

**POTENTIAL IMPACT OF RECENT INVASIVE INSECT SPECIES  
ON THE CONCORD CITY FORESTS  
January 27, 2016**

**INTRODUCTION**

FORECO has been retained by the City of Concord since 1987 to assist the City with its Forest Management program on City-owned lands. Most of FORECO's involvement has been on City Forests, but occasionally get involved with projects in the City Parks and other recreation areas as well as private land with Conservation Easements where the City has a deeded interest.

Recently, the Concord area has been subject to invasive species that will have a major impact on the tree populations within the City. The species include the Hemlock Woolly Adelgid, the Red Pine Scale and the Emerald Ash Borer. All three species are fatal to the infected trees though it may take several years for the trees to succumb after the initial infestation. Of the three, the Woolly Adelgid is the most treatable, mainly by "painting" the tree trunks with an insecticide. The Emerald Ash Borer can also be treated by an insecticide, but involves an injection system which can be expensive over time and is usually focused on trees of historic significance or where the cost of removal outweighs the cost of treatment. Some predators of the Emerald Ash Borer have recently been released in the Concord area by the New Hampshire Division of Forests and Lands Forest Health Program, but it is too early to assess any results. There are no recommended treatments for trees infested with the Red Pine Scale, though small ornamental shrubs could be treated with certain pesticides. Unfortunately, many of the red pines in the Concord area are found in groups that were planted for either aesthetic or reforestation purposes and the red pine scale spreads very rapidly in such situations. In 2015 it became apparent that many of the ornamental red pines along Interstate 93 and the red pine plantation at Rollins Park were infected with the red pine scale which led to a meeting in January 2016 attended by several City Departments to address the infected tree issues within the City.

**POTENTIAL IMPACTS TO CITY FORESTS**

**Hemlock Woolly Adelgid**

This small, wingless, sap-sucking insect attaches itself to the base of the hemlock needles and literally sucks out the nutrients carried in the water/sap as part of the tree's evapotranspiration process. A heavy infestation will eventually defoliate the tree which stops the photosynthesis process and kills the tree. In the past, frigid winter weather had kept the Adelgid from moving into New Hampshire, but warmer winters due to climate change have allowed the Adelgid to move north and it has become established in southern New Hampshire. A small infestation was found on the Penacook Lake watershed along District 5 Road in 2014. The Division of Forests and Lands Forest Health Program personnel treated the site but some Adelgid was again found there in 2015. The State will look at the site in the Spring of 2016, but numerous infestations recently found in Merrimack County appears to mean that the pest has now become established in central New Hampshire.

Hemlock is considered a low value timber species in today's markets and has been for quite some time. Demand for hemlock pulp periodically spikes and there is a temporary increase in value, but it has never been sustained for very long. However, hemlock has tremendous value as winter shelter for a variety of wildlife species including deer, rabbit, ruffed grouse, turkey and smaller songbirds. There are many Stands of hemlock found throughout the City Forests, though the pure Stands tend to be located on wetter sites or on the northern aspect of steep hillsides. Hemlock Stands found on drier sites are typically managed for wildlife habitat with emphasis on trying to keep the live crowns close to the ground through timely thinning and the removal of non-hemlock species that do not produce nuts or acorns. Wet sites are avoided in harvest operations on City land to protect the watersheds so hemlocks found in those sites are usually left un-cut. Scattered hemlock stems found in upland areas are often left to promote forest diversity. As a result, the loss of hemlocks due to the Woolly Adelgid will have a minor economic impact to the City Forest program, but will have a major impact to wildlife habitat. White pine is the softwood substitute for winter habitat in the Concord area, but the limbs of white pine are not as stiff as hemlock and cannot hold the snow in the same way hemlock limbs do. As a result, white pine is a poor, but unfortunately, the only substitute for the winter cover currently being provided by hemlock. White pine regeneration should be encouraged on the City Forest lots to make up for the potential loss of hemlock cover.

## **Red Pine Scale**

This insect attacks the tree in a manner similar to the Woolly Adelgid, but then allows another insect, the turpentine beetle, to infest the weakened tree and bore into the tree trunk causing staining of the wood, making it worthless for sawtimber. Although red pine is native to the area, it was a relatively minor species and typically quite scattered throughout the County. When many local farms were abandoned in the early 1900's the white pines that grew into the fields created pure Stands that were susceptible to the white pine blister rust fungus and the white pine weevil. As a result, red pine, which is susceptible to neither, was planted as a substitute for white pine. Unfortunately, it was eventually discovered that the *fomes annosus* fungus infected red pines. The plantation scenario provided ideal conditions for the spread of the disease and many red pine plantations became infested after they were thinned. It also turned out that the red pine lumber was much less desirable than white pine lumber. Eventually, planting red pine was discontinued or limited to aesthetic uses such as ornamentals or for buffer zones.

There were several red pine plantations on the City-owned lands but until the mid to late 1980's when the wood energy industry started in New Hampshire, there was not much of a market for small diameter red pine stems. As a result, the plantations were not thinned and tended to be heavily overstocked. Trees tended to grow fairly tall, but often remained small in diameter. When such stands are thinned, the residual trees tend to bend over. For this reason, a very remote red pine plantation located on the east side of Penacook Lake was clear-cut in 1989. The plantation behind the Waste Water Treatment Plant on Hall Street and another on the Penacook Lake Watershed along Hutchins Street were both thinned in the early 1990's. The Hall Street plantation was again thinned in 2006 when it was noticed that it had become infected with *fomes annosus*. The Hutchins Street plantation was thinned in 2010 and is so far disease free, though it has had several blowdowns. The plantation off of Hall Street became heavily infested with both the *fomes annosus* fungus and the red pine scale around 2013 and was clear-cut in 2015. It was discovered in the summer of 2015 that a red pine plantation that was located on the tract of land north of West Locke Road that the City

recently acquired from UNITIL in a land swap was heavily infected with the red pine scale and had already suffered some mortality. The remaining red pines were harvested in conjunction with an adjacent agricultural field improvement operation. The plantation along Hutchins Street is being monitored and will be clear-cut if and when it becomes infected. A basal area variance will need to be obtained in order to clear-cut the pines along the road and the process is easier after the Stand becomes infected. Whereas red pine is considered a low to medium valued species and is now limited to the plantation on Hutchins Street, the loss of the species will have a very minor impact to the City Forest program. However, it will have a major impact to the ornamentals planted within the City's parks and along local roads and highways. Not only will the aesthetics be lost, there will also be an expense to remove and replace those trees. There may be enough volume in the Rollins Park plantation, especially if the adjacent white pine plantation is also thinned, to cover their removal costs.

### **Emerald Ash Borer**

The Emerald Ash Borer was found in Concord in 2013 and early hopes that it was a very limited infestation proved to be short-lived. Subsequent investigations found infestations throughout Concord and several surrounding Towns. The Ash Borer lays its eggs in the bark of the three ash species (White, Green and Black) found in the Concord area. As the eggs hatch, the larvae eat the cambium layer just under the bark and eventually girdle the tree preventing the passage of nutrients. Of the three species, white ash is the most valuable and is considered medium to high in value. It is mainly found on damp sites and in drainages. White ash had already started to decline in the area due to the "ash yellows" disease, which is one reason the Ash Borer was not noticed as quickly as it had been in other parts of the Country. White ash makes up a very small component of the City Forests and is often associated with riparian zones where harvesting is restricted, though scattered stems can be found on upland areas. Unfortunately, white ash has been planted throughout the City proper for ornamentals and shade trees. Green ash is limited to the floodplain along the Merrimack River and is part of a floodplain forest ecosystem that also contains silver maple and American elm, though most of the elm has since died off from the Dutch elm disease. The Federal Flood Control program has minimized flooding along the river which has allowed some of the upper floodplain zones to start to "dry out" and allow upland species such as oak and white pine to migrate into the floodplain and outcompete the green ash and silver maple. Green ash and silver maples also need periodic flooding to encourage regeneration of those species and the flood control program has greatly reduced the regeneration rates of those two species. However, the river corridor is also heavily infested with the Asian bittersweet which has killed off many of the trees that the vines have entangled. More trees have probably died from being overwhelmed by the bittersweet than by the ash borer. The City owns several tracts along the Merrimack River that contain green ash, though the stocking levels of the ash vary greatly. Lastly, black ash is fairly rare in the City and limited to bog-like ecosystems. Because black ash is found in bogs and seldom grows to sawlog size, it is not considered a timber species.

Whereas white ash tends to like wetter sites or is found along streams and wetlands, very little has been harvested on City Forests in order to protect the riparian zones. But since the discovery of the Emerald Ash Borer, white ash has been marked to be harvested as part of the more recent City Forest timber sales as long as their removal does not negatively impact wetlands. To date, harvested white ash volumes have been quite minimal due to the low overall stocking in the uplands on City Forests.

There are six large City-owned tracts of land along the river. Four are City Forests and include Healy Park, located on the west side of the river between Manchester Street and Loudon Road; Knight-Morono Park located on the west side of an old river meander on the south side of Second Street; Oxbow Bluff Open Space located on the south side of another old river meander north of Garvin Falls Road; and lastly, the Marge Swope Greenway (so-called) located on the east side of the river between West Portsmouth Street and Garvin's Falls and contains forests, wetlands and leased cornfields. There is tract of City land located on the east side of the river between Manchester Street and Loudon road that contains Terrill Park on the south end and leased cornfields on the north end. The last tract of City-owned land along the river contains the City's Wastewater Treatment Plant and leased cornfields. Heavy stockings of green and white ash can are found in Healy Park and Terrill Park. The other parks and City Forests along the river contain both white ash and green ash, but not in significant quantities as most of the terrain is well above river flooding.

The Division of Forests and Lands Forest Health Program has set up an Emerald Ash Borer infestation study site at Terrill Park. They have created an entrapment site in an un-used part of the Park and have treated ash trees in the more developed portions with an insecticide. Program Administrator Kyle Lombard has requested that the ash trees be left alone in the Park unless they become hazardous. The Program has also released insect predators of the Emerald ash borer in the Concord area. It is too early in that study to assess the results, however, the intent of the predator release is to build up the parasitoid population enough to slow the spread of the ash borers to outlying Towns, not to stop the outbreak in Concord.

Healy Park is the only City-owned tract with commercial quantities of green and white ash, most of which are infested with the Emerald Ash Borer and Asian bittersweet. Some infested ash trees within the Interstate 93 right-of-way have already been cut and removed by the New Hampshire Department of Transportation (DOT) as the stems had died and were posing a potential threat to traffic. Basically, all of the ash within Healy Park should be harvested and will produce both firewood and sawtimber. This may require a Basal Area variance to cut over 50% of the basal area along the highway and the Merrimack River. Fortunately, there are probably enough silver maples to prevent the site from looking like a total clear-cut and some areas that are heavily cut may open up views of the Merrimack River. The highway right-of-way boundary is not marked by a fence in the northern end of the Park as it is at the southern end, so there will have to be some coordination with the DOT. Warning signs may also be needed along I-93 on the days when the trees are cut near the highway right-of-way to prevent motorists from being startled by falling trees. The City's sewerage interceptor line and associated service road runs through the lot and needs to be protected during harvest activities. The wetlands found on the lot are part of the seasonal floodplain and may be difficult to harvest unless they are extremely dry or frozen. Access to the lot itself runs under the Manchester Street bridge and that route is flooded when the river rises. In order to maintain the legal bridge clearance of 13.5 feet for the access road underneath the bridge, the grade was lowered under the bridge, bringing it below the typical riverbank elevation causing it to flood when the rest of the floodplain remains dry. Any build up of snow or ice under the bridge in the winter months will make that route unusable for logging trucks. As a result, the harvest should be limited to mid-Fall when the chance of flooding rains is less. Trucking quarantine restrictions on ash logs are eased after October 1, so any Fall-time harvesting should only occur after that date.

Whereas Healy Park is also an arboretum of invasive species, any harvesting should require that the cutting and skidding equipment be steamed-cleaned before leaving the site. Once the ash trees are cut, there will be a tendency for invasive species, especially the glossy buckthorn and bittersweet, to dominate the forest openings created by the tree removal. An invasive species control program should be set up before the ash harvest to address the potential increase of invasive species after the harvest. The most effective way in dealing with the invasive species found on the site is herbicides, which may take several applications to be effective. Removing the invasive species could make this riverside Park more attractive for walkers, hikers and bikers, especially if a sidewalk is built through the Park to connect Manchester Street with Loudon Road as part of the Interstate 93 widening project through Concord. The NH Department of Transportation should also be contacted about the project to see if any City land within the park is planned to be cleared for the wider highway and if the clearing could then be incorporated with the ash tree removal.

## **GENERAL CONCERNS**

There have been many hours invested in blazing and painting the boundaries of almost all of the City Forest lots. Well identified boundaries limit the City's forest management activities to the intended tract and helps prevent encroachments on the part of the abutters. Unfortunately, hemlock and ash trees often dominate the wetter sites and are therefore the trees most commonly blazed to mark the boundary in those sites. Loss of those species may require additional boundary maintenance to blaze other species, such as red maple, to prevent the current boundary lines from being lost.

Another concern is the City's extensive formal network of hiking trails found throughout the City Forests and occasionally on private land. Numerous hemlocks and scattered ash trees can be found along many of the hiking trails, though seldom in the volumes needed to set up a separate salvage harvest. As a result, trees that have become infested along the trails and around trailhead parking lots should be monitored for their hazard potential. Also, if groups of trees along the trails die off, the additional sunlight on the forest floor will encourage shrub growth and forest regeneration. This will then require more frequent "brushing" of the affected trails until the forest canopy closes in and once again shades the trails. In the past, such trail maintenance has been done by volunteers from the Trails Committee as well as paid FORECO personnel.

Respectfully submitted,

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