Red pine is one of the most productive timber species on upland sites. It can often produce one cord or more per acre per year, more than other species growing on the same site. It provides a variety of products from pulpwood to utility poles. At the present time, the highest stumpage prices are received for utility pole and cabin logs. These products are harvested from trees in the 12- to 16-foot DBH range. Red pine provides a long lived attractive tree for recreation. It is a desirable tree in campgrounds, pathways, motorized trails, and travel influence zones. Red Pine should be maintained on a variety of sites. The combination of high volume yield, high stumpage prices, and shorter rotation makes red pine the preferred tree species on sites where softwood timber production is the primary goal. The wide range of products and other values from red pine provides many options for management.

The basic guideline for managing red pine is "Manager's Handbook for Red Pine in the North Central States." Another useful reference is the "Proceedings of the SAF Region V Technical Conference, Managing Red Pine." The following guidelines are given to tailor the information to meet Michigan conditions.

**ROTATION HARVEST OF MATURE STANDS**

**General Forest Zones - Rotation lengths and size**

**Site Index 50 and Less:** The goal is to grow the trees to a maximum stand diameter of 14" to 16" DBH. These stands should not be final harvested at 15" DBH but grown to a larger size if regeneration cannot be guaranteed by artificial or natural methods. When these stands reach 15" DBH, a shelterwood cut may be conducted leaving 50 square feet or the equivalent of 50% crown cover. The final harvest should not occur until 900+ red pine seedlings are established. Information and methods of establishing seedlings will depend on future field trails involving scarification, burning, and other treatments. The rotation length on these sites will vary but should generally be aimed at harvesting small sawlogs.

**Site Index 50 and Greater:** The rotation goal is to grow the stand to a maximum average stand diameter of 15". Stands will be final harvested and then regenerated when they reach this size. The rotation length will probably range from 50 to 70 years.
Water Quality, Travel, and Other Influence Zones: In areas where water quality, aesthetics, or other values are important, a long rotation of 120+ years and large tree look can be used. In these influence zones, scattered clumps or individual red pine in clearcut stands should be left for aesthetic reasons. These stands should be grown to a maximum age of 200 years.

Final Harvesting of Aspen and Jack Pine Type with a Red Pine Component: Generally when final harvesting jack pine or aspen stands, all merchantable trees will be harvested. Manageable clumps or single trees may be left to reduce visual impact or serve other resource values. The economics of leaving individual red pine poles to grow to sawlog size is good.

INTERMEDIATE HARVEST IN RED PINE STANDS

First thinning should be row thinnings. Subsequent thinnings to be individually marked trees. If rows are not present, they can be made as part of the marking pattern. Row thinning will facilitate harvesting equipment movement and reduce logging damage to residual trees. Rows to be removed should be no closer than every third row.

Stands Site Index Less Than 50: The initial thinning will be conducted when the average stand basal area is 140. The residual BA after thinning should be 90. For stands larger than 12" DBH thin when BA reaches 160 with a residual of 120 square feet.

Stands Site Index Greater than 50: The first thinning to develop quality stands should not be conducted until the BA is 160 or better. Basal areas of 180 to 200 are not damaging to stand development and will actually increase future quality and yield. At site indexes of 70+ basal areas of 200+ and residual BA of 120 to 140 square feet are acceptable and even desirable. In subsequent thinnings, residual basal areas should increase 10 to 20 square feet with each thinning up to a maximum of residual BA of 150 square feet. See the "Managers Handbook" for residual basal areas in stands 15" DBH and larger. IPS problems occur primarily in harvesting during a drought. IPS problems can be reduced with cutting specifications that restrict cutting during the period March 1 to May 31 and to no cutting or the removal of all wood greater than two inches in diameter within fifteen days of cutting from the sale area during years of drought.
STAND REGENERATION

The final harvest of a stand at its rotation size is dependent on having a proven and reliable method of regenerating the stand in its present condition and sufficient budget to accomplish the project. Stands will not be final harvested unless both of these conditions are met.

**Stands SI Less than 50:** For stands in which the SI is less than 50, regeneration may be difficult. Natural regeneration is the preferred method in these stands, due to economic reasons. In the Upper Peninsula, natural regeneration on these sites has been the most successful with most plantings failing, while planting has been successful in the Lower Peninsula. Field trials of a variety site preparation techniques will be initiated and tested in the near future.

**Stands SI Greater than 50:** For stands with a site index greater than 50, planting is the proven regeneration method. When stands reach the rotation size, they should be clearcut and replanted. Natural regeneration of some of these stands is likely possible but the techniques are not well developed at this time.

Unless red pine has a proven history of naturally regenerating in a particular set of conditions, natural regeneration should be treated as an experimental process and not conducted as a routine practice on sites not matching those conditions.

SITE PREPARATION

Site preparation for red pine planting can be either mechanical or chemical. The site preparation should leave the seedling free of significant competition for the first three years after planting and free of overtopping woody competition for the life of the plantation. This may require a combination of mechanical and chemical site preparation. Herbaceous vegetation competes with newly planted seedlings at least as well as wood competition. Choosing the method of site preparation must be done with a high degree of sensitivity for actual and perceived effects on the environment. Economics plays a strong part in this decision but the environment and public acceptance take the forefront.

Mechanical site preparation is usually accomplished with a V-plow on the tractor on the planting machine. Other equipment is also available for this purpose.
Chemical site preparation can be accomplished with a variety of chemicals and application techniques. Aerial application is best suited to large broadcast sites. Excellent site preparation has been obtained using a ground application of Velpar or Roundup plus Oust. Some of the best results have been obtained using band or spot applications of Velpar immediately prior to or after planting. All chemicals must be used and applied according to the label and state and federal laws.

Fire is an effective tool reducing timber harvesting slash and competing vegetation. Scarification with a rolling chopper and chains will also break down slash sufficiently to permit a trencher or planting machine to operate. It is very important to keep stumps lower than four inches so that regeneration machinery can operate in a harvested area.

PLANTING

The goal for most red pine plantation establishment is to create a fast growing high quality stand. Plant 900 trees per acre at an 8-foot by 6-foot spacing on a well prepared site. The minimum number of surviving trees at the end of the first growing season should be 650 trees per acre.

Attention must be given to insect and disease factors when establishing red pine stands. Site conversions have the greatest risk. Sites with large numbers of oak and other hardwood stumps may develop problems with Armillaria. Areas with a history of Sclerotoderris and frost pockets should be avoided when establishing new plantations. When open or semi-open grassy areas are scheduled for planting, a check should be made for white grubs. Siroccoccus or Deerskin Droop may effect young stands, particularly natural stands originating from seed or shelterwood cuts. The overstory should be removed as soon as there is sufficient seedlings on the ground. Root Collar Weevil can create problems in stands planted near Scots pine plantations or other infected pine stands. Alternate hosts for Saratoga Spittlebug may need to be controlled.

MANAGEMENT OF YOUNG STANDS

New plantations will need monitoring at age 1, 3, and 5 years and periodically thereafter for survival and need to control competition, insect, and disease problems. The goal is to have 650+ well established trees after one year. Naturally regenerated stands should be treated exactly the same as planted stands and be included in a monitoring program.