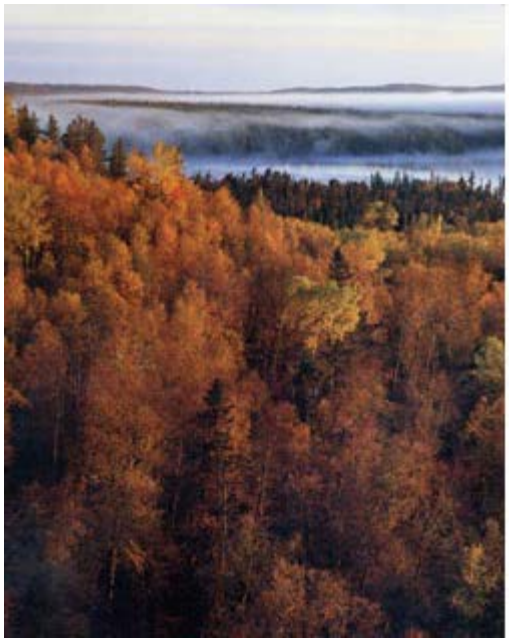
# Minnesota Forest Health Highlights 2002

## The Resource

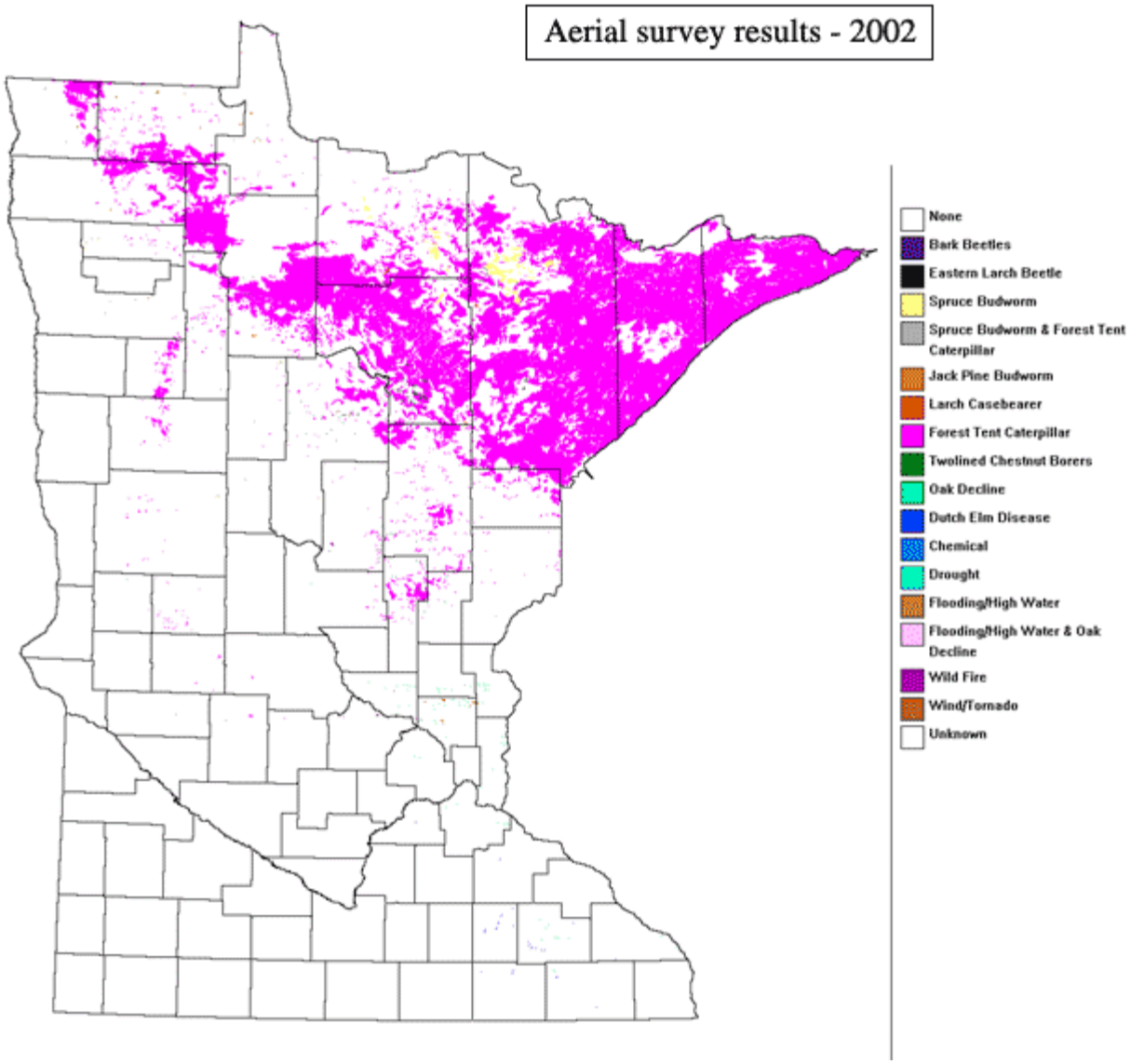


In Minnesota there are approximately 16.7 million acres of forest land; 14.7 million acres are classified as "timberland" or lands capable of producing timber and are not withdrawn from timber utilization or associated with rural or urban development. Forest land ownership includes 38% non-federal public lands, 36% NIPF, 17% federal and tribal lands, and 9% forest industry and other corporate lands.

Two major industries depend on Minnesota's forest lands: forest industry and tourism. The forest industry is Minnesota's second largest manufacturing industry employing more than 55,000 people. The value of the forest products manufactured in Minnesota exceeds $7 billion and accounts for 16% of all manufacturing dollars generated in Minnesota. The tourism industry is Minnesota's second largest employer employing over 140,000 people and accounting for a payroll in excess of $3 billion. Gross receipts from tourism exceed $6 billion. Over 70% of people who took at least 1 spring or summer trip in Minnesota rated "observing natural scenery" as the most important activity of their trip.

### Aerial survey results

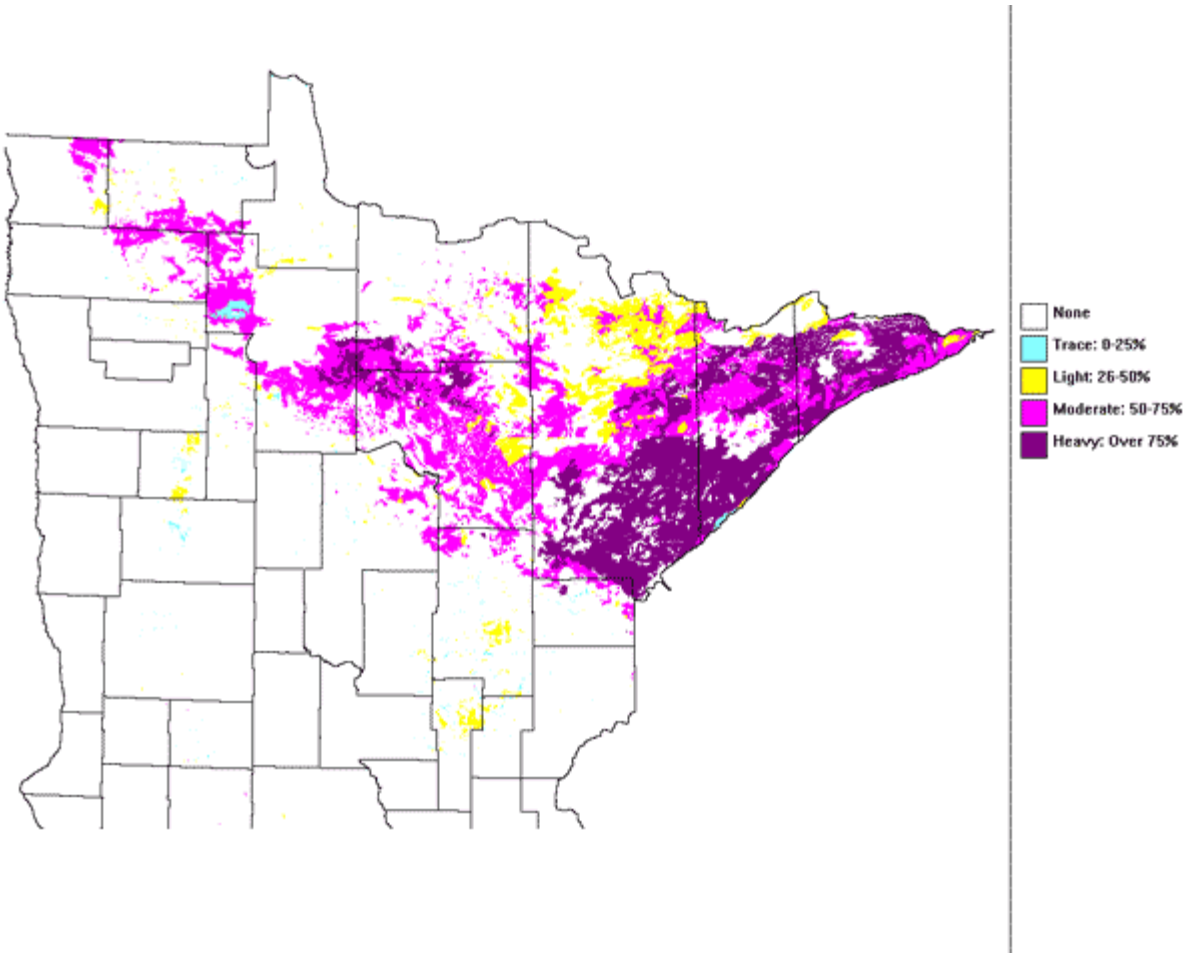
| General detection surveys - 2002 | | |
|---|---|---|
| *Damage agent* | *Damage* | *Acreage* |
| Forest tent caterpillar | Defoliation | 7,374,057 |
| Spruce budworm | Defoliation | 90,689 |
| Two-lined chestnut borer | Mortality | 9,665 |
| Larch casebearer | Defoliation | 2,544 |
| E. larch beetle | Mortality | 1,279 |
| Dutch elm disease | Mortality | 2,528 |
| Bark beetles | Mortality | 658 |
| Wind | Mortality | 1,995 |
| Flooding | Mortality | 10,781 |
| Jack pine budworm | Defoliation | 845 |
| Tamarack - unknown | Defoliation | 17,072 |
| Tamarack - unknown | Mortality | 15,966 |
| Total | | 7,528,079 |




## Special Issues

### Forest tent caterpillar

Following a record year for number of acres defoliated, forest tent caterpillars again reached levels far above those previously found. 7,374,000 acres were defoliated in 2002. Surveys of forest tent caterpillar egg masses in central and northeastern Minnesota completed in this summer predict a sharp drop in next year's caterpillars in all sampled areas except near Deer River, Hibbing, Virginia, Finland, and Gooseberry Falls State Park where populations will be high.




Besides the egg mass survey results, there are other clues that forest tent caterpillars will decline next year. First, a comparison of larval surveys in 2001 and 2002 found many more dead caterpillars, killed by diseases, hanging from branches and trunks in an increasing number of locations in 2002. Second, there was a great increase in numbers of the parasitic flies this year. Historically, they mark "the beginning of the end".

## Larch beetles

Larch beetles have been a part of the Minnesota landscape for decades, but the attacks have usually been associated with tamaracks predisposed to attack due to stress from drought, flooding, or defoliation. The size of the areas involved in an attack has usually been small. Mortality is usually confined to individual trees or small pockets of trees. In the last two years though, both the amount of mortality and the size of the areas affected has increased. Much of the mortality has still been confined to small pockets. However, some stands of 30 to 40 acres and larger have experienced over 75 percent mortality. Most attacks have occurred in northeastern Minnesota, but it is thought the mortality can be found throughout the natural range of tamarack in Minnesota.

What makes the larch beetle a bit more insidious is the fact that it's not discriminatory in its eating habits. Mortality has been found in stands ranging from 40 to 160 years in age; on lowland and upland sites; and in pure stands as well as mixed component stands. The damage is quite visible on the ground. As the beetles feast on the trees, woodpeckers feast on the beetles, leaving behind telltale signs that include mounds of bark chips at the base of trees and reddish or white boles, depending on how much bark a woodpecker flakes off as it searches for food. In late summer, needles of the affected trees begin to turn yellow, then brown, before falling off. The dieback begins at the bottom of the crown and works upward, leaving the green tops for last. This progression of mortality makes it difficult to see new damage from the air.

## Spruce beetles - mgt. guidelines

By M.Albers, and Dr. Steven Seybold

Spruce beetles are bark beetles native to Minnesota that attack white spruce trees. In Minnesota, they prefer trees 12 inches in diameter and larger. They will, however, occasionally attack smaller diameter trees. Spruce beetles have been found attacking and killing spruce trees predominately along the northern half of the North Shore of Lake Superior and within several miles of the lakeshore.

To minimize spruce beetle damage you must learn to identify the signs of spruce beetle attack. The best evidence of attack includes reddish boring dust at the base of the tree, and secretions of resin (pitch tubes) on the bark surface of the tree stem. Fallen trees or trees that have more advanced infestations may only have boring dust, but no pitch tubes.

Removal of a small piece of bark will reveal the galleries and mines of the adult and larval beetles. The needles of heavily attacked trees will eventually become tan or red and the tree will die. However, it may take 6 to 12 months or longer for the needles to turn color. A tree with just a few attacks may not die during the first year, but it may continue to be attacked and eventually die in the following year or years. Infested trees are a source of more beetles that are likely to threaten nearby healthy trees.

**Management of spruce beetles is based on three key strategies:**

Maintain healthy and vigorous trees
Remove or destroy fallen trees and tree parts (i.e. high tree stumps) capable of producing large numbers of adult beetles
Manage and control spruce beetle populations

The first strategy is to make your trees as healthy and vigorous as possible. This will make them less attractive to the beetles and better able to defend themselves if they are attacked by beetles. The second strategy involves sanitation and removal of breeding material to prevent large populations of spruce beetles from developing on the property that you manage. These small (3/16th B 1/4th inch) beetles must attack trees in large numbers to successfully kill the trees. Removal of material in which they can breed and develop reduces the available habitat capable of producing large numbers of adult beetles that can attack nearby healthy trees. Fresh windthrown trees can produce 5X to 10X the number of beetles that a standing spruce tree can produce. The third strategy, managing and controlling spruce beetle populations, involves removing or destroying infested trees to reduce the size of local beetle populations and/or protecting your uninfested trees from future attack.

## Two-lined chestnut borer

In mid-August, two lined chestnut borer (TLCB) damage began to show up in Itasca County. By late August, dieback, topkill and whole tree mortality were widespread in northern and southern Minnesota. Some oaks that did not appear to have been attacked by TLCB in 2001 were entirely brown and looked dead by the end of August 2002. Borer galleries could be found in the trunks of these trees down to the soil line.

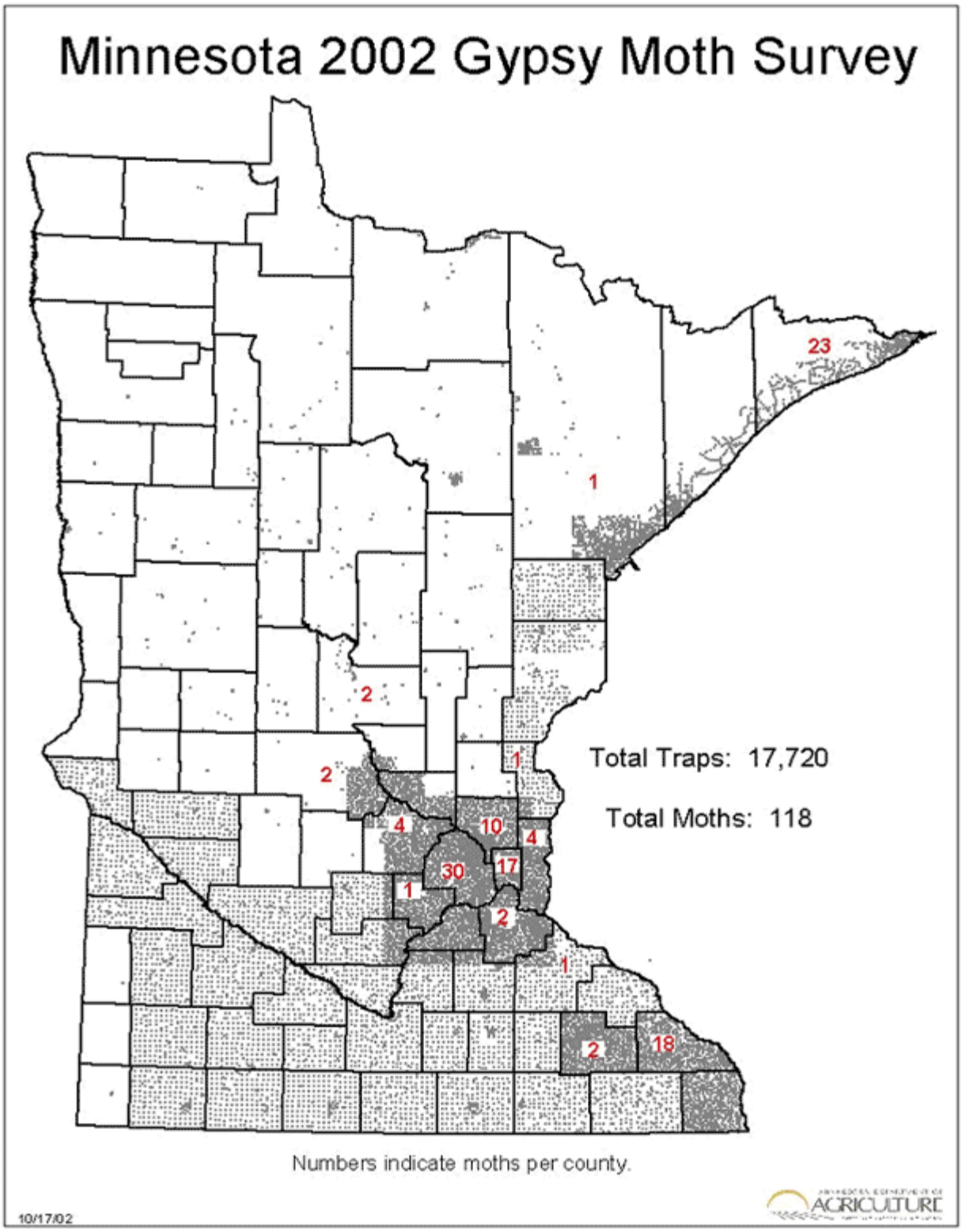
In the northern counties, a few pockets of TLCB were seen in the fall of 2001 but the amount of topkill and mortality seen in 2002 was unexpected. A very dry April, May and June just as the trees were leafing out coupled with two or more years of forest tent caterpillar defoliation were likely the stress factors contributing to the success of the borers.

Aerial survey was flown in late August over about 84 townships in parts of Clearwater, Beltrami, Cass, Itasca, Mille Lacs, Aitkin and Crow Wing Counties. Approximately 10, 000 acres with oak mortality and top kill were mapped. Scattered damage occurred throughout northern Minnesota but the worst damage was in Itasca County. Approximately 7,000 acres of stands with mortality were mapped within a 10 mile radius of Grand Rapids. Additional damage continued to become evident through September. In some stands over 75% of the oaks suffered top kill or mortality. Severe damage occurred in stands that had been recently thinned or in areas where road construction or building construction had recently occurred. However, damage was not restricted to these types of stands.

## Gypsy moth - update

The APPD unit and communication team of MN Dept. of Agriculture (MDA) put together a very success program for 2002. While there were a number of partners involved, along with some outside funding, MDA deserves to be congratulated for their efforts. Nearly 16,000 traps were hung, a record number of acres were treated and a massive PR campaign was

launched, all with positive results.




Statewide trap catch numbers are down considerably. At this time, a total of 119 male moths have been caught statewide (note, traps along the North Shore were still being taken down at the time of this writing). This is the lowest number since 1993, when 93 male moths were caught. While North Shore trapping is not yet complete, the final numbers are not expected to climb dramatically. An additional 11 to 12 suspect moths (not yet confirmed) bring total of moths caught near Grand Portage up to 20 (3 traps had 2 moths and 14 were single finds), with 3 singles in Cook County, and 2 potential singles near

Duluth. Of the 52 state parks that were trapped only 2 male moths were recovered in one state park, Charles A. Lindbergh near Little Falls, Minnesota. A total of 7 moths were trapped at nursery locations within the MDA trapping grid.

Nurseries outside the standard trapping grid and all large-scale timber mills were trapped by USDA-APHIS, with no additional moths found.

2002 treatments:
In 2002, two sites in the metro area (one in Minneapolis near Lake Harriet and one in Golden Valley, near Theodore Wirth Park) were treated with Bt, while a site in Houston County was treated with pheromone flakes.

Lake Harriet: Trapping following the 425 acre treatment found zero moths in spite of signs of early defoliation prior to the treatments and the recovery of two caterpillars found after the treatments were completed. Ten single and one multiple trap of five were caught outside the treatment boundary. None of these finds appear to be related to the treatment site. The treatment boundary and the positive finds outside the treatment boundary will again be delimit trapped during the 2003.

Golden Valley Site: Burlap bands were also used to monitor caterpillar survival at this site, but none were found. Six male moths were recovered, 1 within the mass trapping core, 2 within the treatment boundary, and 3 within the delimit boundary outside the treatment block. The catches were spread out geographically; suggesting the presence of a reproducing population is not likely.

Crooked Creek, Houston County: A 650 acre site, straddling part of the Dorr State Forest was treated with Disparlure (Disrupt II). The use of pheromone flakes is new to Minnesota but is becoming a common occurrence within the national Slow-the-Spread program. The primary advantage over Bt is the increased specificity. Disadvantages include the inorganic plastic chads used as a carrier and the one to two year residual that limits trapping following pheromone treatments. Pheromone flakes work by saturating an area with GM pheromone thus masking the presence of any female moths present (limiting, if not prohibiting mating). However, the flakes also mask the presence of any detection traps, which utilize the same pheromone to attract male moths. Although the area was intensively trapped this year (with no moths found) it will need to be trapped again next year before treatment results can be assessed. Catch history and limiting site factors made this an ideal candidate for the treatment. If the treatment is shown to be effective under MN conditions, it may prove useful in other situations.

North Shore Temperature Study:
With federal funding, support from the OTIS lab of USDA APHIS, and field help from a number of local partners, NRRI, affiliated with the U of MN, placed traps in three 1 square mile plots at varying grid densities as a pilot project to assess the effect of temperature on moth flight and capture rates. At the center of each plot, sterile male moths were released on a weekly basis between July 18 and September 26. Colored external dyes were used to separate moths by release date. An internal dye (incorporated in the food on which the caterpillars were reared) was used to separate wild from reared moths (no wild moths were caught within the study area). Traps were checked regularly and the dye color recorded.

Moth emergence rates ranged between 5 and 78 % per release based on spent pupal cases. Recapture rates ranged between 4 and 7%. However, the largest challenge of the project (besides finding the traps among the alder bogs) was out-witting the chickadees. The birds quickly discovered the release cages and sat there picking the moths off as they emerged to dry their wings. Researchers had to devise mess bags to protect the moths until they were dry and strong enough to fly. Even then, the chickadees snagged a large number of the young male moths. The effect on moth recapture rates per plot won't be known until the data is analyzed this winter.

## Indigenous - exotics found

In 2001 and 2002, we detected

an introduction of the Douglas-fir beetle, *Dendroctonous pseudotsugae,* in Itasca Co., Minnesota. It appears likely that the beetle and many associated insects as well as fungi have been introduced into northern Minnesota in barked logs of western larch, *Larix occidentalis,* imported from Montana. Other insects not known to occur in Minnesota that have been reared from these logs include the larch engraver, *Scolytus laricis,* and the bark beetle predator, *Temnochila chlorodia* (Coleoptera: Trogositidae). Western populations of carpenter ants, Camponotus novaeboracensis, roundheaded borers (5 species, primarily *Tetropium velutinum),* flatheaded borers (2 species, primarily *Phaenops drummondi),* and a false powderpost beetle (species as yet undetermined) have also been found to accompany the imported logs. (see attached list for additional information) A number of fungi have been observed fruiting on the western larch logs including the decay fungus, *Fomitopsis officinalis,* which is not known to occur in Minnesota.

This introduction highlights concerns related to interstate and interprovincial transport of barked wood products for various uses such as log home construction, particularly if materials are moved between coniferous ecosystems with similar climates. Western beetles such as mountain pine beetle, *D. ponderosae,* and various species of *Ips* present a significant threat to coniferous forests of the North Central region. In the case of *D. pseudotsugae,* the impact of the insect on native tamarack *(Larix laricina)* in Minnesota has yet to be determined. A study by Furniss 1976, showed that *D. pseudotsugae* was able to produce progeny in tamarack in the laboratory and also suggested that hybridization between Douglas fir beetle and eastern larch beetle was possible. Introductions of parasites and predators of western beetles transported in the logs could also have unexpected impacts.

Blue-stain fungi carried by the bark beetles are an additional concern. In British Columbia, the fungi *Ophiostoma pseudotsugae* and *Leptographium abietinum* have been shown to be associated with D. pseudotsugae. In Minnesota, neither of the fungi associated with *D. pseudotsugae* nor the fungi associated with *D. simplex* on *L. laricina* have been studied. As a first step, we baited freshly cut tamarack logs for eastern larch beetle. Dr Blanchette made isolations from these logs. Dr Harrington at Iowa State University is working on the identification of these isolates. Various western canker and decay fungi such as *Heterobasidion annosum,* that are not known to occur in Minnesota but could be transported in logs, also present a threat. The consequences of mixing western strains of pathogenic fungi with North Central strains are unknown.

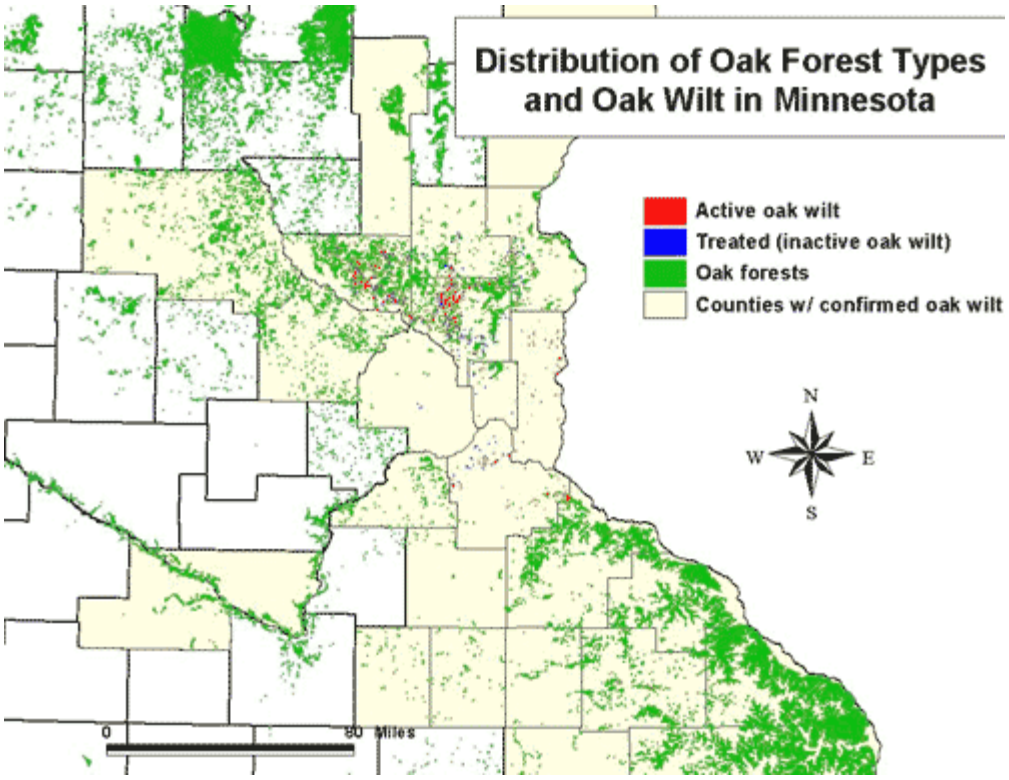
The introduction of *D. pseudotsugae* has potentially severe consequences for Minnesota forests. Although *D. pseudotsugae* would likely face significant competition from *D. simplex* and its predators, the western insect could become a pest of tamarack in the state. Equally alarming is the potential for blue-stain fungi associated with *D. pseudosugae* to cross over

to *D. simplex* or other tamarack-infesting bark beetles. The whole host of western fungi, bark beetles, woodborers and associated insects that are present in western larch logs being transported into Minnesota pose a threat of ecological and economic harm.

Much attention is given to the regulation and interception of non-indigenous organisms from other continents. The introduction of *D. pseudosugae* into Minnesota brings to light the potential threat of transporting organisms indigenous to North America to new hosts and ecosystems in North America via barked wood products for a variety of uses.

## Oak wilt

Community maps for 2002 are being digitized in preparation for the up-coming treatment season. As of the spring 2002, the number of active infection pockets was 6055, with 5959 treated sites (map 1). Sherburne County has the largest number of active infection pockets and the most acreage affected.

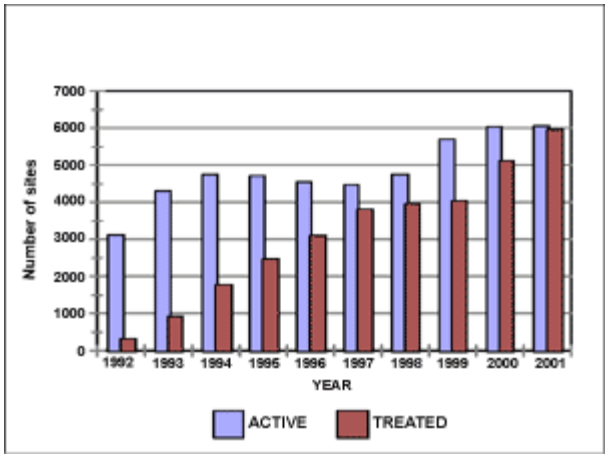


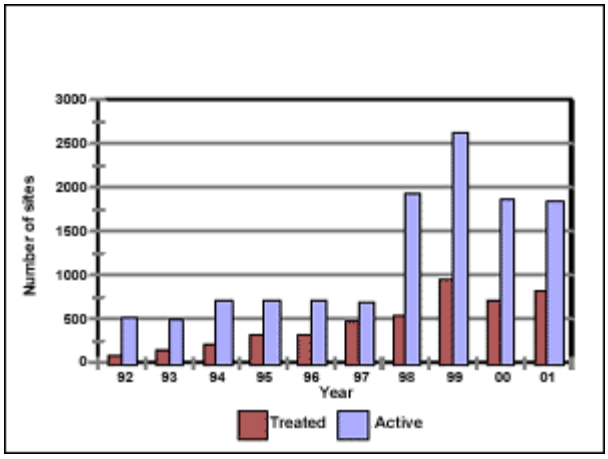

Following the storms of 1997 and 1998, the number of infection pockets dramatically increased in those areas affected by the storms. As a result, the oak wilt epicenter shifted northwestward into Sherburne County, where storm damage and increased development have put a large number of oaks at risk (figure 1 and 2). The spread increases the risk of oak wilt moving into heavily forested counties further north that do not yet have oak wilt. If oak wilt is allowed to spread into these counties, the loss of trees and the cost of disease control could be substantial.

In 2003 and 2004, funding for oak wilt management will be provided through the MN Releaf under an expanded forest health program. The new progrm will provide funding for a number of other forest health issues, which may reduce overall funding levels for oak wilt management.

The incidence of oak wilt in areas under active management since 1992, the continued spread outward from the Twin Cities area and reduced state funding suggest a need to reevaluate state's management strategy. The state's approach has been to suppress the incidence of oak wilt to within levels manageable by local government. However, program delivery and community success has varied dramatically. To make the best use of state funding, a stratified approach is in order. To determine where and how to focus state

management activities, an evaluation will be initiated in 2003, pending budget approval. The study, scheduled for completion in 2005, will include an analysis of change detection as well as ground and community surveys.




## Tatters

For the first time, scattered pockets of oaks in Stearns and Morrison Counties had symptoms of oak tatters. Much of the area in southern Minnesota that was affected last year was free of tatters symptoms in 2002. Tatters primarily affects bur oaks but was also observed on swamp white oak, eastern white oak, a few red oaks and hackberries. The long-term impact remains low. The causal agent remains unknown.

Oak

Hackberry

## Tubakia on oak

Across southern Minnesota, a late season leaf disease can be seen on bur oaks, usually after August 1st. The causal fungus, *Actinopelte dryina,* has had a recent name change to *Tubakia dryina.* This year in August, the University of Minnesota Lab examined samples and confirmed that *Tubakia* is the main leaf spot fungus causing the foliage symptoms.

The appearance can be very dramatic as the entire crown turns brown except a few leaves at the very top. Defoliation can reach 90% in a few short weeks and affected trees look nearly dead. Late season defoliation has minimal impact on the tree's health. However, several consecutive years of defoliation of this nature may have long-term impacts. Stored food reserves could be depleted resulting in dieback by insect and diseases of secondary action. This has not been observed to date on infected trees.

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