JACK PINE MANAGEMENT ON STATE FOREST LANDS
(subtitled: Does Jack Pine turn purple in the fall?)

Introduction

The Jack Pine cover type occupies approximately 395,000 acres of state forest land in Michigan. Most, if not all of this acreage, is a result of the extensive pine lumbering and subsequent forest fires that occurred throughout northern Michigan in the late 1800’s and early 1900’s. Jack Pine is primarily a boreal species that attains it’s southern most extension in the Lower Peninsula. Jack Pine is a pioneer species that is usually found in areas that have been disturbed in such a manner to expose the mineral soil. It usually grows in pure even-aged stands on lower quality sites.

Silvicultural System

For most of our sites, Jack Pine should be managed on an even-aged basis through Clearcutting. Seed tree and Shelterwood systems may also be used if certain conditions are met.

Rotation Length

Rotation length is usually between 40 and 70 years depending on the site. In most cases, 60 years is the recommended rotation length.

Regeneration

Jack Pine, due to its serotinous cones, can be manipulated more than any other pine species when it comes to different regeneration techniques. The Clearcut, Seed Tree and Shelterwood types of reproduction methods can be used to lay the groundwork for successful regeneration when used on the appropriate sites. The regeneration methods that can be used are dependent on several factors that MUST be observed and analyzed BEFORE a particular stand of Jack Pine is to be considered for a timber sale. The factors that must be considered are:

1) Type of groundcover. The type of groundcover that exists on any particular site will have a major effect on regeneration possibilities. Sedge, due to its extensive and deep root system, tends to be unaffected by any site preparation method that is designed to expose mineral soil uniformly over the ground surface, e.g. scarification performed with anchor chains. The understory in Jack Pine stands that are characterized by sedge as the primary ground vegetation has a "lawn" like appearance.

Groundcover typified by Blueberry, Lichen and associated mosses have much shallower root systems that are more likely to be removed by site preparation equipment designed to expose mineral soil uniformly over the ground surface. Exposing large areas of mineral soil allows for regeneration methods outside of a conventional machine or hand planting.

2) Depth to water table. An important factor that influences Jack Pine regeneration. Water tables that are within six feet of the surface during the summer months modify the surface conditions to favor Jack Pine seed germination and seedling establishment. Depth to the water table is best determined by the use of a soil auger, but can also be determined by
observing the local topography, e.g. proximity to a swamp, pond, river or lake. The presence of certain herbaceous plants, such as Leatherleaf, Labrador Tea, Dewberry and Rice Grass (see attached illustrations) can also indicate a high water table or soil that has water holding properties.

3) Proximity to one of the Great Lakes. Similar to depth of water table mentioned in the previous section, the "lake effect" can modify atmospheric conditions by lowering air temperatures and raising humidities to provide conditions that are more favorable for Jack Pine seed germination and seedling establishment. The greatest "lake effect" influence is found along the Lake Superior shoreline in Alger and Schoolcraft counties in District 4. It can also be found along Lake Huron in District 5, and along the Lake Michigan shoreline in both the upper and lower peninsulas.

HOW TO INTEGRATE THESE FOUR VARIABLES INTO THE TIMBER SALE PROCESS

Planning the regeneration system to be used in Jack Pine begins BEFORE the timber sale is to be put up. This will require the land examiner to look at the GROUNDCOVER, DEPTH TO WATER TABLE and PROXIMITY TO ONE OF THE GREAT LAKES while on Operations Inventory. If time of the year makes such an examination difficult, these three items will have to be checked during the initial walk-through before the sale preparation process begins. The attached flow chart has been developed in order to assist the land examiner through such a process. Groundcover is the easiest of these main variables to determine and has been made the "starting point" for any management decisions. Depth to water table and/or lake effect is the second and/or third item to classify. Once these have been established, several options will be available as to the type of cut and regeneration method to be used for any particular site.

1. Sites where Sedge is the predominant ground cover

Stands of Jack Pine that have ground cover typified by Sedge will have to be clearcut and either planted or "furrow seeded". Planting will be done with either a conventional planting machine or by hand planting in furrows produced by a trencher. Both of these methods use machinery that is designed to cut through the thick sedge root system and produce furrows that are primarily mineral soil. If the area is to be planted, the recommended per acre stocking figures will vary as to Region. Because of the problem with the White Pine Weevil in Region Two, Jack Pine should be planted at a stocking of 1,200 trees/acre. The suggested stocking rate of Jack Pine in Region One is 900 trees/acre.

"Furrow Seeding" is performed with special machinery designed to deposit seed in a furrow at the same time the furrow is being constructed. Stocking rates for furrow seeding should approximate the planting rates mentioned above.

Whether or not an area is to be planted or furrow seeded will depend on it's depth to the water table. Water tables that are WITHIN six feet of the surface in summer months can be furrow seeded. Look for the various ground plants mentioned previously that indicate a shallow water table.
2. Sites where Blueberry, Lichen and Moss is the predominant groundcover

Ground Cover typified by Blueberry, Lichen and associated mosses can offer a variety of different management possibilities, some which can lower the cost of regeneration markedly over that of a traditional machine or hand planting. Whenever a Jack Pine stand is found that has groundcover typified by blueberries, lichens and mosses, it is important to determine the depth to water table for this particular site. In situations where the water table is DEEPER than six feet from the surface during the summer months, it is recommended that the stand be clearcut and either machine or hand planted. (See the description of the Sedge groundcover sites for the recommended Jack Pine stocking figures). In situations where the water table is WITHIN six feet of the surface during the summer months, several different management options are available. In most situations, clearcutting is still the recommended type of cut, but the type of harvesting equipment used will determine the regeneration method best suited for the sale area. In situations where the whole-tree harvest method is used and no slash is left, furrow seeding is the recommended regeneration method. If the seeding fails, the option of hand planting Jack Pine seedlings in the existing furrows will still exist. An alternative method would be to scarify the area with anchor chains in order to expose mineral soil and follow up with a direct seeding at a later date. In situations such as this, direct seeding is best done during the late winter or early spring on hard packed snow, using a snowmobile or ATV modified to carry a HERD seeder. Applying seed at a rate of .5 pound per acre will usually result in a well stocked stand of Jack Pine.

In high water table areas, when the type of harvesting equipment used LEAVES slash on the site, it is recommended that the area be scarified with the skidder/anchor chain combination. Such an action will expose mineral soil, break up the slash and scatter the Jack Pine cones over the sale area. For optimum results and to be sure that the slash is properly cured, the area should be scarified within one year of sale completion. Because of concerns for operator safety, the timber sale specifications should also specify that the stump height be less than four inches. Scarification on these type of sites have proven to be very successful throughout Region One and in parts of Region Two.

3. Sedge, Blueberry, Lichen and Moss Mixtures

While Jack Pine stands exist that have pure groundcovers of Sedge or the Blueberry, Lichens and Moss complex, most real life situations will find stands growing on sites that have combinations of both. In actuality, the amount of mix between these two groundcover associations will have little direct effect on actual regeneration methods that can be used on a particular site. The depth to water table and harvest method will determine the whether the site will be planted, furrow seeded or scarified.

Special Cases

1. Shelterwood

In certain areas of Region Two, a variety of Jack Pine exists that has NON-SEROTINOUS cones. The mature cones on these trees open in September and October when the air...
temperature reaches 75-80 degrees. When this variety of Jack Pine is found on sites with the blueberry, Lichen and Moss groundcover and a high water table, the Shelterwood system can be used to regenerate the stand. In this situation, approximately 10-20 square feet of open-cone Jack Pine is left evenly scattered over the sale area. Once the sale is complete, scarifying the area with the skidder/anchor chain combination produces a seed bed better suited for Jack Pine germination. Once successfully regenerated (two to three years after the sale), another sale should be scheduled to remove the remaining overstory trees. This sale should be in the winter in order to not destroy the Jack Pine regeneration. It should be emphasized that, while this system has been proven to be successful, the added expense of marking the open cone trees often outweighs the benefit of the "free" regeneration.

2. Seed tree

Certain areas of the state have large areas of "wet" Jack Pine, or Jack Pine that grows in low areas where standing water is common in the spring. All of these stands are of fire origin and were established in the 1920's and 1930's before effective fire control was instituted on state forest land. These sites are characterized by a well developed groundcover typified by leatherleaf, and offer unique problems for regeneration.

One way to regenerate these areas of "wet" Jack Pine is to mimic the conditions that resulted in their initial establishment. Leaving scattered seed trees and burning the slash produced in a timber sale has proven to be a successful technique of regenerating Jack Pine in these lowland situations. Marking between 15 and 25 Jack Pine per acre will leave enough trees for seed without impacting sale volumes significantly. Trees should be of good form and have full crowns capable of producing large amount of cones. It is essential that logging equipment be utilized that is NOT of the whole tree harvest variety. Logging slash MUST be left in order to provide the necessary fuel to remove the thick herbaceous groundcover common on these sites. Sale specifications MUST be written that specify the type of logging equipment that will be allowed on these lowland sites. Late summer and early fall are the best time for a burn and should only be attempted when the drought index allows for a hot, mineral seedbed producing fire.

Burning these sites requires more in the way of preparation than most prescribed burns. The mechanics of such type of management are involved and are beyond the scope of this guideline. It is essential that the input of the Timber Management Specialist, Fire and Recreation Specialist and Fire Officer be included before the sale preparation process has begun.

Another option on these wet Jack Pine sites is furrow seeding. The time of the year that furrow seeding is to be attempted is very important on these sites and should only be tried in late summer or early fall when the water table has dropped to it's seasonal low. In these situations, whole tree harvesting is preferable to the traditional short wood method because of the low amounts of slash produced. Leatherleaf understories, due to their woody stems and well developed root systems, can be extremely difficult to trench with the furrow seeding equipment Forest Management Division currently uses. Logging slash created by short wood harvesting just compounds the problem.
Regeneration Summary

It should be re-emphasized that Jack Pine offers a variety of options when it comes to regeneration. Clearcutting followed by a machine or hand planting will undoubtedly remain the most common harvesting/regeneration technique. But the costs for both machine or hand planting have been steadily rising and will continue to do so in the future. Some of the "alternative" methods mentioned have the potential of greatly reducing the cost of regeneration for those Jack Pine stands that exist on the appropriate sites. If a particular stand of Jack Pine will allow for the use of one of these other regeneration techniques, every effort should be made to incorporate the necessary changes into the timber sale proposal to achieve that objective.

Wildlife Concerns

The relationship of the Kirtland’s Warbler to the Jack Pine ecosystem is well known. For the purposes of this discussion, the only management change would be the establishment of large clearcuts (200 acres and larger) and their subsequent regeneration. While any of the regeneration methods listed could be used for stand establishment, the most common method is that of machine or hand planting. Stocking should be at a rate of 1,200 trees/acre with the planting machine or trencher following a "weave" pattern. This "weave" pattern results in the creation of scattered openings throughout the planting area that closely mimics the seedling/opening complex that results from Jack Pine wildfires. Refer to the "Kirtland’s Warbler Management Guidelines" for more detailed information.

Insect and Disease

The Jack Pine Budworm is a defoliator of Jack Pine needles and is found throughout the entire range of the tree. Outbreaks of the Jack Pine Budworm occur approximately every ten years and last between two and four years. The larvae start by feeding on the male flowers of the tree, but changes over to new needle growth once it is completely formed. Often the trees are just clipped off at the base and webbed together forming a "tent" of needles, flowers and frass. If the trees are relatively healthy, mortality will usually not occur. Stands can be risk rated as to their susceptibility to damage by the Jack Pine Budworm. Low risk stands are those that are less than 50 years of age, well stocked and are approximately the same height. Moderate to High risk stands are over 50 years of age, poorly stocked and with greatly varying heights. Stands that are in the Moderate and High risk categories should be seriously considered for harvest when found through the inventory process.

The White Pine Weevil is a pest of Jack Pine that is largely confined to the lower peninsula. While the insect is not usually responsible for tree mortality, the larvae can degrade tree form by feeding on the inner bark of the tree’s leader eventually causing it’s death. One of the tree's lateral branches will eventually assume dominance which makes it susceptible to an attack by the White Pine Weevil at a later date. This process can repeat itself over a several years which results in the common and characteristic "cabbage" pine appearance. Certain insecticides such as Lindane have been proven to be effective in controlling the White Pine Weevil, but the extensive acreage of susceptible type in Region Two, and the fact that the tree is rarely killed by this insect, makes large scale applications unlikely. Planting Jack Pine at a stocking of 1,200 trees/acre forces the tree to grow "up" and not "out" and results in a
better formed tree once it is mature.

Both the Jack Pine Budworm and White Pine Weevil are established pests of the Jack Pine ecosystem in the State of Michigan. Both can be controlled, to some extent, through proper forest management techniques, but both are insects that are here to stay and are ones we must learn to live with.

To those who are wondering, the answer to the question posed in the title of this guideline is, Yes, Jack Pine seedlings can and do turn color (a deep, beautiful purple) in the fall.