Lake States
Forest Health Watch

Northeastern Area

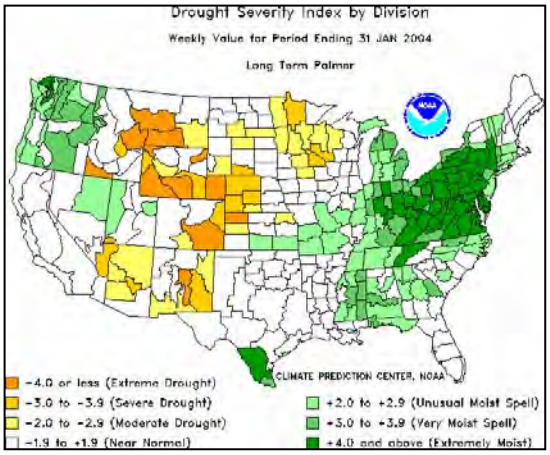
May 1, 2004

About this newsletter…

The Forest Health Protection unit of the Forest Service located in St. Paul, Minnesota produces this newsletter. Our intent is to keep Federal land managers in the Upper Great Lakes region abreast of forest health related issues such as insect and pathogen outbreaks. We need your assistance, please contact us with your observations.

What happened in 2003…

Drought –Most of the western Great Lakes region was under drought stress during the late summer of 2003. This included much of Minnesota and a large portion of northwestern Wisconsin. Drought is thought to have played an important role in a number of insect and pathogen outbreaks that were reported in 2003. This included widespread oak and white spruce mortality within much of the area mentioned above (see more information below). Snowmelt and spring rains occurred in many of these areas, but drought conditions still persist this spring. Drought can kill portions of root systems and reduce the health and vigor of many trees. It can take a long time before full recovery occurs with many tree species. We anticipate the tree resource in the drought prone areas, shown on the adjacent map, may be under significant stress and more susceptible to many insect pests and pathogens.



Palmer Drought Index, January 2004

Oak mortality – Many dead oaks were observed across portions of northwestern Wisconsin and northcentral Minnesota. This pattern started in late summer of 2002. Dead and dying trees were infested with twolined chestnut borer, *Agrilus bilineatus*. This beetle has a histroy of killing oak trees in the region, but it generally requires a stressed host tree to be successful. In this situation, we believe a couple of stressing agents were involved; widespread defoliation by forest tent caterpillar and as mentioned above, drought. The defoliation occurred between 2000 and 2002. As a result, some extensive areas of dead oak were found. With tent caterpillar populations dropping to low levels, the oak resurce should begin to recover. However, if drought conditions persist, further mortality is likely.

For more information on twolined chestnut borer see:
http://www.na.fs.fed.us/spfo/pubs/fidls/chestnutborer/chestnutborer.htm

Winding tunnels of the two-lined chestnut borer.

Black ash decline – Apparently related to drought, we have observed a number of black ash stands that have widespread decline symptoms and high levels of mortality. Trees growing in wet soils, such as black ash, often suffer during prolonged droughts. These trees tend to develop shallow root systems that cannot cope with a prolonged drop in soil moisture.

White spruce plantation decline and mortality – Tree decline and mortality were evident in a large number of white spruce plantations within the Park Falls District of the Chequamegon National Forest and the Kenton District of the Ottawa National Forest. Mortality is extensive in a number of 30-50 year old plantations. Increment cores indicated that many trees in these stands had grown little over the past 10-12 years despite thinning operations, some dating back to the early 1990's. The reasons behind this spruce decline are not completely understood. We have found evidence of a couple of needle pathogens, spruce budworm feeding, and bark beetle activity that contributed to the decline. The needle pathogens may be playing an important role in killing needles in the lower crown. This creates trees with very small live crown ratios. One of these pathogens is relatively common, Rhizosphaera needle cast. The other needle cast disease is newly described in the region, it is called spruce needle drop or "SNEED" for short. The fungus was found on blue and white spruce in Wisconsin in 2002 and was identified as *Setomelanomma holmii*. Although it has been found in association with declining and dying trees it has NOT yet undergone rigorous testing on its pathogenicity. So its role in the white spruce decline on the Chequamegon and Ottawa Forests is still unknown.

Spruce budworm feeding appears to be very recent in the area and may be the final straw for many trees. The needle pathogens are killing the older needles in the lower crown and now budworms are eating the new needles at the tops of the trees. This two pronged attack, combined with dry weather in the area, appears to be the *coup de grace* for many, many spruce trees.

Compounding the problem, we have found trees heavily infested with at least two different bark beetle species, the four-eyed spruce beetle, *Polygraphus rufipennis* and the spruce scolytus, *Scolytus picea*. There are some historical reports of the four-eyed spruce beetle building large populations capable of killing relatively healthy spruce trees. We could see more extensive spruce mortality in these areas, if this occurs.

This spruce decline scenario appears to be quite complicated. The implications may be important in our long-term management of white spruce in the region. Trees that we thought would survive and prosper well past 100 years of age are dying much earlier. There are many questions concerning the role of needle diseases, growing spruce under a plantation culture, thinning regimes, and seed source issues. We also need to remember that northern Wisconsin is along the southern edge of the native range of white spruce. We would like to hear if others are observing similar problems in white spruce.

What to expect in 2004…

So, what does our crystal ball see for this coming summer?

Jack pine budworm – The Minnesota DNR reported intense jack pine budworm activity in northwestern portions of Minnesota's jack pine range. Jack pine budworm populations tend to rise over a 2-3 year period before declining. So, we would expect more jack pine budworm defoliation this summer. In addition to northern Minnesota, watch for budworm outbreaks in the traditional outbreak areas of northwestern Wisconsin and the eastern U.P. Infested trees turn reddish-brown in late June through early July. Budworm caterpillars clip needles. These needles collect in silk webbing and turn brown giving infested trees a characteristic "burnt look" that can be readily seen from a distance. Expect about 5-10 percent tree mortality and 10 percent top-kill following an outbreak. If outbreaks persist, more extensive mortality can occur. For further information see: http://www.na.fs.fed.us/spfo/pubs/howtos/ht_jack/ht_jack.htm

Budworm larvae

Gypsy Moth -- In 2003, Wisconsin reported over 65,000 acres of gypsy moth defoliation, much of this was in northeastern Wisconsin. That number is expected to increase this summer. Oak dominated stands on the Nicolet, Ottawa and the western end of the Hiawatha National Forests are the most likely to experience gypsy moth outbreaks. High populations are also expected along the western edge of the Lower Peninsula of Michigan, especially in the areas around Sleeping Bear Dunes National Lakeshore. For more information on gypsy moth see the section below titled, "Updates on exotic pests".

Gypsy moth caterpillars.

Drought Related Problems – As mentioned at the beginning of this newsletter, many parts of the region have been experiencing drought. Therefore, we expect to see continuing problems with two-lined chestnut borer killing oak trees and additional mortality in white spruce plantations. Both of these concerns were discussed earlier. In addition, we would expect drought to increase the prevalence of a couple of red pine problems, specifically Sphaeropsis blight also referred to as Diplodia blight, and *Ips* bark beetles. The causal fungus of Diplodia is *Sphaeropis sapinea.* In 2003, this pathogen was found in association with widespread pine mortality in west central Wisconsin. It is a fungus that thrives on drought stressed red and jack pines.

Branch mortality on red pine, characteristic of Diplodia blight.

Following past drought episodes in the region we have experienced extensive mortality in paper birch. Much of older paper birch resource was eliminated following the intense drought and heat of 1988. Balsam fir is also subject to drought-induced mortality.

Early Spring Insects and Diseases…

The following are some of our more commonly reported tree problems in early spring.

Anthracnose diseases of hardwood trees are widespread in eastern North America. The most common symptom of the disease are dead areas or blotches on infected leaves. However, classic symptoms are not always seen, especially on ash trees. On ash, anthracnose often causes leaf drop to occur with no or few spots on the fallen leaves. In most cases, anthracnose is simply an aesthetic concern and not a serious health problem for trees. For more information see: http://www.na.fs.fed.us/spfo/pubs/fidls/anthracnose_east/fidl-ae.htm

Birch leafminer – The small adult leafminers will be active as bud break occurs on white birch. Soon after you should see small spots on the leaves where the developing eggs are located. Larvae will start to develop blister like mines (see photo). High populations can make landscape trees very unsightly. Unfortunately, insecticides are often required to avoid damage. Applying a systemic product through the soil seems to work best, but this must be done prior to bud break. If leaves are already expanded, a foliar application using an insecticide with some systemic activity is the best way to kill the eggs and young larvae. If the leaves turn brown, homeowners should no longer spray as most of the damage has already occurred. For more information see: **http://www.na.fs.fed.us/spfo/pubs/howtos/ht_birch/ht_birch.htm**

Introduced basswood thrips – Thrips feeding causes very early season defoliation on basswood. Under close inspection you should see aborted buds and shredded leaves. Trees appear to have a "ragged" appearance (see photo to the right). Thrips are tiny insects that scrape newly developing leaves when they are still in the bud stage. The timing between thrips emergence from overwintering in the soil and bud development seems to be the key for determining the amount of damage in any given spring. If the thrips get to the buds before the leaves expand then damage is intensified. For more see: http://www.na.fs.fed.us/spfo/pubs/howtos/ht_bassthrips/ht_bassthrips.htm

Larch casebearer -- Larch casebearer is a tiny caterpillar that feeds on larch needles. Half-eaten needles make infested trees appear burnt from a distance. Close inspection should reveal tiny cases made of hollowed needles. The caterpillars live inside these cases. Casebearer activity has been observed this year in the Rhinelander area.

Eastern tent caterpillar – This is one of our earliest and most common leaf feeders in the upper Midwest. Eastern tent caterpillar forms a characteristic silk tent on cherry, apple and plum. Other tent-making caterpillars, such as the fall webworm, uglynest caterpillar or cherry scallop shell moth, appear later in the summer on cherry and their tents enclose foliage. The eastern tent caterpillar tent is very neat in comparison and does not enclose leaves.

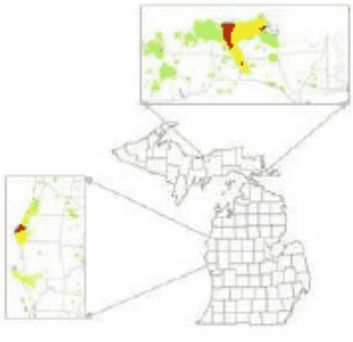
A tent formed on cherry by the eastern tent caterpillar

Updates on exotic pests…

Beech bark disease (BBD) -- was detected in Michigan in the spring of 2000 and is established in the western Lower Peninsula and in the eastern Upper Peninsula. The interaction of an exotic scale insect (*Cryptococcus fagisuga*) and a native and exotic canker-causing fungus (*Nectria* sp.) cause beech bark disease. Once infected by the fungus, trees usually decline and trunks may break at canker sites.

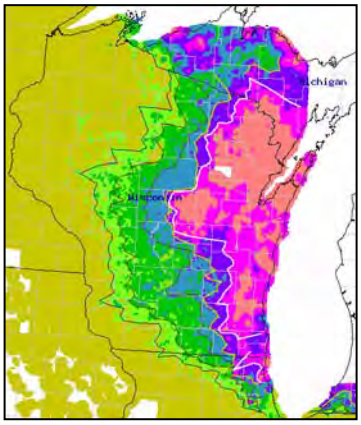
Beech bark disease is viewed as a major threat to the viability of American beech as a major forest component in the region. For more see:

http://www.na.fs.fed.us/spfo/pubs/fidls/beechbark/fidl-beech.htm



Gypsy Moth -- populations continue to move westward across Wisconsin. In addition, established populations exist all across the Upper Peninsula of Michigan. The olive or yellow area in western Wisconsin is relatively clean, with only scattered male moth catches. The brighter greens indicate where male moth captures becomes more consistent, though moth numbers in a trap are still low (1-5 moths). The blue colors indicate higher populations. Finding caterpillars in these areas is relatively easy though visible defoliation is unusual. In the red areas, the state is reporting pockets of visible defoliation, over 65,000 acres in 2003.

Wisconsin is an active member of the Slow-the-Spread (STS) program. This program attempts to reduce spread rates across the gypsy moth front. Last summer, the STS program treated in excess of 300,000 acres in Wisconsin. Much of this was done using mating disruption, the application of tiny plastic flakes impregnated with gypsy moth sex pheromone. In STS, the other common treatment is application of *Bacillus thuringiensis kurstaki*, a bacterial insecticide. The Washburn District on the Chequamegon National Forest has some treatments planned using both flakes and Btk this year.

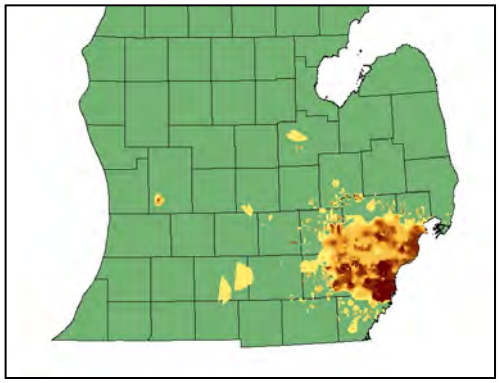


Gypsy moth trap catches in 2003. See the text for further explanation.

Emerald ash borer (EAB) was reported in southeast Michigan in the summer of 2002. Infestations in that area are extensive, covering over 3,000 square miles. Most of the ash trees in and around the Detroit metropolitan area are dead or dying. EAB appears to be comparable in its impact to Dutch elm disease. Scattered outlying populations have been found around Grand Rapids, Lansing, Saginaw, and most recently near Roscommon, Michigan. This is not far from the boundaries of the Huron-Manistee Forest. Other isolated populations have been found in Ohio, Indiana, Maryland and Virginia.

Movement via firewood or infested nursery stock is a great concern. All of our Federal lands in the region should be watchful around campgrounds and other areas where firewood could be used.

For more information on emerald ash borer see:
http://www.emeraldashborer.info/

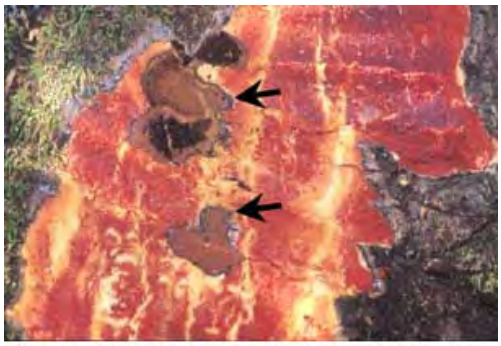


Emerald ash borer density in southern Michigan, 2003.

Our office is planning to visit and survey recreation areas on Federal lands this summer. We will be evaluating campgrounds for the presence of ash trees. Any suspect trees will be closely inspected. We welcome any reports of recently dead or dying ash, especially in and around campgrounds. Send reports to skatovich@fs.fed.us

Sudden Oak Death (contributed by Manfred Mielke, Plant Pathologist) -- Sudden oak death (SOD) is caused by an exotic fungus-like organism of unknown origin. Outside western Europe it is limited in nature to the central California coast and Curry County in southwest Oregon. It causes cankers on red oaks and leaf spots and twig blights on dozens of herbaceous plants. A Pest Alert is at: http://na.fs.fed.us/spfo/pubs/pest_al/sodeast/sodeast.htm

On March 8, 2004 it was reported that *Phytophthora ramorum*, the causal agent in sudden oak death, was confirmed in Monrovia Nursery (LA County, CA), outside the previous quarantine area. Since then two additional nurseries have had confirmed positives for SOD. Plants from these three nurseries have been shipped to all 50 states and Puerto Rico. The plants in question are principally varieties of Camellia, although Viburnum, another host genus, also has been distributed.


Black zone lines are found under diseased bark in oak.

USDA APHIS and State Departments of Agriculture have primary responsibility in tracking down these plants, called "trace-forwards". The results of the immediate trace forwards indicate about 95% of the plants had been further distributed or sold. At the time of this writing, at least eight states have had Camellias test positive for SOD. No states in our region have had confirmed positives.

APHIS and State Departments of Agriculture are conducting surveys of nurseries, greenhouses, and retail outlets. The Forest Service in cooperation with States began a forest survey in 2003 based on a SOD risk map. Risk is based on several variables including the presence of nurseries receiving plants from California, abundance of host plants, in particular *Rhododendron* and *Kalmia* (Mountain laurel), and climate. Regions that have mean winter temperatures below freezing are considered low risk areas. This was based on the requirements for growth of *P. ramorum* in culture, and may or may not be valid in nature. These surveys were conducted in the mid Atlantic states and Southern Appalachians, and no SOD was found. The survey was to be expanded to moderate risk areas in 2004, but given what has happened, a significant expansion is planned. Surveys will now be conducted in all of our states, including 30 plots each in MI, WI, and MN.

In the event that SOD is confirmed in an area, options are few. In Oregon, unsuccessful attempts have been made to eradicate SOD in an isolated forest setting. The area was clearcut and burned, however SOD was subsequently found on sprouts. Herbicides are now being considered, which complicates eradication efforts.

The host list seemingly grows weekly, and the number of states reporting positive finds from this shipment is also likely to grow. Much is unknown about the capability of *P. ramorum* to become established in eastern hardwood forests, although northern and southern red oaks have been found to be susceptible. While this appears to be akin to closing the barn door once the horses have escaped, continued vigilance and immediate response is the only hope we have to possibly eradicate an introduction. There are many websites to keep abreast of the latest developments, one with many links is: http://ceris.purdue.edu/napis/pests/sod/index.html

State Forest Health Reports…

Our state cooperators in Michigan, Minnesota and Wisconsin annually put together a report called forest health highlights. These reports are an excellent record of the major insect and disease activity within each state. Much of the information is directly relevant to Federal lands in the Lake States. They are developed in cooperation with the Forest Service, Forest Health Monitoring (FHM) program, and can be accessed at the FHM web site:

http://www.na.fs.fed.us/spfo/fhm/index.htm

Michigan highlights	http://www.na.fs.fed.us/spfo/fhm/fhh/fhh-02/mi/mi_02.htm
Minnesota highlights	http://www.na.fs.fed.us/spfo/fhm/fhh/fhh-03/mn/mn_03.htm
Wisconsin highlights	http://www.na.fs.fed.us/spfo/fhm/fhh/fhh-03/wi/wi_03.htm



Quiz…

Test your knowledge. The photograph on the left is the root system of a Scotch pine, though the same type of damage could be found on any of our young conifers. We are interested in what removed the roots. Young trees, 3-10 years old are most often damaged. Above ground symptoms of this problem include yellow or red foliage (dead trees), trees that are tipped and easily pulled out of the ground, and large mounds of sand. Below ground symptoms include missing roots, chew marks may be visible (hint) on what remains of the root system. This would be most common on sandy sites, and it seems to be more common in Minnesota and western Wisconsin. The center photo is a balsam fir twig. The needles have small swellings or what are referred to as galls. The photo was taken in early summer. Galled needles tend to drop by late fall or early winter. The photograph on the right is one of our large native moth species.

Quiz answers…

In the first photograph (left), the root system has been eaten by a pocket gopher. Pocket gophers tend to be most common and damaging in young pine stands growing in grassy open areas. We have also observed them on the Chippewa National Forest feeding on white pine root systems in small clearcuts of ¼ acre. Pocket gophers can cause substantial damage under some conditions. The center photo illustrates galls caused by the balsam gall midge, *Paradiplosis tumifex.* Midges are small flies, the larval (immature) stage develops inside the galls. The galls do cause needles to senesce and drop early. This is rarely a significant problem though it can be a problem for Christmas tree growers. The last photo (right) is of an adult Cecropia moth, *Hyalophora cecropia*. This is one of our largest native moths. The caterpillar stage feeds on many hardwoods including birch, maples and cherry.

Recommended reference books…

A good reference book on forest insects and/or diseases can be invaluable. Many are expensive and others are difficult to use with lots of keys and buggy jargon. However, there are a few excellent reference books that are relatively inexpensive and include a number of photographs that greatly aid the identification process. These include:

Insects that feed on trees and shrubs authored by Warren Johnson and Howard Lyon. This book is published by Cornell University Press and is widely available in bookstores. It includes detailed information on the vast majority of tree feeding insects as well as many mite species.

Diseases of trees and shrubs authored by Wayne Sinclair, Howard Lyon, and Warren Johnson. This book is published by Cornell University Press and is widely available in bookstores. It includes detailed information on the vast majority of tree diseases.

In addition to the two books mentioned above, the Canadian Forest Service has published a series of excellent guides that can be purchased. These include:

Insects of Eastern Hardwood Trees, by A.H. Rose and O.H. Lindquist
Insects of Eastern Pine, by A.H. Rose, O.H. Lindquist and K.L. Nystrom

Insects of Eastern Larch, Cedar and Juniper, by A.H. Rose, O.H. Lindquist and K.L. Nystrom
Insects of Eastern Spruces, Fir and Hemlock, by A.H. Rose and O.H. Lindquist

Upcoming forest health workshops…

Beech bark disease symposium, June 16-18, 2004, Saranac Lake, New York.
For detailed information visit http://www.dartmouth.edu/~mpayres/bbd/

Joint meeting of the 45TH Northeast Forest Pathology Workshop and 53RD North Central Forest Pest Workshop, June 8-11, 2004, Niagara Falls, Ontario, Canada.
For detailed information visit http://www.na.fs.fed.us/spfo/ncfpw/ncfpw04/ncfpw04.htm

Publications and resources…

Almost all of our publications are available via our home page found on the World Wide Web. This can be accessed at:

http://www.na.fs.fed.us/spfo/

Copies can be obtained by contacting our office at the address or phone number listed to the right.

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More on declines and diebacks…

Perhaps one of the most difficult scenarios to unravel in forest health is what we refer to as the decline or dieback syndromes. These are actually quite common in the region. We have had regional declines in sugar maple, yellow birch, paper birch, oaks and most recently in white spruce. Below, is a write-up contributed by Dr. Joseph O'Brien a pathologist in our Forest Health unit in St. Paul.

Decline syndromes are complex diseases caused by the interaction of many factors working together to cause branch and tree mortality in a stand. Many different models of decline have been promoted, but the predisposing/ inciting/contributing factor model (represented in the Figure on the next page) seems to make the most sense for explaining much of the decline in trees that we see in the Eastern United States.

In this model, a tree becomes predisposed to decline when factors such as genetic potential or range and climate issues affect the physiology of the tree, transforming a healthy tree into one that is "stressed," or predisposed to decline. Decline first becomes evident in such trees following an acute stress, such as a defoliation event, or a severe drought. At this point, branch mortality is usually evident in the crowns of affected trees. If the inciting stress is relieved, trees can sometimes recover, but in the presence of such agents as root rot fungi, bark beetles or woodborers, trees are likely continue to decline and eventually suffer significant mortality. Decline syndromes can be very difficult to characterize accurately, because of the complexity of the interactions of the factors involved. The decline and mortality of white spruce on the Chequamegon may yet prove to be caused by a primary agent such as a root rot pathogen or a fungus that invades and kills needles or twigs, but it is likely that the real cause of this mortality is the work of several agents working synergistically against these trees.

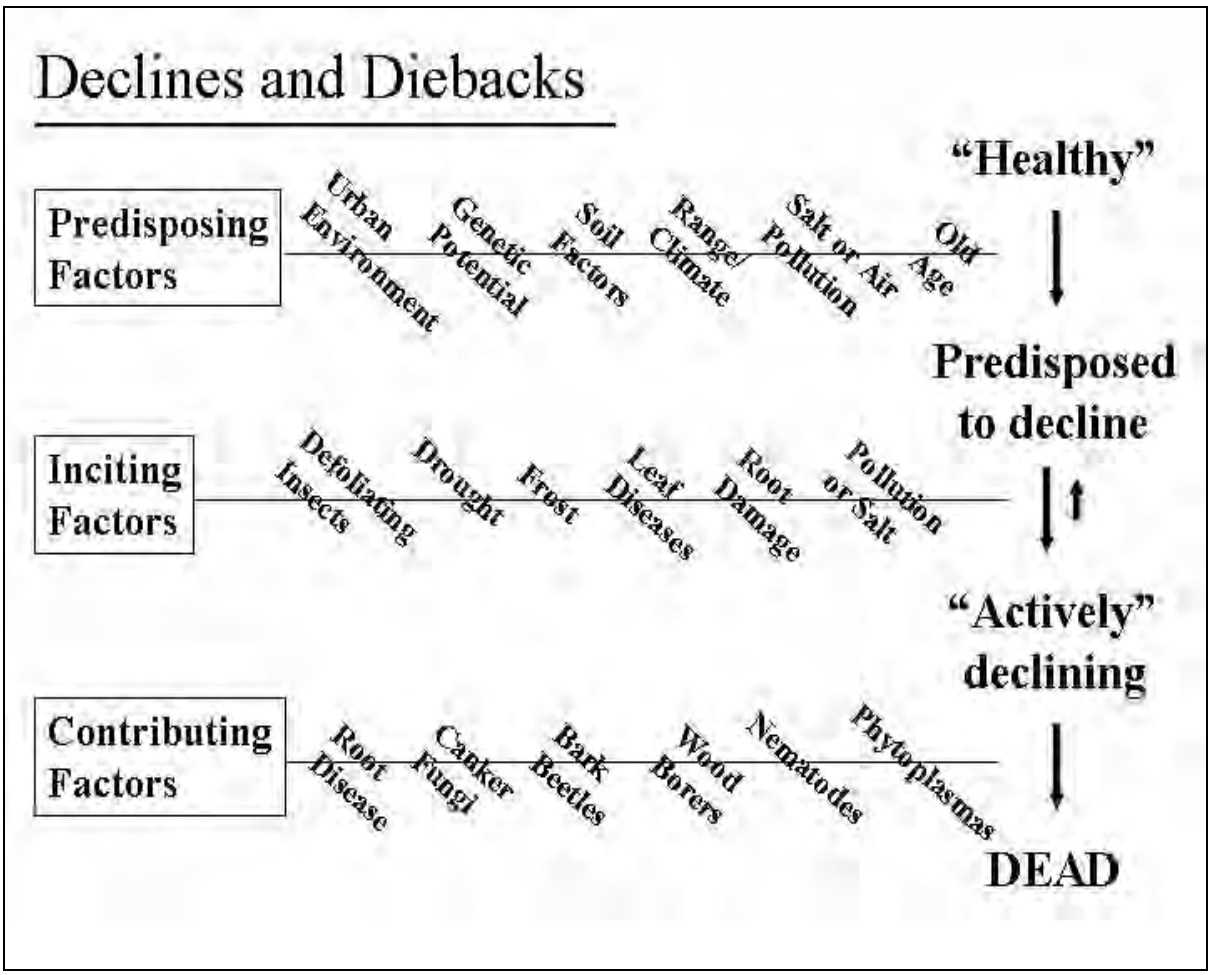

Figure. A model for explaining decline syndromes in trees.