A Concise History of Forest Health in New York -

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Introduction

My work with the New York State Department of Environmental Conservation is to monitor, record, and report forest health conditions. There is a long history of such work in New York dating from before the turn of the century. My observations and conclusions reported here are drawn from this body of work. Knowledge of forest history helps forest managers to avoid the mistakes of the past. Presented below are descriptions of some insects and diseases common to the state with emphasis on introduced pests and tree species.

A Historical Perspective

A view apparently shared by pioneers in the 1600's was that forests stood in the way of progress. Progress came in the way of agriculture and settlements. Early Dutch settlers saw shortfalls in the quality of New World timber as revealed in their council minutes. They reported those ship owners did not want the rotten timber filling the hulls of their ships on return trips to Europe. Apparently, the reference to rotten timber is descriptive of old growth, over mature trees that were growing in the region.

Peter Kalm, a European naturalist boating the Hudson River, noted the conditions of the forests in 1743. He wrote: "Everywhere the trees have never seen an axe, yet they die from the tops downward and rot from within." "Trees," he summarized, "are like animals and grow old

and die." Here, in a few words, the naturalist summed up the state of old growth timber.

Declines of forests have historically been of concern. In the late 1800's, the State Entomologist told the Board of Education that forests were declining. He cited fir declines in Europe in the 1790's, spruce mortality in Rensselaer County in 1843, and the "recent" spruce declines in the Adirondacks. His reports helped draw attention to factors other than manmade pollution in declines, for the declines came largely before tall smokestacks.

The Introduction of Pests

By the turn of the century, New York became a host of many introduced pests. The introductions, coupled with the lost of two-thirds of the forested acreage due to land clearing, raised the fear of a great wood shortage. *Gypsy moths* were reported around 1920 in the Towns of Berlin and Petersburg, Rensselaer County. It was of great concern because people equated defoliation with tree mortality and gypsy moths were seen as great defoliators. Tree climbers scraped egg masses and burned infested trees. A vast chemical arsenal was applied to stem the insect’s spread and to protect infested trees. Unknown at the time, a fungus disease of caterpillars released in 1910 was to save the day, some 70 years later. The fungus showed up in Wards Pound Ridge Reservation, Westchester County in 1987. Since its introduction, it has been found in most counties of the state and it is effective in gypsy moth control. A quarantine remains in effect. It requires outdoor household articles to be inspected and certified free of gypsy moth life stages before shipment out of the quarantine area, which includes all of New York State.

While the battle against the gypsy moth continues, the *chestnut blight* was far more destructive. American chestnut made up 25% of the trees at the turn of the century. Thirty years later, this superior species

declined and usually occurs only as stump sprouts. While resistant American chestnut is on the horizon and great strides are made in the application of sub-lethal strains of the disease to arrest lethal cankers, we are a long way from recovery of the species.

Another king among trees is eastern white pine. Its nemesis is *white pine blister rust*. It was soon discovered that the disease needed an alternate host to develop before returning to pine and killing it. Control efforts focused on the alternate hosts, namely Ribes (currants and gooseberries). Destruction of Ribes was undertaken near selected white pines. In recent times, doubt about Ribes eradication lead to discontinued control efforts. Even the quarantine prohibiting the planting of Ribes near white pines is called into question. It appears that spores from Ribes can travel great distances making Ribes free barrier zones questionable. Also, resistant Ribes are now readily available. In spite of abundant wild and planted Ribes, healthy white pine abounds. Pine growers realize that pruning the lower branch of white pine greatly reduces infection. It is hopeful that we can soon have both Ribes and healthy white pines throughout New York.

Some of our worst tree pests are introductions. The world trade fair in the 1930's is the apparent source of several destructive pests. A Stanford Connecticut entomologist noticed red pine foliage discoloration and tree mortality. The responsible insect was the *red pine scale*. For many years it appeared to spread northward. In retrospect, the northward spread may have been an illusion. As one looks, they see more. The insect apparently bumped into a cold zone and survival was nil north of northern Dutchess County. In one of the surveys, a new species of adelgid, also a killer, of red pine was found in the Town of Kent, Putnam County. As fear rose about the scale and adelgid reaching the large northern plantings and natural extensive stands of red pine, their spread ceased. To be sure, many pines died, especially on New York City watershed lands. But much of the mortality could not be attributed to the scale. The mortality occurred

across the state and far outside the range of red pine scale or adelgid. Mortality is greatest on heavy soils (clays) and poorly drained areas. Red pine naturally grows on deep, excessively drained, low nutrient sands. Typical symptoms are tufted foliage, thin crowns, branch dieback, and tree mortality. Round holes bored into wood by long-horned beetles provide the infection court for blue stain. Bark is peppered with Ips species of bark borers in declining or dead trees. The trees die from the tops downward.

The Hudson Valley is a cradle for pests. Coming out of New York City, a disease swept through the state killing American elms. Many survived. It seemed the worse was over by the early 1960's. Then, mysteriously, another wave of killings took place. This one destroyed most of the elms surviving the first wave. Scientists now know that the second wave was the result of a much more virulent form of *Dutch elm disease*. Elms will not disappear. Not even to the extent chestnuts disappeared. Rather, elms produce seeds at an early age insuring abundant young trees. When elms die off, the habitat for the elm bark beetles diminishes. With it go the vectors that spread the disease. If it were not for the introduced elm bark beetle, not so many elms would have died or at least the disease would not have spread so fast. The native elm bark beetle is less effective as a vector. Even without Dutch elm disease, elms in the Finger Lakes would be in trouble. A disease known as *elm yellows*, considered more virulent than Dutch elm disease occurs widely. As with chestnut, scientists have developed resistant elms.

Still another insect has appeared in southeastern New York, threatening a major tree species, namely, eastern hemlock. In 1987, Chuck McClure first observed *hemlock wooly adelgid* at Bedford, Westchester County. Subsequently, it has been found as far north as Clermont State Park in Columbia County, and as far west as Port Jervis in Orange County. Many individuals predicted the eventual demise of eastern hemlock. To be sure, thousands of hemlocks have

died of the effects of the insect. Tree mortality is widespread in southern Dutchess and Ulster Counties and further south in New York. Still, many trees survive. I inspected four trees in Hudson State Park south of Beacon City each year, since 1987. Two are dead, presumably killed by the adelgid. Two trees survive after ten years - far longer than anyone thought possible when the adelgid first moved into the state. At Bear Mountain State Park and Garrison across the river from the park, adelgids have taken a frightening toll. Infestations have recently been found for the first time in the Seven Lakes areas and along the Palisades Parkway. The insect continues its westward spread from the river valley. It occurs as far west as Port Jervis where it moved in from the State of Pennsylvania. Elsewhere, the adelgid has retreated. At Bard College it cannot be found even through two years earlier every hemlock was heavily infested. At James Baird State Park, no adelgids were found on over-story trees two years after a heavy infestation was observed. Only under story seedlings were infested, apparently protected by the snow. What stemmed the tide of spread? Most likely cold weather has had a major impact. The adelgid, similar to red pine scale and two introduced hemlock needle scales, appears to be cold sensitive. Laboratory tests show otherwise. Adelgids survived temperatures below what is the norm for the area. The variation in results is unknown. It points to the need for continued field observations.

Everywhere flowering dogwood grows *dogwood canker* is found. Not all dogwoods die. Many survive in a diseased state. Improving growing conditions help the dogwood to fight the canker. Using alternative varieties that are less susceptible to the canker is the preferred method of fighting the disease. At the Harriman Estate not a single living dogwood was found, even though, at the time, dead stems were strewn across the property. And in the searching for living dogwood, mountain laurels were also found dying. Tiny pupae were observed on the underside of laurel leaves. A 1930's publication revealed that white flies had infested laurel in Mount Kisco. The

identity of the pupae was confirmed. Wherever the white fly larvae were found, laurel leaves dropped prematurely. The plants appeared dead. In the over story numerous oaks had died. They had died following gypsy moth defoliation and drought. Normally, forests regenerate without being replanted. But at the estate, deer herds browse the seedlings and the as a consequence the landscape is reverting to open lands.

Another major problem needs discussion, *beech bark disease*. It too is introduced. For the disease to infect beech, it requires a wound. Unfortunately, the beech scale spread into New York, creating wounds in the thin bark beech. Nectria fungi followed. Two species are identified that invade the bark. Not all beeches die; some appear immune. Others may survive due to the work of a tiny beetle that feeds on scale eggs. American beech is one of the most common tree species in New York State, especially in northern hardwood forests. Ironically, its numbers may have increased due to the disease, because it has the ability to sprout from roots, and following the death of over story trees it sprouts prolifically.

It is wrong to infer that only exotics are destructive. The *forest tent caterpillar* is a pest native to New York State. It is far more destructive than even the gypsy moth. Its population explodes after a number of years. Why this happens is not clear. When it does, it can destroy foliage on its preferred hosts. Often, only one complete defoliation will lead to trees' death. This is unique since most trees withstand two or even three consecutive years of defoliation before mortality becomes an issue. A fly parasite brings the end to the epidemic. Unfortunately, New York has experienced vast acreage of maple killed by the insect. The most recent round of attacks and dieoff occurred in the early to mid 1990's affecting an area east of Binghamton to west of Jamestown and in another location east of Ontario Lake.

I would also like to state how *acid rain* or other pollutants affect trees. There is little conclusive evidence on the role of acid rain in forest health. Chlorine emissions near point sources kill susceptible leaves and even plants. Ozone causes chlorotic dwarf in eastern white pine. The effect of acid fogs, rains, and dry deposition is unknown on forests, but better understood in laboratory tests. A study of maples in Canada and United States showed that maple health was better in dirty air forests than clean air forests. The better health is not attributed to pollution, but rather the absence of drought and insect defoliation that happened to occur in "dirty" air forests during the study period. In a multi state study of spruce and balsam fir health in the northeast, 30 agents were identified as contributing factors to forest decline. None was air pollution, although, it was speculated that needle discoloration may relate to acids. Acid depositions (including dry and wet particulate) bear watching, but based on scientific reasons, they cannot be singled out as the reason for forest decline or death of individual species in New York State.

Threatening pests lurk just across the border. One is *oak wilt*. Found only one county away from New York, it has taken a toll on oaks throughout its range. Efforts to ascertain its presence have not confirmed it in New York. The work is required to ensure that other states and nations do not throw up protective quarantines barring New York grown oak. Such quarantines would wreak havoc on oak growers and could reduce the market and subsequently, the price of oak stumpage.

Some European pests are destructive and then subside. The Europeans strain of *Scleroderris canker* is such a problem. In the 1970's it killed hard pines in a 13-county area of northeastern New York. A quarantine regulation has been established that prohibits movement of regulated trees from the quarantine area without certification they were free of the disease. Studies have established a biological understanding of the disease. It is believed the outbreak was originally

triggered by weather conditions. The disease has now greatly subsided, but still remains a threat. Cool, wet springs and summers may result in a flare up of the disease, which is particularly destructive to hard pines.

Some tree mortality is misidentified. This was the case for many years with *white ash "decline*." Three pathogens and drought were initially identified as stressors. But in the 1970's, some decades after its recognition, scientists isolated bacteria responsible for the symptoms and death. Even more recently, scientists have shown mortality to be highest in forests divided up into a patchwork of woods and fields. This edge effect was studied by SUNY College of Environmental Science and Forestry scientists. It led to discovery of two leafhoppers that were suspected of carrying the disease. White ash is not likely to die out. It is abundant in many places. However, it is common to find upwards of 90% of the trees dead. Mortality is highest in eastern New York, presumably due to the greater fragmentation of forest land.

For many years butternut was declining in numbers. It was first attributed to a branch pathogen known as the *butternut canker*. Then a fungus was isolated from stem cankers. The cankers kill enough bark to girdle many trees. Everywhere butternut grows the canker occurs. Not all butternuts are susceptible. The risk of cutting healthy, disease resistant trees is great. Loggers observe high rates of mortality in the species. For this reason, they want to cut the trees before their value is lost due to mortality and decay. However, by cutting butternut symptom free trees, they may be removing genetically resistant trees. Scions have been collected from symptom free trees in New York and sent to the US Forest Service for grafting onto black walnut. The grafts are then replanted back in New York. Hopefully, enough grafts will survive to ensure a future supply of butternut trees. DEC has also banned the cutting of diseased free butternut on its state forests in hopes of preserving genetic material for future generations of trees.

Not all insects that are destructive overseas act the same way in the US. The *common pine shoot beetle* is such a pest. It is noted as a tree killer in Europe. So, when it was found in western New York, it was of grave concern. It is not killing trees. It kills branches and that adds up to poorer salability for Christmas trees and aesthetic losses. Its primary host is Scotch pine. A quarantine regulation regulates the movement of material deemed susceptible to beetle attacks. Surveys document the beetle in about 17 New York counties. It is spreading.

Trees that are disease free for decades may also be vulnerable. Norway maple is a preferred species to plant in cities. Its deep dark, full foliage and smaller size than many native maples made it a choice tree for urban planting. In the 1980's a large tar spot disease was observed on maples growing along the Erie Canal. It was only a matter of time before the disease spread widely from one end of the state to the other. No confirmed cases are known in the far southeast region of the state. Maples that are heavily infected drop leaves prematurely. This is especially so during cool, wet seasons. A second organism is suspected because some early leaf drop is free of the tar spot, but not of symptoms. These phenomena require further study. Norway maple is also proving susceptible to declines. On Long Island and in Erie County, to name two locations, the species is declining, presumably from drought induced stress. Norway spruce, similar to Norway maple, is also doing poorly on shallow soils. It dies from the top downward. Norway spruce declines have been observed throughout the state and affect mature trees.

A very recent decline in the tree-of-heaven is observed. It is found throughout the eastern New York in the Hudson Valley region, but not Suffolk or Nassau Counties. Samples have cultured verticillium wilt. The work is not conclusive, since some samples cultured other organisms. The dieback occurs on both fertile and infertile sites, and during wet and dry years. The tree-of-heaven is an escapee. It is generally not favored and even viewed as a weed species. On the

other hand, it is the only shade tree some people have, and even liked for the scented flowers by a few people. Its death has created much debrie and released sites to other vegetation.

Another massive dieoff occurs in an exotic. It is the death of Japanese black pine throughout Long Island. Favored for its beauty and salt resistance, the species was widely planted. Pine wood nematode and black turpentine beetles are responsible for the death of pine. A long-horned beetle carries a blue stain found in many trees in the mid to late stages of death. Native species are now favored for replacement of Japanese black pine. Red cedar is especially useful, but seeds are in short supply for nursery use. A close relative, Japanese red pine, which is also planted on Long Island, is also highly susceptible. DEC has discontinued shipping Japanese black pine to Long Island.

Another disease of an introduced species is *diplopia tip blight*. It kills Austrian pine on Long Island. The disease is so virulent that few, if any Austrian pines survive on the Island. The tree was once widely planted along parkways. Upstate, the tree fairs better. It is, however, still infected with the tip blight.

To wind up this account, the debacle of *Asian long-horned beetle* is reported on. Discovered only a couple of years ago, this resident of Greenpoint and Amityville for the past five or more years, has created quite a ruckus. Millions of dollars have been poured into destroying infested trees and replanting. Intensive searches continue to discover infested trees. A quarantine prohibits the movement of plant material out of the regulated area. Many questions are raised? Did the beetle get to New York on infested dunnage? Will it spread throughout New York and beyond? Can eradication work? Does it kill trees? If governments in cooperation with the landowners of infested trees succeed in eradicating the beetle, it will be a triumph of man over the beast. Failure most certainly will send shivers down the spines of regulatory officials and their cooperators alike. How can we engage in

world trade within increasing the risk to our plant life? This risk springs from accidental introductions of noxious pests. The history of our state is full of such introductions. Once here, many have thrived. And our forests are changed, if not forever, for many decades.

Summary

There is much to be learned by looking at historical data. There is the knowledge of the fallacy of "elm streets." Reliance on one or few species does not make sense along urban streets or for rural forests. Even the "perfect" species like Norway maple eventually ends up with some significant pest problems. Using exotic trees to substitute for native ones appears flawed in some cases. Look at what happened to Japanese black pine and Austrian pine. And bringing native trees to off-sites also leads to problems. An example is the widespread practice of planting red pine on heavy soils. It loves well-drained sandy soils. Biological controls are no-panacea. They are sometimes worth the expense, but payoffs may take decades. Recall how long the Japanese fungus took to become effective against gypsy moths. Science is held up as a hope in combating pests. It is our best hope. But science has not kept pace with introductions. Look at the chestnut blight and Dutch elm disease as examples of the limits of science. Science will produce resistance trees, but how will this resistance get into the wild and propagate? Other problems seem to pose great dilemmas. How, for example, does one deal with ash yellows that appears decline in fractured forests. The present movement is toward building in wooded areas and further dividing the forests. Many diseases are related to old age. Yet while forest health is held in high esteem, our forests are aging and becoming sicker. We need to look at this process from a different perspective accepting that rot and breakage is normal for old age forests.

Will forests die out? An emphatic no! Forested acreage has actually nearly doubled in our state since the 1800’s. The forests are probably

becoming sicker as they grow older and more introduced pests are added. Using lessons of the past, we could go far in helping grow healthier forests. For this reason, the documentation and reporting of forest health conditions is a worthy endeavor.

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