



Highlights

Wisconsin Forest Health

Division of Forestry
WI Dept of Natural Resources

December 2002

The Forest Health Protection Unit and Regional Forest Pest Specialists provided a wide variety of programs and information on forest pests, and continued to teach integrated pest management principles to DNR foresters, industrial foresters, and private woodland owners. Pine pest management was the focus of training this year. Maintaining forest health in northern hardwoods was the focus of logger training, in cooperation with the Forest Industry Safety Training Alliance (FISTA). Insect and disease detection and evaluation surveys were conducted on approximately 13 million acres.

THE RESOURCE

—Forests are important to the economy of Wisconsin, not only in the form of wood products, but also in the form of recreation and tourism. The primary and secondary wood products industry is the second largest employer in the state and puts Wisconsin first in the nation in the production of fine paper, sanitary paper products, children’s furniture, and millwork.

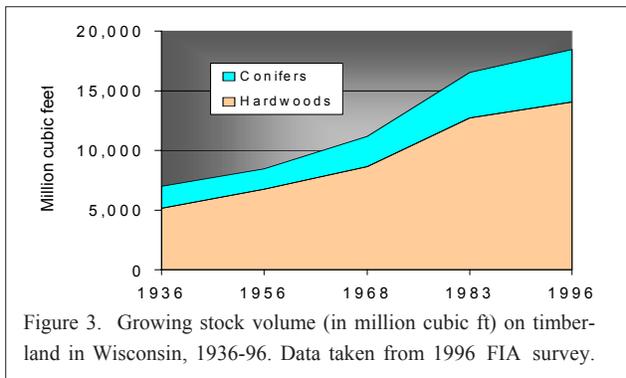


Figure 3. Growing stock volume (in million cubic ft) on timberland in Wisconsin, 1936-96. Data taken from 1996 FIA survey.

The value of shipment of these products annually exceeds \$19.7 billion. Forest and water resources in Wisconsin are a primary tourism attraction for both residents and visitors. The variety of Wisconsin’s forest ecosystems support a great diversity of wildlife spe-

cies, while recreational use of the forests continues to grow and expand.

The area of forestland in Wisconsin has been steadily increasing in recent decades and currently stands at almost 16.0 million acres, representing 46 percent of the total land area. The state now has the most forest land that it has had at any time since the first forest inventory in 1936. Wisconsin’s forests are predominately hardwoods, with 84 percent of the total timberland area classified as hardwood forest types. The primary hardwood forest type in the state is maple-basswood, which makes up 5.3 million acres (34%) of Wisconsin’s timberland area. Conifer types represent 16 percent of the total timberland area (pine forests - 8%, spruce-fir - 6%, and swamp conifers - 2%).

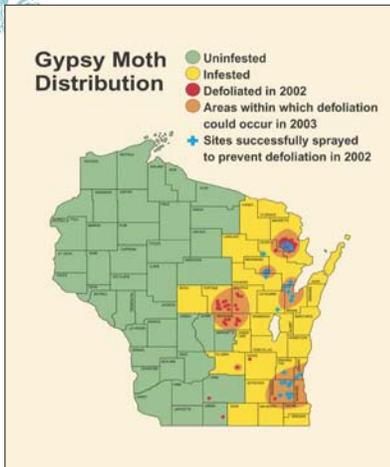
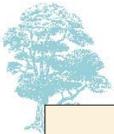
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EXOTICS

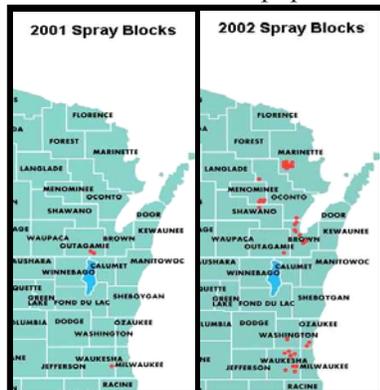
Gypsy Moth

The Wisconsin Cooperative Gypsy Moth Program continued another year of rapid growth, as the number of participating counties is expected to grow from 2 in 2000-02 to 9 in 2001-02 to 17 or 18 in the 2002-03 program year. Several counties in central and southcentral Wisconsin are now participating in the suppression program. Likewise, the number of acres treated by both the DNR suppression program and the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP) slow the spread program increased dramatically. DNR spraying increased from approximately 1,400 acres in 2001 to 6,000 acres in 2002, and is currently anticipated at 20,000 acres in 2003. Spraying done through the DNR suppression program cost \$23.85 per acre before cost sharing. Patches of defoliation greater than 5 acres were seen in twelve counties (including new defoliation in central and southern Wiscon-



sin), with the largest being 33,000 acres in Marinette County. In 2001 statewide defoliation was approximately 3,000 acres, nearly all of which was in Marinette County. Defoliation in Marinette County is expected to be greater in 2003, and will mostly occur in the areas surround-

ing those that experienced defoliation and population collapse in 2002. Based on forest cover types and typical population increases, the central portion of the state can expect widespread defoliation comparable to what occurred in Marinette County this year.



DNR Suppression Program Spray Blocks

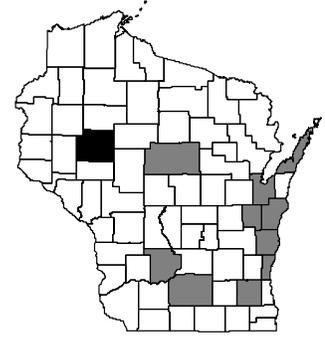
Approximately 330,000 acres were treated by DATCP as part of the national slow-the-spread program. This included 310,000 acres treated with pheromone flakes and 20,000 acres treated with Bt. In 2001 approximately 175,000 acres were treated under this program. Pheromone trapping by DATCP trapped approximately 630,000 moths this year, compared to 380,000 in 2001 (a 67% increase). Eight additional counties were placed under quarantine, bringing the total to 32.

The State's gypsy moth education program also grew. Several new color brochures were printed and distributed, and a DNR-UW Extension website was created. In addition, Governor McCallum declared October 6-12 to be 'Gypsy Moth Awareness Week' in Wisconsin. Television and radio stories and newspaper articles appeared in the media, mainly in Marinette, Peshtigo, Green Bay, Appleton, and Milwaukee.

HARDWOOD PESTS

Ash Yellows - Phytoplasma

—Ash yellows, caused by a phytoplasma, was confirmed in white ash on the Chippewa County forest.

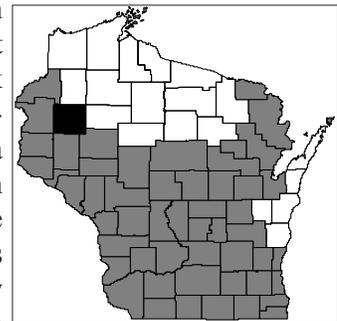


Left: Brooms or epicormic branches are indicative of ash yellows. Right: Map of the distribution of ash yellows in the state; Chippewa Co in black.

This disease is typically more common in urban settings or in woodlots bordering agricultural fields. Confirmation of infection was based on the presence of brooms along the lower portion of infected trees' stems.

Oak Wilt

—Barron County (in black), received its first confirmed report of oak wilt in 2003. Approximately 10 trees in a wooded residential lot on the west shore of Prairie Lake showed symptoms of oak wilt. Laboratory isolation confirmed the cause of mortality. Oak wilt has been active in Wisconsin since the late 1800's and has now been confirmed in 53 counties.



Forest Tent Caterpillar

—It was the fourth year of the forest tent caterpillar (*Melanocarpa disstria*) outbreak in the northern Wisconsin. This year, the level of defoliation was much less severe in many of the areas where the infestation had been observed in pre-





vious years. However, defoliation was still seen in large areas in northern Wisconsin, and the defoliation was severe in some newly infested areas. The caterpillar feeds on a variety of deciduous trees and shrubs, although it prefers aspen, oak, and birch.

In June and early July, an enormous number of friendly flies (*Sarcophaga aldrichi*) were observed throughout northern Wisconsin. Although they don't bite, the swarms deterred many people from enjoying outdoor activities. Friendly flies are a major natural enemy of forest tent caterpillars. Female adult flies lay maggots in the cocoons of the forest tent caterpillars, and maggots kill the pupae by feeding on them. Since there was an overwhelming number of flies throughout northern Wisconsin, it is expected that the current outbreak of forest tent caterpillars is on the decline.

Two-lined Chestnut Borer

—Mortality of mature oak by a native beetle, the two-lined chestnut borer (*Agrilus bilineatus*), was observed throughout northern Wisconsin again this summer (especially in Vilas, Oneida, and Lincoln counties in the northeast and in Douglas, Sawyer, Bayfield and northern Washburn counties in the northwest). Normally a weak secondary invader of oaks injured by drought or defoliation, the two-lined chestnut borer (TLCB) attacked trees this year that had been defoliated by the forest tent caterpillar. Multiple



Galleries of the two-lined chestnut borer (artificially darkened for easier viewing.)

years of defoliation, coupled with dry weather and sandy soils can make defoliated trees much more vulnerable

to attack. The larval stage of this flat-headed beetle mines the cambium of stressed oaks, eventually killing them. Infested trees often show browning and dieback of leaves starting in the upper crown and progressing downward.



Adult two-lined chestnut borer

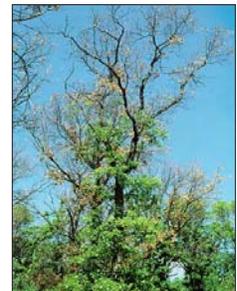
TUBAKIA LEAF DISEASE

widespread on Bur and White oak



A leaf disease caused by the fungus *Tubakia dryina*, has recently been observed infecting bur and white oak throughout southern Wisconsin. Bur oaks are more commonly infected; white oaks are only occasionally infected. This disease has been observed on an annual basis for many decades but has increased in incidence and severity during the last 3 years.

Infected bur oaks have been observed throughout southern Wisconsin and as far north as Portage County. Symptoms first appear in late July and consist of small, necrotic spots on leaves in the lower crown. Throughout August, spots expand, coalesce, and can eventually turn the whole leaf brown. Infected trees often have full crowns of shriveled, necrotic leaves in mid-late August. Bur oaks on a wide variety of sites and of all ages have been infected. Bur oaks that are already under stress from drought or compaction are showing signs of dieback. Samples collected from declining trees have revealed the presence of the two-lined chestnut borer. If these high levels of infection continue, further pressure by the two-lined chestnut borer is expected which could lead to mortality.



Dieback starts at the top and spreads downward.

Due to a dramatic decrease in the population of forest tent caterpillar this year (due to predation by friendly flies), mortality due to TLCB is expected to decrease as well.

Bronze birch borer

—Dieback and mortality of birch were also noticed in Lincoln, Oneida and Vilas counties this summer. Many of these trees were infested with another native wood borer, the bronze birch borer (*Agrilus anxius*). Adult beetles primarily

attack birches that are weakened or stressed by drought, old age, insect defoliation, soil compaction, or a stem or root injury. Attacked birches in northern Wisconsin were weakened by repeated years of heavy defoliation by the forest tent caterpillar. As with the two-lined chestnut borer, the drop in forest tent caterpillar populations this year will probably mean increased survival of birches.



Characteristic emergence holes are D-shaped.



CONIFER PESTS

Red Pine Pocket Decline

—Red pine pocket decline was first reported in Wisconsin in 1975 but was a relatively insignificant problem until about 5 years ago. This disease is actually a complex involving several species of root and lower



Figure 1. A typical pocket has trees in several stages of mortality indicating the progressive nature of the disease.

stem-feeding insects along with their fungal symbionts. A sequence of events is initiated which creates circumscribed areas or “pockets” of progressive mortality of one to several trees (Figure 1). In 2001, the staff of Forest Health Protection initiated a multi-year study of red pine pocket decline. The objectives were 1) to determine geographic differences in disease incidence and severity, 2) to investigate site or stand characteristics or past management practices

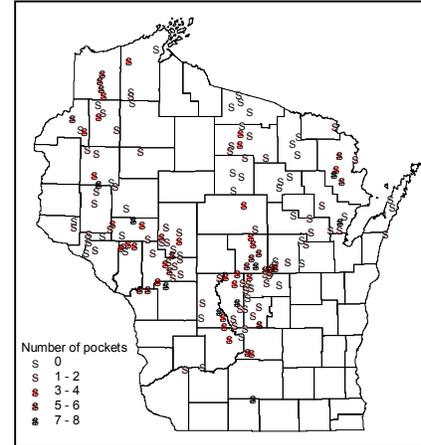
which might be correlated with disease incidence, and 3) to develop from this analysis, silvicultural guidelines which would help prevent pocket formation and/or limit expansion of already established pockets.

The incidence of red pine pocket decline observed in this study was fairly high. Figure 2 shows the location of surveyed stands and the number of pockets per stand. Over two-thirds (109) of 157 surveyed stands had at least 1 pocket. However, the number of pockets per stand was small in most cases and most pockets had few symptomatic trees, over one-third having fewer than 6. On the other hand, there were several stands with a large number of pockets, over 1 pocket for every 2 acres surveyed and where pockets were fairly large, averaging between 1 and 2 percent of all red pine in these stands. This wide variation suggests either that pocket decline is worse on some sites and self-limiting on others or that it is just beginning to show up in many red pine stands throughout the state and that these small pockets may expand rapidly in the near future.

As for geographic distribution, there does seem to be an important difference in disease incidence and severity between northern and southern Wisconsin. The num-

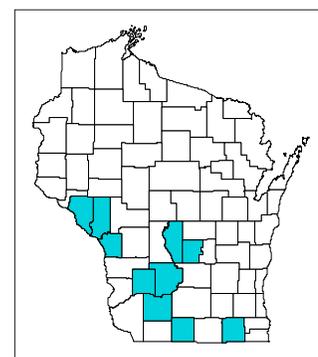
ber of pockets, as well as the average and maximum size of pockets per stand is lower in northern Wisconsin. A very important finding of this survey was the co-occurrence of red turpentine beetle (*Dendroctonus valens*) and *Leptographium spp.* in the vast majority of pockets. *D. valens* and *L. terebrantis* may play an aggressive role in pocket expansion and possibly in pocket initiation. Thinning of stands may play a role in this disease. For instance, a primary feeding site for these beetles is freshly cut stumps as well as healthy trees nearby.

We noticed in this survey that pockets were almost nonexistent in unthinned stands. We also observed very high numbers of *D. valens* in recently thinned stands surveyed during the period of beetle flight in late spring. These observations point to the possible role of thinning and the time of year in which a stand is thinned in pocket formation. Two more years of investigation are planned.



Annosum Root Rot Update 2002

—As part of a random survey of pine plantations for “Red Pine Pocket Decline”, annosum root rot (*Heterobasidion annosum*) was confirmed in six new counties in Wisconsin in 2002. The new counties were Buffalo, Green, La Crosse, Marquette, Trempealeau, and Walworth. This brings the total to ten counties confirmed with this root rot disease. In this random survey, 6 stands out of 157 stands (3.8%) surveyed were found infected with annosum root rot. This survey offers baseline data regarding the frequency in which annosum infections are currently being detected.



H. annosum has been observed in 10 counties in Wisconsin.



Outplanting survey

A joint effort by DNR forest health and nursery personnel was undertaken to survey the survival rate of outplanted red pine. Twenty thousand seedlings on 49 sites were surveyed. Data collected included percent survival, site prep and planting method. Observations were made in the field and laboratory to determine possible causes of seedlings mortality.

In early July, mortality ranged from 0 to 57%. Factors affecting the survival of outplanted seedlings were numerous and included the following: poor planting (too deep, too loose in soil); severe root pruning; wet, heavy soil; heavy weed competition; poor care of seedlings

between lifting and planting; *Sphaeropsis* collar rot and



There were several factors affecting survival of outplanted red pine seedlings.

below average precipitation. A full report on this survey will be presented in the annual report. Efforts to continue outplanting surveys on an annual basis and address factors causing mortality are underway.

WEATHER DAMAGE A Resurvey of Hail Damage

—This summer marked the third year in a follow-up survey of tree damage following a major hail storm in May of 2000 (Manitowoc & Waushara counties) and August of 2000 (Douglas County). In Manitowoc County, the lowland silver maple – ash stand which had been clearcut after the storm continued to show more than adequate regeneration of both silver maple and ash, whereas the selectively cut lowland stand continued to show lack of silver maple and very poor regeneration of ash. Overstory trees on both the lowland and hardwood sites showed an average 30% increase in crown dieback but a similar decrease in transparency. Apparently most new growth was concentrated on the few healthy branches with badly damaged limbs dying off. Only 1 in 30 trees had died on the lowland plot and 2 of 30 had died on the hardwood site.

In a Waushara County red and white pine stand, tree health improved dramatically. Lateral branches had taken over in 92% of trees with dead leaders in 2001. Height growth had improved significantly as well, about 66% higher overall with an increase of over 230% for white pine. Dieback, which had averaged about 40% in



Marcia Frost-Vahradian, DNR forester for Waushara County, shows a comparison of the condition of pines immediately after the 2000 hail storm (left), one year later (middle), and during the summer of 2002. Notice that the browned needles, dead branches and the dead tops in the first two photos are missing in the photo on the right.

2000 and 25% in 2001, was down to about 15% this year. This stand seems to have recovered quite well.

In Douglas County, much of the damaged area was harvested. A sawtimber aspen stand where we are following the health of 100 trees, showed continued improvement, with an average 20% decrease in crown damage severity. The mortality rate was up from 1% in 2001 to 4% this year.

Division of Forestry
P.O. Box 7921
Madison, WI 53707-7921

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Northern Region

Kyoko Scanlon
Forest Pest Specialist
Rhineland
715-365-8934
Kyoko.Scanlon@dnr.state.wi.us
Shane Weber
Forest Entomologist
Spooner 715-635-4156
Shane.Weber@dnr.state.wi.us

Northeast Region

Linda Williams
Forest Health Specialist
Green Bay 920-492-5872
Linda.Williams@dnr.state.wi.us
Bill McNee
Gypsy Moth Coordinator
Green Bay 920-492-5930
Bill.McNee@dnr.state.wi.us

West Central Region

Todd Lanigan
Forest Pest Specialist
Eau Claire
715-839-1632
Todd.Lanigan@dnr.state.wi.us

Southeast Region

Joh Kyhl
Forest Entomologist
Gypsy Moth Coordinator
Milwaukee 414-263-8744
John.Kyhl@dnr.state.wi.us

Statewide

Jane Cummings Carlson
Forest Pathologist
Fitchburg 608-275-3273
Jane.Cummings-Carlson@dnr.state.wi.us
Andrea Diss
Gypsy Moth Coordinator
Madison 608-264-9247
Andrea.Diss@dnr.state.wi.us
Mark Guthmiller
FH technician
Gypsy Moth Coordinator
Fitchburg 608-275-3223
Mark.Guthmiller@dnr.state.wi.us
Sally Dahir
FH technician
Fitchburg 608-275-3319
Sally.Dahir@dnr.state.wi.us

**WISCONSIN DNR
FOREST HEALTH
PROTECTION STAFF**

