

**MONITORING REPORT**  
**INCREASING ASPEN PRODUCTION THROUGH**  
**MECHANICAL STRIP-THINNING**

Grant No. GR 91-00044

By

Bill Berguson, Research Fellow

Period Covered:  
December 1, 1993 - May 31, 1994  
NRRI/TR-94/20A

Prepared For:  
Blandin Foundation

Natural Resources Research Institute  
University of Minnesota, Duluth  
5013 Miller Trunk Highway  
Duluth, Minnesota 55811

**BLANDIN FOUNDATION**

**MONITORING REPORT**

**DUE DATE** June 1, 1994 **GRANT NO.** GR 91-00044

**ORGANIZATION** Natural Resources Research Institute

**PROJECT TITLE** Increasing Aspen Production Through Mechanical Strip-Thinning

**PREPARED BY** Bill Berguson **PHONE #** (218) 720-4296

**DATE AND AMOUNT OF GRANT** April 1, 1991 \$260,000

**PERIOD COVERED FROM:** December 1, 1993 **TO:** May 31, 1994

## SUMMARY

This project has five primary research tasks related to the determination of growth and yield of aspen in response to mechanical strip-thinning; analysis of disease incidence in thinned and unthinned stands and determination of the costs and economic feasibility of mechanical strip-thinning of aspen. All activities for the 1993 growing season related to data collection are complete. The average diameter growth rate of the 200 largest trees in the network of new experiments is approximately 25 percent greater in thinned stands compared to unthinned stands on the same site. Laboratory analysis of soils were completed on all samples to complete that soils database for Task II studies. Measurement of tree growth and analysis of the older previously-thinned stands on the Chippewa National Forest are complete (Task III). Stand 3, which was thinned at age 11 and is now 25 years of age has 17.9 merchantable cords standing volume per acre compared to an adjacent unthinned area which has 9.3 cords per acre. Stand 7, which was thinned at age 12 and is now 21 years old has 5.5 cords of merchantable volume per acre compared to 3.3 in unthinned areas. An inventory of disease was done at Stand 3 and on one site on Blandin Paper Company land. Disease incidence on all plots will be measured this summer on the recently established studies. Economic analyses (Task V) were updated to reflect the rapid changes in aspen stumpage. Assuming a stumpage price of \$22 per cord, the net present value (NPV) of thinned aspen is \$429 per acre versus \$168 for a no-thinning option; a difference of approximately \$261 per acre.

## **PROGRESS DESCRIPTION BY RESEARCH TASK**

### **TASK I. DETERMINE THE EFFECT OF MECHANICAL STRIP-THINNING ON GROWTH AND YIELD ON RECENTLY ESTABLISHED STUDY SITES**

#### **OBJECTIVE**

To evaluate the effectiveness of strip-thinning of aspen in operational-scale field trials under controlled conditions.

#### **BACKGROUND**

Past research on strip-thinning in Minnesota has shown the potential to greatly accelerate growth of aspen stands. This research was based on stands on the Chippewa National Forest that had been previously thinned. However, because of a lack of unthinned areas near thinned areas, these stands do not allow the statistical evaluation of thinning over a variety of strip widths and site conditions. The purpose of Task I is to establish field tests to evaluate strip-thinning over a range of site conditions and accurately evaluate the response of aspen to thinning over time.

#### **PROGRESS**

Tree growth at all of the sites in the network of new experiments have been measured and data entered into computer databases for analysis. Results show that the average diameter growth rate of the 200 largest trees in thinned stands is approximately 25 percent faster than the same group of trees in an unthinned stand. The average growth rate of the 600 largest trees in the thinned stands is 11 percent higher than a similar group on an unthinned stand. This trend is evident at most of the sites with growth response to thinning highest in the larger trees. Trees in the smaller size classes show a reduced response. Some year-to-year variation in growth response is evident across the network of experiments.

#### **PLANS FOR NEXT REPORTING PERIOD**

All trees on the permanent plots will be remeasured and growth data summarized. Marking of the measurement plots on many of the sites will be updated to ensure easy location of all measurement plots for project cooperators.

## **TASK II. CONDUCT DETAILED STAND AND SITE ASSESSMENTS TO DETERMINE REASONS FOR VARIATION IN YIELD RESPONSE BETWEEN SITES**

### **OBJECTIVE**

To formulate practical management guidelines for aspen strip-thinning through detailed assessment of thinning experiments.

### **BACKGROUND**

In order for strip-thinning to become a practical silvicultural tool, guidelines must be developed to assist land managers in selecting stands most likely to respond to thinning. The response of a stand to thinning will be directly influenced by soil and stand characteristics. The goal of this work is to quantify differences between stands and relate these differences to growth response. This work is considered necessary before strip-thinning of aspen can be applied on an operational scale.

### **PROGRESS**

Analysis of soil samples collected on all of the permanent plots was completed during the reporting period. Laboratory analysis of all soil samples for organic matter content is complete.

Analysis of growth response as a function of tree size class was done to evaluate differences in growth response to thinning between similarly-sized trees in thinned and unthinned stands. These analyses showed a statistically significant relationship between tree size class and growth response relative to unthinned trees on the same stand. This information will be used to evaluate the effects of stand differentiation prior to thinning and the likelihood of obtaining an acceptable growth response to thinning on a particular site.

### **PLANS FOR NEXT REPORTING PERIOD**

As mentioned in the previous status report, light penetration is measured annually in the thinned and unthinned plots. These data will be collected in August to evaluate canopy density and changes in density over time. Data will also be collected on shrub density in thinned and unthinned stands. Measurement of strip width and variability in strip width will also be done at all sites. These data will be used in analyses to explain differences in growth response to thinning.

### **TASK III. LOCATE PREVIOUSLY THINNED STANDS THROUGHOUT THE STATE AND ESTABLISH PERMANENT PLOTS TO MEASURE THE EFFECTS OF THINNING ON GROWTH AND MECHANISMS INFLUENCING STAND GROWTH**

#### **OBJECTIVE**

To analyze the growth response of older strip-thinned stands and determine changes in stand volume through time.

#### **BACKGROUND**

Previous research done at the NRRI has concentrated on the analysis of growth responses of strip-thinned aspen stands on the Chippewa National Forest. Although these stands were not designed as formal experiments, they provide valuable information on the influence of thinning on stand growth rates over an extended period of time. Efforts are underway to collect data from selected stands and locate other stands for potential growth analysis.

#### **PROGRESS**

Tree growth data on both Stand 3 and Stand 7 were completed during the reporting period and entered into computer databases. As reported in the previous status report, Stand 3 has approximately 19 merchantable cords per acre in thinned stands compared to 10 in the unthinned portions of Stand 3. Analysis of data collected from Stand 7 shows that merchantable volume is 5.5 and 3.3 cords per acre in thinned and unthinned stands, respectively. These volumes are very similar to those on Stand 3 at the same age.

#### **PLANS FOR NEXT REPORTING PERIOD**

Tree growth in both Stands 3 and 7 on the Chippewa National Forest will be measured during the next reporting period. Permanent measurement plots will be remarked to ensure immediate location for project cooperators.

## **TASK IV. CONDUCT DISEASE ASSESSMENTS (COOPERATIVE WITH THE USFS, NORTH CENTRAL EXPERIMENT STATION)**

### **OBJECTIVE**

Determine the effect of strip-thinning on the incidence and severity of disease in aspen stands.

### **BACKGROUND**

A potential negative effect of thinning is an increased incidence of Hypoxyton canker and other diseases. Annual assessments of disease in thinned and unthinned aspen stands are being done on recently established experiments across the state and older stands on the Chippewa National Forest. Data are being collected to evaluate the impact of fungal and insect pathogens on strip-thinned aspen.

### **PROGRESS**

Disease incidence on Stand 3 (Chippewa National Forest) were evaluated during the spring of 1994. Some cankers were found associated with mechanical injury from strip-thinning although incidence of cankers is generally very low and not of sufficient number to affect ultimate merchantable stand volumes. An inventory of disease incidence was also done in a study on Blandin Paper Company land. These data show some mortality of trees due to Hypoxyton canker, particularly in the suppressed tree size classes. However, no increase in disease or mortality can be attributed to thinning at this time in either the older studies on the Chippewa National Forest or the network of recently established experiments.

### **PLANS FOR NEXT REPORTING PERIOD**

We plan to collect data on all plots during the summer of 1994. Also, data on Hypoxyton canker on an experiment that was thinned by hand will be collected and compared to data collected in 1989. Tree size will be related to disease incidence to evaluate relative susceptibility by size class. The incidence of disease in thinned and unthinned plots will be compared.

## TASK V. ANALYZE THE ECONOMIC FEASIBILITY OF THINNING

### OBJECTIVE

To accurately determine cost inputs and evaluate the economic feasibility of mechanical strip-thinning of aspen.

### BACKGROUND

The primary advantage of mechanical strip-thinning compared to hand-thinning is obviously reduced cost. Because investments in forest management typically require a long time before a return is realized, relatively small changes in up-front costs have the potential to greatly affect the economic viability of a silvicultural operation. An accurate assessment of costs input is necessary before large scale investment in aspen strip-thinning will be considered. Along with this, changes in stand volume over time will greatly affect the economic feasibility of aspen thinning. The purpose of these studies is to construct cash flow models based on thinning costs and projections of future volume.

### PROGRESS

Cash flow models were updated using new stumpage prices made available to the project by the Itasca County Land Department. According to recent auction sales of aspen, stumpage prices are currently in the range of \$22 to \$24 per cord. This is compared to aspen stumpage prices during 1993 of approximately \$14 per cord. The NPV of thinned aspen is \$429 per acre versus \$168 for a no-thinning option using these updated figures in the cash flow model.

Data on thinning costs are continually updated. Based on multi-year data from the Blandin Division of Lands and Forestry (Mr. Chris Peterson), thinning costs on an operational scale are approximately \$18 per acre. This is based on an average of all site conditions that have been encountered to date on their ownership.

### PLANS FOR NEXT REPORTING PERIOD

Data will continue to be collected on aspen stumpage price and thinning costs through the cooperation of project participants. These prices will be incorporated into the existing cash flow model to provide current estimates of the financial returns from an investment in aspen thinning.



## **REPORTS/PRESENTATIONS**

Meetings are scheduled in June with the foresters at the Blandin Woodlands Division and Boise Cascade Corporation to exchange information on the current status of the thinning research.

## **BUDGET STATUS**

A budget report will be forwarded to the Foundation by the Office of Research and Technology Transfer Administration, Twin Cities Campus.