Monitoring the Mighty Duck Timber Sale: a National Forest - Conservation Organization - Research Partnership

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Abstract.—Resource managers are seeking silvicultural solutions to a variety of ecological, economic, and social issues. These issues include maintaining healthy and aesthetically pleasing forests, and sustaining or increasing ecological diversity. To reestablish a conifer component, and thereby increase species diversity, the LaCroix Ranger District of the Superior National Forest planned to apply a reserve tree method (RTM) to reduce the density of aspen suckers and increase survival and growth of planted conifers. The Ruffed Grouse Society questioned widespread application of the treatment because of its potential impacts on early successional forest communities, and offered to help finance a study to monitor results of the RTM. Communication and cooperation among the LaCroix District, the North Central Station, and the Ruffed Grouse Society led to a three-way partnership and a study to monitor and evaluate the results in six stands for 10 years. This long-term partnership will provide mutually beneficial silvicultural information to all parties.

INTRODUCTION

At the 1993 National Silviculture Workshop, Bill Shands (Shands 1994) called for new, stronger relations between Forest Service Research, the National Forest System, and the public in implementing the complicated business of ecosystem management. He also listed, among his seven points of ecosystem management, the need for Forest Service silviculturists and others to help forge these new cooperative relationships. The only change we would suggest today would be to rephrase his last item to read: "No matter what your position description you have an **opportunity** to help forge these new, cooperative relationships!" This paper reports a case study that illustrates his points and shows how communication and cooperation led to a three-way partnership between the LaCroix Ranger District on the Superior National Forest, the Ruffed Grouse Society, and the Silviculture of Northern Great Lakes Forests Research Work Unit of the North Central Forest Experiment Station.

HISTORICAL BACKGROUND

The LaCroix District is typical of much of the public forest land of the northern Great Lakes region. Ecologically, most of the forest types are far different from those of a century ago. Depending on location, the pre-settlement species growing on medium to fine-textured soils of Minnesota, Michigan, and Wisconsin were predominantly shade-tolerant conifers including white pine, eastern hemlock, and northern white-cedar; and tolerant hardwoods dominated by sugar maple, red maple, yellow birch, and basswood (Albert 1995; Braun 1950; Coffman et al. 1983; Kotar et al. 1988). White spruce, balsam fir, white ash, and American elm were common associates. Without stand-replacing disturbances, the aspens occurred as minor associates (Braun 1950).

During the late 19th century, exploitative logging, initially of conifer species, created conditions for slash-fueled wildfires that swept over large areas of the region, destroyed advanced regeneration of the former species, and resulted in "brushlands" comprised predominantly of aspen suckers and stump sprouts of associated hardwood species (Graham *et al.* 1963). Effective fire control beginning in the 1920's permitted these stands to develop into the present-day second-growth forests dominated by aspen.

ECOLOGY AND MANAGEMENT

The aspens are intolerant, rapidly growing, short-lived species that regenerate by root suckers following removal of the parent stand (Perala and Russell 1983). Suckers exhibit more rapid early height growth than seedlings or sprouts of associated species, so they typically form the dominant overstory during the early and mid-stages of stand development. On medium and fine-textured soils, pure aspen stands are rare; most include a component of more tolerant, longer lived species typical of these sites in the absence of disturbance. Until the 1960's, aspen was considered a "weed" species and little was harvested, resulting in an unbalanced age class distribution. Over much of the region, a relatively small portion of the type is less than 30 years old and a much larger proportion is older than 60 years. On most land, aspen is managed for wood products or for a combination of fiber and wildlife habitat. Where wood production is a primary objective, the stands normally are harvested by a silvicultural clearcut of all species and the aspen is regenerated from root suckers. Presumably, the procedure can be repeated and the aspen maintained indefinitely (Perala and Russell 1983).

THE PROBLEM

Clearcutting at frequent (40- to 50-year) intervals to maintain single or dual-species stands in an early successional state conflicts with several of the objectives of ecosystem management (*e.g.,* Irland 1994). Ecologically, this interrupts natural successional processes and "resets the successional clock" (Mladnoff and Pastor 1993). Additionally, the extensive loss of the conifer component from much of the forest area of the Lake States region has caused concerns about ecosystem structure and function and the diversity and quality of wildlife habitat (Green 1995; Mladenoff and Pastor 1993). In this context, members of the Timber Management staff and the Wildlife Biologist on the LaCroix District had discussions about Desired Future Conditions on the District

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and possible ways to reestablish a component of native conifer species. Establishing these species on suitable sites was considered a first step toward increasing species diversity at the stand level. Moreover, total yields of mixed-species stands may well exceed those of aspen alone (Navratil et al. 1994; Perala 1977). Natural regeneration of most conifers on these sites usually is limited by lack of available seed sources. Development of planted seedlings frequently is hampered by competition from dense stands of aspen suckers, stump sprouts, hazel, mountain maple, and herbaceous species. Research on use of prescribed fire for conifer regeneration has begun, but results are not yet available.

APPROACH TO SOLUTION

Ruark (1990) proposed a reserve shelterwood system to convert 30- to 35-year-old, even-aged aspen stands to two-aged stands and concentrate limited site resources (sunlight, nutrients, water, and growing space) on fewer stems per unit area. The method has not been tested or validated, but offers several potential advantages at different spatial scales. At the stand management level, the additional growth of the residual trees would be concentrated on a few quality stems producing high-value sawlogs and veneer bolts rather than pulpwood. Likewise, inhibition of dense suckering could channel the carbohydrate and nutrient reserves in the parent root systems to fewer suckers and increase their early growth.

From a landscape perspective, the resulting two-storied stands are aesthetically more appealing to many people than are clearcuts. Maintaining partial stocking of the site may be less disruptive to normal hydrologic and nutrient cycling processes. Two-storied stands provide structural diversity that benefits some wildlife species (Green 1995; Ruark 1990). The portion of the timber volume retained will reduce the sale volume per unit area, but the Allowable Sale Quantity can be distributed over a larger area. This will accelerate development of a more balanced age class distribution and reduce the eminent "breakup" of overmature stands. From a silvicultural and forest health viewpoint, this is especially important to those Districts that are losing net volume from mortality due to stem decay.

THE MIGHTY DUCK SALE

The sale area is in the northern portion of the District, near Voyageurs National Park along the Canadian border. It includes about 70,000 cords of predominantly mature and overmature aspen in 38 stands, totaling 1,050 ha (2,600 ac) distributed over a 4,740-ha (11,700 ac) area. The Mighty Duck sale is the first of four within the sale area; it included 19,000 cords in 14 stands and was scheduled to be sold in fiscal year 1996. The original intent was to apply the RTM on about 40 percent of the sale area, or 420 ha (1,030 ac). This involved leaving about 25 to 40 dominant, vigorous aspen per hectare (10 to 15 per ac), at a spacing of 15 to 20 m (50 to 66 ft). The objective of the RTM was to reduce the overall density of aspen suckers per unit area. It was assumed that the reserve trees will inhibit suckering to a degree (Ruark 1990). The remainder of each stand will be clearcut, with natural sucker development.

The conventional logging practice in the area is mechanical felling using feller-bunchers, limbing at the stump to a 10-cm (4 in) top diameter, and tree-length skidding with grapple skidders. Except for a penalty for damage to reserve trees, no restrictions on skidding routes were specified. This normally results in skidder traffic over most of the site and helps to control the typically dense understories of hazel and mountain maple. Depending on soil texture and internal drainage, either white pine, red pine, white spruce, or a mixture of white pine and red pine seedlings will be planted between the reserve trees at about 900 to 1,200 seedlings per hectare (400 to 500 per ac). At typical survival rates of 70 to 80 percent, this will provide stands of predominantly aspen with a mixture of conifers adapted to the sites.

During the public comment period on the Environmental Assessment in April and May 1996, concerns were raised by several participants about: (1) the uncertainties surrounding application of the RTM treatment to a 420-ha (1,030 ac) area without prior experience to predict the results; (2) the loss of merchantable volume left in the reserved trees; (3) a potential reduction in the long-term volume of aspen; and (4) a perceived degradation of habitat quality for wildlife species dependent upon early successional vegetation. To address these concerns, the District reduced the area to 220 ha (535 ac) in the Decision Notice and Finding of No Significant Impact issued in June.

In July, the Ruffed Grouse Society further questioned application of the RTM on the grounds that it was unlikely to yield the desired results and that it conflicted with the Forest Plan, which specifies clearcutting and group selection for the aspen type. The District agreed to reduce the area to 60 ha (140 ac) in six stands selected to include both summer and winter logging and a range of soil characteristics and stand conditions. The Ruffed Grouse Society agreed to this proposal and offered to help finance a designed study to monitor and evaluate the results. A condition of the agreement was that an approved study plan would be in effect before the sale was offered. In mid-August the District contacted the Silviculture of Northern Great Lakes Forests Research Unit at the North Central Station to design and conduct a study to evaluate the results of the RTM.

THE RTM STUDY

The District gave our research work unit copies of Environmental Assessment documents, sale area maps, stand and site information, and land type phase descriptions and maps. We used the information to outline a preliminary study plan, and met with District staff in mid-September for an on-site examination of the stands. We then designed a study and prepared a study plan to document initial overstory and understory conditions; evaluate effects of summer *vs.* winter logging; assess logging impacts on site disturbance and soil physical properties; and to monitor the condition and vigor of the reserve trees, density and growth of aspen suckers and competing vegetation, and survival and growth of the planted conifers. The study will provide data on effects of season of logging; overstory density; site disturbance; distribution and depth of logging slash; competing woody and

herbaceous vegetation; and physical soil properties, sufficient to assess development of the regeneration. This information will enable us to evaluate the RTM, and perhaps, to develop preliminary management recommendations for establishment of mixed-species stands on similar sites. Study installation began in late September, and the Mighty Duck Sale was sold on schedule.

DISCUSSION

In our experience, communication and cooperation between the National Forests and silviculture research units in the Lake States have been excellent. However, implementing ecosystem management is changing silvicultural objectives, practices, inquiries and questions. Resource managers are seeking silvicultural solutions to a variety of ecological, economic, and social issues that include sustaining or increasing ecological diversity, maintaining healthy and aesthetically pleasing forests, and restoring fish and wildlife habitat (Kaufmann *et al.* 1994; Baumgras and Skog 1996). Silvicultural research has a long record of providing scientific information and guidelines for maintaining and sustaining productive forests; however our research has emphasized the production aspects of forest management (Loftus and Aune 1995). The complexity of ecosystem management challenges us to change the way we approach and carry out our silvicultural tasks; this means renewed responsibilities for silvicultural research (Loftus and Aune 1995). Research units may not have answers to all of your questions, but we are willing to work with you to find satisfactory answers, or at least to develop "first approximation" solutions.

The Mighty Duck sale and the RTM study illustrate the role of communication, cooperation, and partnerships in implementing ecosystem management. The District was seeking a silvicultural approach to increase species and structural diversity by reestablishing a component of native conifers. The philosophy of ecosystem management says that we can manage forest lands for their full array of values and uses, but this calls for changes in the traditional ways of managing resources (Loftus and Aune 1995). To meet its multiple use objectives, the District was willing to take an adaptive management approach and try a modification of a method that had not been tested nor validated. The Ruffed Grouse Society helped to place the uncertainties of the RTM in perspective, pointed out the need for monitoring and evaluation, and committed to share the associated costs. The partnership provided the Station an opportunity to initiate a study on establishment of mixed-species stands that is likely to require some on-the-ground adaptive management. Adaptive management provides an opportunity for silvicultural research to contribute to the implementation of ecosystem management (Loftus and Aune 1995). It also gives us reason to monitor results and evaluate outcomes of our guidelines and prescriptions. This will improve resource management activities incrementally as managers and scientists learn from experience and new scientific findings.

Although the study is still being installed, and logging has not yet begun, it illustrates how ranger districts, partners, and research units can work together for mutual benefit. The results will give the District information on whether or not the RTM applied to 60- to 70-year-old aspen stands is effective in decreasing sucker density and in facilitating establishment of native conifers. It will provide the Ruffed Grouse Society with data about treatment effects on development of aspen suckers and on wildlife habitat characteristics. The study results will enable us to evaluate the RTM in mature stands harvested in summer and winter, and depending on the outcome, to either develop preliminary management recommendations for similar stands and sites, or design a study to evaluate the RTM under a range of overstory densities in younger age classes. Either way, this partnership illustrates a "win-win-win" situation.

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APPENDIX

Common and scientific names of trees and shrubs.

Balsam fir (*Abies balsamea* (L.) Mill.)
Red maple (*Acer rubrum* L.)
Sugar maple (*Acer saccharum* Marsh.)
Yellow birch (*Betula alleghaniensis* Britt.)
Paper birch (*Betula papyrifera* Marsh.)
White ash (*Fraxinus americana* L.)
White spruce (*Picea glauca* (Moench) Voss)
Eastern white pine (*Pinus strobus* L.)
Bigtooth aspen (*Populus grandidentata* Michx.)
Trembling aspen (*Populus tremuloides* Michx.)
Northern white-cedar (*Thuja occidentalis* L.)
Basswood (*Tilia americana* L.)
Eastern hemlock (*Tsuga canadensis* (L.) Carr.)
American elm (*Ulmus americana* L.)

Mountain maple (*Acer spicatum* Lam.)
Beaked hazel (*Corylus cornuta* Marsh.)