

80 Years of Silvicultural Research at the Dukes Experimental Forest, MI

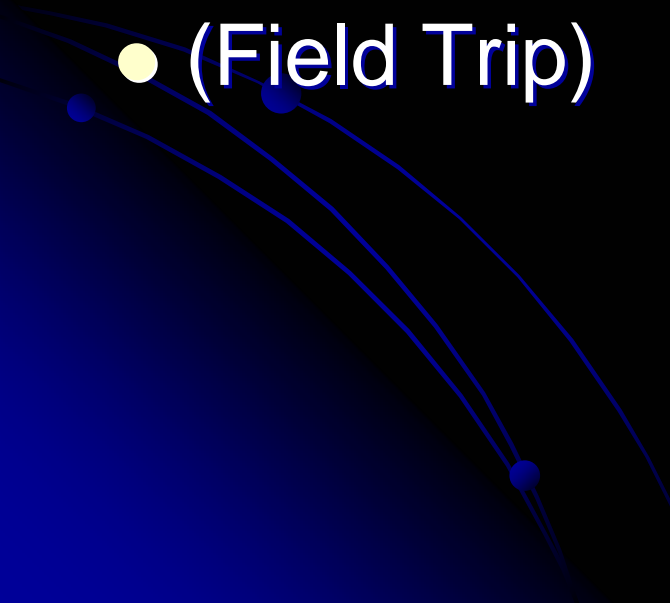
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Co-P.I.: Laura Kenefic

Technical Support: John Bennink

Sponsored by USDA Forest Service,
Northern Research Station

Outline

- Historical Context
 - Cutting Methods Study
 - 2007 Remeasurement *Prelim. Results*
 - Future Plans
 - (Field Trip)
- 

Historical Context

- Custodial Era
(1900-1925)*
 - Stewardship
 - Observational Research
- “Selective Cutting”
(1925-1960)*
 - Sustainability
 - Partial Cutting Case Studies



**Seymour, 2004*

Historical Context

- 1923
 - Forest Service Research
 - Lake States Forest Experiment Station
- 1926
 - Dukes Field Station
 - Cutting Methods Study



Two of the Station's original staff members, A. E. Wackerman (left), and J. A. Mitchell (right), in front of the temporary headquarters of the Upper Peninsula Experimental Forest on June 15, 1926.

Historical Context

Experimental Forest

- Near Dukes, Michigan
- 5500 acres

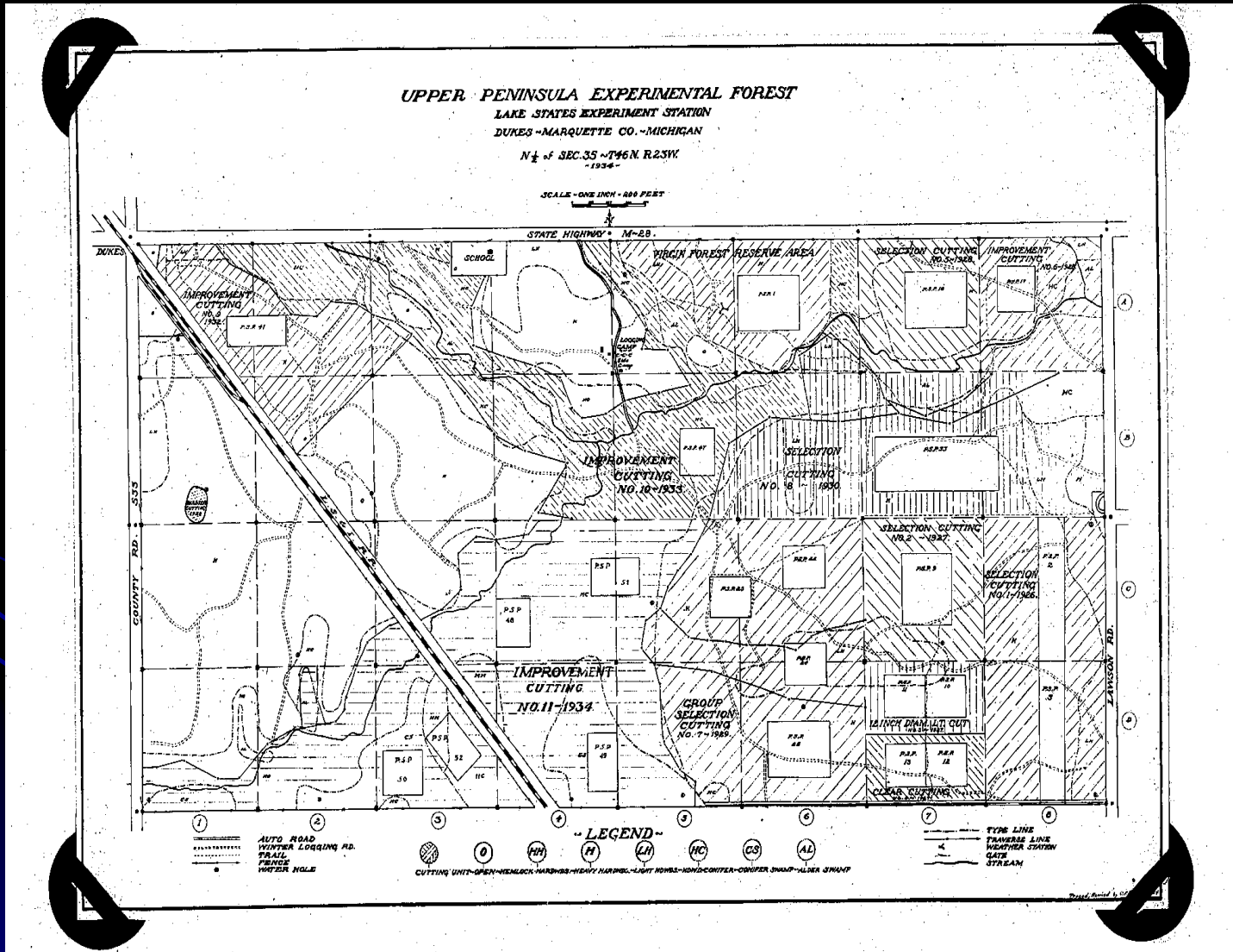


Historical Context

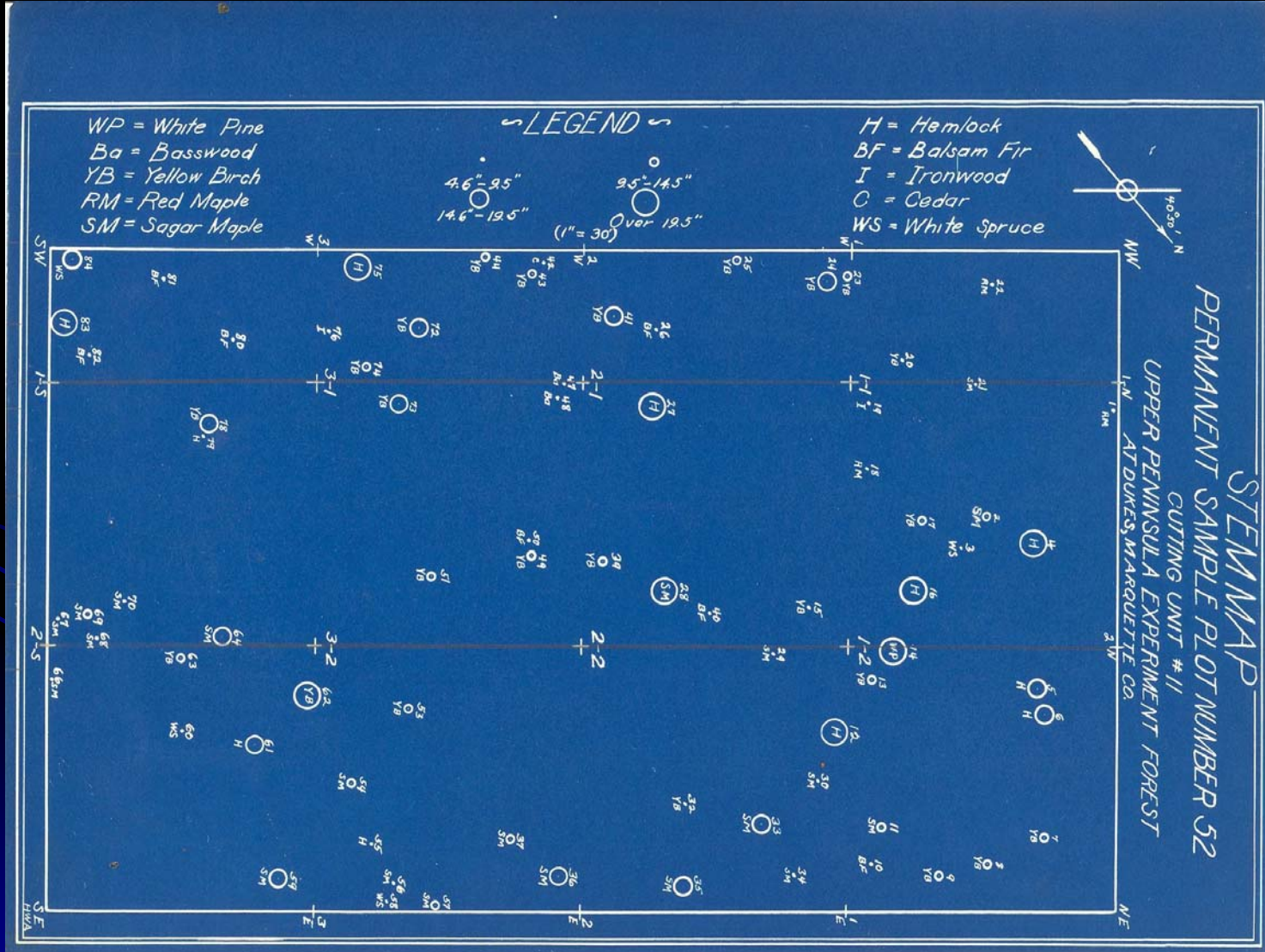
- Northern Hardwood Forest
 - U.P. 2/3 'Natural' State
- Economically Valuable
 - Yellow Birch
 - Veneer
- Ecologically Complex
 - Management Options



Cutting Methods Study



Cutting Methods Study



Cutting Methods Study

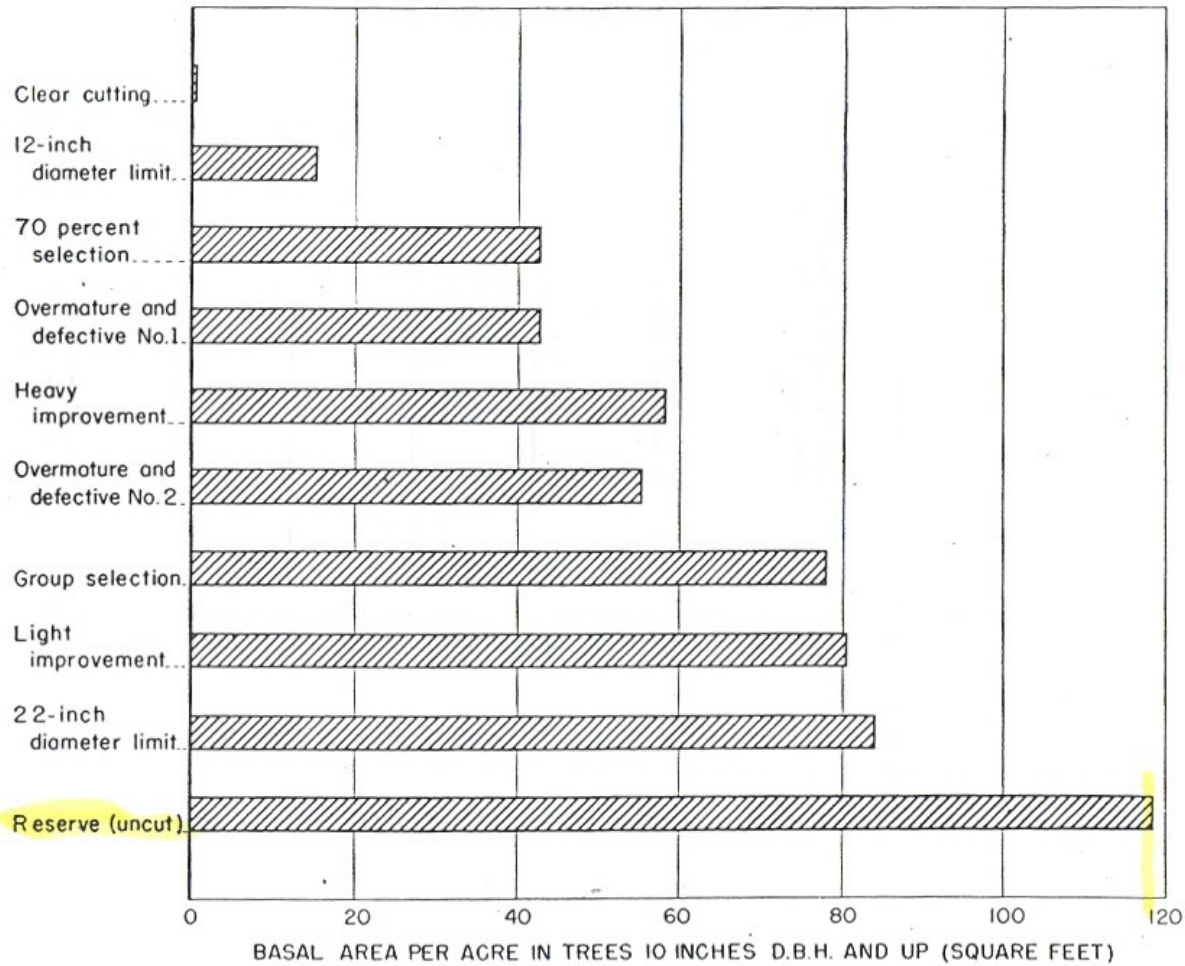
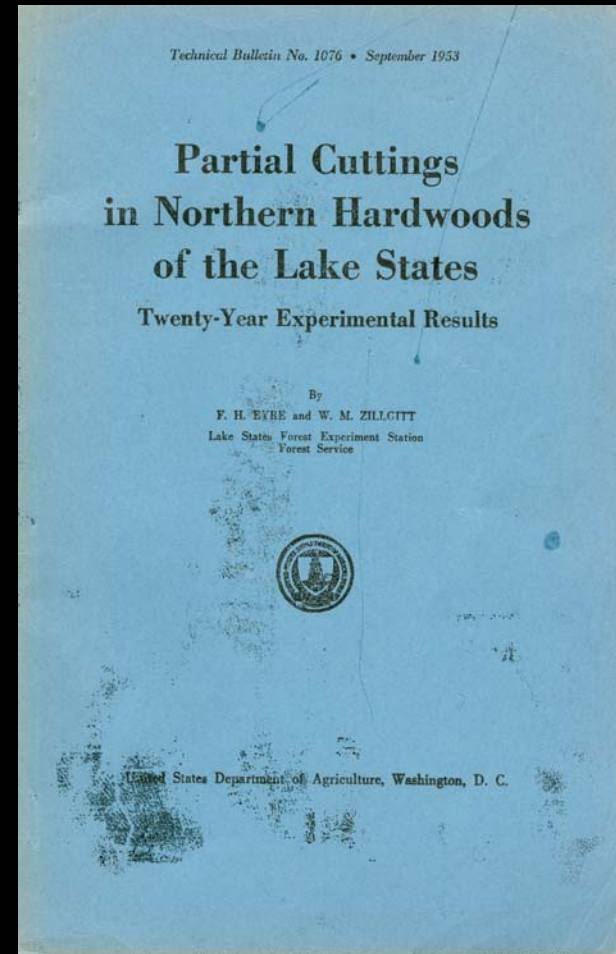


FIGURE 8.—Residual growing stock on permanent sample plots, Upper Peninsula Experimental Forest.

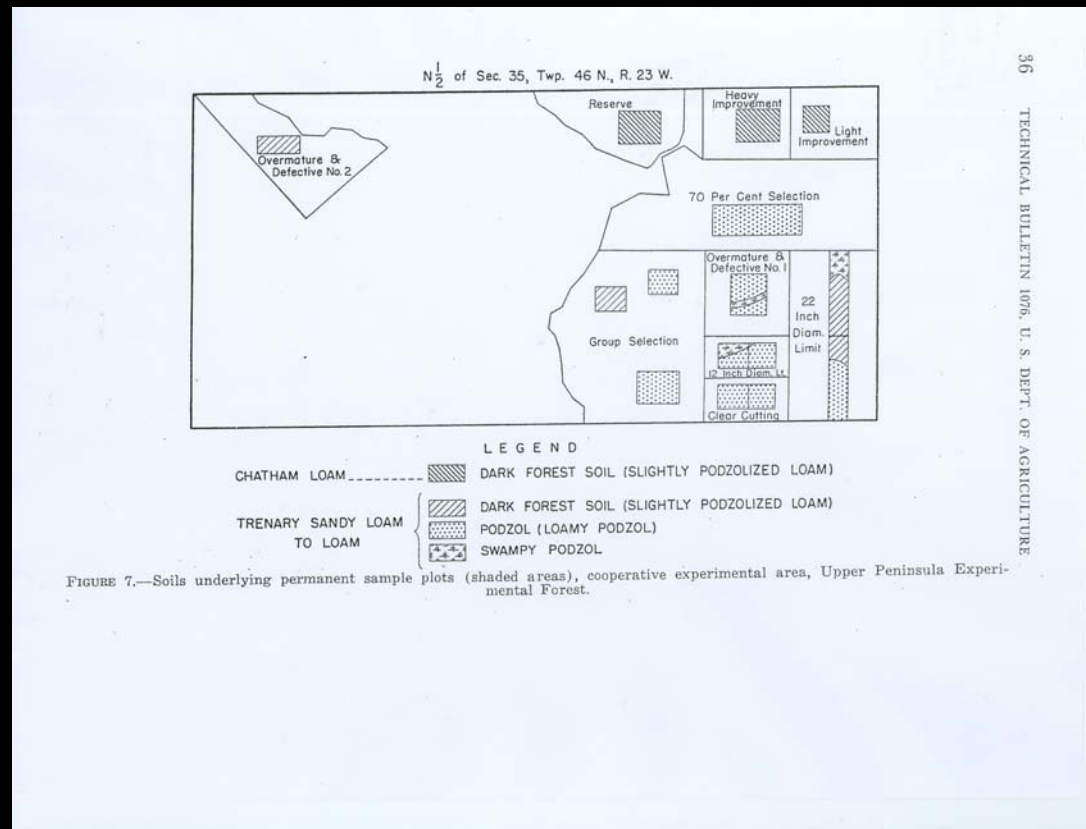
Cutting Methods Study

- 1920-1940's
 - Study Maintenance:
 - Repeated measurements
 - Major Publications:
 - Monograph
 - (Eyre & Zillgitt 1953)
 - Marking guide
 - (Arbogast 1957)



Cutting Methods Study

- Monograph (Eyre & Zillgitt 1953)
 - Ecology
 - Management
 - Issues



Cutting Methods Study

- Marking Guide (Arbogast 1957)
 - Monograph summary



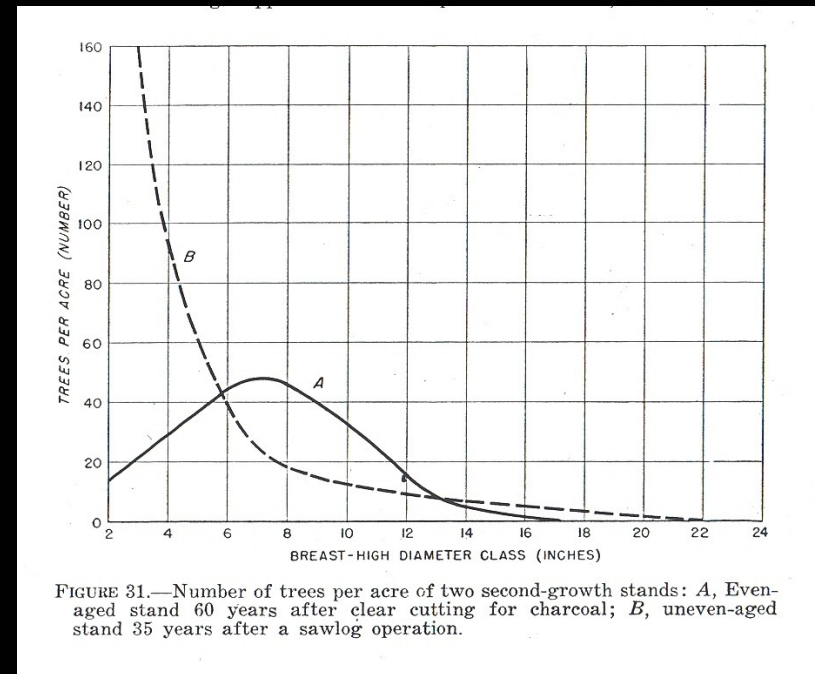
Cutting Methods Study

- Selection System
 - Ecological Attributes
 - Economically Sustainable



Cutting Methods Study

- Selection Marking
 - Unevenaged
 - Reverse-j structure
 - Keep best trees
 - rBA 50-75 in sawlogs
 - Max DBH = 24"
 - Remove defective and high risk
 - ~15 year cutting cycle



Cutting Methods Study

- Selection System Paradigm
 - 20 years of data
 - Unreplicated design
- Other Research
 - New Studies (replicated)
 - Other Organizations

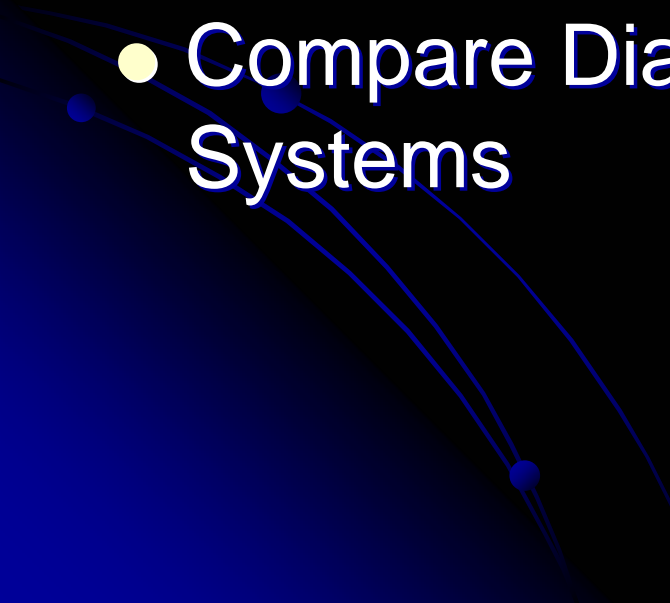


Cutting Methods Study

- 1950-1960's
 - Study continued
- 1970's
 - Study closed
- 1986
 - Demonstration & Interpretation
- 2007
 - Renewed interest
 - Limited long term studies
 - Limited studies with a range of treatments



2007 Remeasurement

- Study Objectives 2007
 - “80-year Test” of 1953 Monograph
 - Compare short and long term results
 - Compare Diameter Limits with Selection Systems
- 

2007 Remeasurement

Treatments:

● Diameter Limits

- Clearcut (> 5" dbh)
- 12" Diameter Limit
- 17" Diameter Limit
- 22" Diameter Limit

● Selection Systems

- *Overmature & Defective Selection (#1 and #2)**
- Group Selection

* *Basis for Arbogast Guide*

2007 Remeasurement

Treatments:

● Diameter Limits

- Clearcut (> 5" dbh)
- 12" Diameter Limit
- 17" Diameter Limit
 - (AKA "70% Selection")
- 22" Diameter Limit

● Selection Systems

- *Overmature & Defective Selection (#1 and #2)**
- Group Selection

* *Basis for Arbogast Guide*

2007 Remeasurement

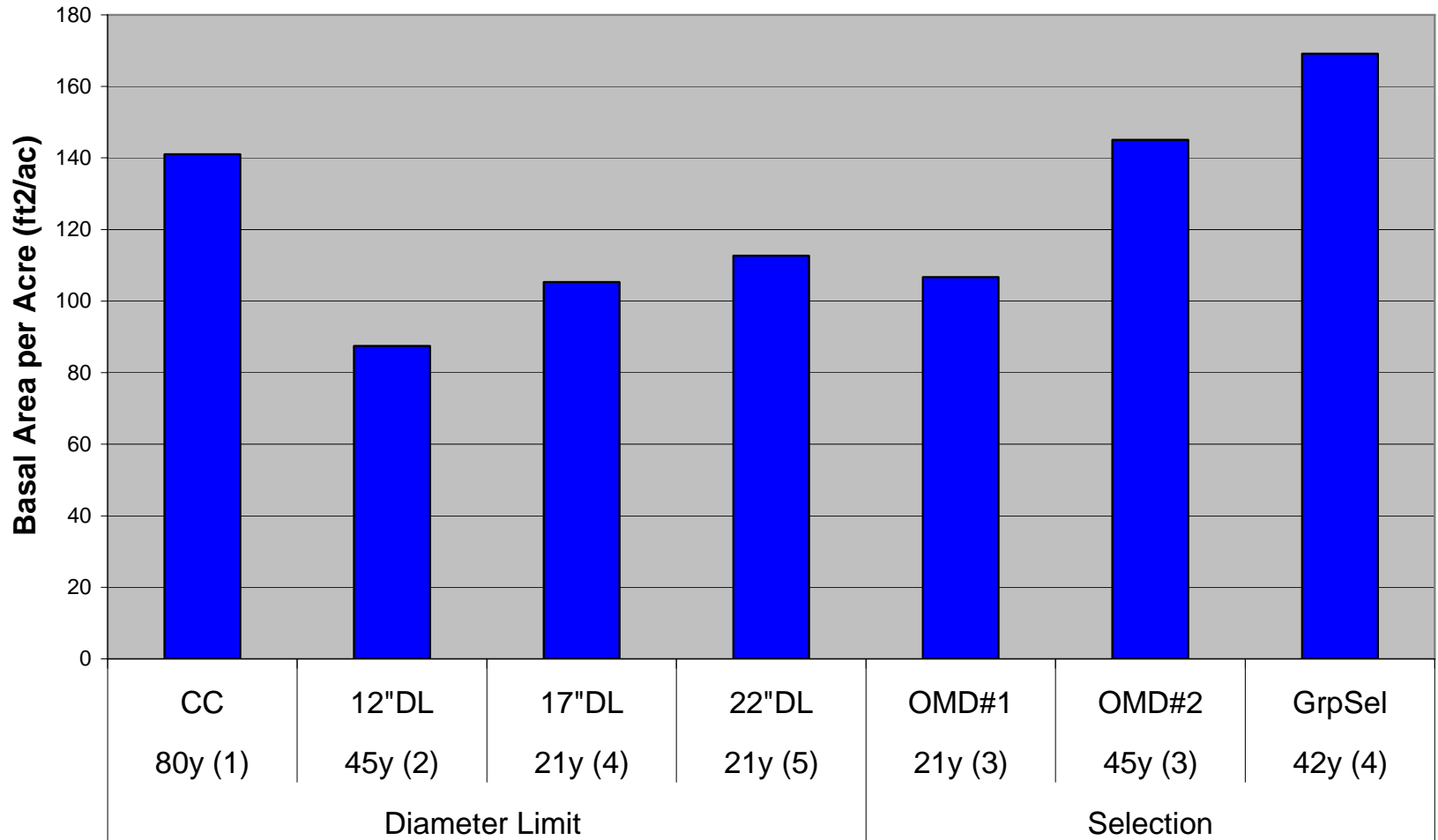
Diameter Limit	Time since last harvest	Total Number of Harvest	Selection	Time since last harvest	Total Number of Harvest
CC	80	1	OMD#1	21	3
12"DL	45	2	OMD#2	45	3
17"DL	21	4	GrpSel	42	4
22"DL	21	5			

2007 Remeasurement

	CC	12"DL	17"DL	22"DL	OMD#1	OMD#2	GrpSel
	80y (1)	45y (2)	21y (4)	21y (5)	21y (3)	45y (3)	42y (4)
	Diameter Limit				Selection		

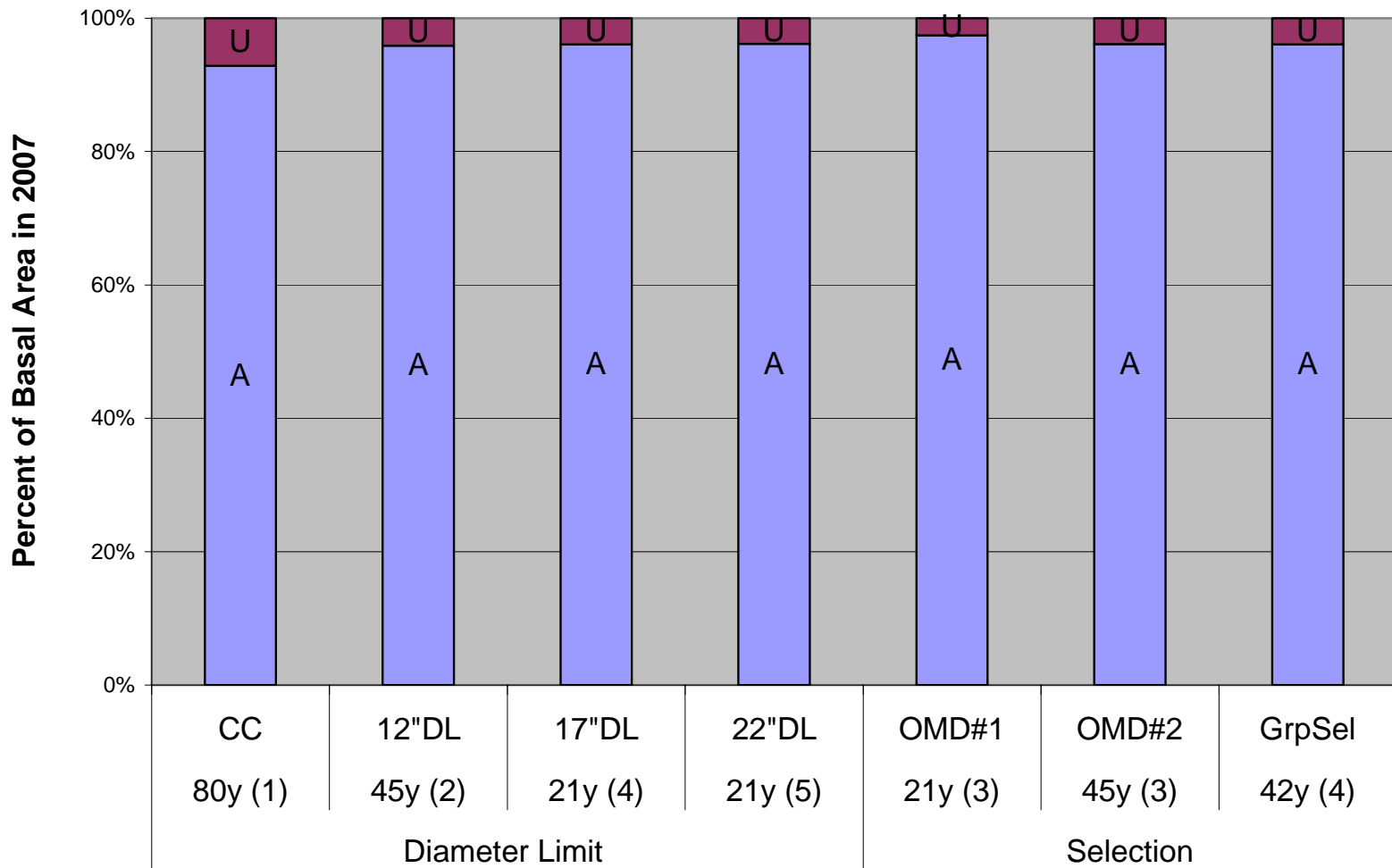
2007 Remeasurement

Basal Area for Trees (>5" DBH) in 2007



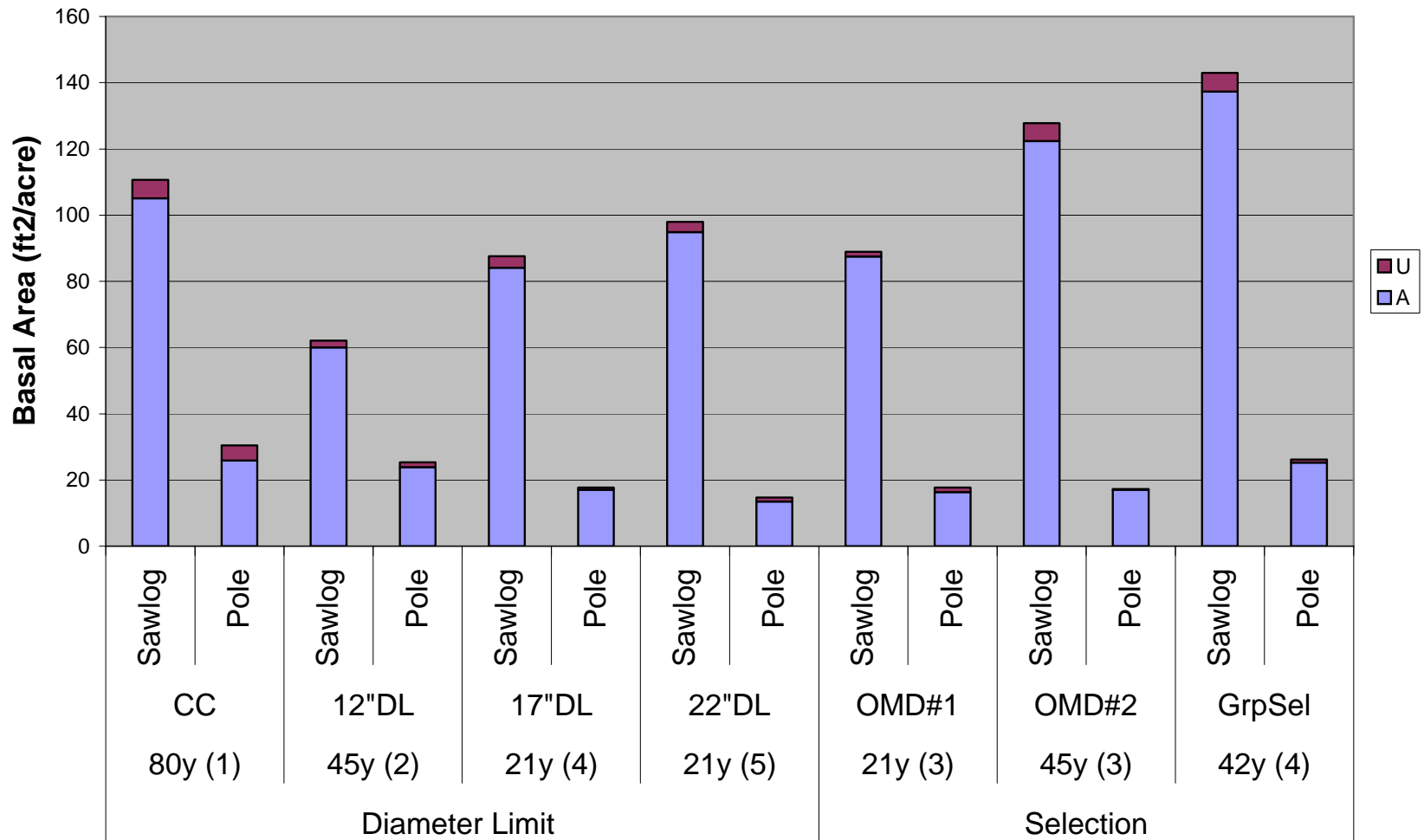
2007 Remeasurement

Proportion of ACCEPTABLE Growing Stock



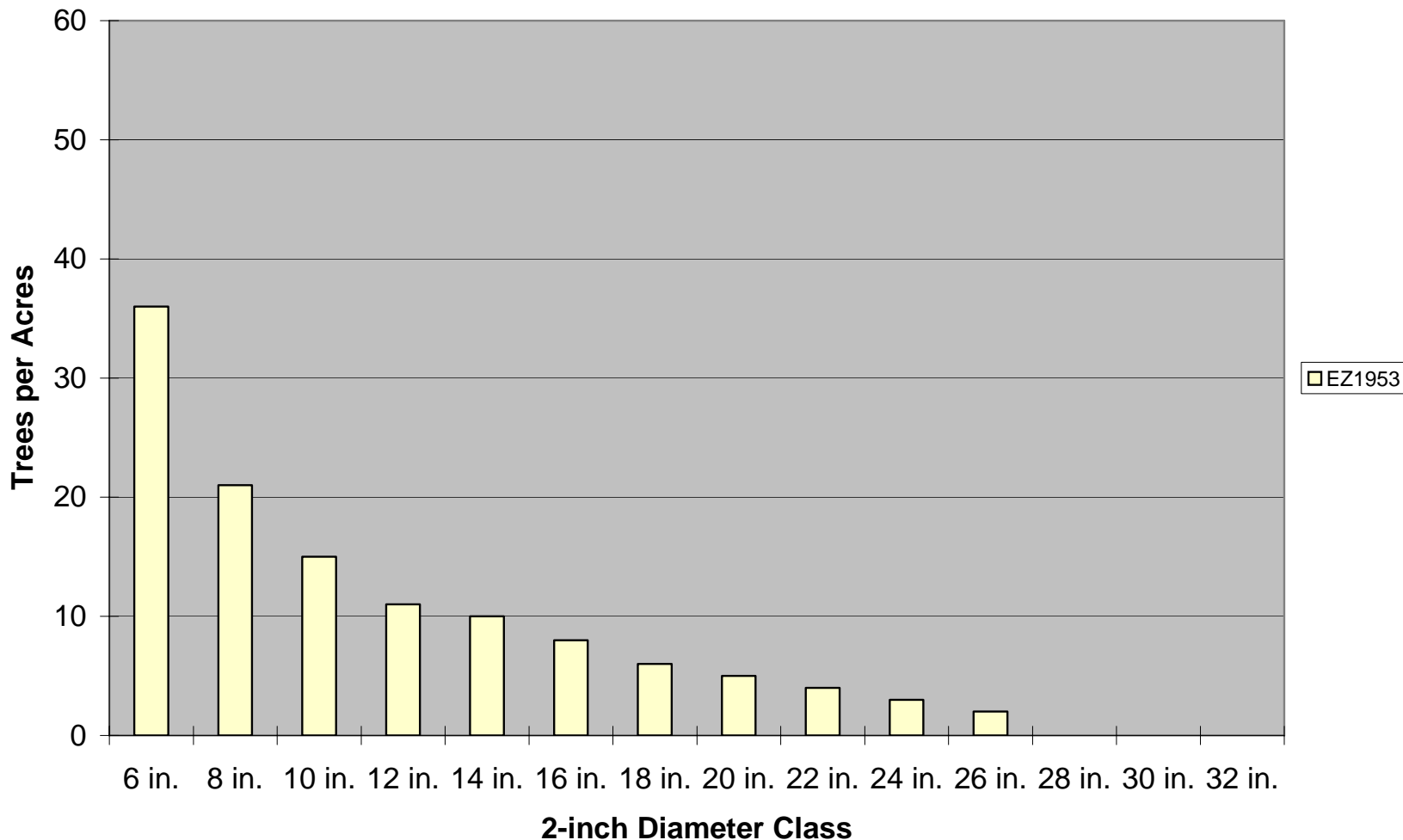
2007 Remeasurement

Acceptable Growing Stock by Size Class in 2007



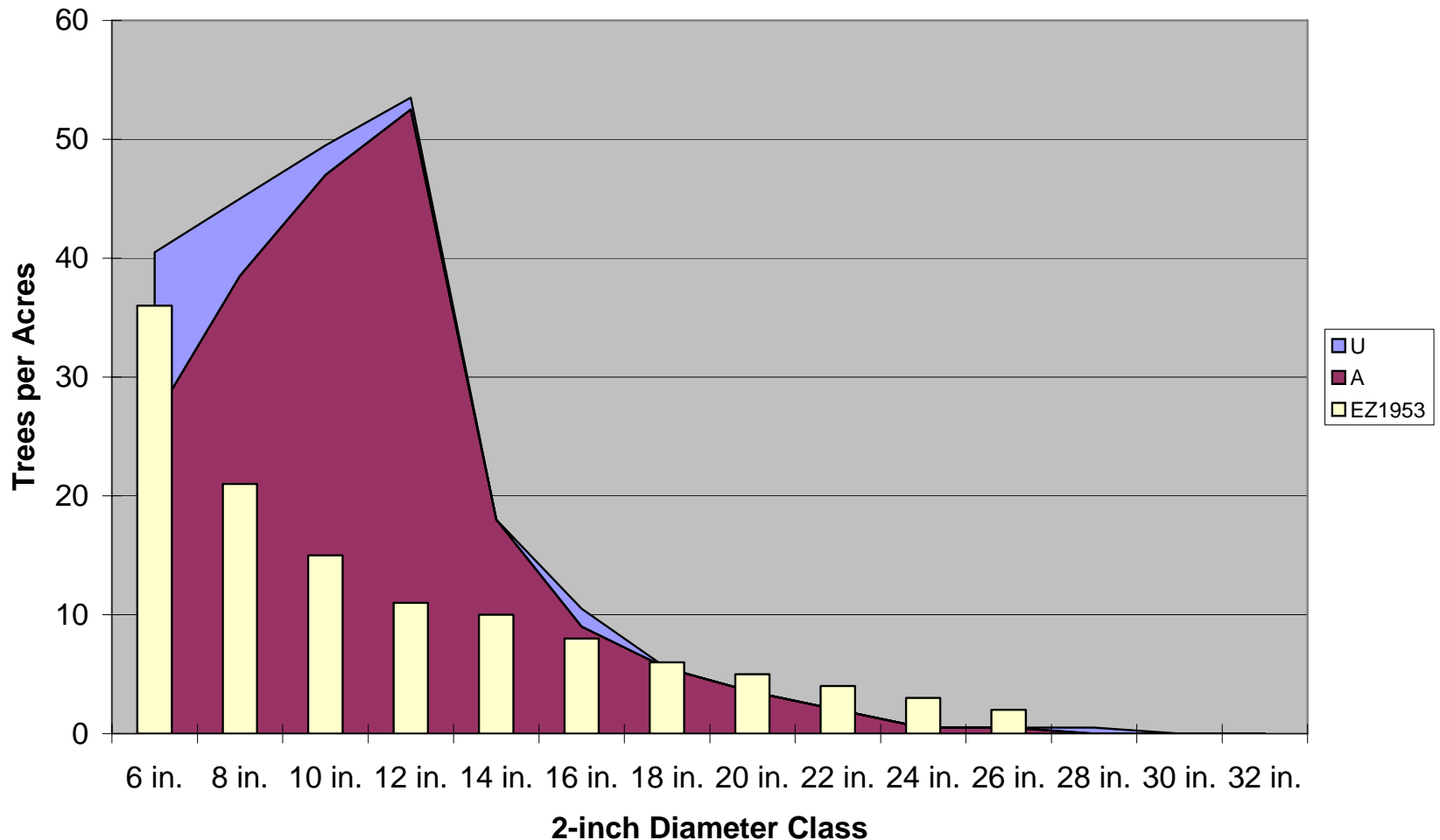
2007 Remeasurement

"CUTTING METHOD"



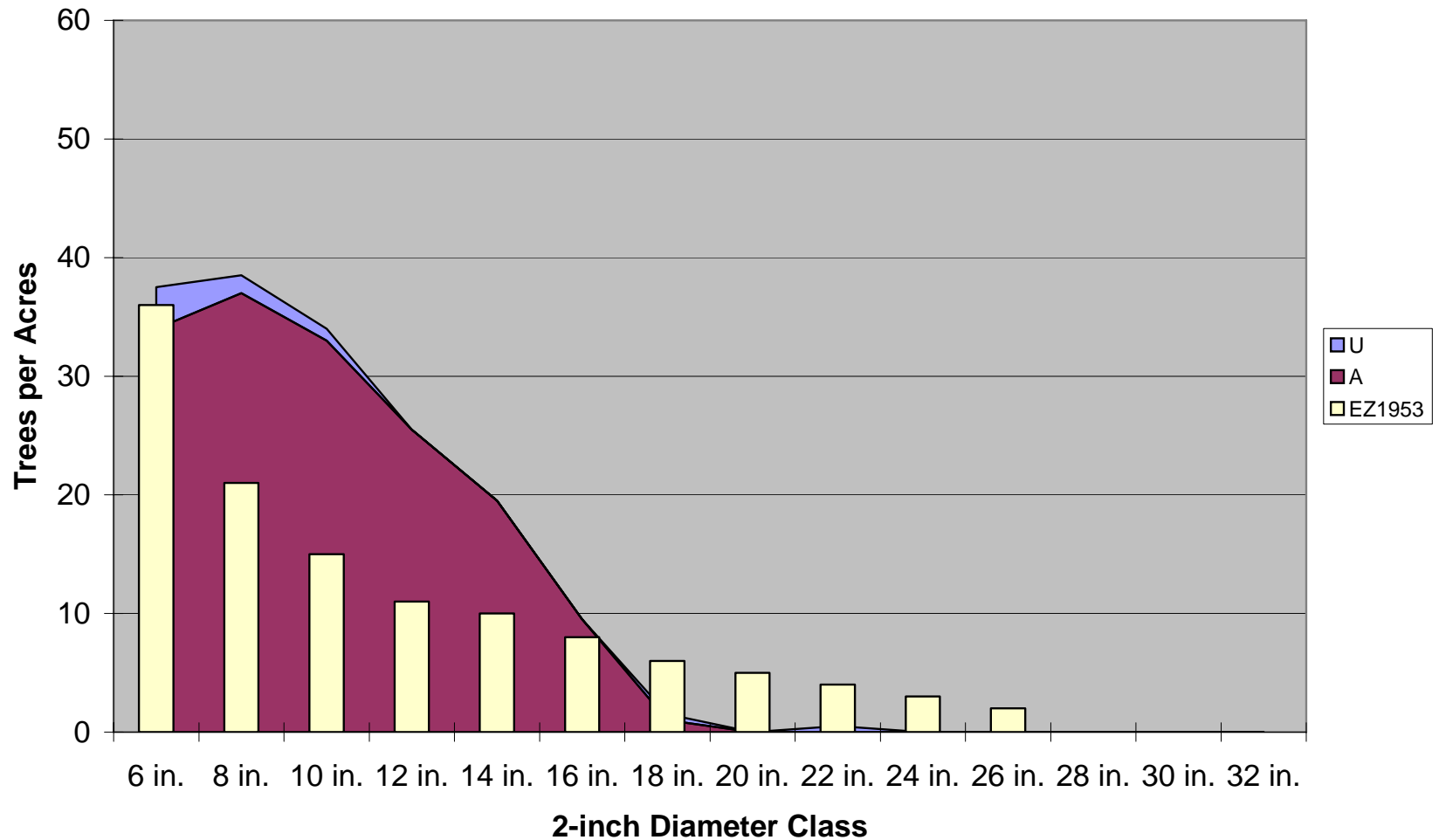
2007 Remeasurement

Clearcut (>5" dbh)



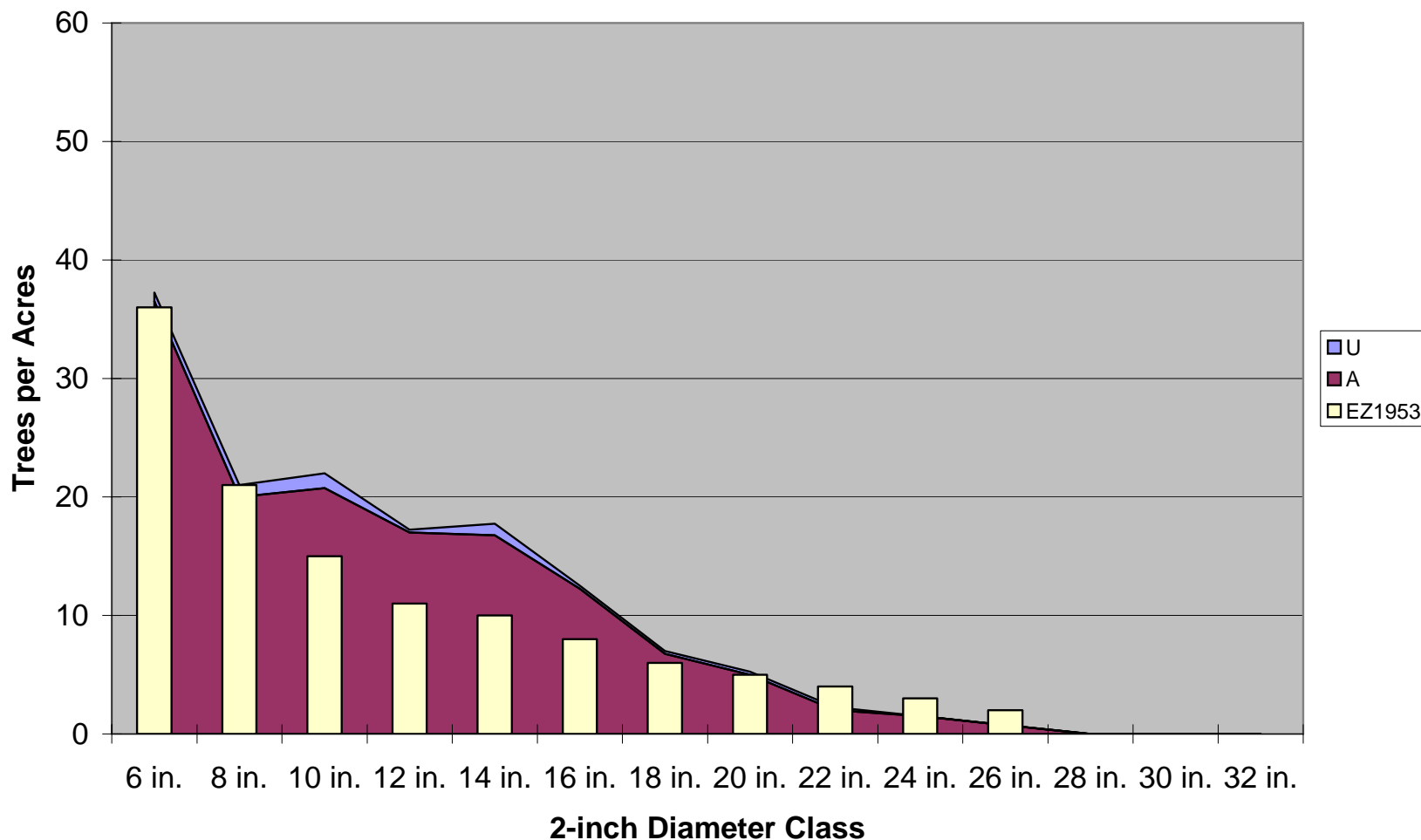
2007 Remeasurement

12" Diameter Limit



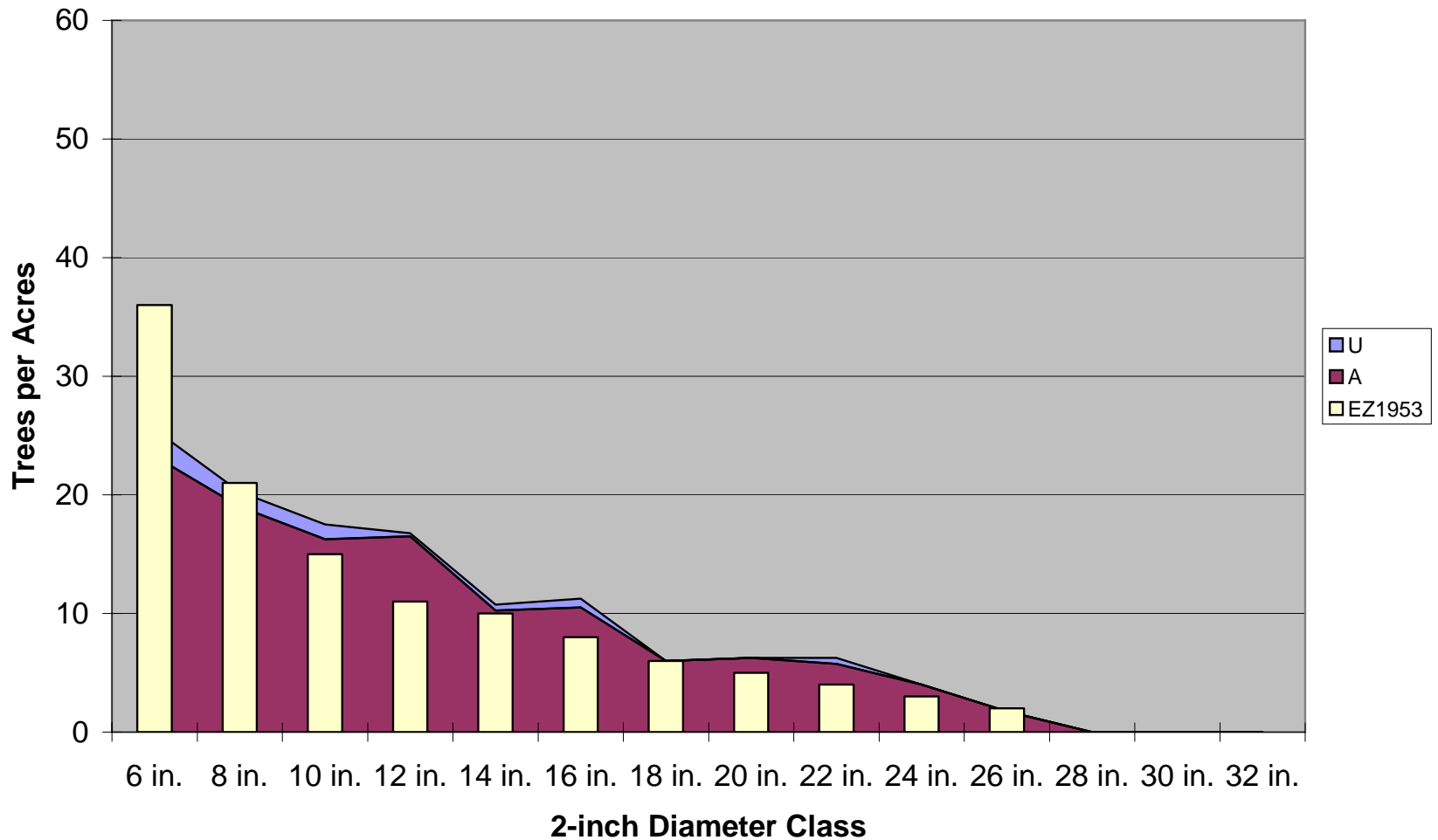
2007 Remeasurement

17" Diameter Limit



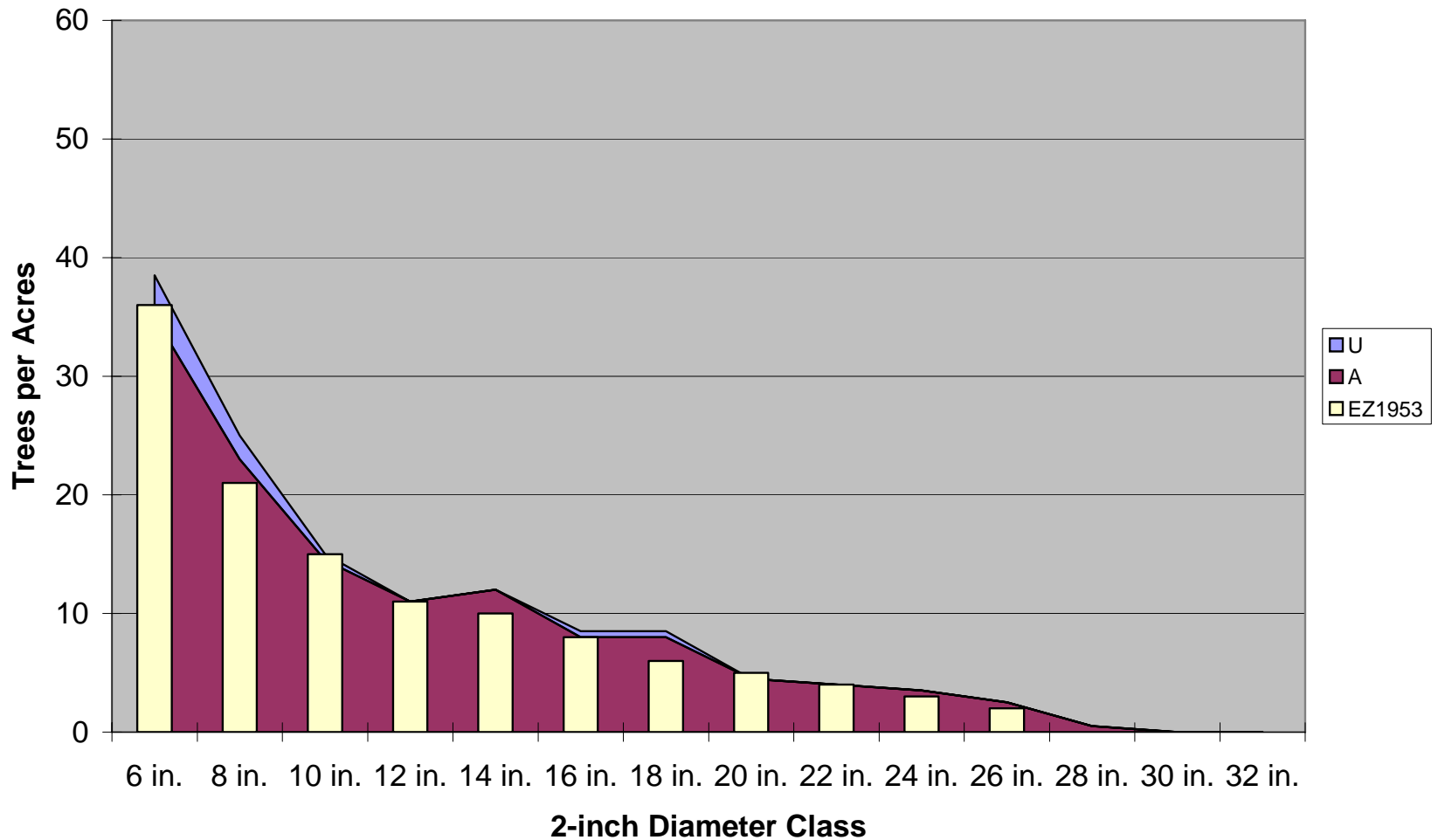
2007 Remeasurement

22" Diameter Limit



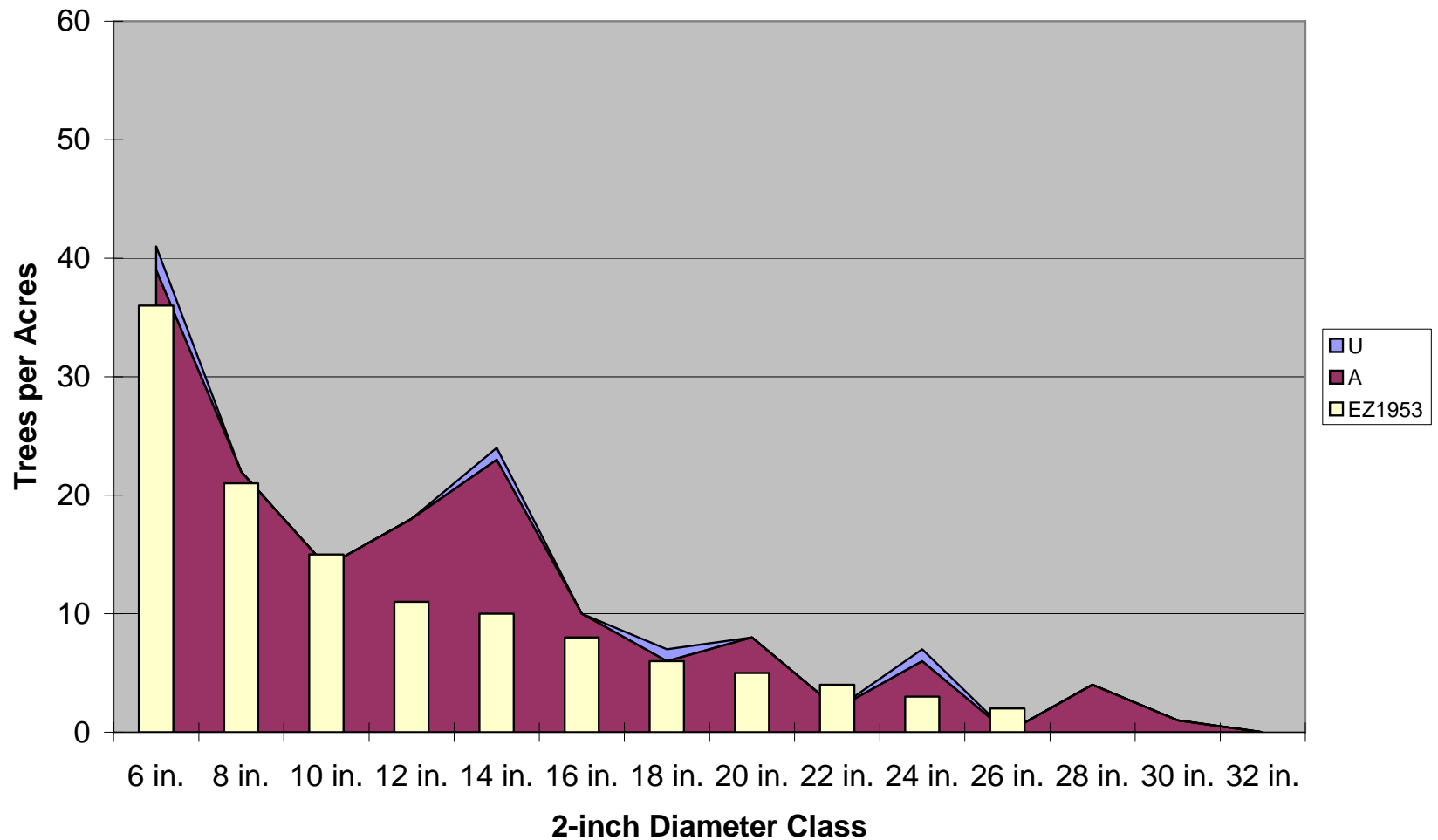
2007 Remeasurement

Overmature & Defective #1



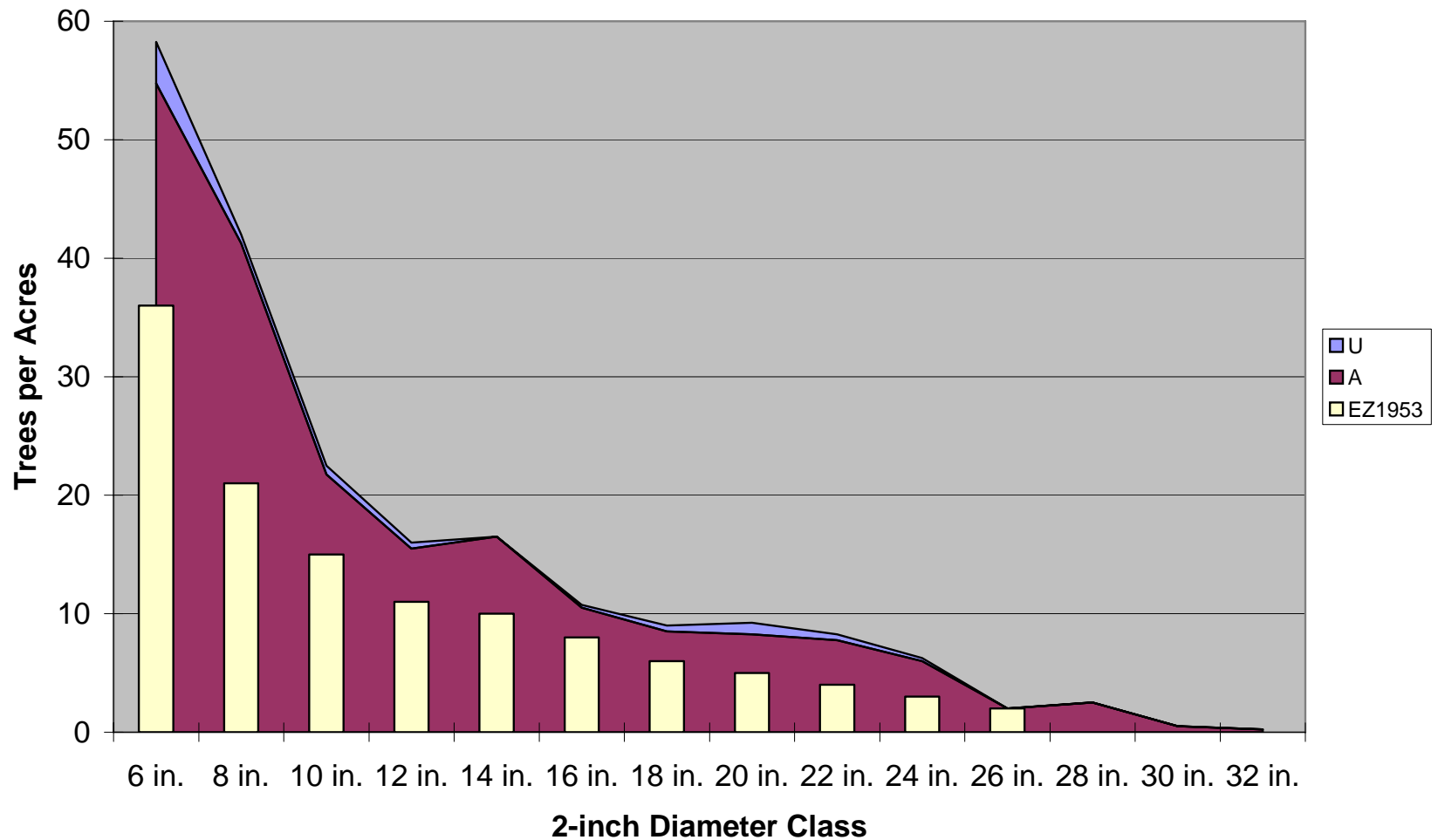
2007 Remeasurement

Overmature & Defective #2



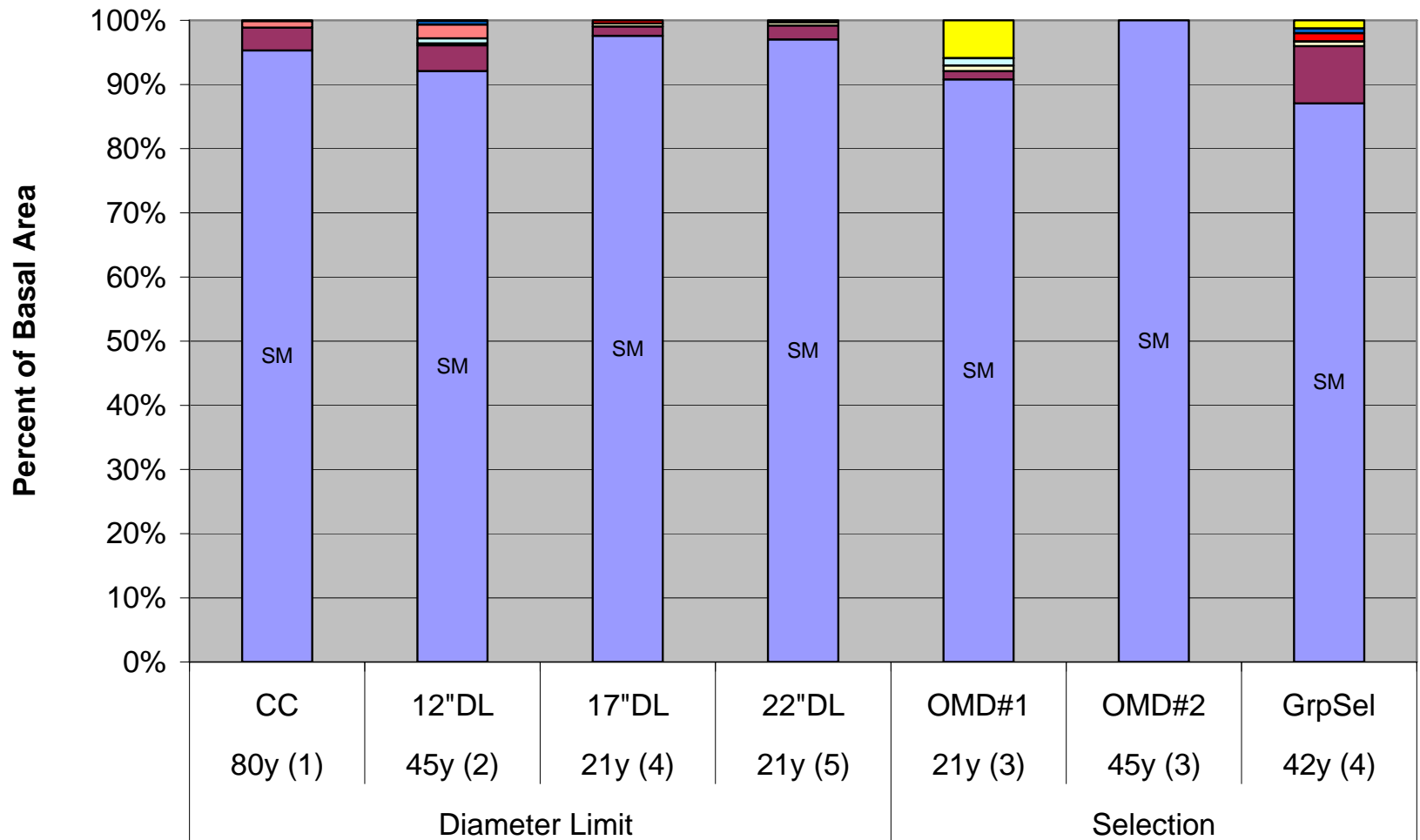
2007 Remeasurement

Group Selection



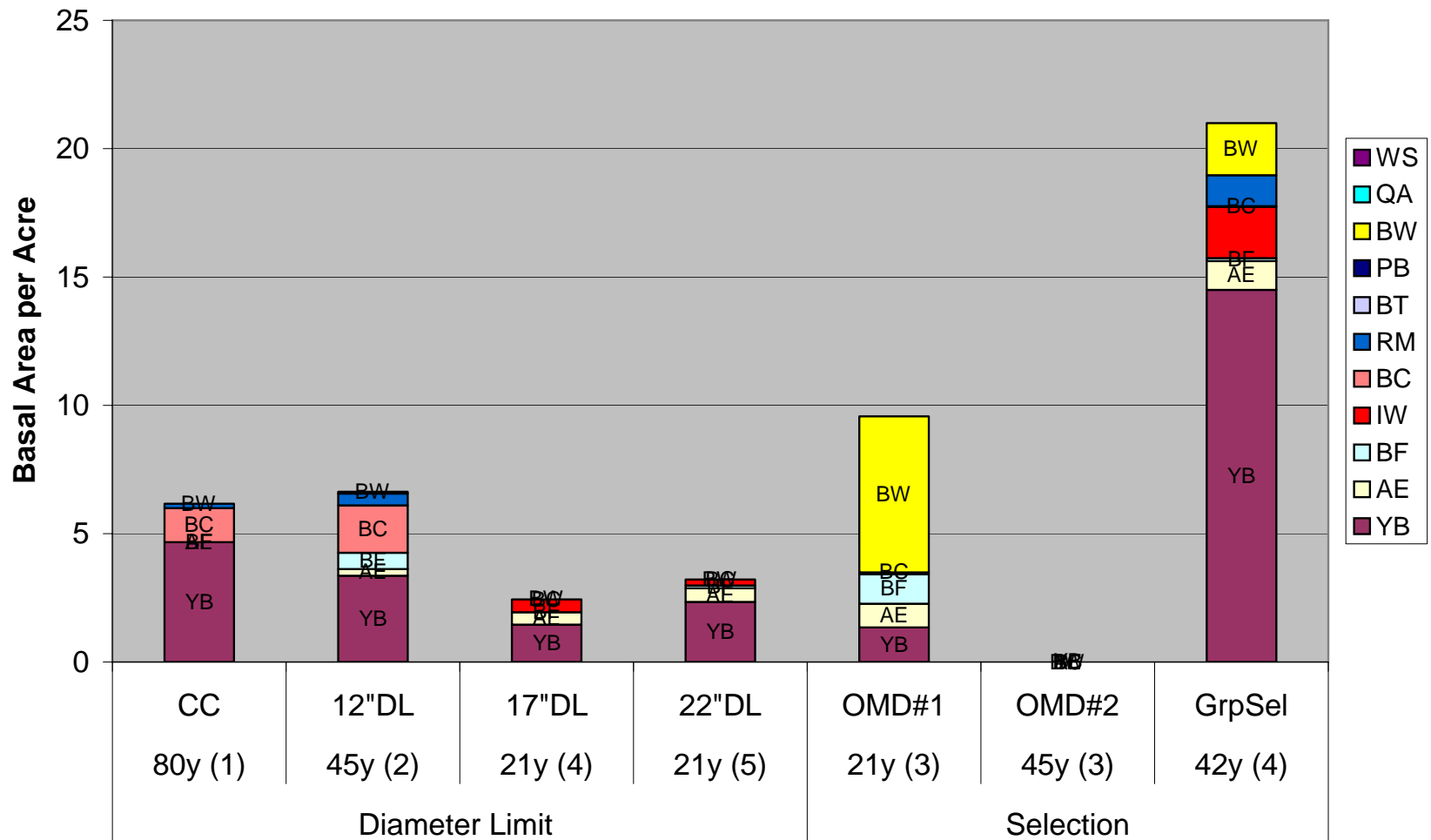
2007 Remeasurement

Tree (> 5" dbh) Composition



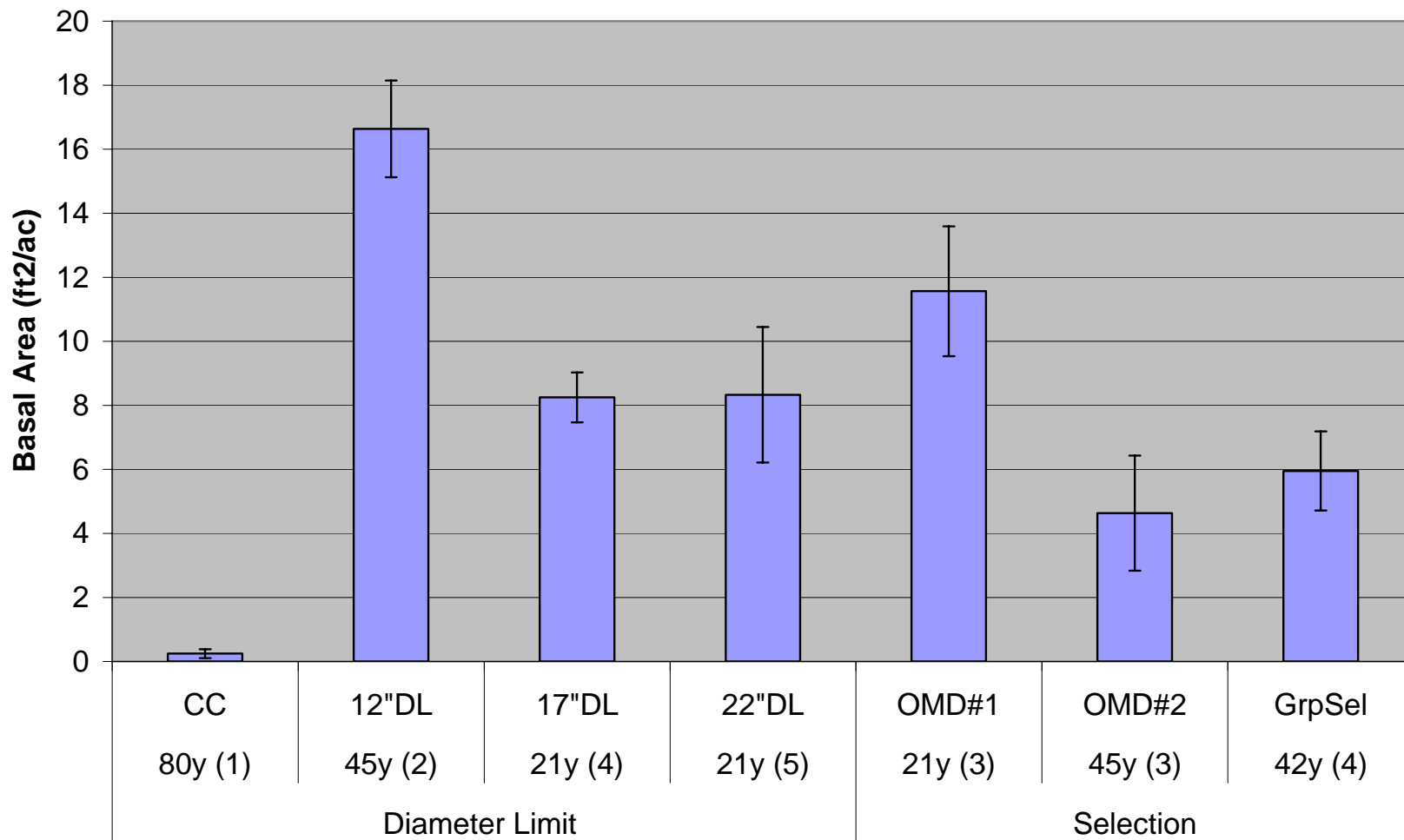
2007 Remeasurement

Tree (> 5" dbh) Composition (EXCEPT Sugar Maple)



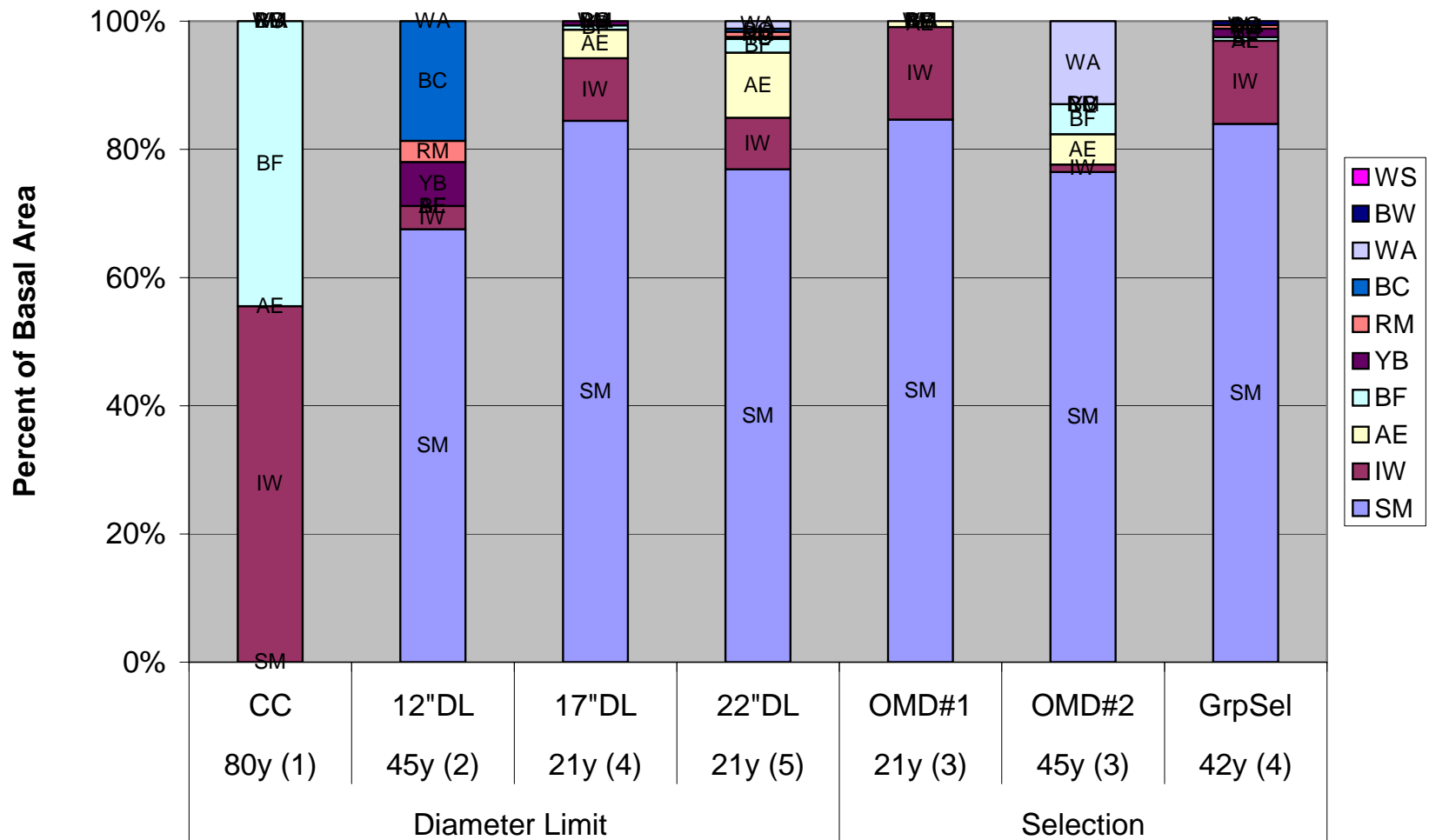
2007 Remeasurement

Saplings (1 - 4" dbh)



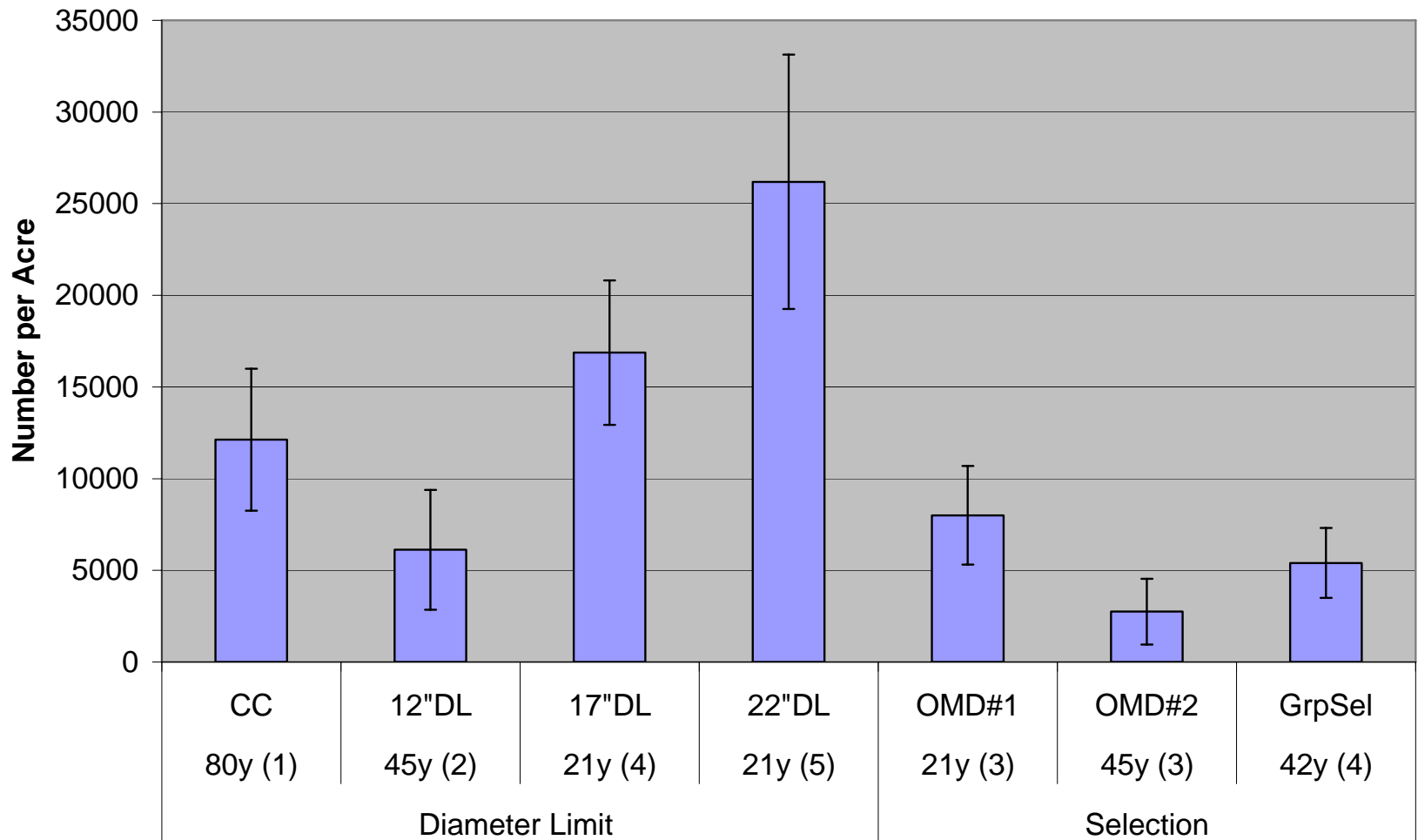
2007 Remeasurement

Sapling (1 - 4" dbh) Composition



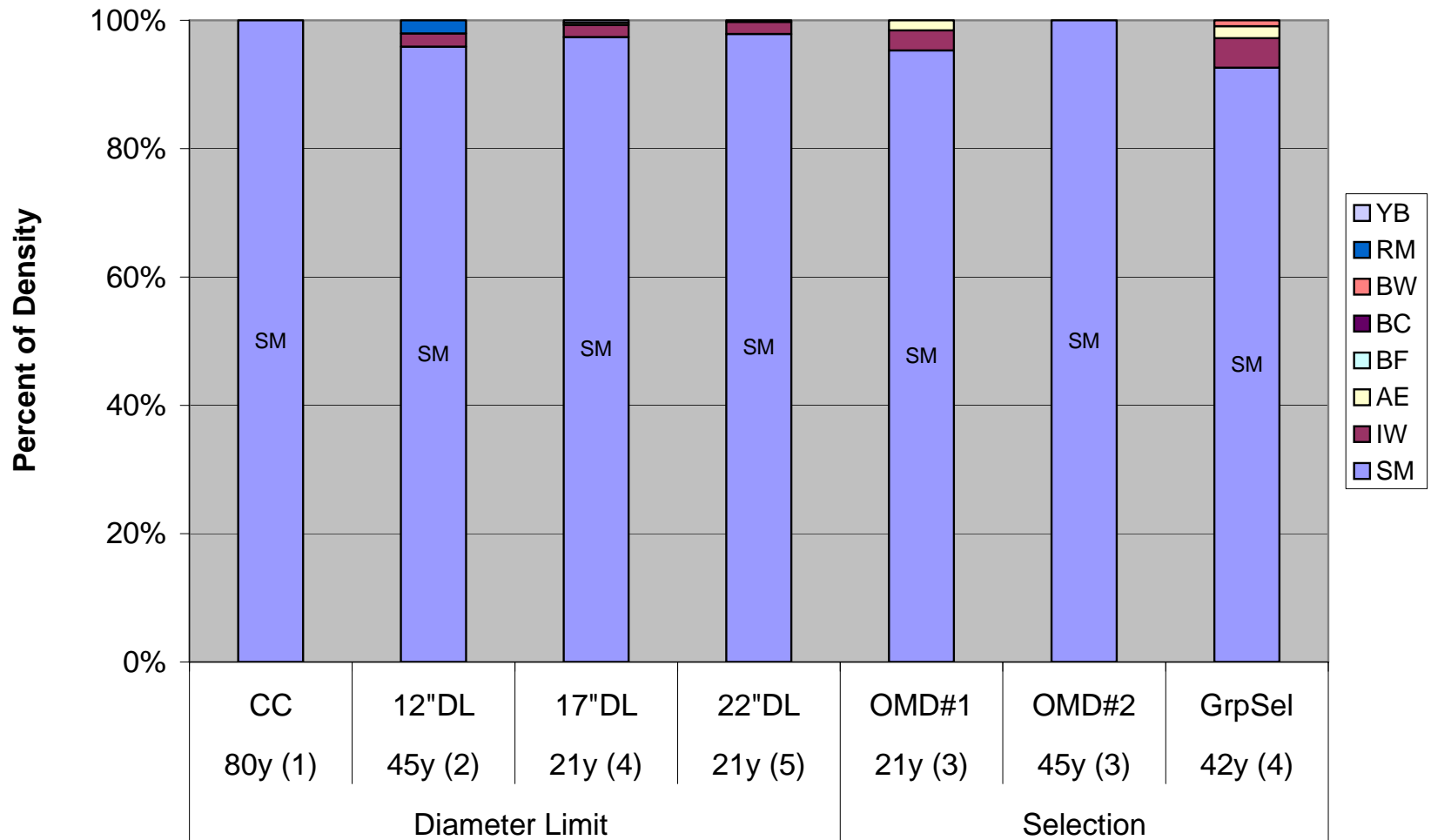
2007 Remeasurement

Advance Regeneration (>1' tall & <1" dbh)



2007 Remeasurement

Advance Regeneration (> 1' to < 1" dbh) Composition



2007 Remeasurement

- Seedlings & Germinants (<1' tall)
 - 100% stocking
 - Except OMD#1 (88%) & 22"DL (94%)
 - Composition
 - Sugar maple dominated
 - Other overstory species found
 - Except yellow birch, white ash, and basswood



2007 Remeasurement

- Summary
 - Acceptable growing stock
 - Greatest in OMD#1
 - Least in CC
 - Diameter Distributions
 - Similarities between Diameter Limits & Selections
 - Selection could reestablish EZ1953
 - Composition
 - Greatest diversity in Group Selection
 - Least in OMD#2



2007 Remeasurement

- Summary
 - Saplings
 - Few midtolerants in Selection
 - Diversity maximized in 12"DL
 - Advance Regeneration
 - Greatest density in 22"DL
 - Few Midtolerant spp. In Selection
 - 100% Sugar maple in CC & OMD#2



2007 Remeasurement

- Comparison with E&Z
 - Moderate intensity harvest may have most merchantable
 - 'Special Cutting Practices' needed for YB
 - Other diameter distributions may be possible



Future Plans

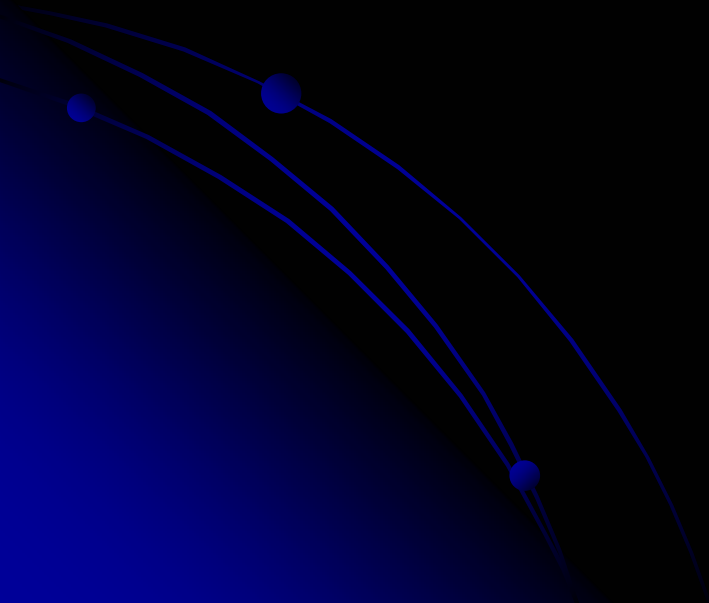
- Archived data analysis
- 2008 Tree Grade data collection
- Publication, Presentation, Field Training



Other NRS Northern Hardwood Management Research

- Revisiting Stocking and Cutting Cycle Study (50+ year record) at Dukes EF
 - Revisit Canopy Gap Study, Cheq-Nic NF (12 yr record)
 - Maintaining Growth & Yield Study, Argonne EF
 - Ecological Forestry research, Argonne EF
- 

Thanks!



Thanks!

