Strategies for Improving Forest Productivity in Minnesota

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Preface: These strategies and suggested gains in forest and related productivity have been compiled by the author from a combination of first principles and experience gleaned from researchers, consultants, and professionals in the Great Lakes Region and beyond. They are intended as a guide to the possibilities in forest management.

(1) Areas with potential for significant gains and estimated range of potential gains [in percent (%) in brackets]

Utilization

1. Smaller top diameters (say down to 2 inch) [1-3%]
2. Variable stick/log length harvesting and transport (including tree length) [2-7%]
3. Utilization of trees < 5" Dbh [1-3%]
4. Utilization of tree tops (branches) [5-20%]
5. Substitution of species currently in less demand for desired species, etc.
6. Biomass harvesting -- logging residues, right of ways, WMAs, etc.
7. Mill improvements [mill improvements in utilization rates have shown increases of 2-3% per decade nationwide for more than 30 years]

Harvest Scheduling

1. Shorter rotation ages to reduce mortality, decay, and succession losses [5-20%].
2. Use of forest wide harvest scheduling models [such applications can avoid much of the allowable cut reductions with group grope (GG) approaches; e.g., GG may lead to a reduction of say 35% or lead to infeasible solutions. [Model applications hold such reductions to 15% or less and bring rigor to the process].

Stand Treatment

1. Improved guidance for species – site matching, e.g., in considering what to plant or encourage on wet, dry, light, heavy or other soil types, and in considering aspect, and other plant competition or animal damage. [choices may simply avoid mortality and/or provide substantial gains in yields].
2. Genetically improved plant materials through conventional breeding [12-22% volume increase per generation of breeding]. Greatest gains are in combination with treatments described below. Hybrids [5-50%]. GMOs may have higher gains. However, hybrids and GMO gains are typically not without very intensive culture. Thus the gains are best compared with usual plant materials that also grown under very intensive culture.
3. Site preparation and early competition control including release [this is a major source of gains in survival and early growth; early height growth may increase 50-100%].
4. Thinning to salvage mortality before it occurs and to improve residual tree growth [5-15%].
5. Thinning early (in rotation), light, and often can salvage mortality, improve residual tree growth, extend tree life and rotation ages and allow for large tree sizes and dramatically increase stand yields [15-100+%]. Very early thinning may be noncommercial but still very important in increasing yields over an entire rotation. Also, thinning can effectively reduce stress and promote tree health and vigor, e.g., by allowing for more photosynthetic area per tree. Of interest is optimal timing and extent of thinnings over a rotation. Note most thinning is in this region is late, heavy and seldom,

i.e., not very productive. In practice, if the crown ratio has fallen much below 40-50%, you have waited too long to achieve a strong response.

6. Fertilization and nutrition (including micronutrients) are related. If there is poor nutrition, growth potential and health will decline. Such treatments have become important in other regions, but they have been studied little here. Responses are likely species, age and site specific and there is often a strong interaction with soil moisture. Possible gains [5-20% in growth, some gains in survival as well].
7. Pruning to increase value growth and yield. Typically up to 17ft. [5-20% in value over 15-20 years, i.e., over the period in which first log grades may be improved].
8. Combinations of the above, especially 1, 2, 3, plus 4 or 5 can double usual yields over a rotation.
9. Retention of herbicide options in silvicultural toolbox. Note increasing pressure from forest land certification agencies to eliminate use of herbicides, including Velpar and Accord.

Communications

1. Professionals, loggers and increasingly landowners will need to become familiar with the options. Classic research documents are essential but insufficient. Need electronic availability of information…see for example the beginnings of the regional web based forest management guidelines at:

   http://ncrs.fs.fed.us/fmg/nfmg/species/index.html

2. An organized and focused system of demonstration sites is also needed…for each region, covertype and stand age grouping, preferably with treatments side by side. Such sites need not be larger than an acre for most purposes, but they need informative signage.

(2) Major research steps to accomplish the above information needs

1. Synthesis of information on utilization options.
2. Synthesis of information on stand treatments discussed here, notably considering FIA data, and existing and new research plot data to shed light on the following points.
   a. Response to thinning early light and often for major cover types.
   b. Response to combinations of treatments for major cover types.
3. Synthesis of information on models/applications for harvest scheduling, including development of growth and yield models for managed stands (i.e., stands developed from using some of the most instructive stand treatment possibilities noted above).
   a. Assessment of stand treatment compatibility with wildlife habitat measures on a stand and forest basis, including development of comprehensive (many species or guild based) wildlife management guidelines for forest managers.
   b. Analysis of the micro (stand) and macro (forest and regional) economics of these treatments alone and in combinations for meeting various ownership objectives.
4. Rapid and widespread documentation and reporting of results, including continued development, refinement and expansion of web based syntheses of forest management guidelines, especially management options and examples that foster productivity.
5. Continued monitoring / tracking of study and demonstration plots.