Lessons on long-term structural Stability after selection cutting in uneven-aged and even-aged northern hardwood stands

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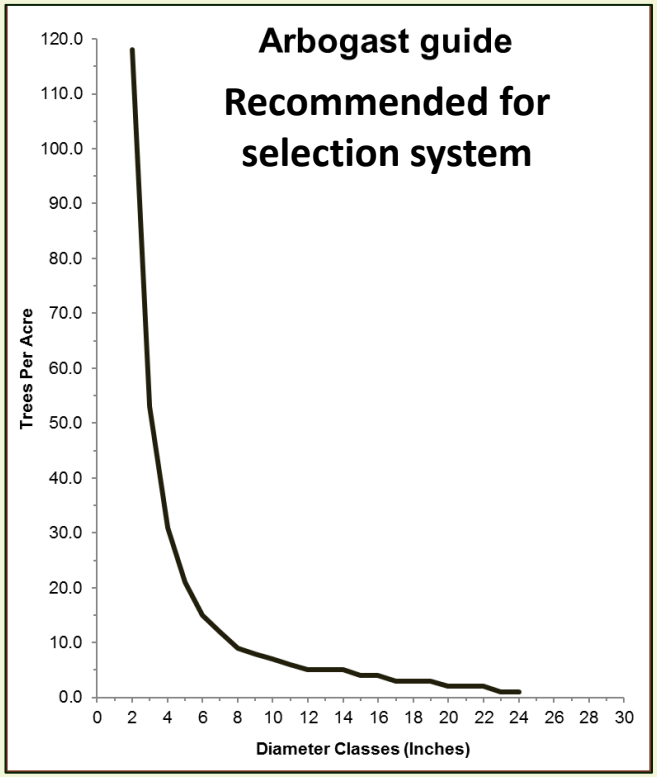
Introduction

Selection cuttings in uneven-aged stands of northern hardwoods maintain:

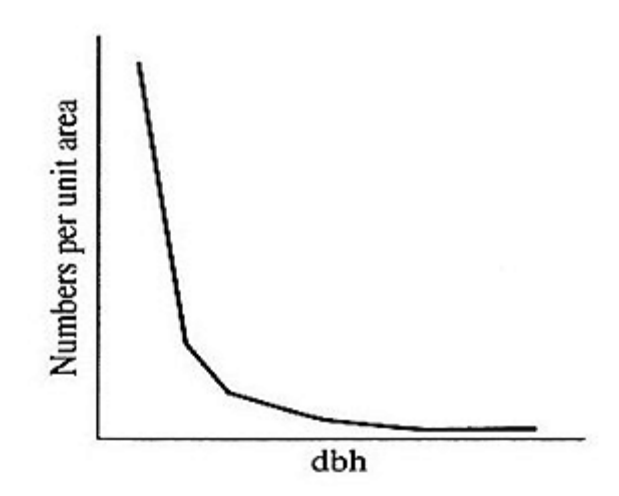
- Sustainable and consistent production
- Stable stand conditions
- Regulated stand structure that can be sustained
- Multiple levels of ecosystem complexity



But applying selection-like cuttings in second-growth even-aged stands might lead to unfavorable outcomes with respect to structural and timber production goals

Introduction

Northern hardwoods have shade-tolerant species that survive in the understory and mid-story for many years. That gives the diameter distribution for both even- and uneven-aged stands an overall reverse-J form.



With species of high shade tolerance …

… many overtopped and lower intermediates live on

This Study

Investigated **long-term structural stability** in northern hardwood stands

Age Characteristic	Site	Number of Stands	Treatment
Second-growth Even-aged with residuals from past high-grading	Argonne Experimental Forest (AEF), WI	3	Selection-like
Uneven-aged	Dukes Experimental Forest (DEF), MI	12	Single-tree selection
	Cuyler and Secord Hill State Forests (CSH), NY	6	
	Anna Huntington Wildlife Forest (HF), NY	8	

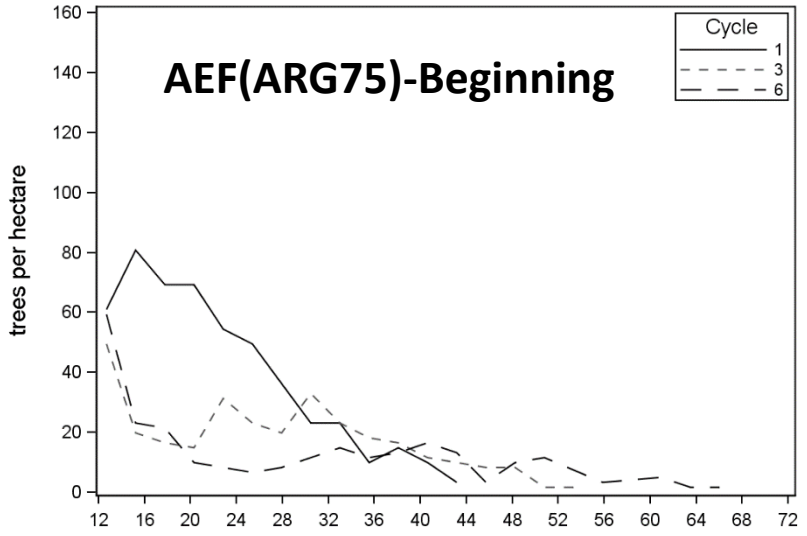
Bassil, S., Nyland, R.D., Kern, C.C., Kenefic, L.S. 2019. Dynamics of the diameter distribution after selection cutting in uneven-aged and even-aged northern hardwood stands: a long-term evaluation. Can.J. For.Res. 49(12): 1525-1539. doi. 10.1139/cjfr-2019-0204.

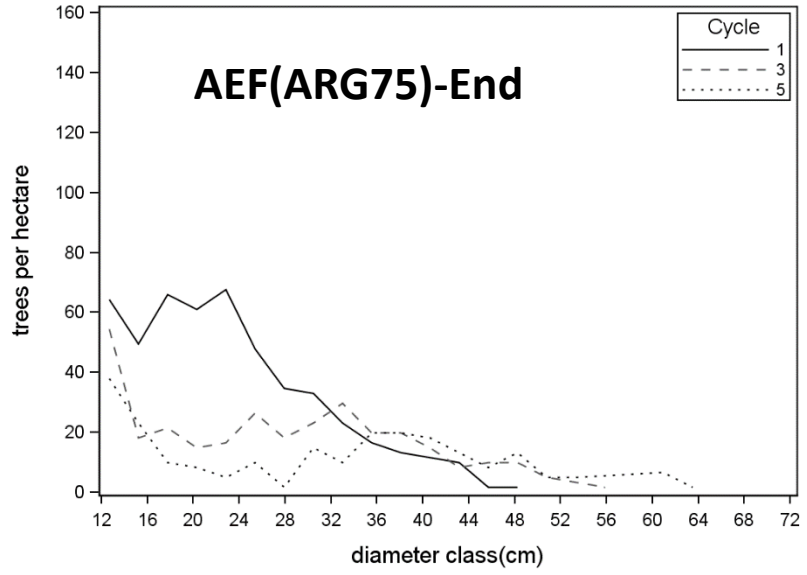
Analysis (SAS 9.4 M1)

1. Visual assessment of plots of diameter distributions through time for trees grouped into 2.5 cm diameter class
2. Plot attributes through time : Median DBH, Residual basal area, Total tree density.
3. Plotting scale and shape parameters through time of fitted 3-parameter Weibull probability density function with location fixed at 11.4cm

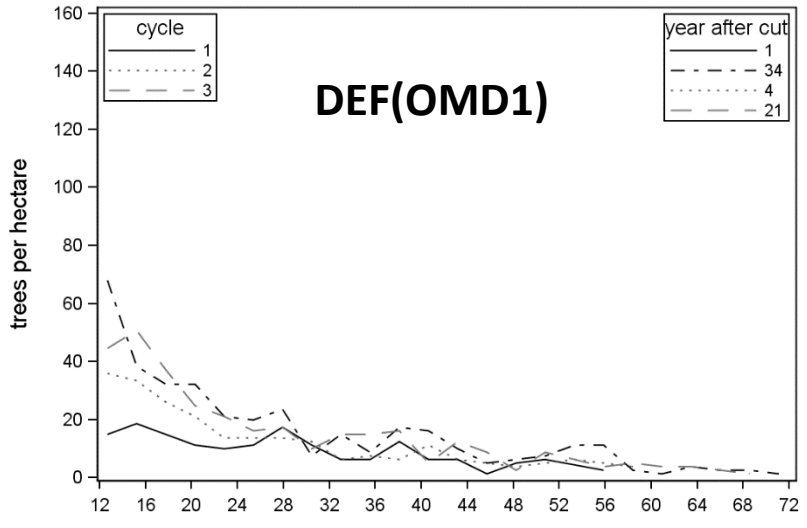
This Results: Diameter Distribution Study

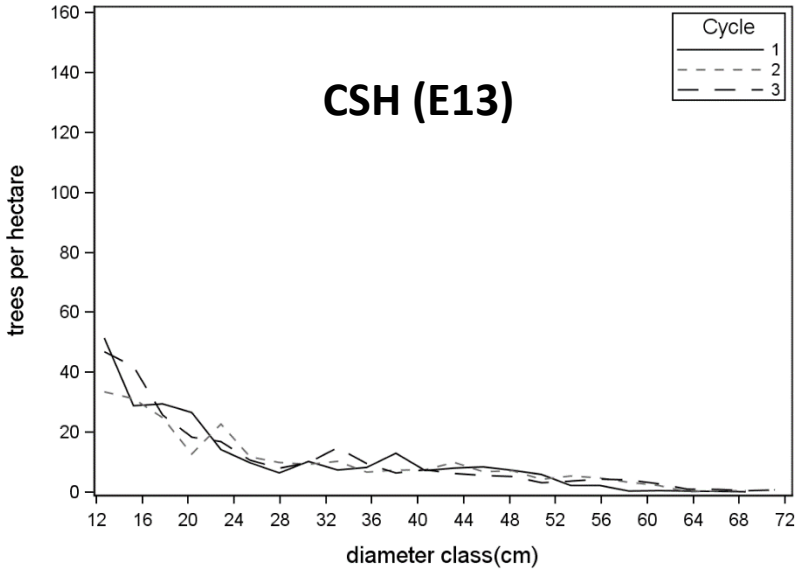
Second-growth even-aged stand





Uneven-aged stand

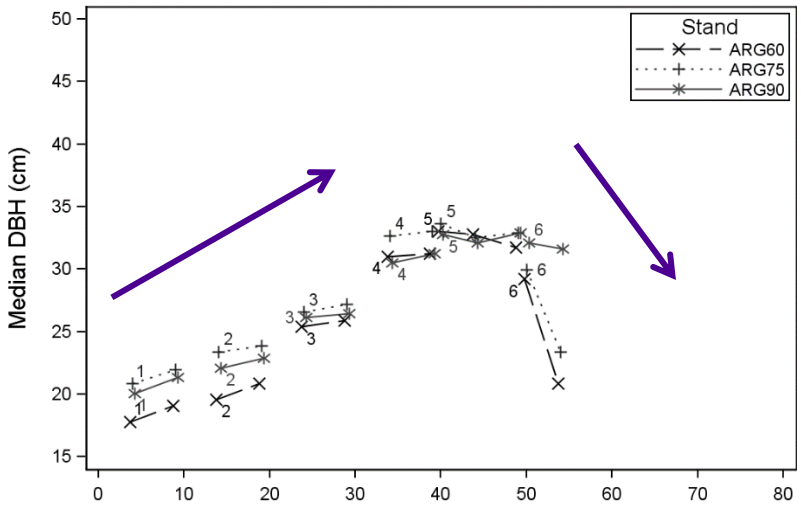




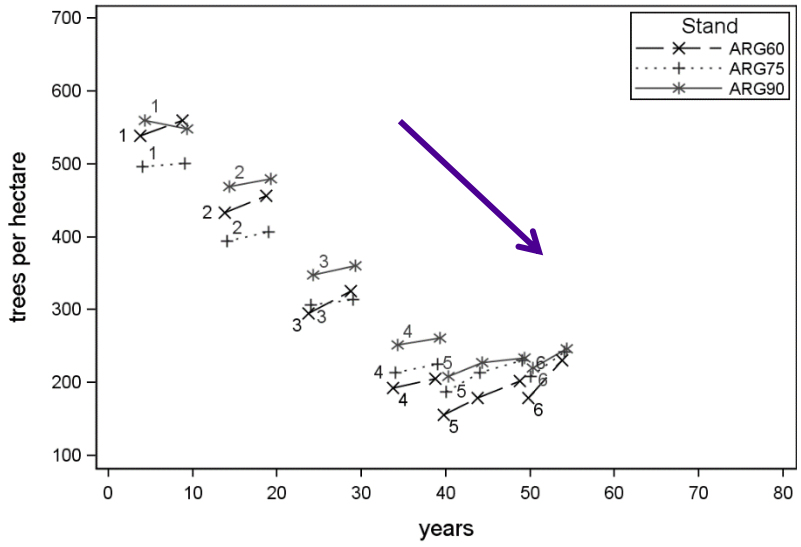
Results: attributes

Second-growth even-aged stand

Median DBH - AEF

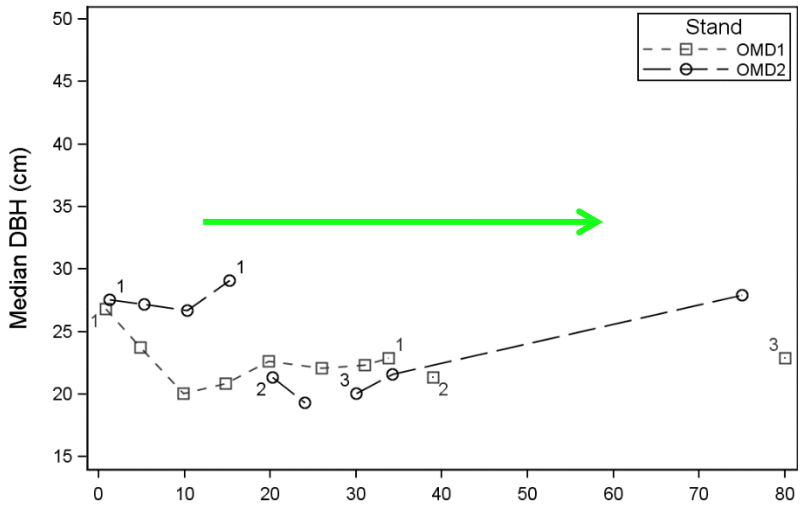


Total tree density- AEF

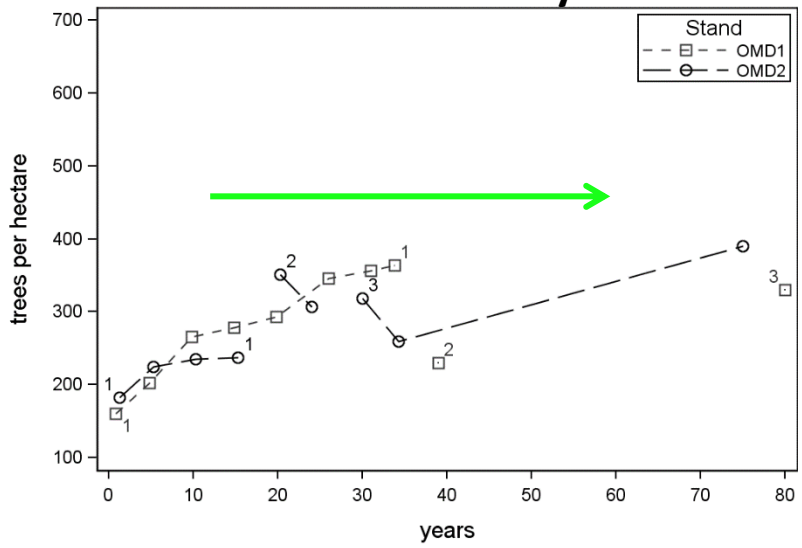


Uneven-aged stand

Median DBH - DEF

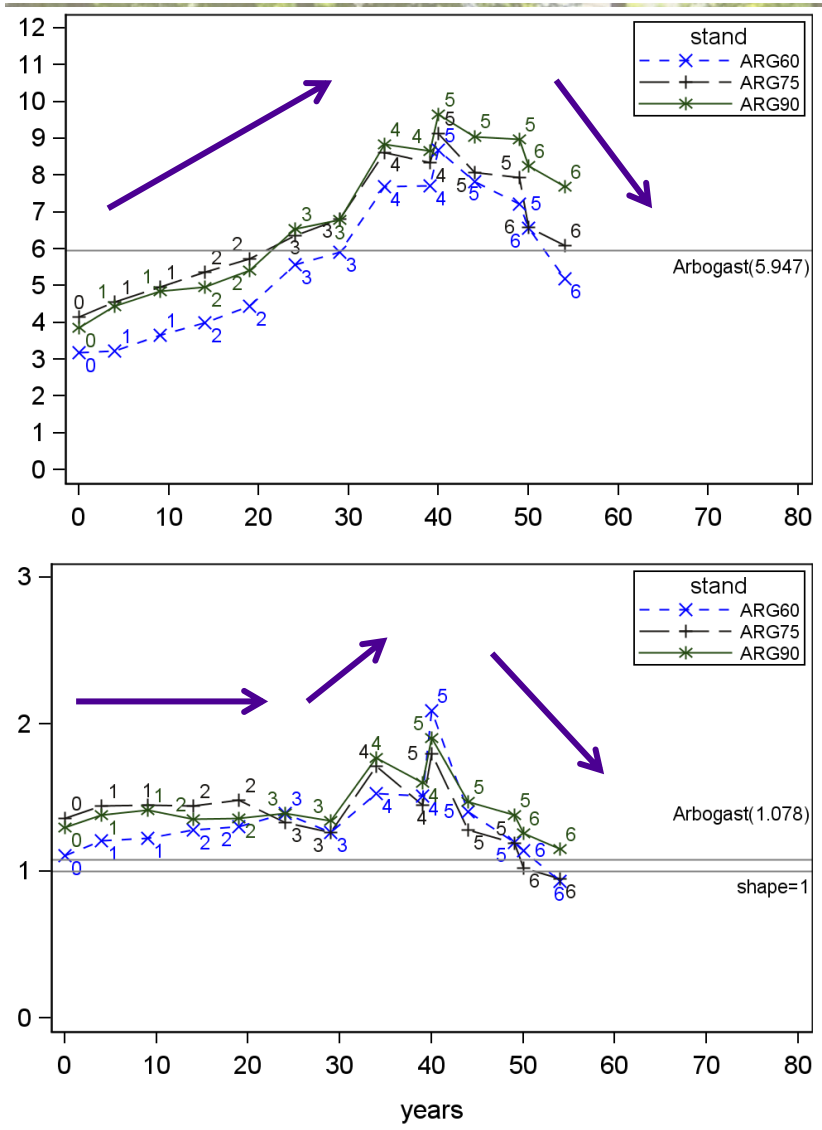


Total tree density- DEF

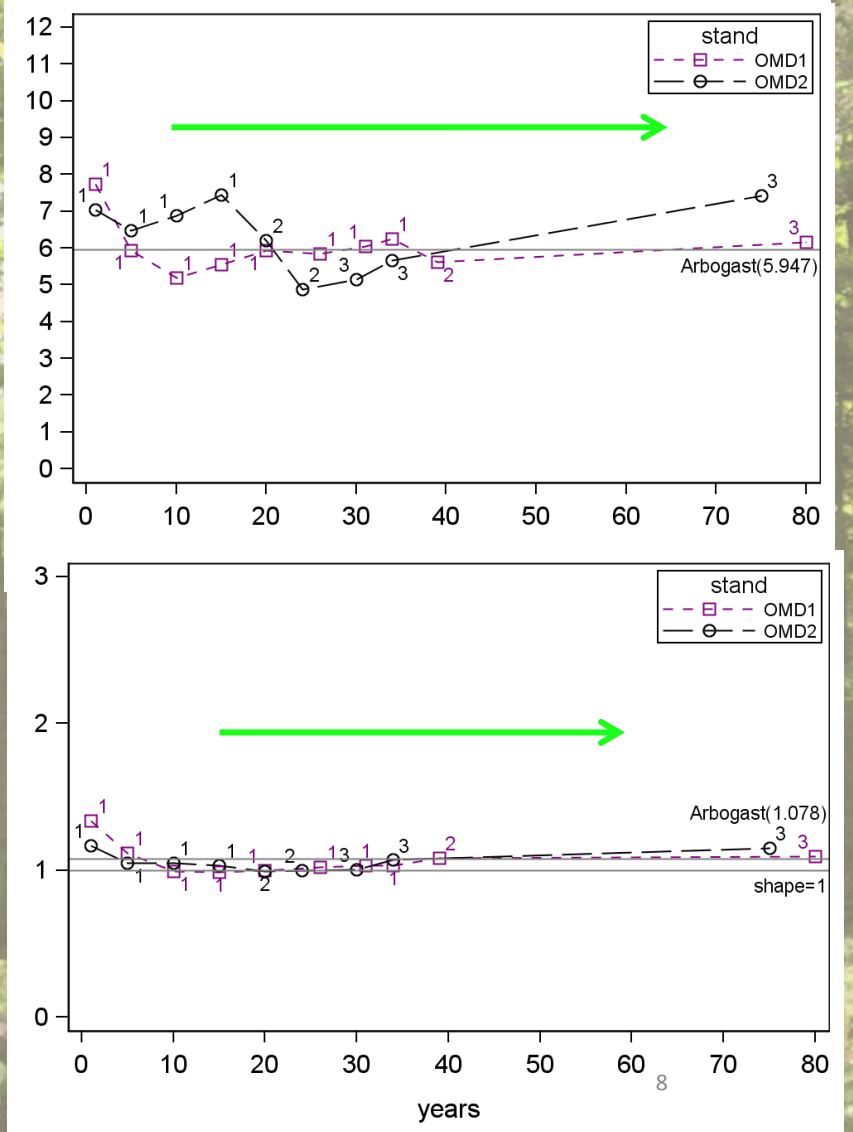


Results: 3-Parameter Weibull function

Even-aged



Uneven-aged



Second-growth even-aged stand

AEF(ARG75)

Uneven-aged stand

DEF(OMD1)

Uneven-aged stand

CSH (E13)

Conclusion

- **Single-tree selection** cuttings in **uneven-aged** northern hardwood stands **created and maintained** a stable diameter distribution and uniformity of conditions through consecutive entries


Picture by Ralph D. Nyland

- But after applying **selection-like** cuttings for six 10-year cutting cycles in even-aged stands, the structure became **unstable** and **unpredictable**


Picture by Christel C. Kern

Acknowledgements

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Thank you

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