

Silviculture Research Priorities For Strategic Paper Fibers In The Lake States

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Introduction

The economic performance of the pulp and paper industry in North America has been weak for more than a decade. Factors affecting performance vary among industry sectors and regions, but generally include slow growth in demand, excess production capacity, and low prices.

To make matters worse, North American pulp and paper mills are facing tough competition from new production systems in the Southern Hemisphere. In general, these new systems have the latest manufacturing technology and associated benefits in operational efficiency and cost. Moreover, most of the new systems include highly productive plantations of desirable wood species such as eucalypts, acacias, and pines. These plantations provide significant competitive advantages to the mills they support. These advantages include low growing costs for land and labor; short haul distances for harvested wood; and excellent wood properties that reduce manufacturing costs and improve the quality of final products.

The Lake States pulp and paper industry has not escaped the adverse effects of global competitive pressures. Wood supply is one of several major concerns. Although wood is plentiful in northern sections of the Lakes States, there are serious concerns about current and future supplies of the “strategic fibers” that the region’s papermakers need to produce world class products at competitive prices. Wood supplies from Federal lands declined sharply during the 1990s, resulting in substantial increases in prices for aspen and softwoods. Mixed northern hardwoods remain plentiful, but concern is growing about

inadequate regeneration of preferred species (e.g., birch and hard maple) in natural stands.

Silviculture research has much to contribute to improving strategic fiber supplies and the competitiveness of the pulp and paper industry in the Lake States. This paper outlines silviculture research needs in the Lake States from the perspective of foresters associated with the pulp and paper industry. Research needs were identified through discussions with industrial woodlands managers and researchers with responsibilities in Minnesota, Wisconsin, and the Upper Peninsula of Michigan. It is clear that the region’s strategic paper fibers include aspen, softwoods, northern hardwoods, and hybrid poplar. Research priorities vary among companies depending on the geographic location and fiber requirements of manufacturing facilities. As a result, the research priorities outlined below are a composite picture of the views of several companies and do not represent the views of any single company.

Aspen

Aspen is a high-value fiber for many pulp and paper mills in the Lake States. Compared to many other hardwoods, aspen has good fiber-to-fiber bonding characteristics, low lignin content, and high pulp yields. Aspen fibers help producers of printing and writing papers achieve desirable sheet properties such as high opacity, brightness, surface smoothness, and bulk.

Concerns about aspen supplies include high prices; the high incidence of rot and stain in wood from older stands; and uncertainty about long-term supply trends. Factors affecting supply trends include:

- increasing demand for aspen by producers of structural panels (oriented strand board) and other engineered wood products;

- public forest policies affecting the availability of existing aspen stands for harvest; and
- lack of silvicultural practice that fosters aspen regeneration and productivity.

Silviculture research has a critical role to play in efforts to sustain and enhance the aspen resource in the Lake States. Priority research topics for the pulp and paper industry include:

- Regeneration
Near-term: Harvest prescriptions for increasing the aspen component in forest areas dominated by low-quality mixed hardwoods.
Longer term: Genetic selection, breeding, biotechnology, and plantation establishment.
- Management of existing stands
 1. Growth and yield research, including studies of interactions among site quality, stocking, and fertilization.
 2. Wood quality research on the influences of site, age, stand density, and moisture stress on staining and decay rates.
 3. Research, development, and demonstration of options for improving wood quality and financial returns to growers by shortening rotations.
 4. Integration of silvicultural practices into cost-effective management systems.

Softwoods

The long fibers of softwood species are critical components of many paper and paperboard products. Long fibers greatly enhance the strength of a paper sheet (e.g., tear and burst resistance) and thus affect the performance of paper machines and final products in use.

Several mills in the Lake States use high-yield mechanical pulping processes to produce pulp for light-weight publication papers (e.g., for magazines and directories). White and black spruce and balsam fir are strategic resources for these mills because papermakers and their

customers value the smoothness, flexibility, brightness, and strength of mechanical pulps in which spruce and fir are the primary softwood components.

Pulp and paper producers have various opinions about the relative advantages of spruce and fir. Some feel spruce generally has better fiber properties and higher wood density/pulp yield. Others believe a mix of spruce and fir provides the best sheet properties. Lumber producers generally prefer spruce because fir typically has higher moisture content and thus requires more time and energy for drying. Papermakers and lumber producers both note that fir from older stands (e.g., > 60 years of age) typically has a high proportion of rot.

Fir is often more available than spruce in local wood markets in the Lake States. Spruce supplies in the Lake States declined dramatically in the early 1990s as a direct result of harvest reductions on Federal lands. Today, substantial quantities of spruce fiber are being imported into the Lake States, while substantial numbers of spruce stands in the region are declining in health and productivity due to overstocking and neglect. Spruce regeneration and growth on non-Federal lands are inadequate to improve the long-term supply outlook. Where spruce regeneration occurs, overstocking is often a problem.

Chemical pulp mills in the Lakes States use several softwood species including the spruces, pines, larches, and balsam fir. Species preferences, tolerances, and use patterns vary among mills depending on final products and local pulpwood market conditions. In general, the ability of chemical pulp mills to use several softwood species is attributable to two factors. First, chemical pulps are used in a wide range of bleached and unbleached products with various fiber requirements. Second, chemical pulping and bleaching remove lignin, color, and extractives from wood fibers, thus allowing production of pulps with high brightness from a variety of species.

Softwood supply is a critical strategic issue for most pulp and paper mills in the Lake States.

Industry research priorities include:

- Strategic assessment of options for increasing softwood production and/or imports.
- Cost/benefit analysis of silvicultural options for maturing and overstocked softwood stands on public and nonindustrial private lands.
- Development and testing of softwood silviculture options for forestry investors and land managers, including thinning and fertilization of pine plantations; further development and accelerated deployment of hybrid larch plantation systems; and economical options for increasing spruce and fir production in stands established by planting or natural regeneration.

Mixed Northern Hardwoods

The Lake States region has an abundance of mixed-species northern hardwood stands. Fibers from these stands are used in several bleached and unbleached paper grades after chemical pulping.

Pulpwood prices are typically much lower for mixed northern hardwoods than for other strategic fibers (e.g., the price for high-quality aspen is often 1.5 to 2 times greater than the price for mixed hardwoods). As a result, silvicultural prescriptions for northern hardwood stands are often influenced primarily by expected returns to sawtimber. It is important to note, however, that some producers of printing and writing papers strongly prefer birch and/or hard maple. Prices for birch/maple pulpwood have been increasing.

Although mixed northern hardwood is an abundant and relatively low-cost resource for pulp and paper mills, there are concerns about long-term supplies because natural

regeneration success has been marginal to poor in many stands. Industry research priorities include:

- Deer management research leading to reliable predictions of time windows for successful hardwood regeneration at a landscape scale based on effective population control measures and knowledge of natural population cycles.
- Herbicide research leading to reliable and cost-effective treatments to control sedge grass and invasive species that compete with hardwood regeneration.
- Research leading to harvest prescriptions that promote regeneration of mixed stands of high-quality hardwoods and softwoods.
- Growth and yield research that enables value growth projection in hardwood stands as a function of site quality, stand density, and species composition.
- Better methods for analyzing uneven-aged stands in harvest scheduling models.

Hybrid Poplars

Research in the Lake States and other regions has demonstrated the great potential of hybrid poplar plantations as sources of raw material for pulp, biomass energy, and other uses. Hybrid poplar plantations are being established on an operational scale in parts of Minnesota, where excellent yields of high-quality fiber on good sites can provide sufficient economic returns to justify relatively high growing costs. Priority topics for silviculture research include:

- *Near-term:* Optimize weed control, stand establishment, tree nutrition, and integrated pest management systems (especially for defoliating insects).
- *Longer term:* Traditional selection/breeding and biotechnology research for genetic improvement of wood quality.

Concluding Remarks

Silviculture research is a core competency of the forestry profession. It produces new forest management technologies and systems that enable progress toward economic and ecological sustainability. The ongoing decline in silviculture research capacity in the United States is a serious threat to the Nation's forest ecosystems and forest products industry. Without silviculture research, forestry loses much of its long-term practical value and becomes difficult to distinguish from other disciplines.

The Lake States region has a long history of achievement in forest stewardship, but has fallen far behind other wood producing regions in recent decades. Scandinavia and other regions have proven that well-integrated systems of silvicultural practices applied on a large scale can produce enormous economic, ecological, and social benefits. These benefits include improvements in tree quality, forest health, product versatility, aesthetics, wildlife habitat, and jobs.

There is an urgent need to assimilate existing knowledge from around the world and produce new Web-based silvicultural guides for the Lake States. The guides should be highly visual and provide “complete recipes” for achieving a range of objectives from wildlife management to timber production. The guides should also describe the potential regional benefits of modern silviculture as a way of building support for long-term investments in forestry research, education, and policy development.

A renaissance in Lake States silviculture research coupled with forest policy initiatives at the State and regional levels could simultaneously improve regional supplies of strategic fibers and forest ecosystem conditions, both in the near term and in the long term. Sustainable improvements in strategic fiber supplies would enhance the competitiveness of the region's pulp and paper mills and the communities that depend on them.