FOREST MANAGEMENT

GUIDE

FOR

NORTHERN WHITE-CEDAR

COVER

TYPE

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
Historical evidence suggests that many present day cedar stands resulted from wildfire that burned through uncut old growth stands or later in slashings created by logging. One study by Verme and Johnston in the Petrel Grade deer yard near Shingleton, Michigan, confirmed that fire favors white cedar regeneration. Fire apparently helps to regenerate white cedar by:

- consuming slash and other debris,
- exposing seedbeds of more decomposed organic soil,
- eliminating advanced reproduction of other conifers, and
- by killing or setting back existing hardwoods and shrubs.

Fire also helps to recycle important nutrients (e.g., K, Ca) found in organic debris, and

- by blackening the soil, creates warmer surface temperatures that allow northern white cedar seeds to germinate earlier and establish deeper roots prior to the hot summer days when these soil surfaces dry out. Fire will also favor spruce and discourage sphagnum and lowland brush.

The Petrel Grade study also showed that burning is not always necessary. Good regeneration occurred after clearcutting on soils with high PH and adequate advance regeneration (e.g., 100,000 seedlings per acre) when slash was left as felled. Burning may also not be necessary in areas that have demonstrated the ability to seed-in naturally following strip cuts or small block cuts. These areas are usually located on sites that are relatively well-drained, consisting of finely granular, neutral to slightly alkaline mucks with little, if any, hardwood species in the original stand.

Broadcast burning of slash may be beneficial following clearcutting where:

- there is little or no advance cedar regeneration,
- thick slash deposits will occur,
- a thick blanket of loose, feather moss is present,
- a heavy component of deciduous brush or hardwood sprouts is present, and
- the site may naturally convert to less desirable balsam fir or other conifers.

Where hardwood competition is anticipated to be a problem for conifer regeneration, burning may be avoided if the hardwoods are cut or killed at least 5 years, and preferably 10 years,
before clearcutting. The shade provided by overstory conifers should cause the inevitable stump sprouts and root suckers to die if the basal area of conifers is kept high. Any significant hardwood competition that did not die should be killed with herbicides the year before final harvest.

A commercial thinning operation to eliminate hardwood competition and other softwoods will necessitate the removal of some cedar as modern logging equipment is wide and needs room to move through the stand. The stand marker should be considering felling space and skidding routes when marking a cedar stand for a removal thinning, while keeping in mind leaving as much basal area of cedar as possible and practical.

Northern white-cedar slash, whether pure or mixed with other conifers, can be burned safely and effectively on organic soils. A good burn and successful regeneration should occur if the following guidelines are followed:

(1) Lay out 4 chain by 4 chain cutting blocks. Clearcut blocks of this size should not need to be seeded as the entire clearcut is within the seeding range of cedar. In one study, Nelson recorded the distances that cedar seeds from the cardinal directions as follows:

<table>
<thead>
<tr>
<th>Direction</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>93 feet</td>
</tr>
<tr>
<td>West</td>
<td>158 feet</td>
</tr>
<tr>
<td>South</td>
<td>80 feet</td>
</tr>
<tr>
<td>East</td>
<td>143 feet</td>
</tr>
</tbody>
</table>

Larger burns would be more efficient and cost effective to carry out. However, these would generally result in fairly expensive artificial regeneration requiring seeding or planting. Blocks of the size recommended ensure a reliable source of natural seed.

(2) If larger cutting blocks are desired, artificial seeding should be used to supplement the inadequate cedar seed supply in the interior of the burns. Cedar seed should be applied at a rate of 1/8 to 1/4 lb. per acre, assuming a 75% viability.

(3) Cut all stems 1 inch and larger to produce a complete clearcut.

(4) Main skid trails should be located on the edge of the cutting rather than through the center.

(5) Cutting specification should require that slash is evenly distributed over the entire cutting.
(6) A 20 ft. wide slash-free alley should be cleared around the perimeter of the cutting block to contain the fire. This slash removal work could be written into the harvesting contract.

(7) If seed trees are left, a 30 ft. wide slash-free alley should be cleared out around each tree. This practice is not encouraged, however, because of the ease with which these trees ignite and the high cost of clearing these patches.

(8) Burn the slash in July or August following the cutting. A prescribed fire severe enough to kill residual hardwoods and shrubs or to improve moss seedbeds requires drier and hotter conditions than a burn designed to consume slash or kill residual conifers. Burning should be done under the following conditions:

<table>
<thead>
<tr>
<th>Time or Weather Variable</th>
<th>Average Burn</th>
<th>Severe Burn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time since rain (&gt;0.1)”</td>
<td>3 to 10 days</td>
<td>(\geq 7) days</td>
</tr>
<tr>
<td>Minimum relative humidity</td>
<td>30 to 60 percent</td>
<td>45 percent</td>
</tr>
<tr>
<td>Maximum air temperature</td>
<td>60° to 90° F</td>
<td>(\geq 80°) F</td>
</tr>
<tr>
<td>Maximum wind speed</td>
<td>5 to 15 mph</td>
<td>5 to 15 mph</td>
</tr>
</tbody>
</table>

**Fuel Moisture**

- 1 hr. time lag: 5-9%
- 10 hr. time lag: 7-13%
- 100 hr. time lag: 13-20%

**Fire Behavior**

Backing fire - against wind
10’ average flame lengths

**NOTE:** *A more reliable way to measure burning conditions for cedar swamps will need to be investigated. In the Petrel Grade deeryard burns, for example, despite intense heat, the moss/litter (seedbed) component only burned to a maximum depth of \(<3\) cm (1.2 inches) with an average of \(1.4\) cm (\(\frac{1}{2}\) inch). More precise parameters will be obtained after more burns are accomplished.*

(9) Burn when conditions will ensure consumption of most slash less than 1 inch in diameter.
(10) Burn square shaped cuttings using the downwind-corner set method with torch carriers starting at the same corner downwind and proceeding slowly at equal speed in opposite directions until they meet at the furthest upwind corner of the cutting.

On mineral soils, broadcast burning should be severe enough to expose mineral soil. Local conditions and experience may indicate, however, that mechanical ground preparation such as scarification is more efficient than burning.

Regeneration counts should be delayed 3 to 5 years as a minimum after the burn. White-cedar seedlings are inconspicuous and subject to high mortality. If the resulting regeneration is not adequate (e.g., <60% stocking), hand planting of nursery stock may be necessary. Containerized stock is recommended; however, this stock must be planted early in the summer to allow the roots to grow and stabilize the tree. If not stabilized and deer browse on them in the Fall, experience has shown that many of the trees will be pulled completely out of the ground.

In areas that have demonstrated adequate regeneration without burning, the strip clearcut system can also be used. Cut alternate E-W strips, 66 to 100 feet wide, and scatter the slash. Windrowing slash should not be allowed. Once adequate regeneration is established, remove adjacent strips but leave an apparently wind-firm cedar tree as a seed source approximately every 66 feet within the strip.

Continued success, once adequate white cedar regeneration is established, largely depends upon minimizing the impact of deer. If the swamp is large, it may be desirable to schedule regeneration cuts in several compartments each winter to distribute the deer herd evenly and reduce browsing pressure in any one area. Normally cutting will be done only during winter months, unless economic feasibility dictates it can be done during another time of the year and a regeneration cut is of such overriding importance that the winter browse in tops can be sacrificed. It is important that cutting within each swamp complex be carried out each year. The management of the entire swamp could also be jeopardized because planned annual cuttings may not provide sufficient browse for deer if populations increase. Cedar regeneration could be over browsed and killed before being able to outgrow the reach of deer. In these cases cedar regeneration should be fenced to exclude deer. Various exclusion designs are now in place or will be built in the near future. A recommended design will not be listed at this time until those in place can be studied for effectiveness and comparative costs.

Cedar stands which do not have yarding deer in or near them have the best chance to regenerate to cedar. Even though deer do not actually yard in the stand, if the stand is close to a yard fall browsing prior to going into the core yard may be enough to eliminate cedar regeneration. Since cedar can take over 20 years to grow out of reach of deer, a higher population can develop before the trees are tall enough and the stand can be lost even though at the time of regeneration cut there were no wintering deer in the area. To help alleviate this potential problem, a swamp complex should be regenerated within a few years so all the
cover in an area is eliminated. If the herd unexpectedly builds up to the point where it could overbrowse the cedar regeneration, the lack of thermal cover in the area will encourage the population to move to another area in the early winter, thereby taking browsing pressure off of the regeneration.

Cedar stands within areas of heavy snowfall, e.g., the Lake Superior watershed, have the advantage of deep snows to protect the regeneration during much of the yarding season. If cutting takes place every year in the swamp, the deep snow and the browse on the ground will work hand in hand to protect regeneration in previous years cuttings.

Stands that are primarily cedar, e.g., 95% cedar and 5% black spruce, tamarack and balsam fir, can be thinned. Many cedar stands are all-aged and thinnings may provide the necessary canopy gaps to help duplicate nature. The advantages of thinnings include the harvesting of shorter lived species of spruce, tamarack and balsam fir and the cutting of some cedar; more growth on the better residual cedar trees; and, by leaving a fully stocked cedar stand, the options for future cedar management including everything already mentioned. A residual basal area number will not be recommended. What is recommended is to thin the cedar, leaving as much cedar as possible, and at the same time doing a complete stand thinning and allowing for adequate skidding room with modern logging equipment. The disadvantages of thinning cedar include the possibilities of opening up the stand too much so blowdown begins to occur; and if deer are present during the winter, the residual canopy will encourage deer browsing of any cedar regeneration.

**MECHANICAL SCARIFICATION**

Because of the uncertainty associated with prescribed burning it is desirable to have other methods of site preparation available. Mechanical scarification is one alternative that improves seedbeds by exposing decomposed organic soil and reducing slash. Limited trials have been partially successful but have pointed out several problems:

- Because these sites are wet, flotation is a major obstacle to be overcome. Wide tracks or large tires are necessary to prevent severe compaction as well as keeping the equipment from getting stuck.

- Small mounds of organic matter, stumps, and logs seem to be the prime sites for cedar seed germination and establishment. The action of the machines tested eliminates these micro-sites. Many cedar sites are too flat, and scarification that completely levels the site may greatly reduce suitable germination sites by leaving the surface too wet for much of the growing season. The presence of cattails is an indicator that the site has a very high water table, and machines that level the site should not be used because micro-sites are eliminated. The mechanical scarification equipment tested so far would only be suitable on sites with pronounced natural drainage.
The machines tested (the "Madge Roto-Clear" and the "American Ranger") are both large, specialized, expensive pieces of equipment. This fact alone will probably limit their use. Less expensive "Hydro-Axe" attachments for skidders have also been used; and, while they can clear brush, they do little for scarification.

**MOUNDING**

Another mechanical site preparation concept being tested is the creation of small mounds throughout the site. These mounds provide seedbed of more decomposed organic soils and are better drained than the rest of the site. A mounder is mounted on the rear of a Cat D7F crawler and utilizes two hydraulically-powered scoops that penetrate the ground and form mounds automatically as the crawler travels forward. This unit treats an average of 2 acres per hour. In another application of mounding, Mead Corporation has successfully demonstrated the use of a construction excavator to scoop up mounds for planting. Both of these techniques show promise and are being studied as a possible standard treatment for certain sites.

**HERBICIDE**

The use of herbicides is another method that may become important for cedar site preparation. Currently two herbicides are being used in Delta County to control hardwood competition that sometimes crowds out cedar regeneration. Imazapic (Arsenal) appears to be an excellent herbicide for this purpose and is licensed for wetlands use. Glyphosate (Accord) is licensed for wetlands use but has shown little control of red maple, which is a common competitor in many cedar cuttings.

**FINAL NOTE**

This management guide is the best we have at this time. Research being done at the Upper Peninsula Tree Improvement Center, just outside of Escanaba, under the direction of Dr. Ray Miller is providing new insight into cedar management. We will attempt to update this guide periodically as more and more new information becomes available.