Cedar
Evaluation
Development
inform**A**tion and
Research

ACTION GROUP

CEDAR NOTE #2

October, 1991

SITE PREPARATION FOR NORTHERN WHITE-CEDAR

Mike Lanasa and Mike Zuidema

In the past little emphasis was placed on site preparation for regeneration of northern white-cedar. Stands were often strip cut to allow for natural seeding, however, little attention was paid to the micro-site or seedbed conditions necessary to ensure germination and establishment. This CEDAR NOTE reports on several methods of cedar site preparation that show promise: Prescribed burning, mechanical scarification, mounding, and herbicides.

PRESCRIBED BURNING

Petrel Grade deeryard fire.

Petrel Grade deeryard after fire.

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 deeryard 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.

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:

Direction	Distance
North	93 feet
West	158 feet
South	80 feet
East	143 feet

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 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:

Time or weather variable	**Average Burn**	**Severe burn**
Time since rain $\geq$0.1"	3 to 10 days	$\geq$7 days
Minimum relative humidity	30 to 60 percent	45 percent
Maximum air temperature	60^{o} to 90^{o} F	$\geq$80^{o} F
Maximum wind speed	5 to 15 mph	5 to 15 mph
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 (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 direction until they met 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 is recommended.

Once adequate white cedar regeneration is established, continued success largely depends upon minimizing the impact of deer. The management of the entire swamp could 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 exclosure 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.

MECHANICAL SCARIFICATION

American Ranger operating in Delta County.

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 mechanical scarification equipment tested so far would only be suitable on sites with pronounced natural drainage or in conjunction with mounding, described below.

- 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 scarification.

Although these problems seem daunting, work continues to refine the mechanical scarification techniques. Given the technical difficulty of prescribed burning in swamp sites, mechanical scarification may be the only reliable alternative available.

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 will be further reported on as results become available.

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. Imazaphr (Arsenal) appears to be an excellent herbicide for this purpose but is not yet 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.

A memorandum dated 6/16/91 from the directors of the EPA's Offices of Wetlands Protection, Pesticide Programs, and Compliance Monitoring has clarified the "wetlands" warning found on many pesticides. They conclude;

> "*Pesticides bearing a "wetlands" warning must not be applied directly to water, or to areas where surface water is present ..."*

This means that one can apply herbicides without a wetlands clearance if there is no water present on a site as long as the pesticide does not find it's way into water after application. Copies of the memorandum mentioned above are available from members of the CEDAR Action Group.

Cedar Notes will report more detailed information on site preparation methods as it becomes available. If you are trying any of these techniques or others not mentioned here please send your results to us so that we can share them with the Cedar Action Group.

SELECTED REFERENCES

Deer Range Improvement Manual, Michigan D.N.R., 1978.

Nelson, Thomas C. A Reproduction Study of Northern White Cedar.
Game Division, Department of Conservation, Lansing, Michigan, 1951.

Verme, L. J. and Johnston, W. F. Regeneration of White Cedar Deeryards in Upper Michigan, Michigan D.N.R. and U.S.D.A. Forest Service, North Central Forest Experiment Station, Grand Rapids, MN 1973-84.

The *CEDAR Action Group* is a group of managers, researchers, and land owners that are interested in the northern white-cedar resource of Michigan. They meet regularly, schedule educational events, support information gathering activities, and periodically publish reports like this one. CEDAR NOTE #1 is titled: "Guidelines for establishing animal exclosures for research in cedar stands". For more information contact the Chair: Raymond O. Miller, Michigan State University Department of Forestry, 6005 J Road, Escanaba, MI 49829.