

Northern white-cedar regeneration: *promise and problems*

A field tour of sites at Michigan State University's
Upper Peninsula Tree Improvement Center
6005 J Road, Escanaba, MI

Conducted on August 20, 1997 by Ray Miller

This document and others are available on the Internet at <http://forestry.msu.edu/upfor/>

Summary

Northern white-cedar was part of the landscape of Michigan's Upper Peninsula long before Europeans settled the area. It still forms about 10% of the commercial forests in the region, and is the most numerous type of tree in the central U.P. This species makes a vital contribution to the well being of watersheds, wildlife habitats, and forest industries in the U.P. Cedar can live a long time (we have found trees up to 316 years old), it has a remarkable ability to surviving in the shade (we have found 80-year-old trees that are only 11' tall), and it grows on a wide range of sites (from limestone cliffs to deep swamps).

Cedar forests have thrived here from prehistoric times until recently, when they have fallen on hard times. The forests we see today are the result of widespread logging at the turn of the century. Cedar regenerated well following these cuts and until about 1945 when regeneration failures began to occur. Research to understand why this is so and what can be done about it has been underway, on and off, throughout the last 50 years.

On this tour you will visit some of the cedar research areas at Michigan State University's Upper Peninsula Tree Improvement Center in Escanaba, MI. You will see that many factors effect cedar regeneration -- some that are well understood and others that are still a mystery. You may conclude that solving some of the problems may require a great deal of public education, political will, and time.

STOP #1 -EXCLOSURES.

White-tailed deer and snowshoe hare both use northern white-cedar as food in the winter. At this site browsing animals have removed all of the cedar leaves they can reach. The only foliage that's left on small trees is either higher than deer can reach, below the snow pack in winter, or in parts of the site where deer can't go. What you see here should be no surprise -- but shows what can happen when deer or hare populations grow large.

Deer have been prevented from reaching cedar trees at this site in three ways:

- ❑ Plastic tree shelters are shown in the foreground.
- ❑ An 8'-tall woven wire fence was constructed where the man is standing.
- ❑ An area where the older trees of the site blew down in a windstorm is visible in the background. Because deer cannot move around in the blow-down area it acts like a natural enclosure.



A variety of deer exclosures are being tested in Escanaba, MI

(UPTIC photo)



A 7-yr-old cedar grows well in this shelter (UPTIC photo).

Plastic Tree Shelters

These plastic tubes act like mini-greenhouses to increase growth and to protect small seedlings from animals. The tree at the left is healthy and has grown 4 feet in seven years -- which is pretty good for a cedar. The one at the right has only grown 2 1/2 feet during that same time and has a lot of dead foliage. Most trees we planted in these tubes died back like this, and many did not survive at all. These tubes keep the deer from browsing the seedlings, but have caused other problems on our site.



With the tube removed, you can see that the top of this cedar is dead (UPTIC photo).



An 8'-tall woven wire fence is effective but expensive (UPTIC photo).

Wire Fences

Woven wire fences can be built to exclude deer from young cedar trees. This fence is 8' tall and encloses a small area but others have been built to enclose areas up to 100 acres. This type of fence is very expensive so other designs have also been tried. We have some electric fences on this station that are cheaper to build and fairly effective at limiting deer browsing.





A protected tree grows 6 ½' in 7 years (UPTIC photo).

The effect of browsing deer is obvious when trees planted inside the fence are compared to those that were planted outside. After seven years, protected trees (like the one on the left) have grown up to 7' tall while unprotected trees (like the one on the right) are either dead or are short and stubby – hiding below the snow during the winter. Although we will see an exception to this rule at our next stop, stories like this can be told almost anywhere in the central U.P.



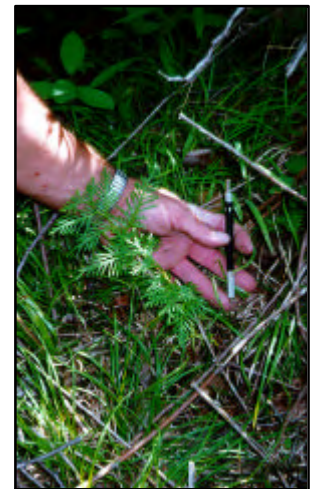
An unprotected tree is less than 1' tall after 7 years (UPTIC photo).

Natural Exlosures

When cedar grows on wet soils like this one, it is susceptible to tipping over in high winds or under heavy snow loads. When groups of trees tip over, a tangle of trunks and branches occurs that is all but impassible for large mammals like us and like whitetail deer. Just such an area occurs at the back of this site. You can see from the picture that this is not a place for a casual stroll. As a result, deer have been excluded from this area and small cedars are becoming established – unmolested amid this jumble of tree trunks. Deep snow may also exclude deer from some cedar stands in the northern U.P. Getting cedar to regenerate has never been a problem at the DNR's Cusino Wildlife Research Area in Shingleton where they get about 300" of snow each year.



Blown over trees produced this jumble of brush that excludes deer (UPTIC photo).



Small cedars grow amid the brush pile (UPTIC photo).



STOP #2 -CARRYING CAPACITY, MIGRATION, AND PALATABILITY

At the first stop we saw a place where deer are preventing small cedar seedlings from developing into larger trees. We don't know exactly how much of the U.P. has this problem, but most agree that the area is large. We also know that there are places today where cedar can be regenerated easily, like along US Route 2 near Gulliver, and on the limestone cliffs around St. Ignace. There are also places where cedar has regenerated well in the recent past, as we will see at Stop #4 today. To explain these two situations we could speculate that either:

1. Cedar can regenerate when there aren't enough deer to eat it all, or
2. The only cedar that regenerates is the type that deer don't like to eat.

Following the first hypothesis, many people say that we could solve the cedar regeneration problem simply by reducing the number of deer. Maybe so, but how many deer is "*too many*." We don't have the answer to that question and no work is being done to answer it. Further more, suppose we agree on a population number, how do we get the deer to stay where *we* want them rather than wandering off to where *they* want to go?



Deer have eaten all the cedar foliage they can reach in the swamp at the edge of this field (UPTIC photo).

choice. A single study done by the DNR in 1958 suggested that deer prefer cedar grown on swamp soils to cedar from upland soils but no research has been done since then. It might be possible to find and plant cedar that deer don't like to eat.

Even if we plant bad-tasting cedar everywhere, we will have to deal with the first hypothesis eventually. Deer may not prefer to eat the cedar in this patch today, but you can bet that if they get hungry enough they'll eat it anyway. Sooner or later we will have to know how many deer is "*too many*."

This stop provides evidence that the second hypothesis can explain some of what we see happening. On one side of this field we can see that deer browse the area heavily. The photograph at the left shows that all the foliage within 5 ½' of the ground has been removed from the trees in the swamp at the edge of the field – just like at Stop #1. A curious thing happened on the other side of the field though. The photograph below shows a nearby patch of unbrowsed cedar seedlings growing in a small opening on upland soils. Even though several deer trails run directly through the patch, the seedlings are doing well. Although there are enough deer to eat all the cedar on one side of this field, they don't touch the cedar on the other side. It seems the deer are making a



Deer have avoided eating this cedar, growing on upland soil, at the other side of the same field (UPTIC photo).

STOP # 3 - STAND STRUCTURE AND DYNAMICS.

Cedar forests cover vast areas of the Upper Peninsula. Many of them are like the one at this stop. Together with the US Forest Service and Michigan Technological University, we began studying these forests three years ago to understand how they became established and grew. Dr. Eric Heitzman dissected over 1,100 cedar trees at 33 study sites in 11 forests throughout the central U.P. He counted and measured rings from the top to the bottom of each tree and was able to reconstruct the development of each forest.



Collecting disks from cedar trees for analysis (UPTIC photo).



Dr. Eric Heitzman ages cedar trees (UPTIC photo).

In this forest at UPTIC, Eric found a few trees that are 130 to 200 years old. These are remnants of the forest that was here prior to a logging operation that probably occurred around 1895. Maybe these were the small or deformed trees that the loggers didn't want. The rest of the trees here became established between 1895 and 1940. As you look at this area you will see many 1- or 2-year-old seedlings (like the ones in the picture below). What you don't see are large seedlings or saplings like the ones at our last stop. In fact there are no trees here that are younger than 57-years-old!

Something has changed since 1940 that is preventing new cedar from joining this stand. This same pattern is repeated over and over again in mature cedar forests throughout the region. Small fences, like the one in this area, have been erected in all 33 of Eric's study sites to quantify the extent to which deer are responsible for this regeneration failure.



New cedar seedlings start growing on an old stump (UPTIC photo).

STOP #4 - MICROSITES.



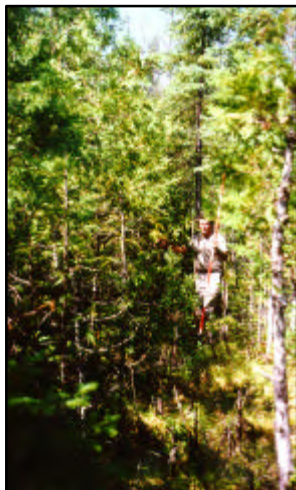
26 years after a clearcut, cedar has regenerated well at the near end of this lane but poorly at the far end - 600 feet away (UPTIC photo).

This last stop on our tour is in a swamp area that was clearcut about 26 years ago. Joe Housman, a local high school student, discovered an interesting trend here. Cedar makes up over half of the stems on the north side of the new forest, pictured at the left. As we travel south along this 600' lane, cedar becomes less abundant and nearly disappears from the forest. Rod Chimner (a graduate student at Michigan State University) studied this gradient to see what's causing it.

He looked for changes in: Elevation, deer use, soil depth, groundwater chemistry, and water table levels but didn't find any. Rod finally discovered that as you go from north to south in this forest the ground changes from being bumpy to being fairly flat. As you walk through the site you will instinctively try to step from bump to bump and avoid low, wet spots. Cedar apparently does the same thing - seeking out the highest ground.

At the north end of the lane, 81% of the ground is above water in the spring (...is a bump...). Here, cedar makes up about 50% of the stems and shrubs make up only about 7%.

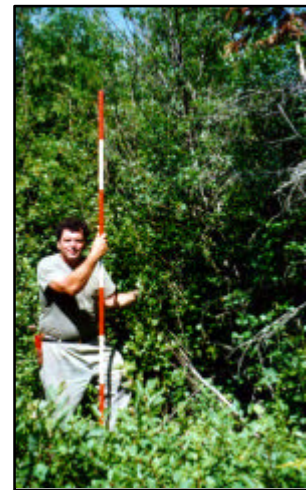
At the south end of the lane, 50% of the ground is under water in the spring. Down there 60% of the stems are shrubs and hardwoods and only 5% of the stems are cedar.



Cedar dominates areas with numerous high spots (UPTIC photo).

The amount of land that rises above the water in spring can be effected by changes in site drainage. When beaver dams, roads, or railroads are built, water movement often changes and has far-reaching consequences. You can frequently find places along highways and roads where all the trees have died from excessive flooding. The situation here is not as severe as that, but it is dramatic.

Another factor effecting the number of high spots is the natural process of settling that goes on in these swamps. Big mounds, like the ones caused by windthrow at Stop #1, gradually settle into the swamp and are lost over time. When trees are harvested, no new mounds are created. Meanwhile, old mounds continue to settle, flattening the sites. It may be necessary to create mounds artificially to sustain the cedar resource in places like this.



Shrubs dominate areas with numerous wet spots (UPTIC photo).

Main Points To Remember:

- ❑ Northern white-cedar occupies a large part of Michigan's forests. It is the 4th most common type of forest in the state.
- ❑ Cedar was widely cut and regenerated well at the turn of the century, but problems have developed in the last 50 years or so.
- ❑ Cedar is long-lived and flexible so we have time to fix the problems, but we probably shouldn't wait another 50 years.
- ❑ In many places, deer eat all the new cedar seedlings before they can become part of the forest.
- ❑ Cedar does regenerate well in places like blow-downs and high snow areas where deer are excluded for long periods.
- ❑ Building exclosures is expensive. Reducing the herd size is difficult.
- ❑ Deer moving from one area to another make it difficult to predict where the next problem will arise.
- ❑ Deer avoid eating some types of cedar growing on upland soils.
- ❑ Cedar prefers to grow on high spots or mounds in the swamps. When these sites are flooded or subside, cedar does not regenerate well.
- ❑ For more information about northern white-cedar, visit Michigan State University's U.P. Forestry site on the World Wide Web at:

<http://forestry.msu.edu/upfor/>

