

Lesson 10

Monitoring

15 minutes

Objectives

- ▲ Discuss the need and differing objectives for establishing growth response monitoring
- ▲ Describe the Ministry of Forests monitoring strategy and methodology

Equipment Needs

- ▲ Overhead projector
- ▲ Lesson 10 transparencies

Method

Lecturette with overheads

Instructions

The main point of this lesson is the need to monitor similar stands to find the trends in response from fertilization. Monitoring does not always need to be concerned with absolute numbers. The type of response – positive or negative – and its duration are important to determine the effectiveness of a fertilizer application and the appropriateness of treating similar stands.

The monitoring of an operational fertilization growth response must first have defined objectives. These can range from simply ensuring that the suspected deficient nutrient has been temporarily corrected, to quantifying, if desired, the actual amount of increased wood volume or change in stand development to shorten the rotation. There is also a relationship between the response pattern to fertilization and the stage of stand development. Therefore, the analysis and sampling program may have to differ for stands of different age, site and number of fertilization treatments.

Three main methods of monitoring are recommended. **Foliar analysis** can be used to assess individual tree response to fertilization. A pre- and post-fertilization sampling scheme of the same dominant and co-dominant trees can be used provided the area surrounding the trees selected is checked for uniform fertilizer application at the time of treatment. Stratification is required with very large blocks of greater than 100 hectares. The purpose of the permanent sample plot approach of the Ministry of

Forests is to build a database for the development of growth and yield equations and tables. Project staff should be encouraged to look at needle weight response and foliar analysis to assess the effectiveness of operational fertilization treatments. Pre- and post-fertilization sampling of pre-selected trees should be encouraged.

It is important to measure and record the weather conditions before, during and after fertilizer application. The weather may help to explain anomalous results, such as low response rate due to heavy rain immediately after the fertilization treatment. Inspection during application of uniform pattern and within the range of the target application rate should also be completed.

Operational trials are recommended to establish a better base for determining fertilization response. **Increment cores** of fertilized stands will yield historical data on the type and duration of response by diameter growth. Nitrogen-induced deficiencies will also be evident in an increment core if the time of fertilization can be determined on the core. Nutrient deficiencies caused by fertilization will probably also be evident in the stand's condition and vigour. For example, nitrogen-induced boron deficiencies will produce dead leaders and stunted, unacceptable height growth.

Contact with the regional stand tending forester is important for all monitoring. This specialist will be able to advise on the best monitoring programs for the district and stands in which the fertilization program has been conducted. As well, the stand tending forester will be able to link district trends into a provincial scale and provide post-fertilization trends from other regions and districts.



Monitoring Objectives

- ▲ Site selection – Monitoring guidelines
- ▲ Quality control – Monitoring operations
- ▲ Response measurement – Monitoring stand behaviour after treatment
- ▲ Past efforts have focused at the stand level
- ▲ Monitoring how, and how well, site selection and operations have been conducted is useful to judge effectiveness of fertilization program





Fertilizer Application Monitoring

Objectives

- ▲ Define acceptable accuracy standards to:
 - Monitor contractor performance
 - Document for treatment records
- ▲ Aim for +/- 10% accuracy





Estimation of Fertilizer Application Rate

Total amount of fertilizer applied/size of area

- ▲ No estimate of variability

Sample traps

- ▲ Use only in open areas
- ▲ Cumbersome and time consuming
- ▲ No information on swath width or overlap
- ▲ Fertilizer may bounce out
- ▲ Large number of traps required
- ▲ Use in control and fertilized plots to compare

Measurement of swath width and overlap on ground

- ▲ Quick and easy
- ▲ No prill counting or weighing



Growth Response Monitoring

- ▲ Install operational plots (“short-term” PSPs)
- ▲ Monitoring essential to supplement research but cannot substitute for it
- ▲ Appropriate monitoring strategy will depend on treatment objectives
- ▲ Confirm and document methodology and responsibilities prior to the fertilization treatment
- ▲ Representative control blocks must be established before fertilization
- ▲ Establish database in each district to note response trends

