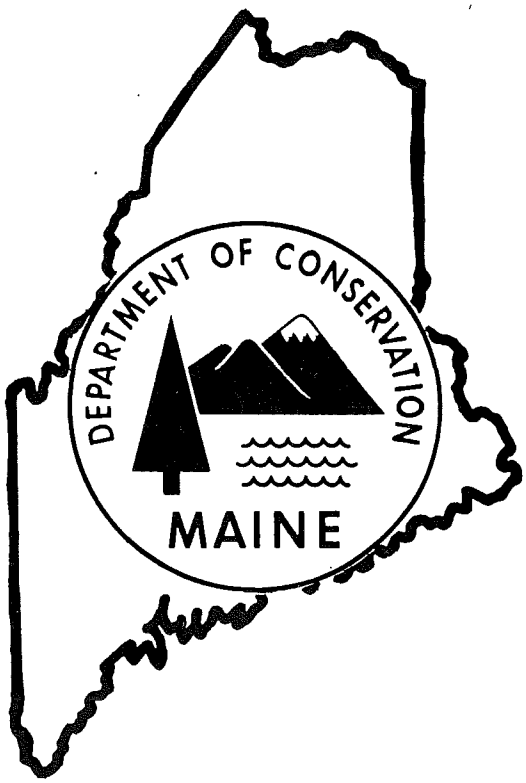
FOREST & SHADE TREE INSECT & DISEASE CONDITIONS FOR MAINE

A Summary of the 1986 Situation



Insect & Disease Management Division
Summary Report No. 1
March 1987

Maine Forest Service
MAINE DEPARTMENT OF CONSERVATION
Augusta, Maine

C O N T E N T S

FOREST & SHADE TREE INSECT & DISEASE CONDITIONS FOR MAINE
A SUMMARY OF THE 1986 SITUATION

Although we were confronted with a diversity of relatively minor problems and continuing surveys in 1986, for the first time in many years no major pest problems or crises commanded our attention. This is not to say that we are "home free" but simply that we seem to have experienced a calm in the storm. This breather has given us an excellent opportunity to assess our direction including the opportunity to formulate and begin implementation of new approaches to pest management where appropriate. In most cases this does not mean drastic changes in services to our various users but simply involves making our work more efficient so that we can address greater needs of a wider range of constituents.

Highlights of Division Activities for 1986

Thomas Rumpf was named State Entomologist in April of 1986, succeeding Clark Granger. Tom had been director of the Spruce Budworm Management Program since 1982 and was already familiar with many aspects of forest pest management when he assumed the formidable task of bringing the activities of the budworm and other entomology staff back together following about 10 years of separation. This recombination of staff was necessitated by reductions in dedicated revenues brought on by drastically declining spruce budworm populations. By early in 1986, budworm staffing levels had been reduced from 26 positions in June of 1985 to 7. Five more budworm positions were lost or transferred during the year and the remaining two are expected to be lost or transferred as dedicated funds run out in September of 1987.

While the core of the entomology staff did not change noticeably during the season, it was becoming evident that there was a need to designate specialists to handle the growing demands in certain aspects of forestry. Clark Granger was named Christmas tree specialist for the Maine Forest Service to handle all but pest related problems and Richard Bradbury was designated regeneration pest specialist. Henry Trial, Jr. remains specialist for spruce budworm related activities, David Struble for hardwood insects and Douglas Stark as staff pathologist. Since August, we have continued to look into further specialty assignments.

It has become increasingly evident that much of our work in the future will be directed more at managing pest problems using a variety of techniques and disciplines. It was recommended by a review team* that the Division's name be changed to reflect this understanding. The suggestion was adopted and we are now officially recognized as the Insect and Disease Management Division of the Maine Forest Service of the Maine Department of Conservation.

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* Dr. John Dimond and Dr. Bill Ostrofsky, University of Maine; Tim Sawyer, P.H. Chadbourne & Co.; Jerry Williams, International Paper Co.; and George LaBonte, Henry Trial, Jr. and Thomas Rumpf, Maine Forest Service.

Additional changes which occurred during the 1986 season were primarily procedural. A thorough review of Division programs was conducted by the Entomology Division Review Team* and reviewed by the staff. As a result of our introspection, several steps to improve the efficiency and effectiveness of the Division are planned. If you have suggestions concerning priority needs which should be addressed by the division, forward your ideas to Tom Rumpf, State Entomologist, Insect and Disease Management Division, Maine Forest Service, Maine Department of Conservation, State House Station 22, Augusta, Maine 04333 (Phone (207) 289-2791).

Publications

The need to evaluate and improve our methods of information dissemination has become one of the main focal points of our "new image" effort. One step is to improve this summary report and the periodic pest condition newsletters to more nearly meet your needs. A questionnaire was included in our first issue in 1986. Your response was good, and a number of changes are planned in this and future issues based on suggestions we received. The first change which we have tried in this issue is the grouping of problems into resource specific categories to facilitate information retrieval. We have also slightly changed our style, to include a cover and table of contents for our annual summary. The slight content/style changes were necessitated so that we could more fully utilize our new word processor and printer. Further changes should appear with the periodic field season issues. We are also improving our production methods and style for our information sheets on particular pests and coordinating this effort with other State and Federal agencies to broaden our coverage of topics. We plan to provide more detailed information on a number of our programs through circulars and technical reports. To insure continuity we will standardize our technical report and information sheet formats. We have also begun improving our public visibility through increased numbers of talks, training sessions and displays.

Division publications during the 1986 season include the following:

Bradbury, R.L. and E.A. Osgood 1986 (Nov.). Chemical control of balsam twig aphid, Mindarus abietinus Koch (Homoptera : Aphididae). Me. Agr. Expt. Sta. Tech. Bull. 124. 12pp.

Bradbury, R.L. 1986 (Nov.). Efficacy of selected insecticides against the white pine weevil (Coleoptera : Curculionidae). Me. Dept. of Conserv., Me. For. Serv., Ent. Div. Tech. Rpt. No. 25. 8pp.

Entomology Division. 1986. Forest & Shade Tree-Insect & Disease Conditions for Maine. 13 issues from May 1 through August 20. Edited by R.G. Dearborn and Douglas A. Stark.

Trial, Henry, Jr. and M.E. Devine. 1986 (August). Spruce Budworm in Maine, Results of the 1985 Project, Biological Conditions in 1985 and expected infestation conditions for 1986. Me. Dept. of Conserv., Me. For. Serv., Ent. Div. Tech. Report No. 24. 71pp.

Copies of the publications mentioned above are available through the Entomology Laboratory.

1986
PEST SUMMARY

While the diversity of pests and the incidence levels of some species did increase in 1986, the intensity of individual pest problems remained low or declined for the most part. Of interest, however, was the apparent rise in incidence of stress related problems such as bark beetles, shoestring root rot and various declines. Problems affecting the regeneration of conifers also appeared to be on the rise at a time when concerns about the future of our forest resources are being expressed.

Populations of specific pests generally continued along trends begun in 1985 with further decline in the spruce budworm and low levels of hardwood defoliation in 1986. The only insect pest which consistently drew attention was oystershell scale on beech. There were hot spots of defoliation and damage by others such as the spruce budworm, gypsy moth, birch casebearer, birch leafminer, arborvitae leafminer, white pine weevil and pine spittlebug, but this was to be expected.

The highlight of the Forest Disease Survey was confirmation of the presence of the pinewood nematode in Maine. Continuing pathological problems of significance include white pine blister rust, European larch canker and related quarantine activities, scleroderris canker, annosus root rot, regeneration problems associated with Armillaria root rot, hardwood and softwood rusts, Botrytis blight of greenhouse grown containerized seedlings, needle cast disease, hardwood cankers and decays, maple decline, dwarf mistletoe on spruce along the coast and off-shore islands, and larch decline.

In addition to the "standard" pest problems for the season we experienced a number of interesting and unusual problems as well. These included: severe porcupine (and/or squirrel) debarking of hardwoods in southern Maine; hail and wind damage in SW Maine; tussock caterpillar invasions in central and eastern Maine and spruce tumors in coastal sections and at Garland.

The following is a summary of various problems which we found affecting forests and shade trees during the 1986 season. More detailed accounts of some of these will be included in our in-depth annual report which will be available on a very limited basis by late spring. To facilitate location of problems of specific interest in this report we have organized our summary into resource specific categories. We would appreciate your comments on our selection of categories as well as on any other aspect of this report.

The categories we have selected are:

A - Forest Pests - Softwoods
B - Forest Pests - Hardwoods
C - Plantation, Regeneration, Nursery and Christmas Tree Pests
D - Shade Tree, Ornamental and Miscellaneous Pests

Each of these categories is broken down further into sections on insects and diseases (the disease section includes abiotic factors). Pests of softwoods growing naturally as forest regeneration are generally included in Section A after they reach pole size. Additional information on specific items can be supplied upon request.

(A) Forest Pests - Softwoods

Insects

Arborvitae (Northern White-Cedar) Leafminers (4 species) - Populations of these species and their damage in 1986 remained at relatively low levels throughout the range of the resource in Maine except in the extreme southeast. In coastal areas from East Machias to Dennysville, including Cutler, Trescott and Lubec, damage from these leafminers ranged from moderate to severe with some associated mortality. With increasing interest in arborvitae in that portion of the State, there has been rising concern over its fate. Plans are being made to look into the problem further in 1987. Winter surveys will be conducted throughout the State as they have been in the past to determine trends.

Balsam Woolly Aphid (*Adelges piceae*) - This insect continues to be a serious problem on balsam fir throughout much of the southern half of the State. Trees infested by this species fairly quickly "slide over the brink" when hit by defoliators such as the spruce budworm. This aphid frequently escapes incrimination due to its inconspicuous habits. Although no insect can be seen readily in the gout stage (the common stage in Maine presently), the gouted twig bases should be readily visible. From a distance the characteristic "flat-topped" appearance of infested trees is easily recognized. Southern areas of the State seem to have the highest incidence of the "flat-topped" fir. The easily recognized woolly trunk phase of this aphid seems to have all but disappeared

Larch Casebearer (*Coleophora laricella*) - "Scorched" foliage, evidence of feeding by this insect, was not as prevalent in 1986 as in 1985.

Larch Decline/Bark Beetle (*Dendroctonus simplex*) - Since the early 1980's we have become aware of an increase in unexplained spotty decline of larch, particularly in the southern half of the State. Attempts to link spotty mortality specifically to one of the larch pests (bark beetle, canker, casebearer, nematodes or sawfly) have been unsuccessful. The closest association appears to be with bark beetles but this may not be a cause-effect relationship. A number of plots were set us in 1984 to monitor this condition. While results from surveys of coastal larch stands do not indicate a serious overall loss yet, the situation and trends in the monitored plots do indicate potential worsening-at least in those areas with current mortality and attendant beetle populations.

Larch Sawfly (*Pristiphora erichsonii*) - Only one report of a single tree infested by this species was received in 1986. The infested tree was in King & Bartlett Township.

"Red Fir" (Stilwell's Syndrome) - The sudden appearance of scattered red-colored fir throughout the spruce-fir forested areas in mid summer continued to draw comment in 1986. Although no actual levels of abundance have been established, it did appear that incidence levels of

this problem were up slightly in 1986. The fungus, Armillaria mellea seems to be consistently involved in this disorder (See Shoestring Root Rot in Section C - Diseases).

Eastern Spruce (Bark) Beetle (Dendroctonus rufipennis) - As there are still many stands of large or overmature spruce throughout northern and eastern Maine which have been defoliated one or more times by the spruce budworm, we were interested and concerned to learn of recent infestations of the eastern spruce beetle. This species was linked to heavy losses of spruce following the spruce budworm outbreak early in this century. Most of the areas reported so far are very small and have either been harvested or are in protected zones. The largest area which was observed covered approximately 1,000 acres in northern Maine but was in a protected zone (harvesting excluded). The problem at this point seems to be in check but we will continue to follow up as new areas are reported. See also Veiled Polypore (Diseases, Section A which follows).

Spruce Budworm (Choristoneura fumiferana) - Spruce budworm populations have collapsed over all of Maine except for portions of Hancock and Washington Counties and even these areas show all signs of a collapse in 1987. Populations have reached the lowest levels recorded in Maine since 1970. The duration of this downturn, however, cannot be predicted. Surveys conducted in the spring of 1986 showed that budworm populations were as low or lower than predicted. Nearly all of northern and western Maine had very low populations of L-III larvae. Areas in the southeast, where high and extreme populations were predicted, had high and some moderate spring counts. Surveys of late instar larvae showed further declines in budworm numbers beyond what was expected from normal seasonal population decline. By the L-VI stage, budworm were difficult to find in northern and western Maine.

The area of moderate to severe defoliation in 1986 was estimated to be 600,000 acres, about half the 1985 area, with nearly all the defoliation occurring in the southeastern portion of the state.

The 1986 predictive survey (for the 1987 season) indicates a further decline in budworm numbers. Every sample taken in northern, central and western Maine had a low L-II count; many were zeroes. In the southeast some areas of high and moderate population were identified, but counts are extremely variable and the size of these areas is greatly reduced from 1985 levels. Moderate to extreme defoliation is expected on about 230,000 acres in 1987 (Fig. 1), about a third of the 1986 area. All the areas are in the southeast. A detailed report on spruce budworm conditions for 1986 and predictions for 1987 should be available by spring.

A small scale experimental spray trial using several Bacillus thuringiensis (Bt) formulations was conducted in southeastern Maine during 1986. The test covered 2,800 acres and was a cooperative effort between the Maine Forest Service, the University of Maine (Dr. J.B. Dimond), Abbott Laboratories, Zoecon Corp., and Champion International Corp. Six Bt formulations and eight spray regimes were tested. All applications were made with a single thrush aircraft equipped with Micronair rotary atomizers. Spray deposit was assessed on fir needles.

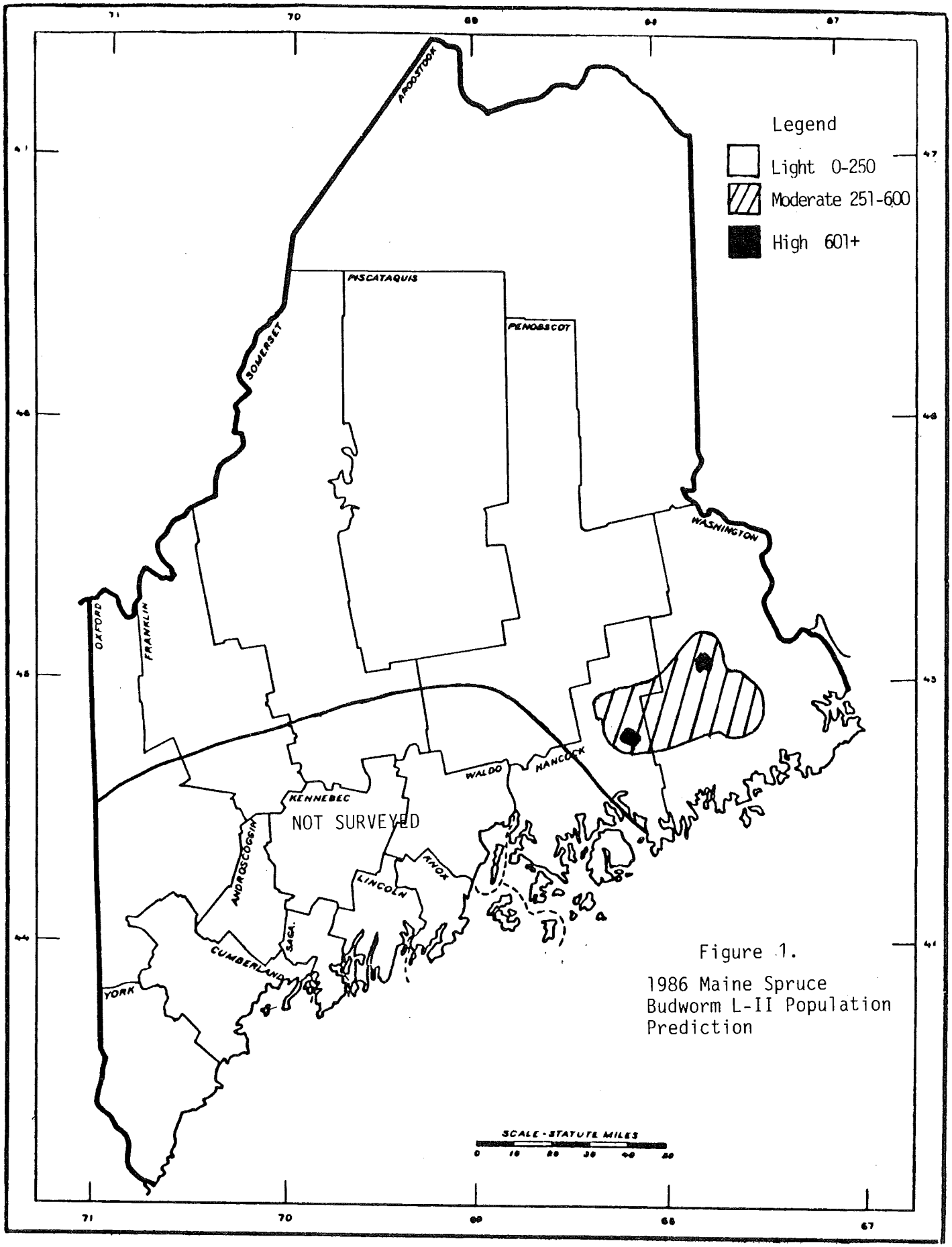

Figure 1.
1986 Maine Spruce Budworm L-II Population Prediction

Split applications of San 415-32LV (Thuricide) and Dipel 8AF were found to be very effective in reducing populations and in saving foliage on fir and especially on spruce. All formulations tested were effective on fir but Dipel 12L and Thuricide 64LV single applications were not effective on spruce. These results were not unexpected in view of recent operational results with split applications and other research comparing split and single strategies. A complete report of this spray trial will be available in the spring of 1987.

Other budworm related activities conducted during the 1986 season included: a pheromone trapping program, parasite monitoring, a study of the efficiency and economy of the present L-II laboratory methods and cooperation with Dr. John Dimond of the University of Maine on microsporidian studies. The presently very low population levels of the budworm have also prompted a review of the effectiveness of existing survey methods.

Spruce Coneworm (Dioryctria reniculelloides) - Coneworm populations have continued to run somewhat parallel to spruce budworm populations statewide. Their numbers dropped to extremely low levels in 1986 in all but spots in Hancock and Washington Counties. Populations of this species are expected to remain generally low at least through 1987 and damage will be light.

White Pine Weevil (Pissodes strobi) - See Section C.

(A) Forest Pests - Softwoods

Diseases

Annosus Root Rot (Heterobasidion annosum - Fomes annosus) - This root rot was confirmed in 1986 from Peru in a 25-30 year old white pine plantation which had been thinned 8-10 years ago. This was the only new report for the season although another report is being investigated. This can be a serious problem and should be watched for.

Eastern Dwarf Mistletoe (Arceuthobium pusillum) - Incidence of this parasitic plant appears to be increasing on white spruce in coastal areas. A severe situation exists on Monhegan Island, where mistletoe-caused mortality has created a fire hazard. Heavy damage was also reported on McGee and Barter Islands in the Port Clyde area, on Marsh Island in the Round Pond area, and on Linekin Neck in the East Boothbay area. Red spruce is also affected, but brooming response is generally much less than for white spruce. Seeds were readily ejected on October 8 when female "brooms" were disturbed.

European Larch Canker (Lachnellula willkommii) - The quarantine boundary has been stable since 1984. Only one new township (Thomaston) was added to the list of confirmed townships in 1985, and no new infestations were found during summer survey activity in 1986. Age determination studies indicate that both the Washington/Hancock and Lincoln/Knox/Waldo County epicenters were approximately 17 years old in August of 1986.

Compliance agreements entered into or renewed involved Boise Cascade, Georgia-Pacific, International Paper Co., Scott Paper Co., and S.D. Warren.

Pinewood Nematode (*Bursaphelenchus xylophilus*) - This conifer-inhabiting nematode was first confirmed from Maine on October 29, 1986 from the towns of Whitefield and Baldwin. Since that date, confirmation has also been received from a sample submitted from Albion. The host species in all cases was eastern white pine, although larch, spruce, and fir were also sampled. Determinations were done by Ms. Shari Halik, Research Technician, University of Vermont, Burlington, through agreement with Dr. Dale Bergdahl.

Rhizosphaera Needlecast (*Rhizosphaera kalkhoffii*) - Incidence is generally down, but was reported on white spruce in Clinton.

Scleroderris Canker (*Gremmeniella abietina*) - The basal needle discoloration symptom and canary-yellow stain on wood just beneath the bark were obvious on May 23 in a localized, unsanitized area in Eustis. Sanitized areas in Eustis, Coplin Plantation, Aurora and T19 MD failed to yield symptoms, and testify to the effectiveness of timely low pruning as a management tool.

Septobasidium/Matsucoccus/Caliciopsis Complex (*Septobasidium pinicola/Matsucoccus macrocicatrices/Caliciopsis pinea*) - This complex of fungus organisms and a scale insect was found on small-crowned, pole-sized and mature white pine in Baldwin and Casco. Heavy pitching was the major external symptom, while large patches of dead cambium and inner bark were symptoms observed when the bark in the crown area was peeled. Overstocking when the stand was young may have contributed to this condition which was causing unthriftiness and mortality. In Baldwin this complex was associated with the pinewood nematode, pitch mass borer, bark beetles and Shoestring root rot.

Sirococcus Shoot Blight (*Sirococcus strobilinus*) - This problem was observed in Eustis, Aurora, T19 MD, and Gouldsboro. At the latter location, mature trees contained green branches on only 8-10' of the upper crown. Several trees, up to 50 feet in height appear to have been killed by this disease organism. The host species in all cases was red pine.

Spruce Cone Rust (*Chrysomyxa pyrolae*) - A light to moderate infestation was observed on white spruce cones in Glenwood. The alternate hosts are species of *Pyrola* (Shinleaf) and *Moneses*. Spores on cones were easily dislodged on July 2.

Spruce Needle Blight (*Lirula macrospora*) - A heavy infection on lower branches of Black Hills spruce was observed in a small, pole-sized stand in Orland. The fungus occurs as shiny, black, linear fructifications on the underside of the needles.

Spruce Tumor (Cause undetermined) - Tumors or burls 10 inches or more in diameter were commonplace on white spruce on Monhegan Island. Tumors were also observed on occasional white spruce on Linekin Neck, East Boothbay.

An extremely rare occurrence of spruce tumors was investigated on Preble Hill in Garland, many miles from the nearest salt water. Tumors at times exceeded the size of a basketball, and occurred on the bole and branches high into the crown. Tumors on spruce only occur inland in relatively few places in the entire world. The exact cause for this aberrant, rapid growth rate of tumors is not known.

Veiled Polypore (Cryptoporus = Polyporus volvatus) - This small, unusual fungus was collected at the northeast corner of T12 R11 (Robbins Brook area), and was associated with a heavy infestation of the eastern spruce beetle, Dendroctonus rufipennis (See Insects, Section A). This saprot fungus generally fruits from beetle emergence holes on trees that have been dead for about one year.

Weather Related Problems - A **Hail** storm, with "stones" up to baseball size, hit the Naples-Raymond area on June 3rd. Leaves, needles and small branches were stripped from trees. Many male flowers were knocked off white pine in this storm, windows were broken, and unprotected vehicles were pock-marked. Several additional hail storms passed through southwestern Maine later in the summer and although damage was severe in some areas, none rivaled the June 3rd storm.

White pine also suffered badly in some areas of southwestern Maine from breakage associated with locally high winds. These occurred as a result of local storms and backlash from late summer and early fall Atlantic storms.

White Pine Blister Rust (Cronartium ribicola) - A total of 71,351 acres in 23 towns were surveyed (scouted) for Ribes (currant and gooseberry bushes) in 1986. During this period there were a total of 1,862,245 acres in the control area of which 1,171,300 acres were greenlined (no further work needed as long as current infection conditions exist). This leaves a balance of 690,945 acres in need of scheduling for survey (scouting) work. With a 10 year rotation, one tenth of this acreage should be worked annually to maintain a schedule providing protection from blister rust to reproduction and pole-sized stands.

Regarding the quarantine section involving planting Ribes in Maine; a list was prepared of post offices outside the quarantined area to which currant and gooseberry nursery stock could be shipped. No European black currants (Ribes nigrum) or any of its hybrids may be shipped anywhere within the State of Maine.

White Pine Needle Blight (SNB) - Symptoms from this disorder were not as pronounced in 1986 as they had been in 1985 but were still obvious.

(B) Forest Pests - Hardwoods

Insects

Birch Casebearer (Coleophora serratella) - Previous areas of contiguous defoliation have dissipated into discreet spots totaling less than 1,500 acres primarily in southeastern (Whiting - 500 acres) and western

(Rangeley Plt. - 1,000 acres) Maine. Populations elsewhere generally caused little noticeable defoliation in 1986.

We are continuing to monitor stands defoliated in 1983 and 1985 where some decline is now evident. At this time we are unable to predict future populations but expect some localized intensification.

Birch Leafminer (Fenusa pusilla and Profenusa thomsoni) - Populations of and damage from both species seemed to be slightly greater in 1986 than in 1985. Infestation of gray and hybrid birch by F. pusilla continued to cause the most striking damage early in the season. Profenusa thomsonii on white birch seemed to be only slightly more prevalent than in 1985.

Cankerworms (Several species) - Bruce spanworm (Operophtera bruceata) populations remained low in 1986 in spite of noticeable moth activity in the fall of 1985. No defoliation was reported. Numbers of **cleft-headed spanworms (Biston betularia cognataria)** were up in 1986 and were frequently brought to our attention although no defoliation was reported. This was the first year in many years that this very large (2-3" long) looper or inchworm with a strikingly notched head has been noticeably common in Maine. It feeds on a variety of deciduous trees. **Spring cankerworm (Paleacrita vernata)** and **fall cankerworm (Alsophila pometaria)** numbers were also at low levels in 1986 with only spotty light defoliation reported in southwestern Maine. The **winter moth (Operophtera brumata)** has still not been reported from Maine.

Fall Webworm (Hyphantria cunea) - This mid season, loose tent maker was more prevalent in 1986 than in 1985 over much of the southern half of the State.

Forest Tent Caterpillar (Malacosoma disstria) - No noticeable defoliation by this pest was reported in 1986 and populations remained low. Stands defoliated heavily during the last outbreak appear to have stabilized with no additional mortality evident.

Greenstriped Mapleworm (Dryocampa rubicunda) - Although both larvae and moths of this species were again quite common in central Penobscot County in 1986, little defoliation was noted.

Gypsy Moth (Lymantria dispar) - Acres of noticeable defoliation rose to 13,697 in 1986 from 10,249 in 1985. Although some light defoliation was reported in Kennebec County, most of the heavier defoliation occurred in central Penobscot and Northern Hancock and Washington Counties where locally up to 100% defoliation was observed. Populations of this imported species continue to expand outward to the north and east and a slight but general rise in numbers has been noted throughout much of southern Maine.

Hardwood Defoliators (general) - Although defoliation of hardwoods by caterpillars generally seemed to be down in 1986 from 1985, the diversity of species reported to us from hardwood hosts seemed to be up. As a

matter of fact, our taxonomic expertise was frequently taxed in securing identifications for some species. Of the groups in question, the prominents and tussocks seemed to generate the most interest (See also Tussocks in Section D - Insects).

Oak Leaftier (Croesia semipurpurana) - Populations of this early season defoliator of oak seemed to be up slightly in 1986 from 1985 levels although only limited spots of noticeable defoliation were detected.

Over the past five years we have begun to see higher than anticipated mortality in oak stands which had been previously defoliated by the oak leaftier. Although we have not established a cause-effect relationship, we expect to find that under certain conditions several years of severe oak leaf-tier defoliation can stress even fairly vigorous oak beyond the point of recovery.

Oak Twig Pruner (Elaphidionoides villosus) - Although some trees seem to be hit by this species year after year, population levels for the twig pruner do tend to vary with the seasons. Populations for 1986 rose somewhat from 1985 levels.

Oystershell Scale (Lepidosaphes ulmi) - Areas of symptomatic, infested beech increased from 500 acres in 1985 to more than 5,000 acres in 1986. Most of the noticeably affected stands were in central and eastern Maine. Much of the increase in acreage was due to expansion of existing infestations, but a number of heavily infested smaller stands were also observed in areas well away from older infestations.

While top dieback, tip and understory mortality were evident throughout the 5,000 acres or more, complete tree mortality of overstory trees is minimal to date and is associated with beech scale/nectria. In heavily infested stands virtually all of the beech and some of the yellow birch regeneration has been killed. Sugar maple regeneration is showing heavy leader and branch mortality in many of these areas.

A map of Maine showing the 1986 scale status has been included (See Fig. 2).

Poplar Leaf Folding Sawfly (? Phylocolpa spp.) - This tiny naturally occurring insect normally remains inconspicuous but heavy populations in eastern Maine did stimulate interest early in June of 1986. The situation was especially striking at Bradley and Milford where a combination of very small foliage and multiple folds gave poplar crowns a very thin appearance. No serious damage to the hosts was evident.

Porcupine Damage - This past season we received more reports than usual of what appears to be porcupine damage to trees. Although some feel that squirrels had a role, we still feel that porcupines were the primary culprits. The most striking damage occurred over the winter of 1985-1986 to sugar maple in at least three areas; Mount Vernon, Belgrade and Sidney. In Mount Vernon, scattered trees ranging from saplings and

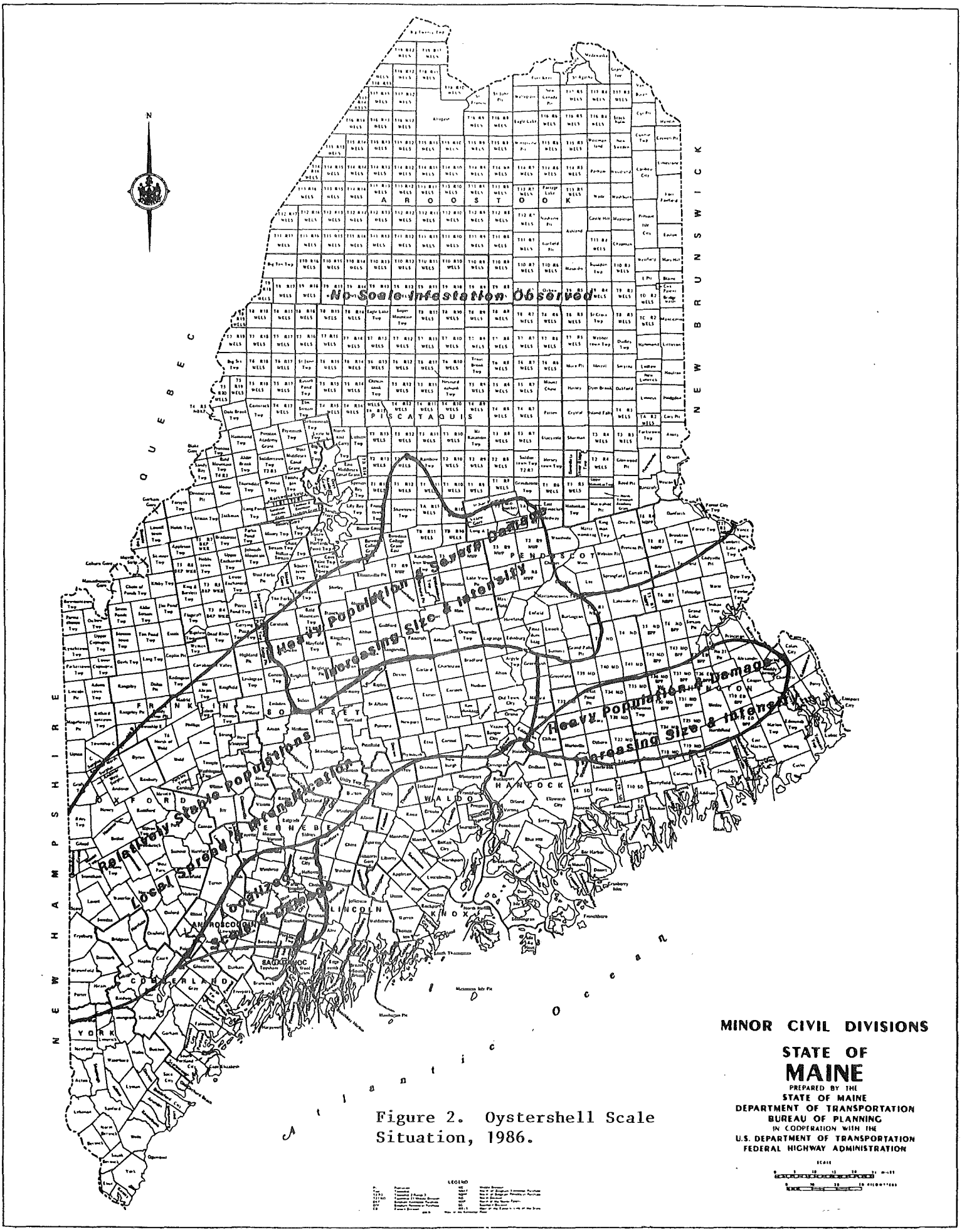

Figure 2. Oystershell Scale Situation, 1986.

sprouts to 6" DBH trees over several acres adjacent to a cornfield suffered various degrees of bark removal. Some were completely debarked, others partially. In Belgrade, large (2' DBH ±) maple adjacent to McGraw Pond showed severe debarking in the upper crown. In Sidney, several trees in the 7-9" DBH category were nearly completely debarked. Bark in all cases was removed to the sapwood. In some cases shredded bark could be found to litter the ground around the trees, in others shredded bark was not as evident. It also appeared that smaller rodents, possibly squirrels, fed on the bark of smaller branches, saplings and twigs. Many of these trees died during the season.

Other trees noticeably affected during the same time period were white pine in Manchester and red pine in Houlton. The white pine were infected by white pine blister rust and the porcupines seemed to be drawn to the cankers. The red pine were smaller plantation trees.

Saddled Prominent (Heterocampa guttivitta) - Although numbers of moths generally increased for the third consecutive year in 1986, no defoliation by larvae was noted.

Satin Moth (Leucoma salicis) - Populations of this species continue to remain very low.

Tussocks (See Section D - Insects).

(B) Forest Pests - Hardwoods

Diseases

Ash Leaf Rust (Puccinia sparganioides) - Areas which had suffered several consecutive years of heavy infestations of combined ash leaf rust and ash anthracnose (**Gloeosporium aridum**), especially in the Cumberland Foreside and Yarmouth areas, were down to light infestations this year. An exception was the Arrowsic area, where heavy rust infection persisted, with localized tree mortality continuing to occur.

Gymnosporangium Rust (Gymnosporangium sp.) - Amelanchier (Serviceberry) fruit were heavily infected on Monhegan Island and were ready to release aeciospores on July 28.

Maple Decline - Serious concern has been expressed in recent years over the rise in frequency of decline symptoms showing up in maple stands in the northeastern U.S. and eastern Canada. This is especially startling in high value "sugar bush" areas. Many of the declining maple situations in Maine can be explained as being caused by high grading, logging injury, salt damage, compaction, construction, grade change, stress from insect defoliation and canker disease organisms. On a cursory inspection of a public lot in Sandy Bay Township maple decline was not a serious problem, and those instances where it was observed, it generally could be explained by one of the above causes. A similar examination was made of several sugar maple stands in Quebec, Canada adjacent to and between

Coburn Gore and Sandy Bay Township. This area had been aerially surveyed by Quebec provincial personnel and had been found to contain some stands with 50-100% of the trees showing dieback. On these we found evidence of Nectria and Eutypella cankers, and butt rot caused by Fomes connatus, Shoestring root rot, frost cracks, seams and unhealed tap holes. Some of the affected trees were relatively old and appeared to have had a long history of tapping.

Reports of maple decline in Maine during the 1987 growing season are encouraged, to help us better evaluate the seriousness of the problem.

Oak Leaf Blister (Taphrina caerulescens) - A moderate infection on red oak in Fayette had leaves with blisters developing on June 6.

Phomopsis Gall (Phomopsis sp.) - Galls on red oak up to 6 inches in diameter were observed on many trees in a localized area in Fayette. Scattered branch mortality and total mortality of some pole-sized trees resulted. A single affected tree was observed in New Gloucester. Susceptible trees should be discriminated against in thinning operations.

Poplar Fruit Blight (Taphrina johansonii) - Approximately 50% of trembling aspen capsules were aborted by this fungus organism in Augusta. Infected capsules were bloated and bright yellow in color on May 9.

Shoestring Root Rot (See Section C - Diseases).

Weather Related Disorders - The severe hail storm which hit southern Maine in June of 1986 caused considerable damage to hardwoods as well as softwoods (See Section A). Although some twig and branch breakage did occur, the most noticeable evidence of injury seemed to be the resultant mechanical defoliation. Additional signs of injury may become evident as bruises and other wounds develop into dead spots and/or become infected with opportunistic disease organisms.

(C) Plantation, Regeneration, Nursery and Christmas Tree Pests

Insects

Balsam Gall Midge (Paradiplosis tumifex) - Populations of this Christmas tree pest have remained at endemic levels since 1984. No problem areas were reported in 1986.

Balsam Twig Aphid (Mindarus abietinus) - Populations increased in 1986 from 1985 levels especially in plantations which had already been noticeably infested. Several plantations of 10 acres or more showed damage severe enough to warrant control. Bradbury and Osgood (1986) published information on the control of this cyclic pest of balsam fir (See Publication section).

Conifer Sawflies (Many species) - Over the years there have been situations involving severe defoliation of plantation softwoods by a number of sawfly species. Among these, the yellow headed spruce sawfly (Pikonema alaskensis), larch sawfly (Pristiphora erichsonii), European spruce sawfly (Gilpinia hercyniae), introduced pine sawfly (Diprion similis) and white pine sawfly (Neodiprion pinetum) have been the most notable. Although no sawfly defoliation of softwoods was reported to us in 1986, as more trees are planted, owners should be alert to the potential for serious defoliation by this group of insects.

Mites (Several species) - Buildup of mite populations in some plantations in 1986 caused very noticeable webbing and mottling. This injury was especially damaging to Christmas tree stock. As mites appear to be on the rise as serious pests in some situations, it may be necessary to provide targeted control programs for them.

Pales Weevil (Hylobius pales) - Nearly 5 acres of light to moderate damage was reported on balsam fir in Greene in 1986. This is the second such report within the past two years involving Christmas trees. These instances are more likely the exception rather than the rule.

Pine Spittlebug (Aphrophora parallela) - Populations of this species rose in 1986 and were spotty but locally heavy. No serious injury was noted.

Regeneration Pests - With large acreages of Maine forests now harvested or destroyed by the spruce budworm, a methodology to address pest management strategies for the emerging regeneration is beginning to evolve. The following steps have already been taken to insure that activities are off to an orderly and effective start:

1. A loose bound reference book of existing pertinent literature was assembled and distributed early in the season to forest managers/landowners in an effort to increase their awareness of regeneration problems.

2. Richard Bradbury was designated as regeneration pest specialist for the Division to handle both insect and disease aspects.

3. Most major landowners were contacted during 1986 to determine the current needs and status of regeneration problems. Where possible, on-site inspections were also made.

4. A regeneration pest survey is being designed which will generate a list of actual and potential problems for Maine as well as monitoring and predicting methods to be employed.

During the 1986 season a number of pest problems were observed but most remained very local and with little damage. Problems encountered were: spruce budmoth *(Zeiraphera spp.); An unknown lepidopterous tip borer*; white pine weevil* (Pissodes strobi); regeneration weevil (Hylobius congener); pales weevil* (Hylobius pales); spruce gall

aphids* (Adelges spp.); mound ants (Formica spp.); Cinara aphids; Shoestring root rot* (Armillaria mellea) and fir-fern rust* (Pucciniastrum epilobii). (*) These problems are discussed elsewhere in this report.

Saratoga Spittlebug (Aphrophora saratogensis) - This past season was the first time in a number of years in which we have had a report of significant damage from this pest. Moderate to severe browning was observed over 100 acres or more of 2 to 3 foot tall red pine in T19 MD. Light damage was also observed on adjacent jack pine and taller red pine. Light to moderate, but very spotty, browning was also observed in a number of additional red pine plantations in eastern Maine which could bring the total affected acreage to 500 acres for the season. Heavy losses of planted stock are expected in T19 MD and possibly as much as 10% in other scattered areas.

Spruce Budmoth (Zeiraphera spp.) - This complex of two species (possibly more) was found to be fairly common throughout the State where its preferred host, white spruce was of suitable size (1.5 meters or taller). While damage ranged from moderate to heavy locally in the Millinocket to Patten area and in the northeastern portion of the State, it did not even begin rivalling damage experienced in white spruce plantings in neighboring New Brunswick. The incidence of this pest in plantations and regeneration appears to be on the increase and damage may soon exceed economic thresholds in Maine.

Spruce Gall Aphids (Adelges spp.) - Populations of these species appeared to increase in 1986 with noticeable infestations occurring locally especially in central and northern Maine. While the most immediately serious damage is to the aesthetic quality of the trees (especially important on Christmas tree stock), serious growth loss and mortality can occur.

Strawberry Root Weevil (Otiorhynchus ovatus) - This insect again proved its capability of seriously damaging the roots of nursery stock in 1986. The roots of conifer transplants in one area of southern Maine showed signs of heavy feeding, associated with abundant grubs, when checked early in May. Adult weevils began appearing in early June. Conifer seedlings should be carefully monitored for this insect pest for at least the first few years of growth.

Unknown Lepidopterous Tip Borer (? sp.) - Damage was noted on white spruce terminals and on some laterals in localized areas of northern and central Maine in 1986, however, the pest has not been captured and identified. Past damage was seen in early May in the Telos area and a subsequent check in June found recent damage but the insect was gone. This insect will be high on the list of priorities in 1987. Damage is similar to that of the eastern pine shoot borer, Eucosma gloriola, but the host and the timing of the life cycle is not consistent with the literature.

White Pine Weevil (Pissodes strobi) - This species continues to be the most destructive insect pest of eastern white pine plantations throughout the State. Damage to Norway spruce can also be heavy, while lower rates (<5%) of infestation have been observed on white, red and black spruce.

We are expanding our efforts to deal with this problem on two fronts, control and surveys. Efforts to develop new control methods (insecticide, dosage, application methods and timing) are covered in our Technical Report No. 25 by Richard Bradbury. Activity has also begun to develop monitoring and risk predictive methods which could minimize damage to the trees while reducing dependency on chemical controls.

In 1984 we started a general survey for white pine weevil relating numbers of weeviled to healthy leaders in plantations (primarily). A series of 33 plots were selected in 1984 which were scattered throughout the southern half of the State. All but 3 of these were revisited in 1985. An additional 18 plots were set up in 1985 of which 3 were in northern Maine (a total of 48 plots in 1985). A total of 47 plots were visited in 1986 of which only 4 were new. In all plots the number of trees out of a sample of 50 showing current weeviling was recorded. Surveys were made between mid-August and mid-October. The results summarized by area, follows:

Area		No. Plots	Ave. No. Weeviled/ 50 Trees (Range)	% Weeviled
SW	- 1984	15	10 (3-28)	20
	1985	22	10.5 (2-20)	21
	1986	18	6.3 (2-16)	13
WC	- 1984	13	6.4 (1-15)	13
	1985	14	7.9 (0-27)	16
	1986	15	5.3 (0-18)	11
E	- 1984	5	6 (1-20)	12
	1985	9	16.2 (7-33)	32
	1986	10	21.9 (14-38)	44
N	- 1984	0	0	0
	1985	3	0	0
	1986	4	1.75 (0-4)	4

Averages 1984 - 5.6
1985 - 8.6
1986 - 8.8

SW - South West - That area south of Rte. 2 from Bangor to Gilead and west of the Penobscot River.

WC - West Central - North of Rte. 2 from Bangor to Gilead, west of the Penobscot River and south of a line from Patten to Dole Brook (South of these townships).

E - East - East of the Penobscot River and south of Rte. 9 from Bangor to Calais.

N - Aroostook County and the northern tips of Penobscot, Piscataquis and Somerset Counties.

The results from this survey pose some interesting questions, although interpretation of trends at this point would likely be of relatively little practical value. Some points to ponder as we consider the future of this survey are:

1. Are trend values collected in this manner of value to plantation managers?

2. Can the methods be changed to provide more useful data? We initially intended to return to the same plots year after year from the time trees reached 3-4 feet in height until they exceeded 30 feet. We now find that weevil incidence increases within a plantation over this period to a critical level of somewhat less than 50% annually and then appears to level off. To measure general statewide or area wide populations we would have to remove this within-plantation effect.

3. Would there be a value in using data of this sort to risk rate individual plantations as to their need for controls.

Plans are being made to reevaluate this survey during the 1987 field season and to compare data from this survey with additional data of a similar nature collected in the early 1970's. Our findings will determine the course of action for this pest in the future.

Woolly Pine Needle Aphid (Schizolachnus piniradiatae) - Expected populations of this species on red pine did not materialize in 1986. High numbers of eggs were reported in the fall of 1985 from a number of southern Maine plantations but when checked for aphids in 1986, few were found. No eggs were reported from these areas in the fall of 1986.

(C) Plantation, Regeneration, Nursery and Christmas Tree Pests

Diseases

Botrytis Blight (Botrytis cinerea) - This fast growing fungus organism can destroy merchantability of greenhouse-grown containerized conifer nursery stock if strict attention is not paid to sanitation both within and in close proximity to the greenhouse. Heavy spore loads from stored plant debris outside the greenhouse may be drawn in through the air intake fans.

Fertilizer Injury - Black Hills spruce three feet high being grown for Christmas trees in Nobleboro were injured by placement of fertilizer too close to the stem.

Fir Needle Rusts:

(Uredinopsis mirabilis) produces white spores on the underside of fir needles and has sensitive fern as its alternate host. White-colored spores were seen on fir in China on June 21 and in Hodgdon on July 21.

(**Pucciniastrum epilobii**) - Balsam fir reproduction which developed after a clearcut operation in T4 R11 near Soubunge Mt. had lost 75% of its current year's needles by July 21 due to damage by this rust organism. Fireweed (Epilobium spp.), the alternate host species, occurred in profusion in the area. Spores of this rust occur on the lower side of fir needles and are yellow in color.

(**Pucciniastrum goeppertianum**) produces yellow spores on the underside of fir needles, and has blueberry as its alternate host. The disease on blueberry causes a witches' broom to be formed. Yellow-colored spores on fir needles can also result from infection originating from a willow host.

Yellow-colored spores were observed on fir needles in China on June 21.

Lophodermium Needlecast (Lophodermium pinastri) - Light infections were observed on Scots pine in Eustis, Searsmont and Greenbush.

Naemacyclus Needlecast (Cyclaneusma minus = Naemacyclus minor) - Needles on 1983 to 1985 wood of Scots pine were heavily infected in Lincolnville Center and in Searsmont. Scots pine being grown for Christmas trees should be inspected annually for signs of this disease because of the severe needlecast it can cause on trees approaching market size.

Rhabdocline Needlecast (Rhabdocline pseudotsugae) - Heavy infection of 1985 Douglas-fir needles occurred in Cornville, Nobleboro, Greenbush and Orland. The Nobleboro plantation has been hit by both Rhabdocline and Swiss needlecasts for several consecutive years. One 15-foot tree in this plantation appears to be immune to both diseases, while adjacent trees exhibit varying degrees of needle loss. Unlike the tip browned needles of Swiss Needlecast, Rhabdocline-infected needles have a mottled, purplish appearance.

Rhizosphaera Needlecast (Rhizosphaera kalkhoffii) - The incidence of this striking needlecast was down in 1986. Only one report was received which involved several small white spruce in Clinton.

Scleroderris Canker (Gremmeniella abietina) - See Section A - Diseases

Shoestring Root Rot (Armillaria mellea) - Armillaria mellea is an opportunistic root rot fungus which can and does kill both hardwood and softwood trees of all ages, especially following stress. Abundant food is readily available for this organism in cutover areas and as more reforestation planting takes place, losses from this disease will increase. Newly-planted stock already has planting stress as the first strike against it, so be kind to those seedlings. Natural regeneration may be less vulnerable.

Sirococcus Shoot Blight (Sirococcus strobilinus) - This disease was commonly observed on natural red pine reproduction in the Eustis area and on plantation stock locally in Washington and Hancock Counties in 1986. Dead needles bending noticeably downward near the fascicle sheath give evidence of infection (See also Section A - Diseases).

Spruce Needle Rust (Chrysomyxa sp.) - Less than 10% of needles on white spruce reproduction were observed to be infected on July 2 in Glenwood. Rust spores were easily dislodged at that time.

Swiss Needlecast (Phaeocryptopus gaumannii) - The incidence of this disease appears to be increasing in Douglas-fir plantations. Heavy infection of 1984-1985 needles was observed in Cornville, Oakfield, Nobleboro and Greenbush in 1986. Tip browning of needles with tiny, round, black fructifications emerging from stomata on the underside of the needle, helps to distinguish this disease from Rhabdocline needlecast.

Western Gall or Pine-Pine Rust (Endocronartium harknessii) - Spores on mature galls on Scots pine in Old Town were still covered when examined on May 15, but were released readily from galls on Scots pine in Farmington on May 26. Sanitation pruning and destruction of galls well before mid-May will aid considerably in preventing new infections.

Winter Drying - Light to moderate browning of a long-needled variety of Scots pine being grown for Christmas trees was observed in Lincolnville Center and Greenbush in 1986.

(D) Shade Tree, Ornamental and Miscellaneous Pests

Insects

Alder Flea Beetle (Altica ambiens alni) - Populations of this species generally continued to decline in 1986 although defoliation of alder was still quite striking locally across central Maine. Reports of larvae and adults as a nuisance were not as common.

Ants (Myrmica rubra) - This very aggressive ant with a painful sting was reported from Boothbay Harbor in 1986. Although introduced into this country nearly 100 years ago, the species hasn't moved far from coastal areas of the northeast. Colonies occur beneath wood, debris, stones and other objects which have remained on the ground for a season or more. When items over a colony are removed, the ants attack and sting vigorously. Nursery stock which is balled and burlapped makes an ideal hiding place.

Browntail Moth (Euproctis chrysorrhaea) - Surveys were conducted in the Casco Bay area for overwintering webs of the browntail moth caterpillars during the spring and fall of 1986. All known current infestations, and several suspect areas, were scouted during these visits. While only a portion of the webs were clipped and destroyed on Vaill Island, all were clipped and destroyed elsewhere. The results of these activities are shown on the following page:

Number of Webs Found

Location	Spring 84	Spring 85	1986 Spring	1986 Fall
Vaill Island	383	3,525	3,395*	513*
House Island	362	355	841	-
Seguin Island	1	0	0	-
Long Island	0	-	113	33
Harpswell	0	1 (?)	-	-
(coastal mainland)	-	-	-	-
Peakes	-	-	1	-
Cliff	-	-	1	-

* Web populations on Vaill Island increased strikingly in 1986 and these figures only include those webs which were clipped. This number was estimated to be less than 1/2 of the number actually present.

It now appears that populations of this insect are intensifying on islands where it was known to exist in recent years and some spread to nearby islands appears to be taking place. We will be watching this situation.

Mountain-ash Sawfly (Pristiphora geniculata) - This species appears to be on our list of perennial problems affecting ornamental mountain-ash with few ups and downs. The 1986 season was no exception with the usual complaints in spite of the fact that control of the problem is fairly easy to achieve.

Tussocks (Several species) - In 1986 the term "tussockosis" came to be applied to psychological and physical reactions to those abundant "fuzzy" caterpillars which seemed to be everywhere. Although more than a dozen species were involved (See our Conditions Report for August 20, 1986 (86-13) for a key to species and discussion), only populations of the hickory tussock (Halysidota caryae) and the pale tussock (Halysidota tesselaris) seemed to be common enough to deserve the title "epidemic." Both seemed to be most abundant in association with birch over the southern half of the State.

In spite of the abundance of caterpillars from late summer into the early fall, no significant defoliation of trees was reported. What did happen was that when caterpillars reached maturity and began wandering, they became curiosities. Several schools in infested hardwood areas were plagued with many cases of rash produced when school children handled the "cute" little "fuzzy things." Urticating hairs which readily dislodged from the caterpillars were apparently the cause of the rash. School nurses frequently had difficulty discerning the cause and seriousness of the problem.

Woolly Alder Aphid (Prociphilus tessellatus) - Populations of this aphid were very high this past season in Kennebec County and we received several reports from Waterville and Augusta. Even though many large silver maples were heavily infested, damage was mainly aesthetic and restricted to distortion of the foliage. The most striking outcome of the infestation involved the "snow" of white woolly fibers which rained down over many objects beneath (especially cars) following a windy period in early July.

(D) Shade Tree, Ornamental and Miscellaneous Pests

Diseases

Dutch Elm Disease (Ceratocystis ulmi) - In spite of a very wet summer, wilt symptoms were obvious on diseased trees by June 24 in the Augusta area. Towns which once had a sanitation program, but have recently relaxed their efforts due to budget or other constraints, experienced an epidemic situation this year that will require the takedown of many dead trees to prevent personal and property damage.

Maple Decline - (See Section B - Diseases)

Sugar Maple Flagging - Isolated dead branches with brown leaves attached were commonly observed after the advent of hot weather in early August. Three weakly parasitic fungi generally were associated with this flagging: Steganosporium (black, tar-like spots on the branch); Nectria cinnabarina (hemispherical, pink-coral-colored, pinhead-sized eruptions) and Cystospora (Numerous, tiny, raised pustules with a white center). Dead and flagging branches should be pruned and removed from the area, since these fungi will continue to release spores and possibly cause new infections. Maintaining shade tree sugar maples in a vigorous condition will help to avoid this condition.

Information on any entry in this report can be requested by calling or writing to the Entomology Laboratory, 50 Hospital Street, Augusta, Maine 04330 Phone (207) 289-2431.

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86-14 Insect & Disease Management Division Augusta, Maine

(Issued March, 1987)