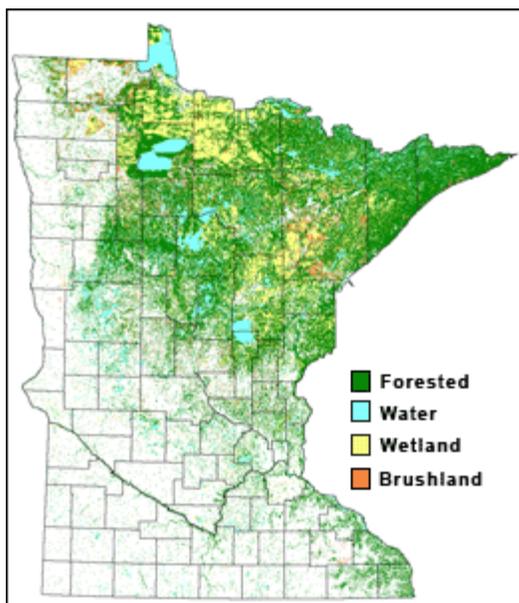


The Resource

The forest resources of Minnesota

In Minnesota there are approximately 16.3 million acres of forest land, of which 14.9 million acres are classified as "timberland" or lands capable of producing timber. Forest type acreage can be found in the table below. (Source of data is the Minnesota 2001 Eastwide Database provided by the USFS-NCES). A geographical depiction of forest land

location can be seen on the map. An additional 960,000 acres are not included in productive timberland due to their inclusion in the Boundary Waters Canoe Area Wilderness or other reserved land category. Forest land ownership is 46% private, 27% state, 14% county, 12% National Forest and 1% other federal ownership.



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.

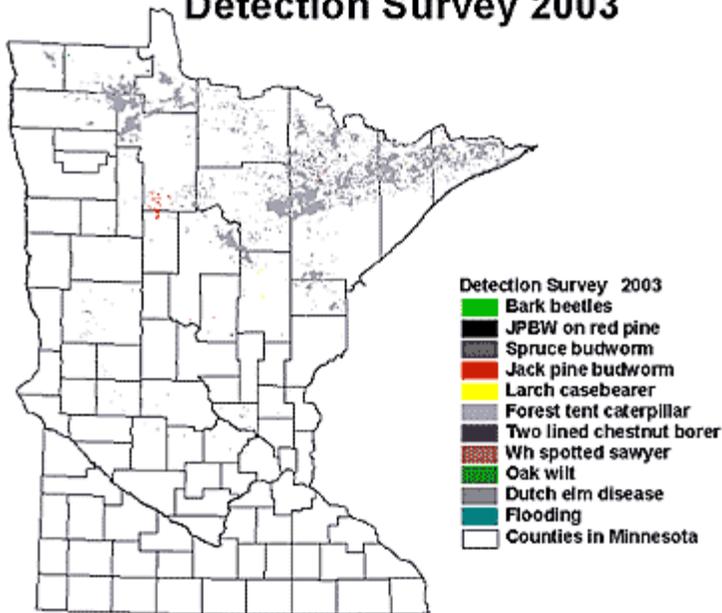
Area of timberland by forest type	
Forest type	Acres in thousands
Jack pine	418.7
Red pine	381.7
White pine	70.7
Balsam fir	421.8
White spruce	86.6
Black spruce	1375.5
Cedar	565.8
Tamarack	648.2
Other softwoods	3.9
Oak	1252.0
Elm-ash-cottonwood	1218.0
Maple-basswood	1758.9
Aspen	5143.4
Birch	1078.6
Balm of Gilead	457.3
Non-stocked lands	101.3
Total	14,982.4

2003 Detection Survey Results: Minnesota

Causal agent	Damage type	Acres detected	Trend

Bark beetles	Mortality	1,189	Up by 100%
Hickory bark beetles	Mortality	4	
Spruce budworm	Defoliation	34,601	Down by 60%
Jack pine budworm	Defoliation	18,546	NEW this year
Larch casebearer	Defoliation	1,660	Down by 40%
Forest tent caterpillar	Defoliation	2,254,050	Down by 70%
Two-lined chestnut borer	Mortality	12,557	Similar to last year
White spotted sawyer	Mortality	3,426	NEW this year
Decline (of Scots pine)	Mortality	136	
Oak wilt	Mortality	4,513	
Dutch elm disease	Mortality	74	
Porcupine	Mortality	1	
Domestic animal	Mortality	10	
Flooding	Mortality	7,986	Down by 30%
Wildfire	Mortality	168	
Wind/ tornado	Breakage	586	Down by 75%
Winter injury	Discoloration	17	
Herbicide	Discoloration	12	
Logging damage	Mortality	364	
Unknown:	Defoliation	5,174	
	Discoloration	7,375	
	Dieback	4,155	
Mortality of larch (likely larch beetle)	Mortality	6,079	Down by 50%
Mortality of all other host species	Mortality	11,145	
Total		2,373,828	

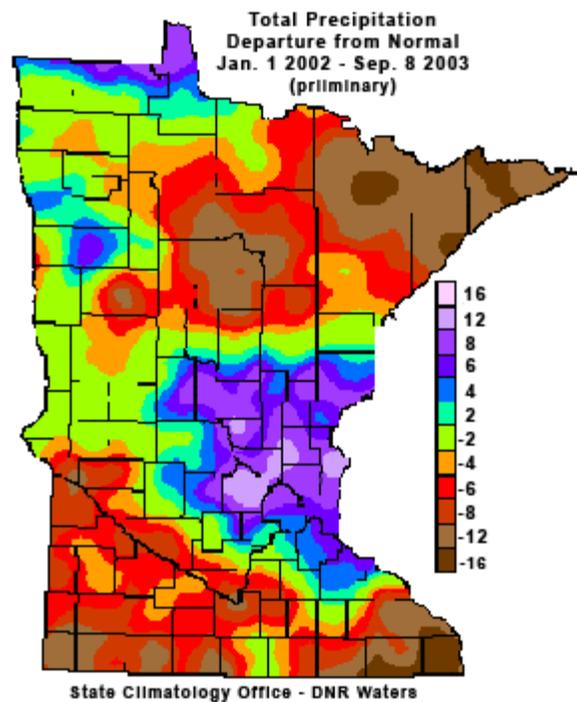
Detection Survey 2003



Twenty months of drought.... and counting

Since January of 2002, many areas in the state are short eight or more inches of rainfall. That's like taking the trees growing in Itasca County (down by twelve inches of rainfall) and moving them west to Jamestown, North Dakota. A few areas are down by as much as sixteen inches. Again, moving the trees in Cook County westward, it's as if the trees were living in Sioux Falls, South Dakota for the last twenty months.

Serious and long-term impacts to the affected forests are already being observed where additional stresses occur, such as two-lined chestnut borer in FTC-defoliated oaks in Itasca County and jack pine mortality in a single year due to jack pine budworm defoliation in Beltrami County.

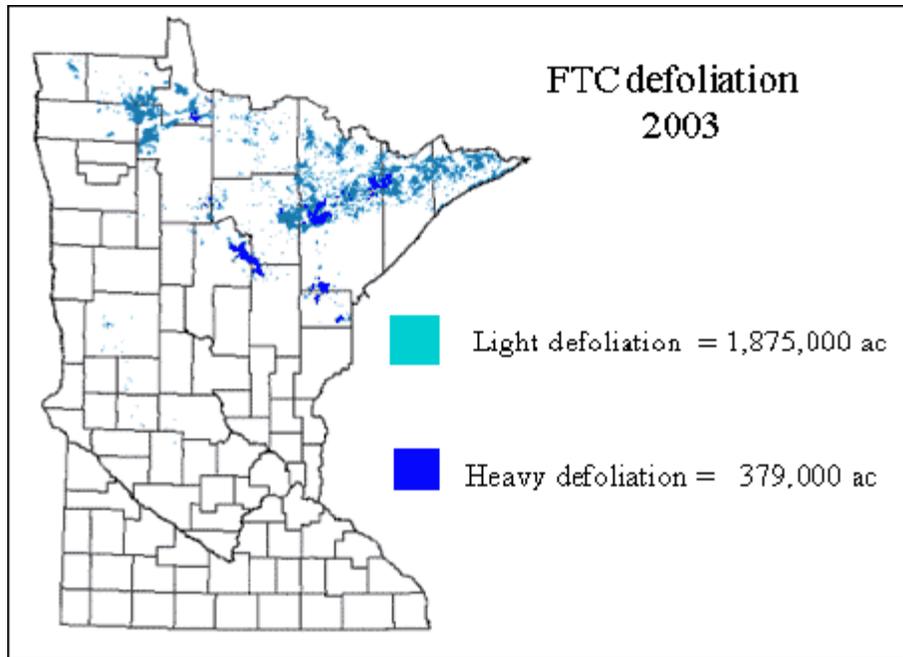
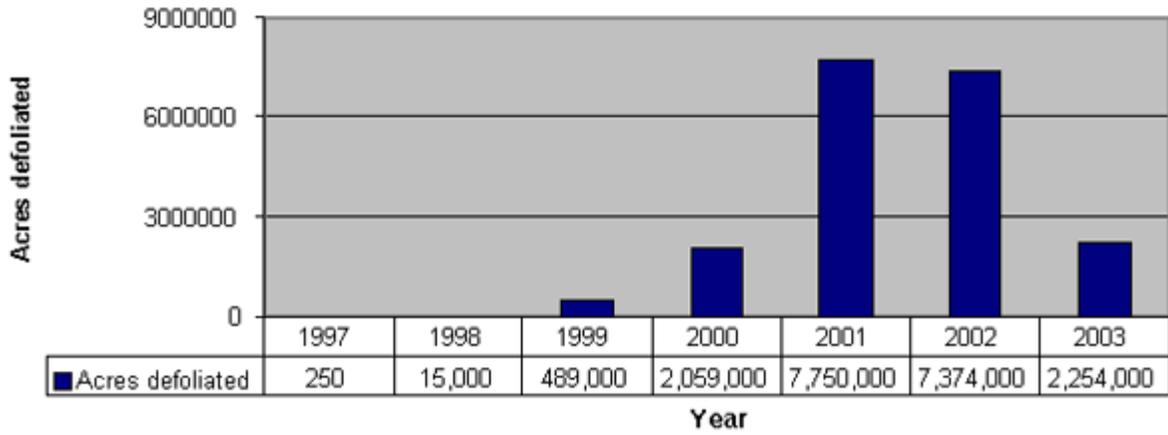


Forest tent caterpillar

Although FTC populations were on the downswing in 2003, 2 and 1/4 million acres were defoliated in May and June. See chart and map. Defoliation was patchy except in the northeastern counties where it was continuous. Concomitant with the end of an FTC outbreak was a plague of friendly flies, *Sarcophaga aldrichi*. Friendly flies are parasites of FTC pupae and build up to astronomical numbers by the end of the FTC outbreak. Most people feel that the annoyance caused by the flies is worse than the nuisance caused by the caterpillars.

Next year, populations should even be smaller, but it wouldn't be unusual to still have some localized spots of defoliation next year. And, unfortunately, the friendly fly populations won't collapse until late next summer.

Acres of FTC in Minnesota



Moth counts	Type of trap

Cooperative Minnesota Gypsy Moth Program

2003 Season Summary

Taken from MDA Final Report

General survey program

The Minnesota Department of Agriculture (MDA) was the lead agency during the 2003 gypsy moth detection survey program. Other cooperators included USDA, APHIS, PPQ; USDA, FS; DNR and the Three Rivers Park District in the Twin Cities metro area. Staff in the cooperative program set approximately 17,790 delta traps across the state, and 535 male moths were recovered. See map. This was a 453 percent increase from 2002, when 118 male moths were recovered.

Moth counts	Type of trap
317	Standard detection (1 trap/sq. mi)
25	Standard detection (1 trap/ 4 sq. mi)
94	Delimit (16-36 traps/sq. mi.)
55	Nursery
32	Nursery delimit
7	Mill
5	State Park
535	TOTAL

Traps were set at one trap per square mile (1/1) in areas considered high-risk for the introduction and establishment of gypsy moth due to human activity levels, preferred habitat for gypsy moth, and the advancing gypsy moth front from Wisconsin. Areas designated high-risk included the seven-county Twin Cities metro area, counties bordering Wisconsin in central and southeastern Minnesota, and along the shore of Lake Superior including the entire city of Duluth. The remainder of the state receives traps at one trap per four square miles (1/4) on a four-year rotation, with approximately one-third of the state receiving traps in any one year. The entire eastern half of Minnesota was trapped in 2003.

As in 2002, a seasonal trapper conducted "hike-in" trapping along a predetermined 1/1 grid (as opposed to using available roads) for all of the Grand Portage Reservation. Two hundred forty traps were set on the Grand Portage Reservation, and six moths were caught in five traps. Forty-nine traps were set on the Fond du Lac Reservation, and no moths were trapped. Nine hundred fifty traps were set in Superior National Forest, and three moths were caught in three traps.

Nursery and mill trapping

Nurseries either reporting stock sources from gypsy moth-quarantined areas or who are wholesale dealers are considered high-risk. Outside the standard detection grid, 34 high-risk nurseries were trapped and one moth was found.

Logging mills are considered high-risk if it is known or likely that they have out-of-state sources or if they are within 60 miles of Wisconsin counties trapping fifty or more moths. Outside the standard detection grid, 16 high risk mills were trapped and no gypsy moths were recovered at these mills. Three mills are under federal Compliance Agreements for gypsy moth. A Compliance Agreement is designed to decrease the risk of gypsy moth establishment and allows mills to transport logs from gypsy moth-quarantined areas for milling or pulpwood. Mills under compliance are trapped at 36 traps per square mile for one square mile. Sappi, Blandin and International Paper were trapped and no gypsy moths were found.

Egg mass surveys

Three egg mass surveys were conducted in the fall in response to relatively high trap catches at the sites. Two sites were within the Twin Cities metropolitan area (Edina and Hugo) and one was in rural southeastern Minnesota (Rollingstone). The Minneapolis site was part of the 2002 Lake Harriet treatment delimit area. Twenty-two moths were caught in seven traps at this site, the largest number of finds at a single site for the 2003. During the egg mass survey, more than a dozen egg masses were found on two large, isolated oak trees. This site will receive a treatment in the spring of 2004. No egg masses were found during the two other surveys.

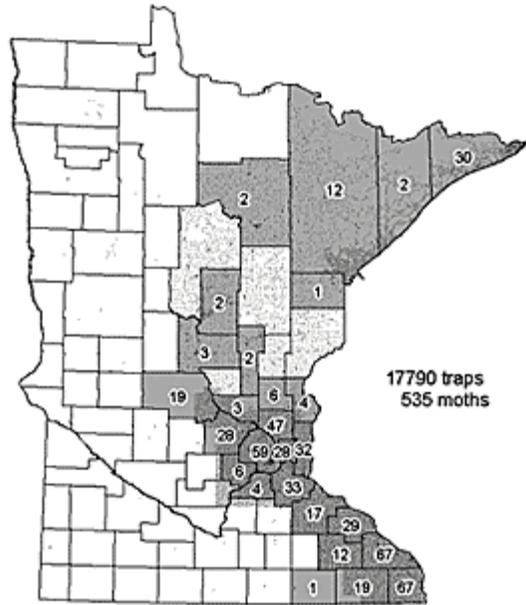
Regulatory incidents - quarantine breaches

In early July, MDA was notified that Colorado blue spruce shipped from another Midwestern state to an Iowa nursery was infested with gypsy moth larvae and egg masses. One Minnesota nursery had received stock and when a site inspection was conducted, three spent egg masses were discovered. A Stop Sale Order was immediately issued until further inspection could be conducted, but was suspended the next day when no other life stages were located.

In late July, multiple males were caught in survey traps at four nurseries: two in the Minneapolis-Saint Paul metropolitan area (Blaine and South St. Paul) and two within 70 miles of the Twin Cities (Hanover and St. Cloud). All four businesses were immediately issued Stop Sale Orders. Inspections at the four sites revealed multiple gypsy moth life stages, and as a result, each of the nurseries entered into formal compliance agreements with MDA and USDA, APHIS. One provision of the compliance agreements was that the nurseries must treat for gypsy moth in the spring of 2004, and all conifer material must be held off-sale until treatments have been completed. Two of the businesses were unable to over-winter their conifers so those nurseries elected to burn potentially infested material. Further investigation into the source of the infested material at the four Minnesota nurseries revealed three separate nursery quarantine breaches from three different states within the federal gypsy moth quarantine. All material arrived in Minnesota with the proper gypsy moth certification paperwork.

Two of the Minnesota nurseries received infested stock several months before the quarantine breach was discovered, allowing for possible cross-contamination of other stock on site. The majority of the potentially infested stock had already been sold to other nursery dealers, landscape contractors, or homeowners across the state by the time MDA learned of the breach. Follow-up surveys are being conducted across Minnesota to determine if stock sold to secondary customers was indeed infested. See map.

2003 Gypsy Moth Totals by County



MINN

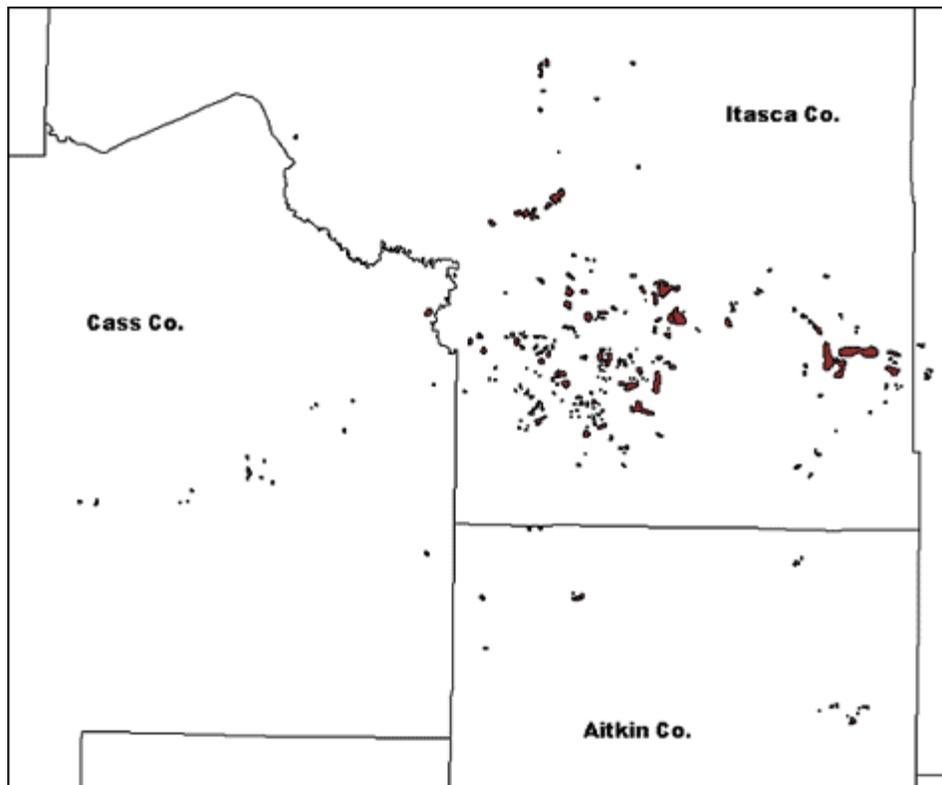
Two-lined chestnut borer

For the second year in a row, many oaks were attacked and killed by two-lined chestnut borer (TLCB). In a special aerial survey flown this September by DNR Resource Assessment, 12,557 acres of stands with oak mortality were detected in Itasca, Cass, northern Aitkin, northern Crow Wing and southeastern Beltrami Counties. In many stands, 80 to 90% of the oaks are now dead.

TLCB is a native opportunistic insect that is able to attack and kill weakened stressed oaks of any species. The trees were attacked



because they were stressed by forest tent caterpillar defoliation for the past three years and 20 months of drought. Where additional stresses occurred, such as, construction damage or recent thinning, there was nearly 100% mortality of oaks in the affected stands.

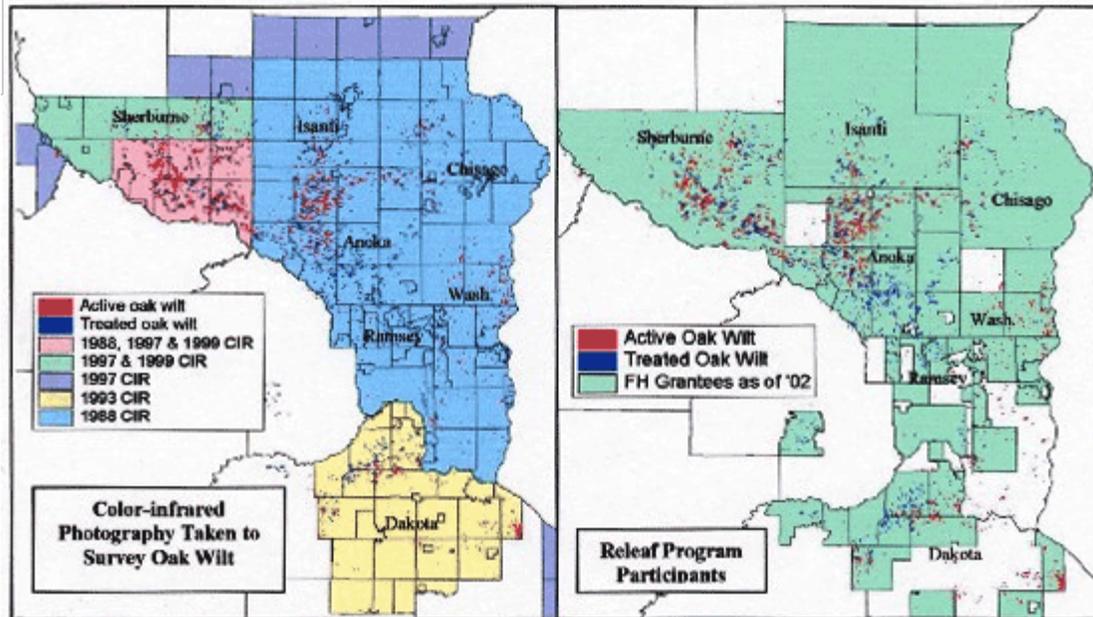


Oak wilt management

The year 2002 marked 10 years of active oak wilt (OW) management within the Minnesota Department of Natural Resources (MN DNR). Active management began with a federal pest suppression grant in 1992 which continued until 1997. In 1998, the effort was incorporated into a community assistance program called Minnesota Releaf which was funded by the state legislature. On the program's tenth anniversary, the change in program goals and the increasing need to upgrade the technologies used to collect, manage and interpret treatment data, prompted an evaluation of the Minnesota oak wilt program. A preliminary analysis of the existing data was completed in 2002. In 2003, a formal assessment of the status of OW in Minnesota was initiated with the support of both state and federal funds.

The overall goal of the Federal Suppression Project was to lower the incidence of oak wilt to levels manageable by local units of government and thus build local capacity to sustain long-term community forest health. Based on research that described the average rate of spread and satellite infection development, the density of oak wilt manageable by local government was determined to be one infection pocket per square mile. The control zone or focus area was defined as the six county area (Sherburne, Isanti, Chisago, Anoka, Ramsey and Washington Cos.) known to contain the most oak wilt. Dakota County was added to the list the following year. The original project objectives were to reduce the incidence of oak wilt within 75% of this control zone to one active infection center per square mile and to do so within five years through active community assistance.

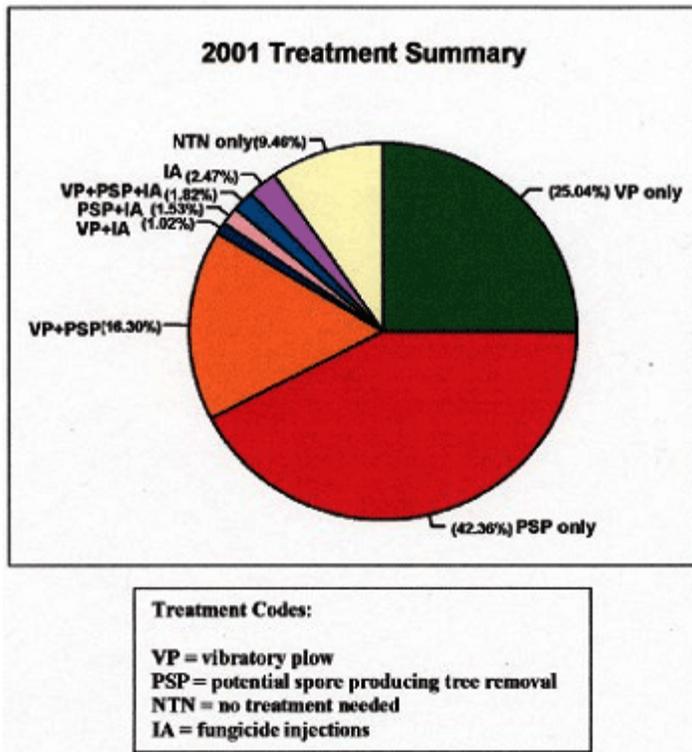
n the initial inventory, 3006 infection pockets were identified in 44 townships. By 1997, 8387 infections centers had been identified across an expanded control zone of 79 townships. Participating communities had treated 5164 infection pockets or 61.5% of the known pockets. Even though the combined survey data indicated that the density was nearly twice as high as expected, the cost-share program lowered the density of oak wilt from 2.97 centers per square mile to 1.58. Within 53% of the control zone, the density was lowered to one infection center or less (see annual charts). Given the high initial density, this is a significant accomplishment. The other significant program accomplishment was the high level of public awareness and involvement achieved. During the five years of the first federal suppression project ('92-97), communities and private citizens spent \$3,043,294.00 to match \$1,950,000.00 in federal funds, for a project total of \$4,993,294.00!!



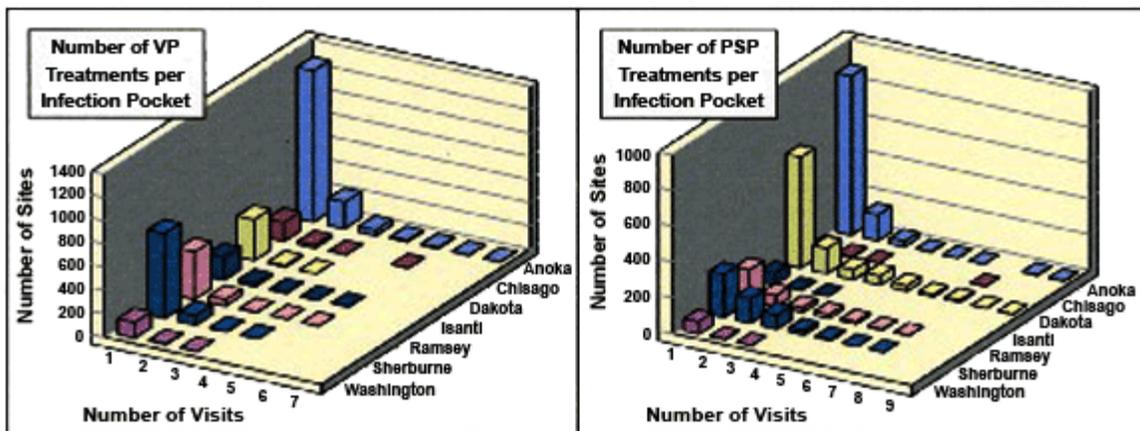
The federal suppression project ended in 1997 and the state incorporated oak wilt management into the Minnesota Releaf program. Since then funding has been uncertain with funds available some years and not others. Intermittent and/or delayed funding has impacted the level of management activities and in a few cases, community participation. Yet public support has remained high as demonstrated by the number of letters and testimonies given in support of state budget requests during the '02-03 legislative session. During this same period, the incidence of oak wilt began to increase. Factors included funding levels for community programs, increased urban development and a series of severe spring windstorms that whipped the north metropolitan area in 1997 and 1998.

The storms damaged trees over a wide area at the height of the oak wilt infection period. By 1999, the incidence of oak wilt had reversed previous gains in several areas, particularly in Sherburne County; hit the hardest by the storm events, and the numbers have continued to climb since then.

In response to increasing questions about program accomplishments and necessary funding, the data was exported to Arc/View and for the first time the treatment histories were assessed. Sites were considered 'treated' if they had received any combination of treatments or if it were determined (by the community) that no treatment was necessary (i.e. the pocket was no longer active). Communities reported VP treatments alone on 25% of the treated sites and PSP alone on 42% of the sites. Only 16% of the sites received both VP and PSP treatments. Fungicide injections were becoming more common. Data collected for the first time in 2001 indicated 4.37% of the sites received fungicide injections in combination with other treatments and 2.47% received fungicide injections alone (see treatment charts).

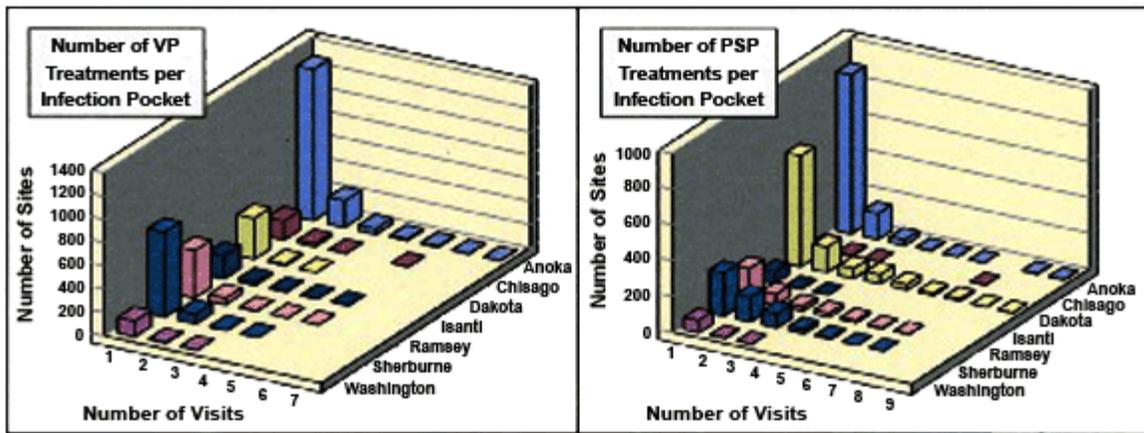


Once the treatment data became available, a number of new questions arose. Correlations between disease incidence and differences in local program implementation began to become apparent. How annual treatment data was obtained (which varied by community) determined the level of detail provided. The size of the paper maps relative to community size seemed to influence the reported acreage. And the codes used to denote treatment methods were being confused at times and not corrected.



These issues created doubts about the reliability of the data. While the trends described help program managers understand where problems may exist in state program delivery, they couldn't be used to redesign the program to meet changing needs. Yet, the increase in disease incidence (and decreasing resources with which to control it) meant program adaptations were needed. But based on what?

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A formal reassessment of the status of oak wilt in the state was initiated in 2002. New CIR photography was taken of 33 townships with another 76 townships flown in 2003. The data will be used to establish a baseline for the current federal CSP and to analyze the change in disease incidence based on a variety of factors. The primary goal is to evaluate our current management strategy; is it working at a program level and if not, why not. A secondary goal is to describe factors outside our control (like urban development and storm damage) and the influence they are having on disease incidence so we can incorporate that information into the way we prioritize treatments (and cost-sharing).

With the continuing increase in disease incidence, one of the biggest questions we face is whether or not it is possible to stay ahead of the spread of oak wilt. While some communities are doing an excellent job of staying current, others are falling behind. Modifying the means of program delivery and enhancing resident outreach may be all that's needed in some cases. Better enforcement of PSP removal for instance is one area where improvements can be made. But in other areas, disease incidence seems to be increasing in spite of well-run, full-service programs. Whether or not our strategies are inadequate, or outside factors are having a stronger influence, these areas serve as a source of continued disease pressure that may eventually overwhelm those that currently have oak wilt under control.

The situation resembles that seen in the gypsy moth slow-the-spread (STS) program. Those with the worst problem are tempted to throw up their hands because of the effort and expense involved in slowing the spread of oak wilt. However, continued management is critical to the well being of the oak resource as a whole. If those with the worst problem quit now, neighboring areas will be overrun. It is easy to focus only on those trees in your own back yard. But if we are to succeed, it is important that we all work together to preserve Minnesota's oak resource. Hopefully, the assessment project will provide the answers we need to regain lost ground and build on earlier accomplishments.

Leaf tatters

As of May 20th, areas affected last year in southern Minnesota look to be free of tatters. Tatters is a late spring early summer condition that affects the emerging leaves of primarily oaks, and hackberry. As the new leaves emerge from over wintering buds they appear lacy or tattered. This condition has been observed throughout several mid-western states for more than 10 years. The first reports were from Iowa in the 1980's. More recently, it has been observed in Minnesota and Wisconsin. The

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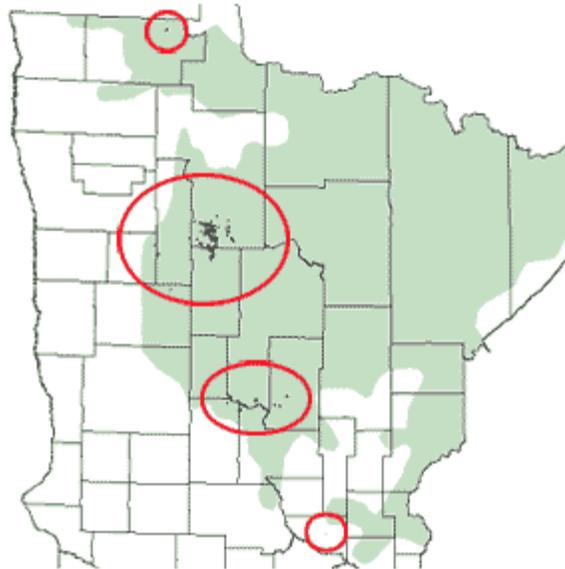


In the oaks, tatters affects primarily the bur oaks. It has also been observed in Minnesota on swamp white oak, eastern white oak, and on a few red oaks. Newly emerging leaves of affected trees have missing leaf tissue between the veins, which gives the leaves a lacy or tattered appearance, hence the name tatters. In some years large areas of the landscape have been affected in southern Minnesota. Tatters is most apparent in the tree crowns during the first week in June. Please report any symptoms of tatters in your area to DNR foresters.

Jack pine budworm

It's been several years since the last jack pine budworm outbreak in Minnesota and, frankly, this outbreak was way overdue. Since 1954, outbreaks in western counties have been four to seven years apart. The last JPBW outbreak ended in 1994, making it a whopping nine years since budworms were active here.

We have four hot-spots in the state, from Roseau County reaching down to Sherburne County. See map and table.



Jack pine budworm defoliation in 2003
Natural range of jack pin in Minnesota

Location	Acres defoliated
Roseau Co.	114

Jack pines near Bemidji and in most of Beltrami County are showing signs of budworm defoliation and topkill. Light to moderate defoliation is also apparent in three other locations. See map and table. Unfortunately, most affected stands are more than 60 years old, are suffering the ill effects of a recent drought and are low vigor as evidenced by having only two years of needles on their shoots. This means that negative impacts, topkill and mortality, are likely to occur in the next couple of years.

Location	Acres defoliated
Roseau Co.	114
Bemidji and southwest	16,807
Brainerd and west	1478
Sherburne Co. (on red pine)	147
Total	18,546



Jack pine forests occupy about 300,000 acres in northwestern Minnesota and are subject to periodic outbreaks of jack pine budworm, *Choristoneura pinus*, a native defoliating insect. Historically, outbreaks vary widely in size and severity but occur at four to seven (up to twelve) year intervals and last two to four years. The damage produced by these outbreaks can range from moderate defoliation producing minor growth loss to severe, multi-year defoliation producing topkill and mortality.

Budworm populations and activity are expected to increase in at least the three northern locations and "spread out" to stands between Bemidji and Brainerd. In fact, some of these stands already had a slight tinge of defoliation this year. And, factoring in the hot, dry summer weather, it's a good bet that we'll see defoliated jack pine stands in Cass, Wadena, Hubbard, Becker and Clearwater Counties next year. In Sherburne County, budworms have defoliated a few red pine stands totaling 147 acres. Here pre-salvage harvesting and insecticides will be used to manage the impact of the outbreak.

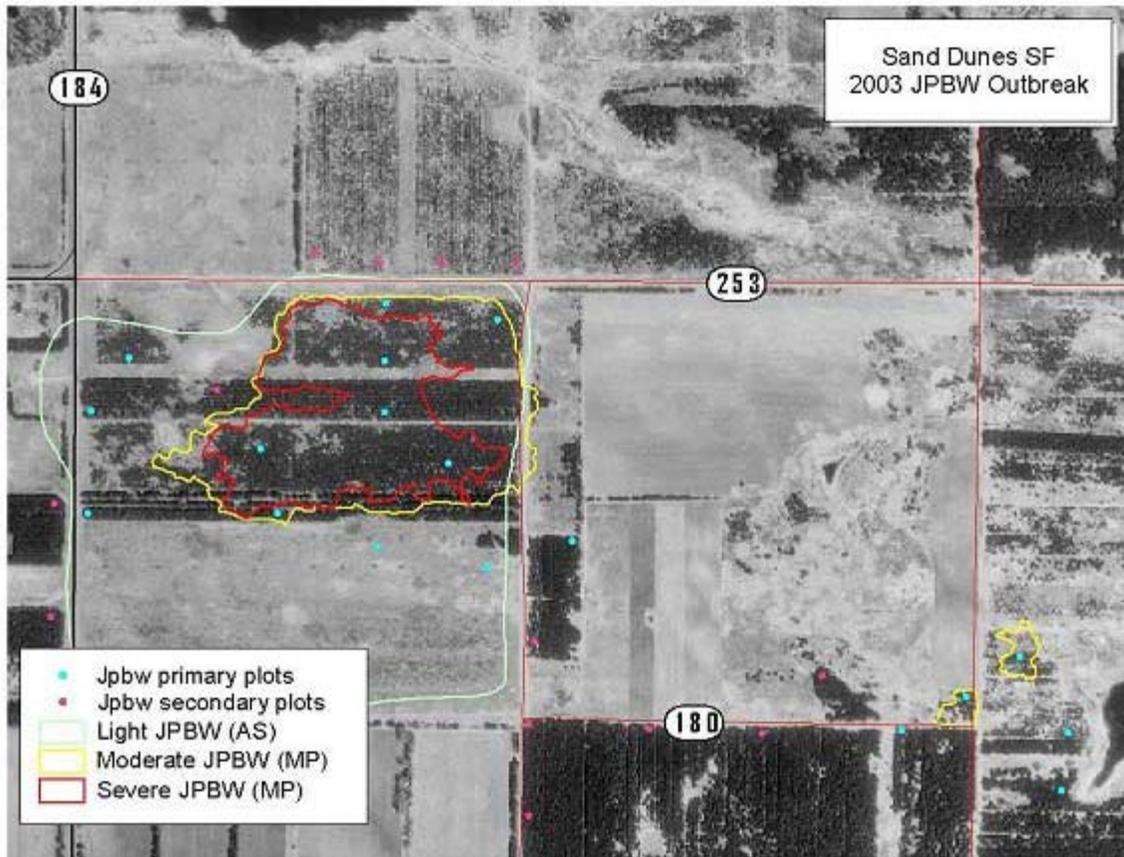
Jack pine budworm in red pine

This summer, DNR staff discovered foliar damage in a 147-acre red pine plantation of the Sand Dunes State Forest in Sherburne County. The plantation is more than 40 years old and has been thinned. When the site was inspected this summer, both red pine shoot moth and jack pine budworm (JPBW) were found damaging the stand. JPBW had defoliated 79 acres, some of which was already showing top kill. There are only a few scattered jack pines in the area and, for the most part, they looked better than the red pine.

In the first year of defoliation, damage ranged from 30-90% in the core area. It is fairly unusual to see extensive defoliation of red pine by JPBW, particularly when there is little if any jack pine in the area. (The nearest noticeable JPBW defoliation of jack pine this year was 75 miles to the northwest, in Todd Co.) So how this infestation became established is not known. It is also not known what factors contributed to the heavy defoliation.

The only other records of JPBW on red pine in Minnesota that we could find were in 1956 and 1957 near Cloquet, Pequot Lake and Bemidji. Top kill occurred in 1957 after 80% defoliation. However, in those events, defoliation occurred over two years and the adjacent jack pine was also heavily damaged.

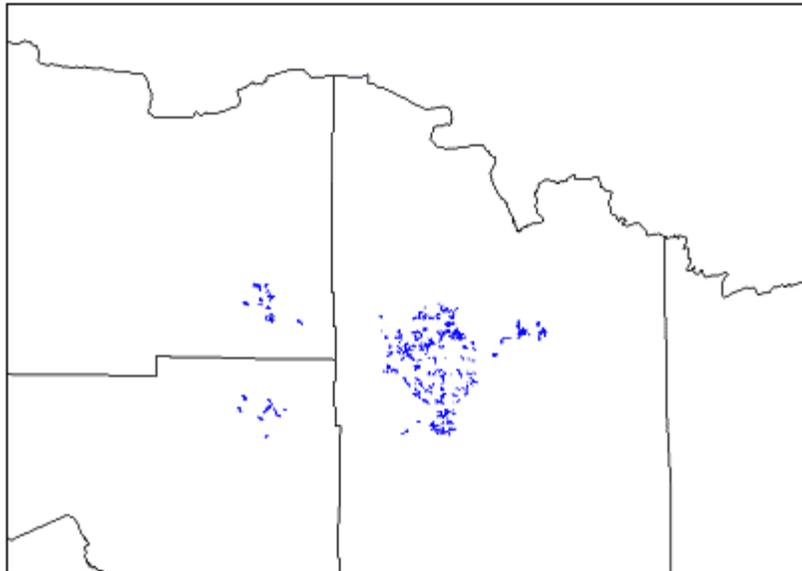
To help determine the likelihood of defoliation next year, an egg mass survey will take place this month. The extent of the population and the likelihood of it moving to adjacent stands will also be assessed.



Spruce budworm

This year marks the 50th consecutive year of spruce budworm outbreak in Minnesota.

Acres of defoliation declined compared to those mapped in 2002. Budworm activity remains centered in northwestern St. Louis, northeastern Itasca and eastern Koochiching Counties.

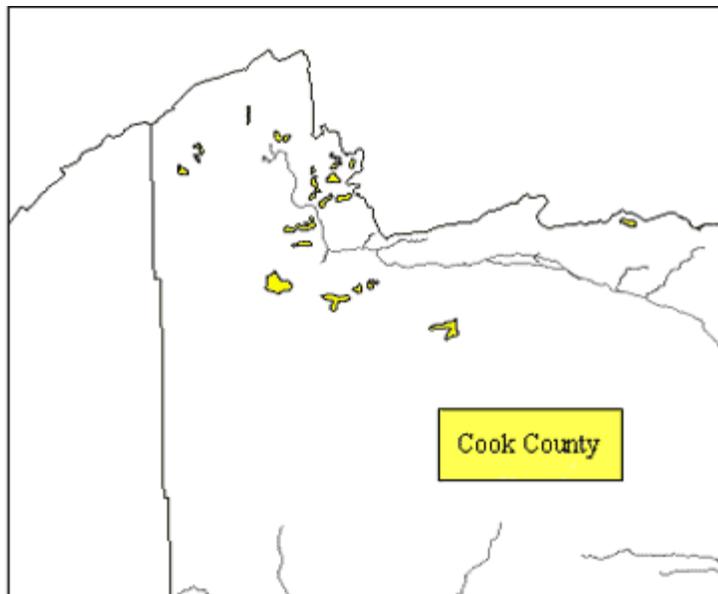


Spruce budworm defoliation in 2003

Sawyer beetles kill stands of living jack pine

During the aerial survey flown this past summer, 3426 acres of jack pine stands with mortality due to wood borers were mapped near the Gunflint Trail corridor in Cook Co.

We usually think of wood borers, *Monochamus* spp., infesting trees that have already been killed by something else, like drought, fires, wind or bark beetles. Kamal Gandhi, a graduate student at the U of MN studying insects following the 1999 blow down in the BWCA, has found otherwise. She found up to 100% mortality of jack pine on her plots due to wood borer attack.



Spruce beetle

Spruce beetle a native bark beetle seldom seen in Minnesota has been killing large diameter white spruce

Apparently the wood borer populations built up in the downed pine trees over the last few years and were then able to attack and kill standing live jack pine. She observed large numbers of female wood borers ovipositing on standing live jack pine in blow down areas. Apparently, the wood borer populations built up in the downed pines since 1999 and then were able to attack and kill standing live jack pines. We do not normally see large scale mortality resulting from sawyer attacks.

Spruce beetle

Spruce beetle a native bark beetle seldom seen in Minnesota has been killing large diameter white spruce trees along the shore of Lake Superior the past few years. The amount of mortality is increasing and expanding as new infestations continue to be found. The problem was first noticed in Judge Magney State Park in Cook County. Dying trees have now been found along Lake Superior as far south as Gooseberry Falls State Park. Results of a North Shore State Parks Spruce Beetle Study funded by a Coastal Zone Management Grant are presented in the table below. The damage is most obvious within a few miles of Lake Superior but has also been found in a number of white spruce stands in Koochiching County as well in a dying spruce windbreak in Wadena County. The beetle is likely present in other locations and will be found as more people learn to look for and identify it.

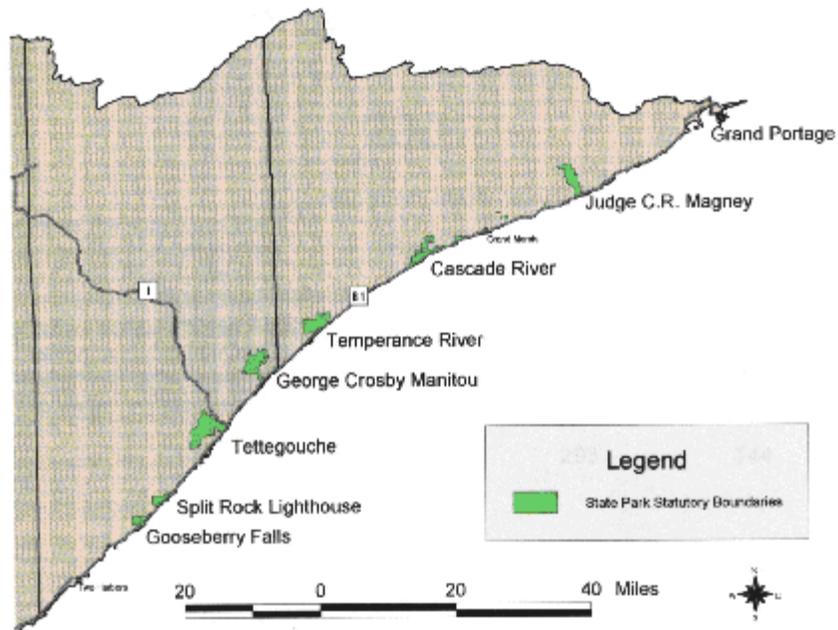
The beetle prefers large diameter trees (12 inch diameter and larger) but has been found in trees as small as 6 inches in diameter. It also prefers stressed trees but has also been killing some pretty healthy looking ones. A large tree can be killed in one growing season if attacked by a large number of bark beetles. Recent attacks on trees are best found by looking for pitch tubes on the trunks of the trees.



Spruce Beetle



Pitch tubes on trunk



Field Survey Summary

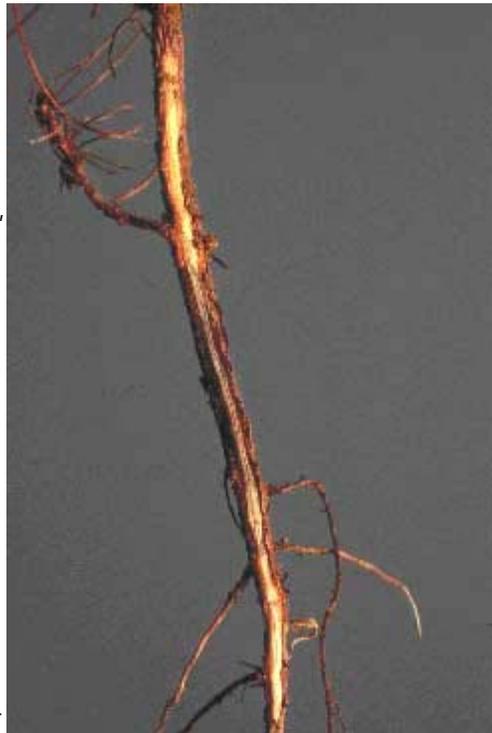
Spruce Beetle Infested Trees

	2001	2002
Grand Portage State Park	9	10
Judge Magney State Park	194	252
Cascade River State Park	40	124
Temperance River State Park	6	11
Crosby Manitou State Park	19	94
Tettegouche State Park	25	59
Split Rock Lighthouse State Park	0	1
Gooseberry Falls State Park	0	1

Sphaeropsis collar rot

DNR Forestry has experienced two consecutive years of poor red pine plantation establishment due, in part, to a disease caused by *Sphaeropsis sapinea* (formerly known as *Diplodia pinea*). It is best known for causing shoot blight on young red pines planted under older, overstory pines in the Lake States. In other parts of the world, *Sphaeropsis* causes other types of diseases, notably, collar rot. In August of 2002, we initially found that collar rot was a problem in red pine seedlings produced in our State Nurseries.

Collar rot is an infection of the bark, cortical and wood tissues of the root collar. Collar rot infections girdle the seedlings which results in the sudden death of the seedlings during the summer. It is common for infected seedlings not to candle out after they are planted. Symptoms at the root collar include: loose bark, blackened cortical tissues, black/dark blue staining of woody tissues, presence of dark resins and presence of fruiting bodies in bark above the root collar.



Red pine seedlings can become infected as 1-0, 2-0 or 3-0 seedlings while still in the nursery. The main sources of infection in the nursery are pine windbreaks. (Windbreak trees become infected as insects carry spores from nearby pines.) *Sphaeropsis* spores are produced in infected cones and on blighted shoots. Then, wind-driven raindrops carry the spores down onto the bed of seedlings. Shoot blight data from the 1980's show that seedlings more than 600 feet away from a windbreak can become infected. Within the seedbed, dead or blighted seedlings produce spores that can be water-splashed onto adjacent seedlings. This is the main source of infection for a 2-0 and 3-0 seedlings. US Forest Service researchers, Palmer and Nichols, showed that nearby dead seedlings supplied 10,000 times more spores than nearby windbreak pines.

Dr. Glen Stanosz, Univ. of Wisconsin-Madison, has been working on *Sphaeropsis* diseases of pines since 1991. He recently found that the fungus can persist in live seedlings without producing any disease symptoms. In other words, *Sphaeropsis* is a latent pathogen. The fungus passively exists in the bark of the root collar. As long as the seedling is vigorous, the fungus cannot produce the disease symptoms. Only when the seedlings are stressed, by having an internal water deficit, does the fungus become activated. Internal water deficits could be instigated by poor stock handling or storage, transplant shock, J-rooting, drought, hail damage or deer browse.

Both 2002 and 2003 were drought years, providing more than adequate drought stress which activated the latent *Sphaeropsis* infections in red pine seedlings. In new plantations, the effect of *Sphaeropsis* can be distinguished from the effect of drought when red pine seedlings are planted side by side with other conifer seedlings. In 2002, average losses in red pine were 67% ,while in other conifers, losses averaged 12%. *Sphaeropsis* caused 55% of the losses. The data is not in for the plantation losses during 2003, but results seem to look similar to last year. The DNR is currently assaying the red pine seedlings that would be shippable in 2004 for the incidence of latent infections. DNR Nurseries may purchase red pine seedlings from other nurseries if these studies show that the stock has more than 5% latent infections.

Why now? Why Minnesota? Actually, North Dakota, Wisconsin and Michigan state nurseries are currently struggling with this problem. One theory has it that our native "Lake States" *Sphaeropsis* strain had been ecologically replaced by the more aggressive (and deadly) "World Wide" *Sphaeropsis* strain. A little forensic pathology work on older plantation survival and lots of research on *Sphaeropsis* strains and ecology may shed some light on

this epidemic.

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