Northern Hardwoods through the Eyes of Practitioners: Case Studies on the Great Lakes Silviculture Library

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Every time natural resource managers design and apply a treatment to a forest stand, then observe or monitor outcomes of that treatment, they learn about how a system responds based on numerous factors. Lessons from silvicultural treatments implemented within an agency or company can provide a wealth of knowledge within it, there are relatively few opportunities for practitioners to share those lessons across administrative boundaries. We created the Great Lakes Silviculture Library in 2015 to provide a platform for practitioners to share these lessons more broadly.

The Great Lakes Silviculture Library is a free, open-access library of real-world forest management case studies, hosted by the University of Minnesota's Cloquet Forestry Center (Fig. 1). Most case studies are published by professional resource managers from the states of Minnesota, Wisconsin, and Michigan, United States, and the Canadian Province of Ontario. Reviewing case studies gives users a valuable insight into practical questions, issues, and solutions faced by the people making management decisions across Lake States forests.

Case studies are generally the equivalent of three to five standard pages of written text, following a flexible content template provided by library editors. Most case studies are authored by resource managers. The library is online at https://silvlib.cfans.umn.edu.

We reviewed the content of published Great Lakes Silviculture Library case studies addressing northern hardwoods stands. Our objective was to characterize and describe the content of these northern hardwoods case studies, with a focus on the following questions:

- What questions are natural resource managers asking?
- What problems are they facing?
- What silvicultural systems are they applying?
- What lessons and themes emerge from their work?
- To what extent can case study data serve as the foundation for useful research into practical silviculture issues?

As of June 2021, 123 case studies were published in the library. To identify case studies pertaining to northern hardwoods, we used the following inclusion criteria: (1) categorized by the authors and editor as northern hardwoods cover type; (2) content focused on species most commonly considered northern hardwood: paper birch *(Betula papyrifera),* yellow birch (*Betula alleghaniensis)*, basswood (*Tilia americana*), sugar maple (*Acer saccharum*), beech (*Fagus* spp.), northern red oak (*Quercus rubra*); and (3) focus on aspen (*Populus* spp.), white spruce (*Picea glauca*), hemlock (*Tsuga* spp.), or other species but only in combination with management designed to promote the northern hardwood species in the second group.

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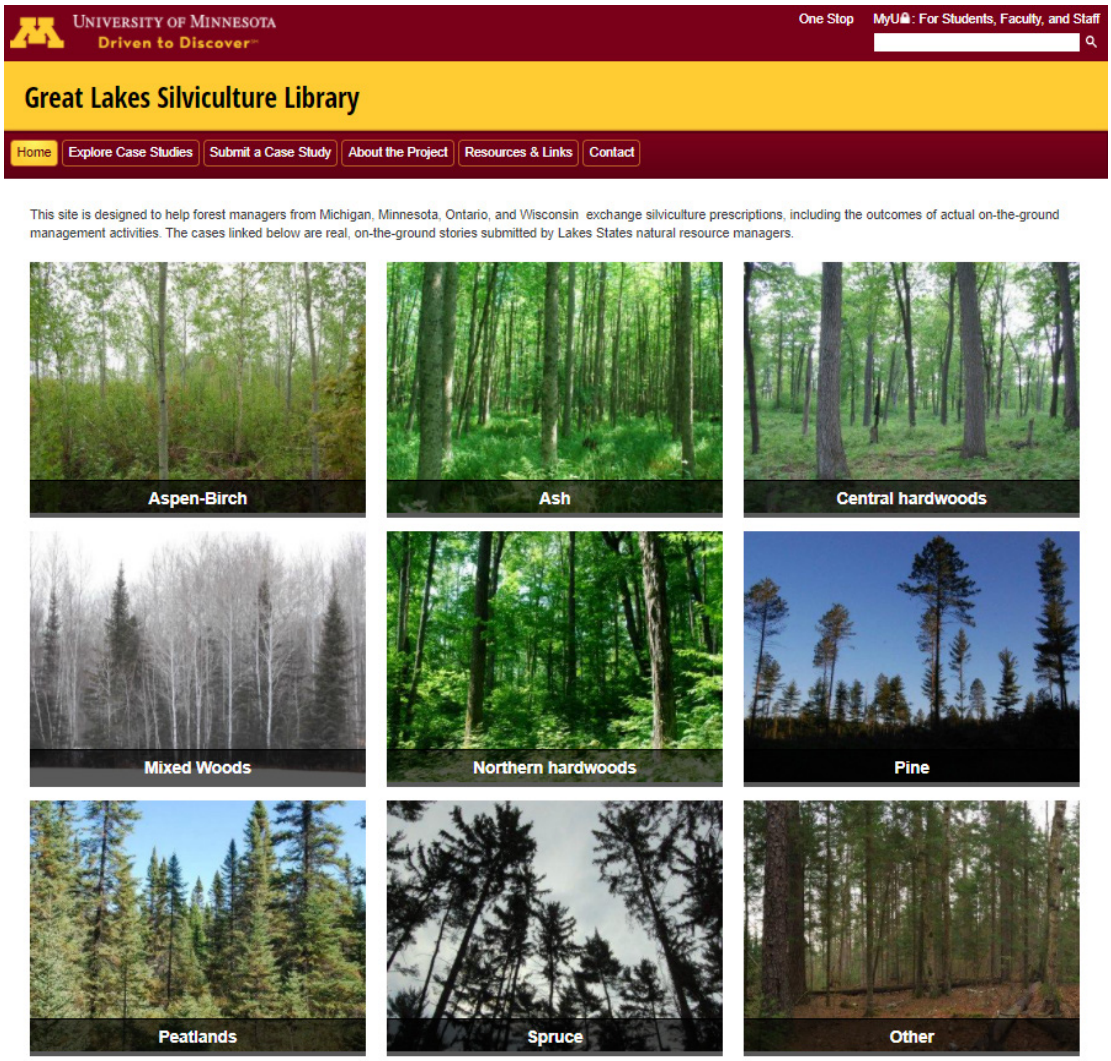

Figure 1.—The Great Lakes Silviculture Library homepage at the time of the 2021 Northern Hardwoods Conference.

We used the following exclusion criteria: (1) case studies describing pure mixed-oak management, no management for "core" northern hardwoods species; and (2) focus exclusively on white oak (*Quercus alba*) or other peripheral species.

Applying these criteria, we identified 28 case studies as pertaining to northern hardwoods.

BASIC DESCRIPTIVE STATISTICS

Northern hardwoods case studies are nearly all from public ownerships and are mostly from Minnesota. Of 28 case studies, 17 are from stands in Minnesota, 9 are from Wisconsin, and 2 are from Ontario. Ownerships included 11 state owned properties, 9 county owned properties, 3 tribal or federal/crown owned properties, and 2 private properties.

SILVICULTURAL GOALS AND SYSTEMS APPLIED

Silvicultural goals were included for 26 of 28 case studies. Nineteen case studies focused on regeneration objectives, four on intermediate treatments such as thinning or timber stand improvement, two on sanitation or salvage, and one on browse protection. Two case studies were excluded from this analysis because they involved only enrichment plantings in an assisted migration study.

Case studies applied a variety of silvicultural systems including shelterwood (9), variable density thinning (3), single-tree selection (3), group selection (3), and the seed-tree system (2). The other eight case studies focused on site preparation, species thinning, sanitation, or browse protection treatments and did not include a regeneration harvest.

THEMES AND EXAMPLES

Case studies revealed a high level of creativity and practical innovation. While admittedly subjective, interesting examples include:

- Throwing out the rulebook, relying on forester judgement in a declining stand: 33 years of northern hardwood management, Ashland County, WI[2]
- A creative use of shelterwood to regenerate black cherry on Crown lands in Ontario[3]
- Conifer strongholds: Assisted migration enrichment plantings, by The Nature Conservancy and Superior National Forest[4]
- Variable density thinning over multiple cutting cycles to maintain a multi-aged northern hardwood stand in Aitkin County, MN[5]

The following themes were common in the northern hardwoods case studies:

- Diversifying stands to increase resilience
- Regenerating northern hardwood species including paper birch, yellow birch, basswood, sugar maple, beech, northern red oak
- Simplifying complex silvicultural systems
- Forest health issues including deer browse, oak wilt, and sedge competition

Although all case studies were published in 2015 or later, climate adaptation was not mentioned as a common focus. Several case studies involved practitioners experimenting with making complex single-tree selection or variable-density thinning prescriptions simpler, more practical, and easier to apply operationally.

VALUE AND LIMITS OF CASE STUDY DATA

Case study data have value as way to share practitioner knowledge, priorities, and management issues. These data provide examples of how natural resource managers are using different silvicultural techniques to meet management goals and objectives. The goal of the Silvicultural Library is not to replace peer-reviewed products. What it can and does do is open opportunities for communication that may lead to deeper investigation through replicated studies with statistical analysis. Case studies also have value as a source of ideas or solutions from across administrative boundaries (Moser et al. 2022).

The case studies submitted to the Silviculture library do not reflect a random sample. Thus, case studies likely do not reflect all questions or lessons learned by practitioners. The number

[2] https://silvlib.cfans.umn.edu/content/33-years-northern-hardwood-management-ashland-county

[3] https://silvlib.cfans.umn.edu/content/shelterwood-regenerate-black-cherry-crown-ontario

[4] https://silvlib.cfans.umn.edu/content/conifer-strongholds-changing-northwoods-landscape-crooked-lake-usfs

[5] https://silvlib.cfans.umn.edu/content/multi-aged-northern-hardwood-forest-aitkin-county

of case studies is limited but growing. As the data pool continues to grow, more similarities and differences in issues across regions, sites, and treatments can be explored. A final limitation may be the amount of data and the type of data collected; the data collected are generally part of a management organization's internal inventory and monitoring protocols, which vary across organizations and are designed to answer questions different from those of interest to library users.

CONCLUSIONS

Twenty-eight of 123 case studies published on the Great Lakes Silviculture Library describe real-world northern hardwoods silviculture treatments. Most describe work on public lands. These case studies include a diverse mix of silvicultural treatments with a variety of objectives that include increasing stand diversity, reducing forest health threats, and regenerating desired species.

Platforms like the Silviculture Library give foresters a voice and can inform future applied research. We're always looking for case study submissions.

The slides accompanying this presentation are available at http://z.umn.edu/nhcSL.

LITERATURE CITED

Moser, R.L.; Sagor, E.S.; Windmuller-Campione, M.A. 2021. **The Great Lakes Silviculture Library: insights into a case study platform**. Journal of Forestry. 120(3): 289–301. https://doi.org/10.1093/jofore/fvab062.

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