillaria species in the Rocky Mountain Region. USDA Forest Service, Renewable Resources, Rocky Mountain Region Technical Report. (In preparation)

*U.S. GOVERNMENT PRINTING OFFICE: 1995-676-516/25109