Tools for rehabilitative silviculture in degraded hardwood stands

FEMC 2025 – Burlington, VT

John D. Foppert

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Overview

- **Background, motivation & context**
- **Principles of rehabilitative silviculture**
- **Rehabilitative silviculture in practice**
- **Barriers to implementation**
- **NSRC Project**
  - **Purpose**
  - **Partners & pieces**
  - **Progress**
  - **Prospects**
- **Conclusion**

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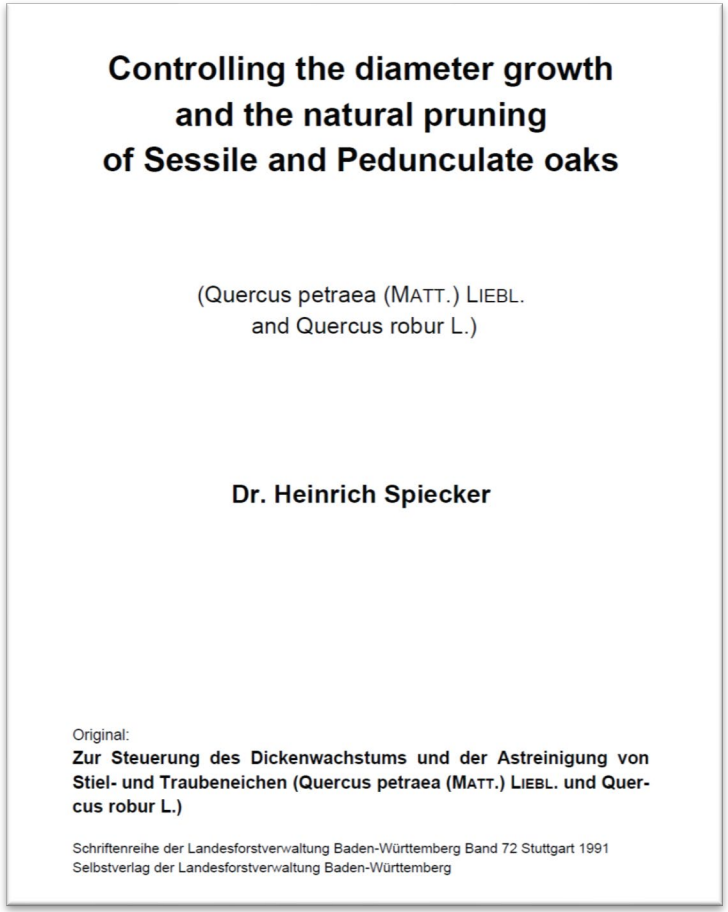
Background

- **Envisioning precision hardwood silviculture**



Controlling the diameter growth and the natural pruning of Sessile and Pedunculate oaks

(Quercus petraea (MATT.) LIEBL. and Quercus robur L.)

Dr. Heinrich Spiecker

Original:
Zur Steuerung des Dickenwachstums und der Astreinigung von Stiel- und Traubeneichen (Quercus petraea (MATT.) LIEBL. und Quercus robur L.)

Schriftenreihe der Landesforstverwaltung Baden-Württemberg Band 72 Stuttgart 1991
Selbstverlag der Landesforstverwaltung Baden-Württemberg

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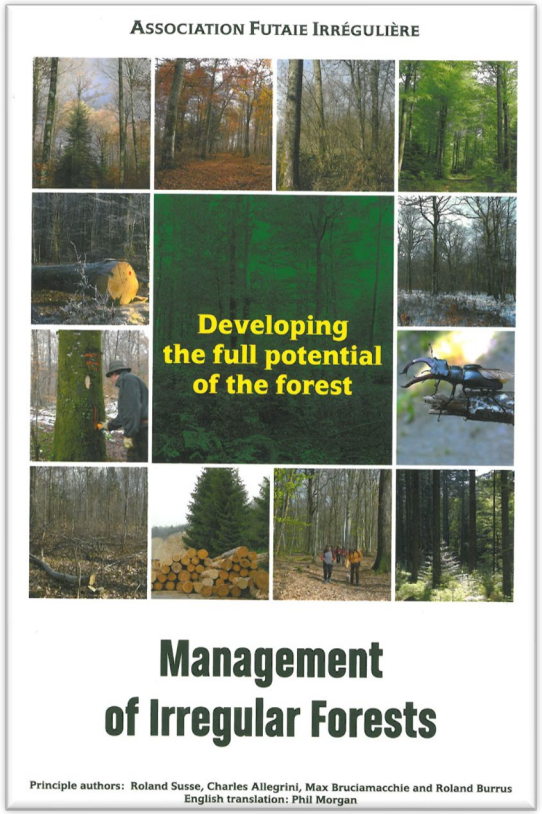

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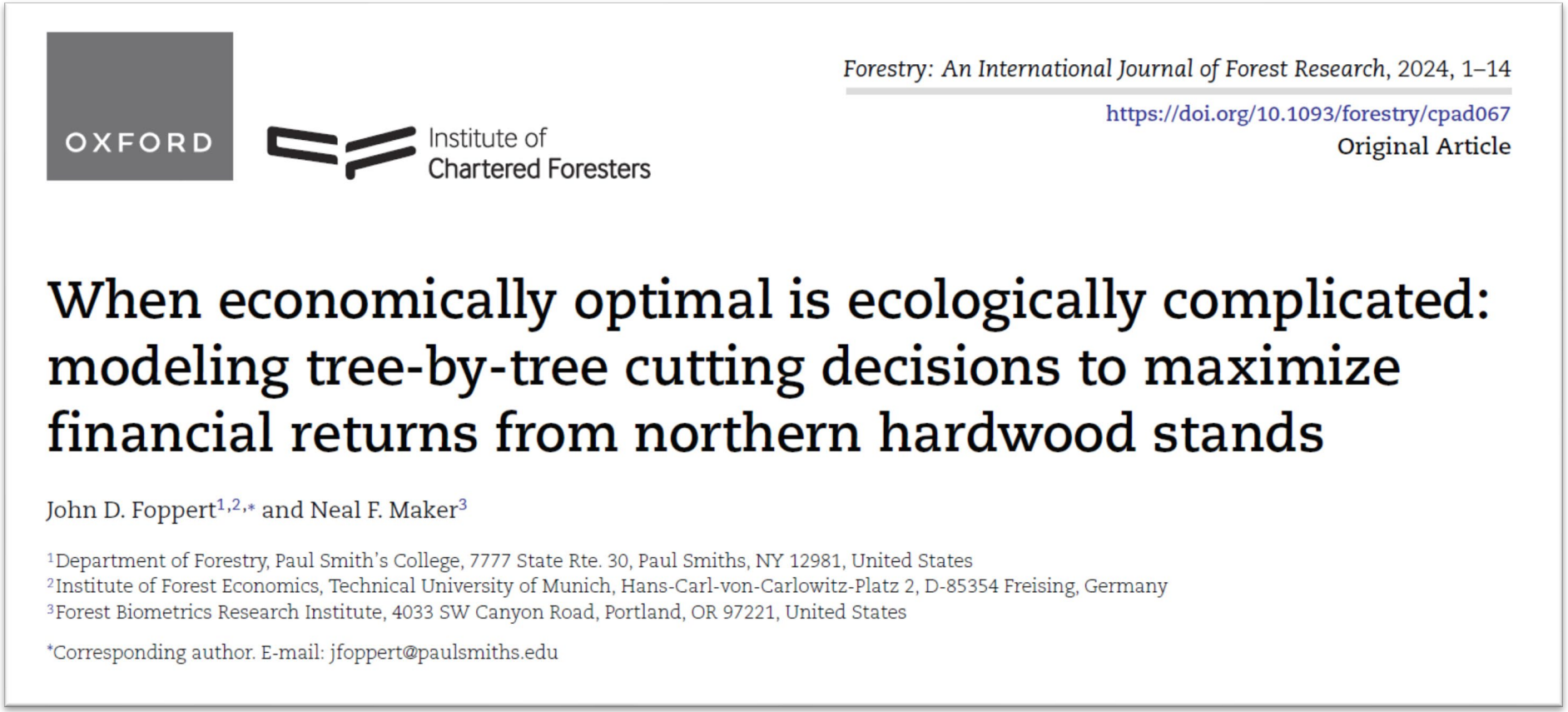

OXFORD

Institute of Chartered Foresters

Forestry: An International Journal of Forest Research, 2024, 1–14

https://doi.org/10.1093/forestry/cpad067

Original Article

When economically optimal is ecologically complicated: modeling tree-by-tree cutting decisions to maximize financial returns from northern hardwood stands

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- **Optimal management…**

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Background

- … or optimal response to mismanagement?

Background

Forest Ecology and Management
Volume 432, 15 January 2019, Pages 415-426

Evaluating degradation in a North American temperate forest

John S. Gunn [a], Mark J. Ducey [a], Ethan Belair [b]

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https://doi.org/10.1016/j.foreco.2018.09.046 Get rights and content

Highlights

- Exploitative harvesting practices are widespread in northern New England (USA)
- Future availability of high-quality forest products could be compromised.
- Regional forest inventory data were used to assess tree species stocking and quality.
- Almost half of northern New England forests are in a degraded condition.
- Slight trend of increased stocking comes from undesirable species and form.

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Background

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Check for updates

Worse off on purpose: An economic analysis of deliberate forest degradation

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ARTICLE INFO

Keywords:
High grading
Statistical discounting
Optimal harvesting
Northern hardwoods

ABSTRACT

High grading is, by definition, wealth-destructive, and yet the practice is widespread. Explanations of high grading typically assume landowners are greedy, impatient, or ignorant. None of these explanations are robust. This paper develops an analytical model of landowner decision making that provides a richer explanation for this counterproductive practice. The model centers on buyers' behavior in markets for heterogeneous-quality forestland. Facing imperfect information, it is rational for buyers to shade their estimated valuation of a pro-

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The best forestry money can buy:

Efficient contracting for silvicultural expertise

(and the limits thereof)

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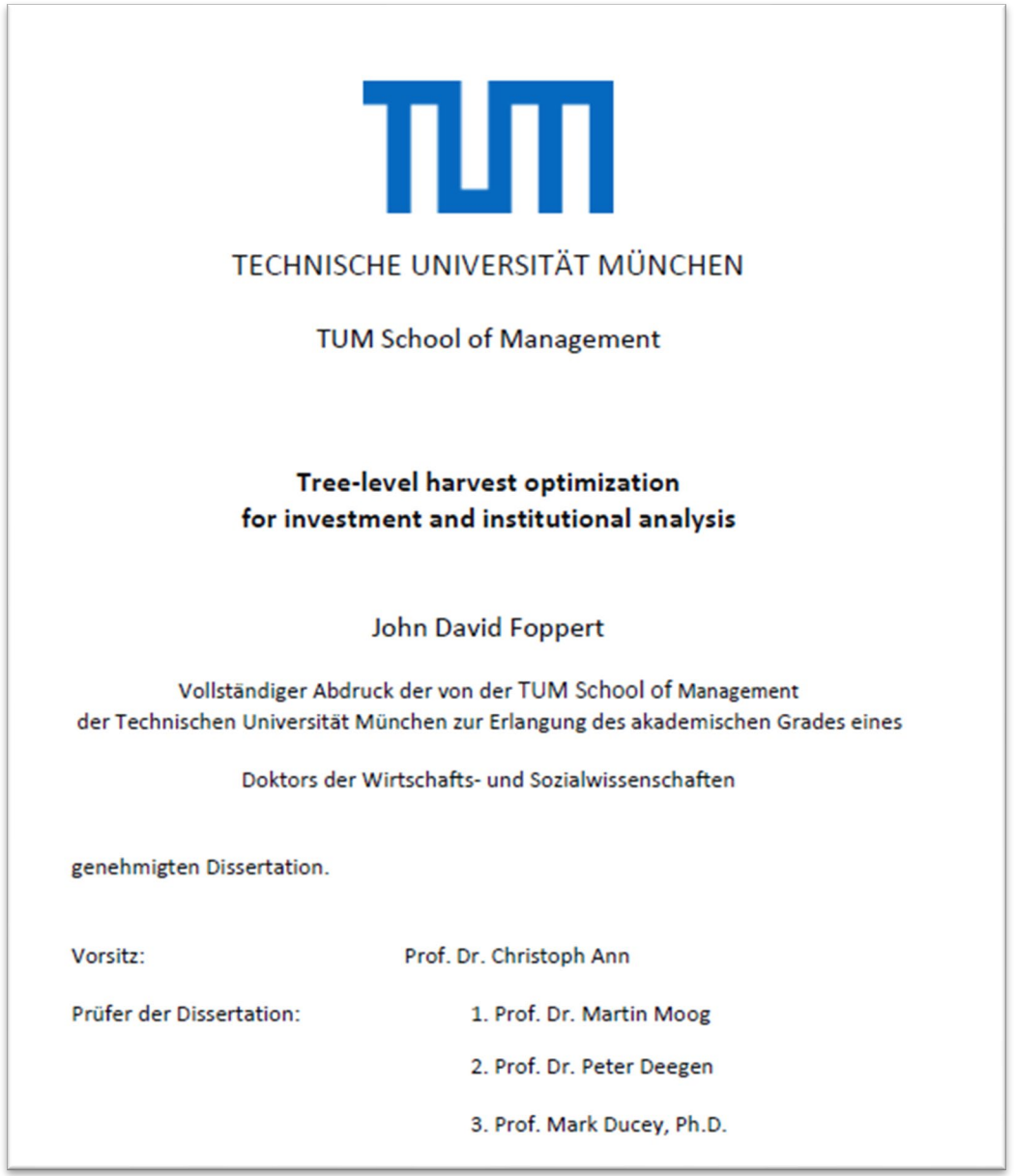

TECHNISCHE UNIVERSITÄT MÜNCHEN

TUM School of Management

Tree-level harvest optimization for investment and institutional analysis

John David Foppert

Vollständiger Abdruck der von der TUM School of Management
der Technischen Universität München zur Erlangung des akademischen Grades eines

Doktors der Wirtschafts- und Sozialwissenschaften

genehmigten Dissertation.

Vorsitz: Prof. Dr. Christoph Ann

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1. Prof. Dr. Martin Moog
2. Prof. Dr. Peter Deegen
3. Prof. Mark Ducey, Ph.D.

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Principles of Rehabilitative Silviculture

Rehabilitating Cutover Stands: Some Ideas to Ponder

Ralph D. Nyland
Faculty of Forest and Natural Resources Management, State
College of Environmental Science and Forestry,

Here's The Issue

Landowners who have cutover stands usually want to rehabilitate them at no out-of-pocket cost. That always proves challenging. In fact, rehabilitation must start with the investment of assessing conditions that diameter-limit and other exploitative cuttings created. Then managers must identify ways to improve the situation, and finally select an alternative that minimizes additional cash outlays in the process. At best, they often settle on a least-cost approach, hoping it will return a stand to profitability in a reasonable time.

Yet landowners and their managers face a harsh reality. Having allowed or encouraged diameter-limit cutting, they already incurred a heavy cost in:

- production opportunities lost due to poor stocking after the heavy cutting
- reduced quality and vigor of the residual trees
- lessened revenues due to prior cutting of the most desirable species

Figure 1.—Commo
stands after thinnin
Smith 1986).

A Basic Strategy

Rehabilitation of cutover stands requires four basic measures:

1. even the spacing between residual trees by removing the poorest ones;
2. concentrate the growth potential onto trees of acceptable quality, or the potential to grow into ones of reasonable value;
3. regenerate a new cohort to fill the empty space; and
4. control interference to enhance regeneration success.

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Principles of Rehabilitative Silviculture

Changing our mental model from growing volume to producing value: The case of uneven-aged hardwood management

by Jean-Martin Lussier[1]

ABSTRACT

The selection system is a common management system in uneven-aged tolerant hardwoods stands in Crown forests of eastern Canada. This silvicultural system aims to produce a sustained yield of products and services at the stand level, using frequent partial cuttings that harvest the mature and valuable portion of the forest, while tending the rest of the stand to increase its productivity and value for future cuttings. Current practices involve the use of empirical partial cutting guides to decide the number of trees to both harvest and maintain at each cutting cycle, typically to maximize long-term sawlog and veneer production. This paper demonstrates that by replacing this objective function with the maximization of the net value of the harvest for the whole value chain by using a simple mathematical optimization model, forest management can be greatly improved in terms of profitability. Nevertheless, further developments are needed for improving forest management optimization models in order to better balance short-term profitability and long-term ecological, economic and societal objectives.

Key words: Selection system, hardwoods, uneven-aged silviculture, optimization, economic, value chain, profitability, steering treatment

Principles of Rehabilitative Silviculture

RESEARCH ARTICLE

J. For. 112(3):287–295
http://dx.doi.org/10.5849/jof.13-041

silviculture

Managing Heterogeneous Stands Using a Multiple-Treatment Irregular Shelterwood Method

Jean-Martin Lussier and Philippe Meek

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Principles of Rehabilitative Silviculture

Rehabilitation Silviculture

This approach is applied to large areas with heterogeneous stand conditions (microstands) too small

be commercially marginal. The overall strategy is to remove mature or unacceptable growing stock, release acceptable growing stock or regeneration, and create/release regeneration where AGS is absent, generally using

difference is that each acre, or group of acres, presents a different challenge. Over time, these areas can be transitioned to individual even-aged or uneven-aged stands, as appropriate (Fig. 8) (see Kenefic et al., no date; Nyland 2011).

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Principles of Rehabilitative Silviculture

- **Work with what you've got**
  - **Identify good growing stock (species, vigor, quality)**
    - **Poles/sawtimber: 3- or 4-sided release**
    - **Liberate saplings**

- **Where you've got nothing to work with…**
  regenerate as much as the landowner can stomach

- **Match regeneration method to silvicultural constraints**
  - **Site and stand limitations**
  - **Markets and operations**
  - **Social license**

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Rehabilitative Silviculture in Practice

Adirondack example:

- **Deficient, excessively well-drained till sites**
- **Low-density remnant overstory (~40 ft^2/ac)**
- **Beech-dominated mid-story**
- **5-15 tr/ac reserve-quality poles/small ST (maple, birch, cherry)**
- **Whole-tree harvest systems, biomass chip markets**
- **1-5 acre regenerative openings (residual BA < 10 ft^2/ac), complete midstory/understory removal, thorough scarification**
- **“Boom’s-length” tending along trails and around patches**

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Rehabilitative Silviculture in Practice

- **Patch boundary layout**
- **In-patch reserve tree designation, marked to keep**
- **Skid trail layout**
- **Off-trail / patch-edge tending, marked to cut**

Rehabilitative Silviculture in Practice (or not)

Barriers to implementation:

- **Technical barriers -**
  - **Spatial complexity/field-of-vision constraints**
  - **Reserve tree selection criteria**
- **Administrative barriers - “What box am I supposed to check?”**
- **Social / relational barriers - “Were you even listening to me?!**

I said I care about *habitat* !”

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NSRC 2024: Tools for Rehabilitative Silviculture to Enrich Habitat and Restore Productivity in Degraded Hardwood Stands

Project Objectives:

(1) develop refined management guidance and implementation protocols for rehabilitative silvicultural treatments in degraded hardwood stands

WHAT TO DO

(2) quantify the potential impact of these practices at stand, landscape, and regional scales

WHY TO DO IT

(3) equip land managers with quantitatively rigorous, easy-to-use support tools to help them implement these practices confidently and efficiently

HOW TO DO IT

(4) effectively communicate the benefits of these practices to landowners and policy makers

NOW, GO DO IT!

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NSRC 2024: Tools for Rehabilitative Silviculture to Enrich Habitat and Restore Productivity in Degraded Hardwood Stands

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NSRC 2024: Tools for Rehabilitative Silviculture to Enrich Habitat and Restore Productivity in Degraded Hardwood Stands

Research activities

- **Prescription optimization methods development**
  - **Improved harvest cost and residual stand damage models**
  - **Optimization of crop-tree selection criteria**
  - **Spatially optimized treatment type delineation**
- **Habitat use monitoring**
- **Impacts and benefits modeling**
  - **Landscape-scale modeling**
  - **Region-wide modeling**

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NSRC 2024: Tools for Rehabilitative Silviculture to Enrich Habitat and Restore Productivity in Degraded Hardwood Stands

Project outputs

- **Mobile app and GIS toolkit**
  - **Field data collection**
  - **Treatment delineation decision support**
- **Technical management guide & workshop**
- **General audience outreach material**

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Questions?

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