

Rim Lakes Forest Health Project

Silviculture Specialist Report



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April, 2011

Desired Conditions, Forest Health (Project Purpose and Need)

Forest health is defined by the vigor and condition of the forest stands, and the presence of insects and disease that affect the sustainability of the forest:

- Native insect and disease activity is within HRV, and non-native insects/diseases are absent/incidental and;
- Stand densities are at levels that facilitate overall forest development, tree vigor, and resilience to characteristic disturbances, and;
- Forest structure represents all age classes necessary for a sustainable balance of regeneration, growth, mortality and decomposition, and;
- Overall these conditions are resilient to natural biotic and abiotic disturbances (e.g., insects, diseases, fire, and wind).

Forest Plan Requirements

- **MSO habitat (all mixed conifer & pine oak)**
 - **Protected areas** – no cutting trees > 9” dbh
 - **Restricted areas** – no cutting trees > 24” dbh
 - Pine/oak type (manage 10% for threshold nest/roost habitat)
 - Mixed conifer type (manage 25% for threshold nest/roost habitat)
- **Goshawk habitat (all ponderosa pine)**
 - ***Foraging Area (FA) Habitat***
 - Manage for uneven-aged stands (balance of age classes)
 - ***Post-Fledging Family Area (PFA) Habitat***
 - Manage for uneven-aged stands (balance of age classes), higher density than FA
 - ***Nest Area Habitat***
 - Manage for high-density mature forest structure

Project Area Existing Stand Conditions (ponderosa pine)

- ***Uneven-aged stands***
≈ 55% of forest area
- ***Mature* even-aged stands, (VSS 4)***
≈ 15% of forest area
- ***Immature even-aged stands (VSS 1-2-3)***
≈ 30% of forest area

* Mature age structure refers to physiological seed-bearing condition. In full-crowned ponderosa pine, this occurs at approximately age 50+.

Existing Condition	Desired Condition
<p>Forest Structure and Spatial Arrangement:</p> <p>Uneven-aged stands 55% of forested area Even- aged stands are 45% of forested area</p> <p>Typically closed canopy with few canopy gaps and openings</p>	<p>Forest Structure and Spatial Arrangement:</p> <p>Uneven-aged stands 100% of forested area Balance of young, mid, old aged</p> <p>Variable canopy density Groups /clump with canopy gaps/openings (30-40% overall)</p>
<p>Forest Health:</p> <p><u>Density:</u> Typically closed-canopy (high density). PP BA range 11 – 360 (avg 91) MC BA range 30-235 (avg 99)</p> <p><u>Insects:</u> Bark beetle activity occurring in patches</p> <p><u>Disease:</u> Dwarf mistletoe infections are widespread and in large patches</p>	<p>Forest Health:</p> <p><u>Density:</u> Variable canopy density. PP BA range 45 - 55 MC BA range 55 – 75 (stand avg. including regeneration gaps/openings)</p> <p><u>Insects:</u> Bark beetle activity occurring in groups, but not stand-wide</p> <p><u>Disease:</u> Dwarf mistletoe infections occur in isolated tree groups consistent with historic conditions</p>
<p>Forest Vegetation, Species Composition:</p> <p>Dominant species composition shifting toward shade tolerant, fire intolerant species. (Southwestern white pine, aspen , oak ,and other hardwood species decreasing).</p>	<p>Forest Vegetation, Species Composition:</p> <p>Shade intolerant species dominate. Southwestern white pine, aspen, oak and other hardwood species well represented and increasing</p>

Forest Plan Requirements, Old growth

- *Seek to develop or retain old growth function on at least 20% of the naturally forested area by forest type in any landscape.*
- *Key Concepts:*
 - Desired conditions provide for old growth as a component of the uneven-aged forest similar to historic distribution (groups, individual trees, and patches)
 - balanced proportion relative to other forest structure stages assures continuous representation of old growth over time

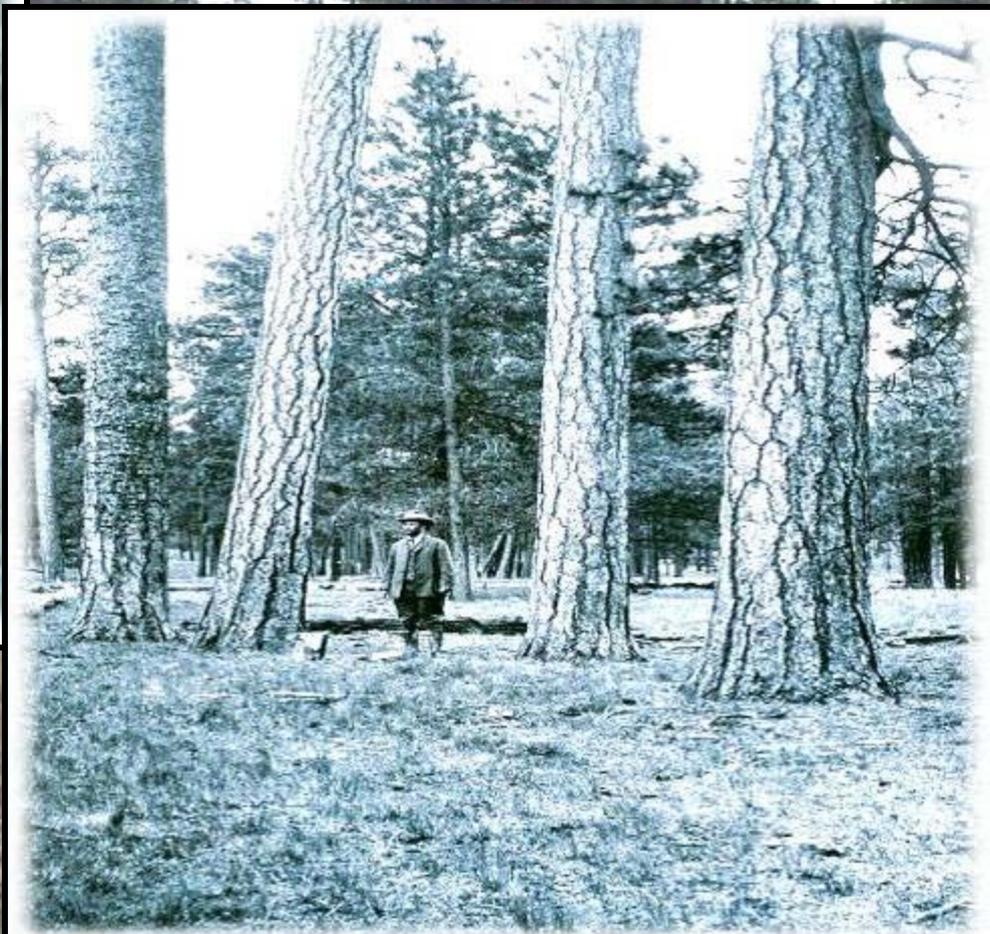
Commonly Used Pre-settlement *Reference Conditions* in Southwestern Ponderosa Pine



1910 – Flagstaff, AZ



1911 – Zuni Mountains, NM





Issued November 24, 1911.

U. S. DEPARTMENT OF AGRICULTURE,
FOREST SERVICE—BULLETIN 101.
HENRY S. GRAVES, Forester.

WESTERN YELLOW PINE IN ARIZONA
AND NEW MEXICO.

BY

THEODORE S. WOOLSEY, Jr.,
ASSISTANT DISTRICT FORESTER, DISTRICT 3.



WASHINGTON:
GOVERNMENT PRINTING OFFICE
1911.

LETTER OF TRANSMITTAL

UNITED STATES DEPARTMENT OF AGRICULTURE,
FOREST SERVICE,
Washington, D. C., July 25, 1911.

SIR: I have the honor to transmit herewith a manuscript entitled
"Western Yellow Pine in Arizona and New Mexico," by Theodore S.
Woolsey, jr., assistant district forester, district 3, and to recommend
its publication as Bulletin 101 of the Forest Service.

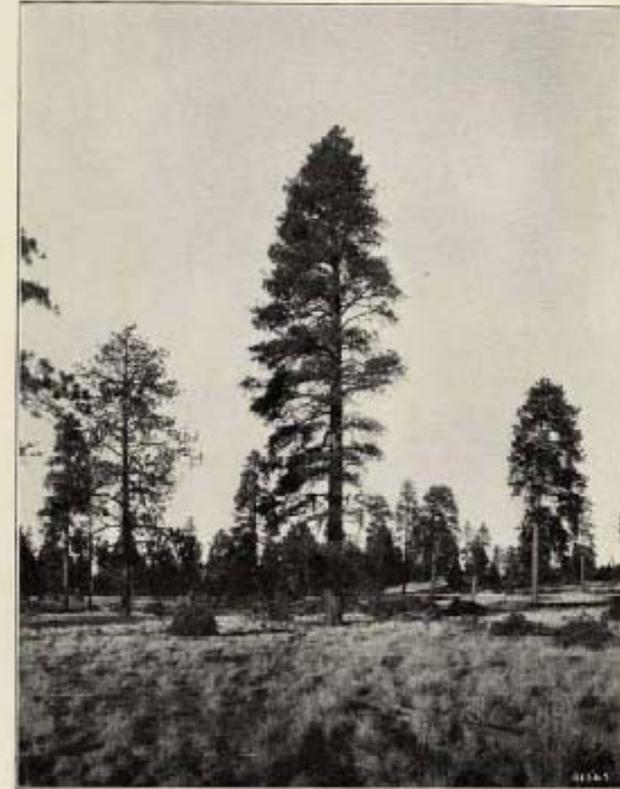
Respectfully,

HENRY S. GRAVES,
Forester.

HON. JAMES WILSON,
Secretary of Agriculture.

Bul. 101, Forest Service, U. S. Dept. of Agriculture.

PLATE I.

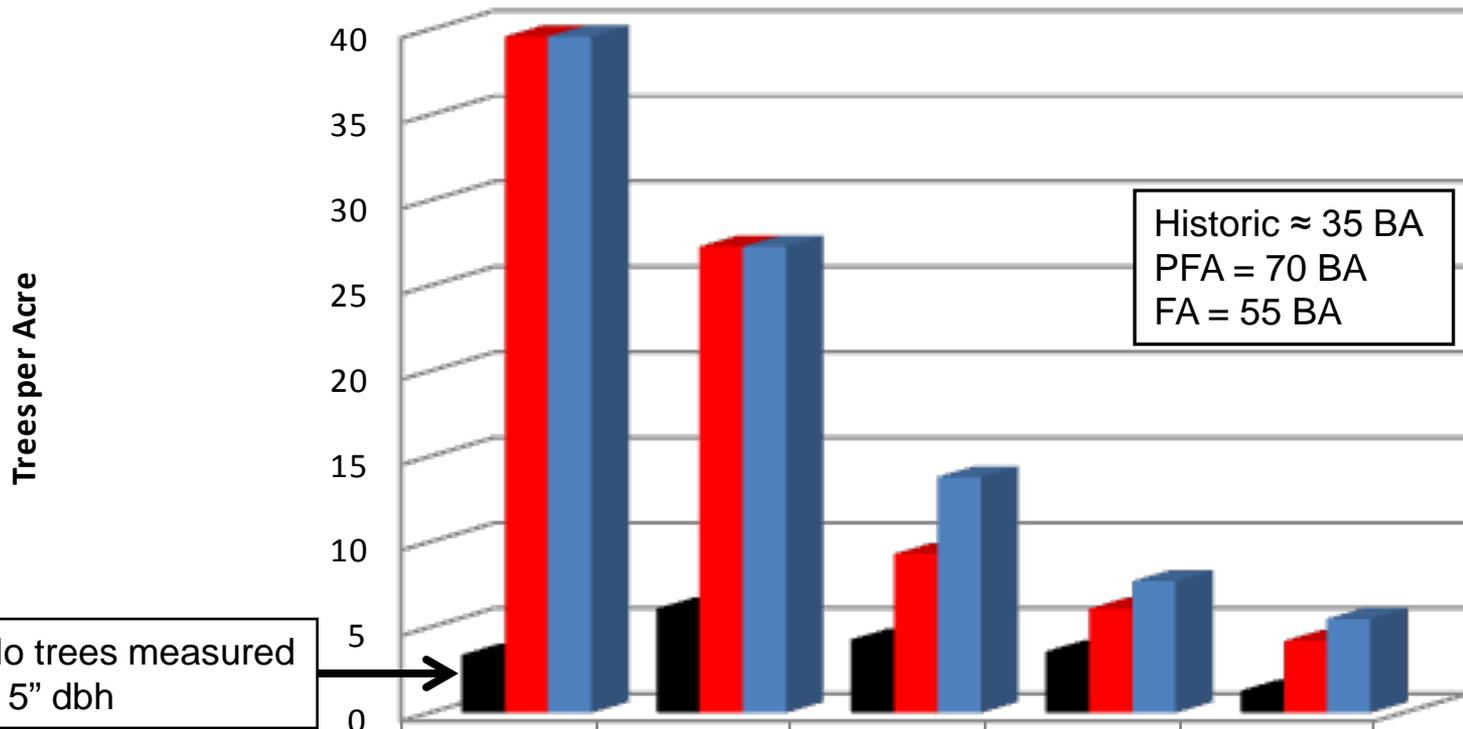


TYPICAL OPEN STAND OF WESTERN YELLOW PINE, AFTER CONSERVATIVE CUTTING,
TUBAYAK FOREST.



Reference Condition Data

Comparison Trees per acre by Diameter Class Historic (1910) to Desired Condition for Goshawk Habitat (1910 Northern Arizona ponderosa pine forest inventory plots summary)



No trees measured
< 5" dbh

Historic ≈ 35 BA
PFA = 70 BA
FA = 55 BA

	0-6*	7-12	13-18	19-24	25+
■ Historic (1910) *	3.4	6.1	4.3	3.6	1.3
■ Foraging Area Desired Condition	39.6	27.3	9.3	6.1	4.2
■ PFA Desired Condition	39.6	27.3	13.8	7.7	5.5

- Historic conditions from aggregation of Northern AZ large plots measured by Woolsey.
- Desired densities reflect contemporary multiple resource objectives.

Analysis of Alternatives

- Vegetation Evaluation Criteria

- ***Forest Health***

- Stand density
- Disease (dwarf mistletoe distribution) & beetle hazard

- ***Forest Structure***

- MSO habitat Forest plan requirements
- Goshawk habitat Forest plan requirements
- Old growth Forest plan requirements

- ***Forest species composition***

- Favor shade intolerant species (especially Southwestern white pine, aspen, oak, other hardwoods), but maintain all species

- ***Old growth Forest Plan requirements***

- both alts. meet required allocation % at Ranger District level.



Alternative B

*Implementation Example:
Eagar South Goshawk Habitat
Management Demonstration*

**Uneven-aged stand, average
productivity site**

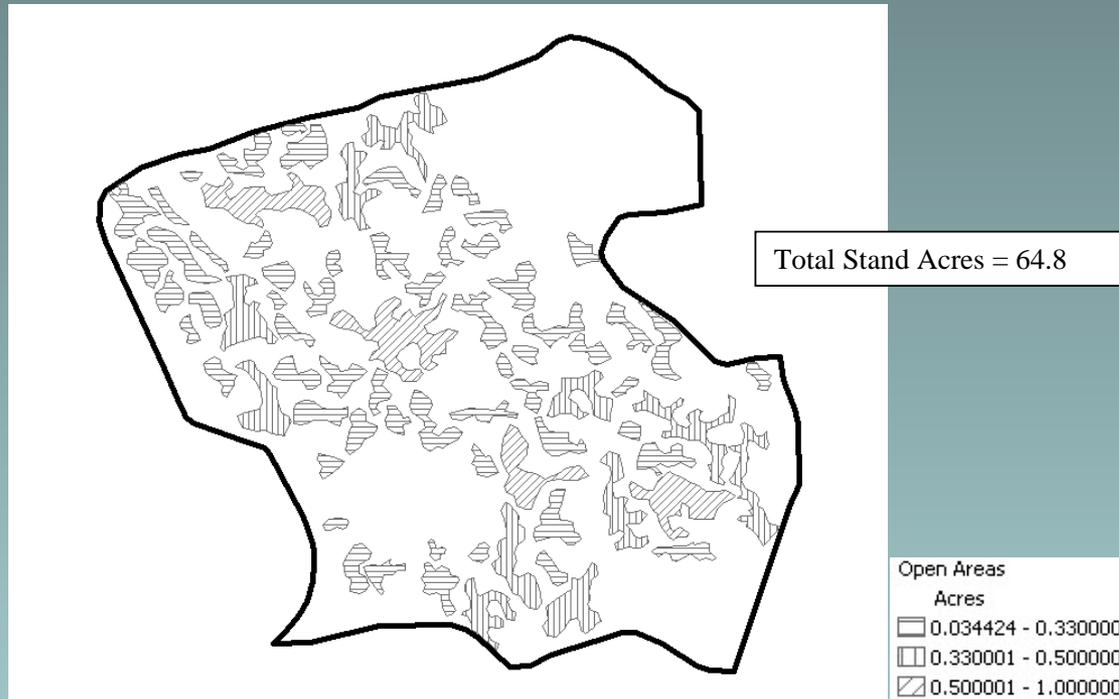


Pre-Treatment, 2007
-High-density
uneven-aged stand

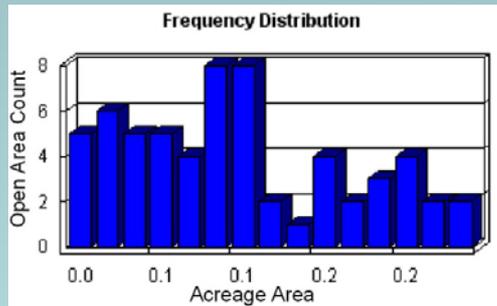
Post-Treatment, 2008
-Uneven-aged stand,
70 ft² BA



Created Regeneration Gaps & Openings

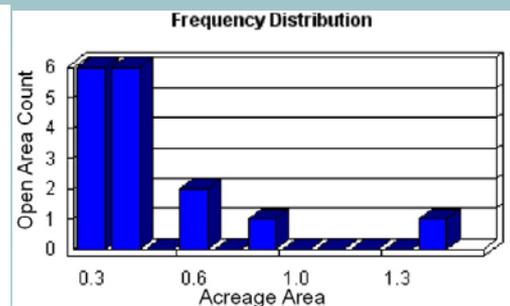


AREAS LESS 0.33 ACRE



Count: 61
Minimum: 0.034
acre
Maximum: 0.282

AREAS GREATER 0.33 ACRE

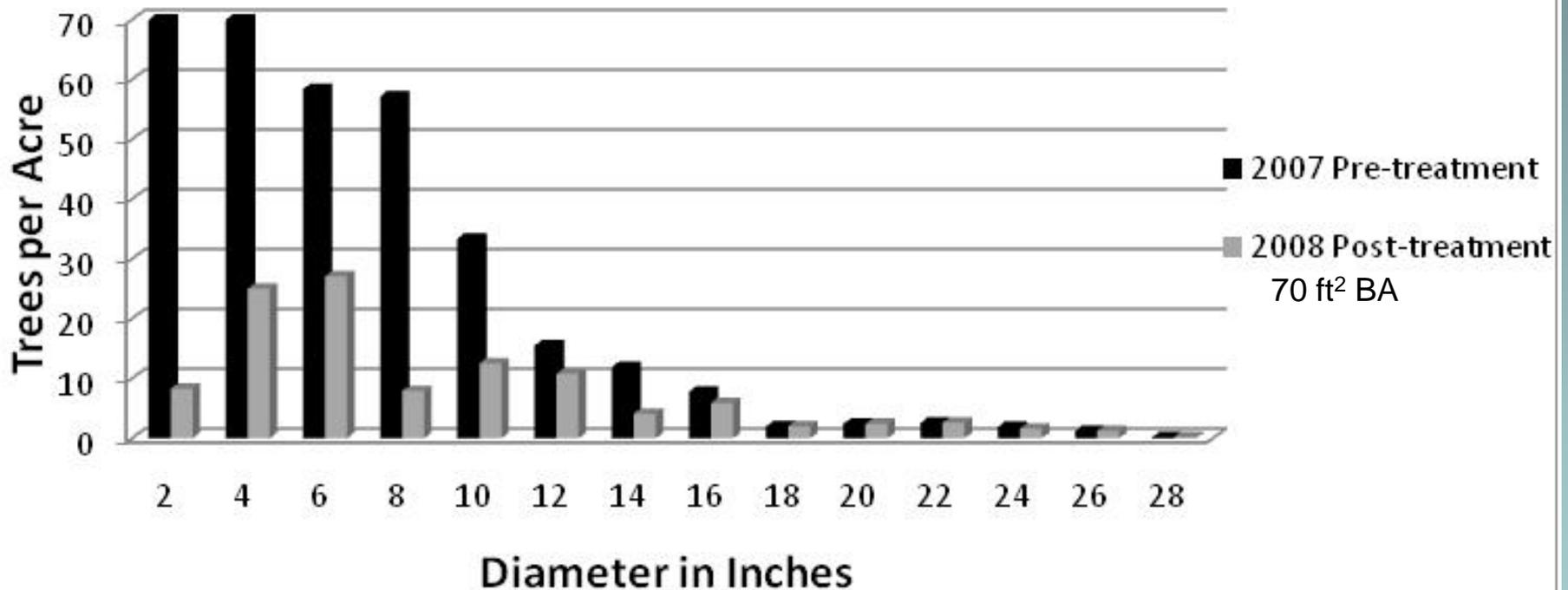


Count: 16
Minimum: 0.331
acre
Maximum: 1.392

Regeneration gaps & openings were created on approximately 26% of the area (14% of the created openings ranged from 0.33 to 1.4 acres in size)

Post-Treatment, 2008

Eagar South Pre & Post Treatment Comparison



Trees in the 2 and 4 inch classes exceed 70 trees per acre pre-treatment.

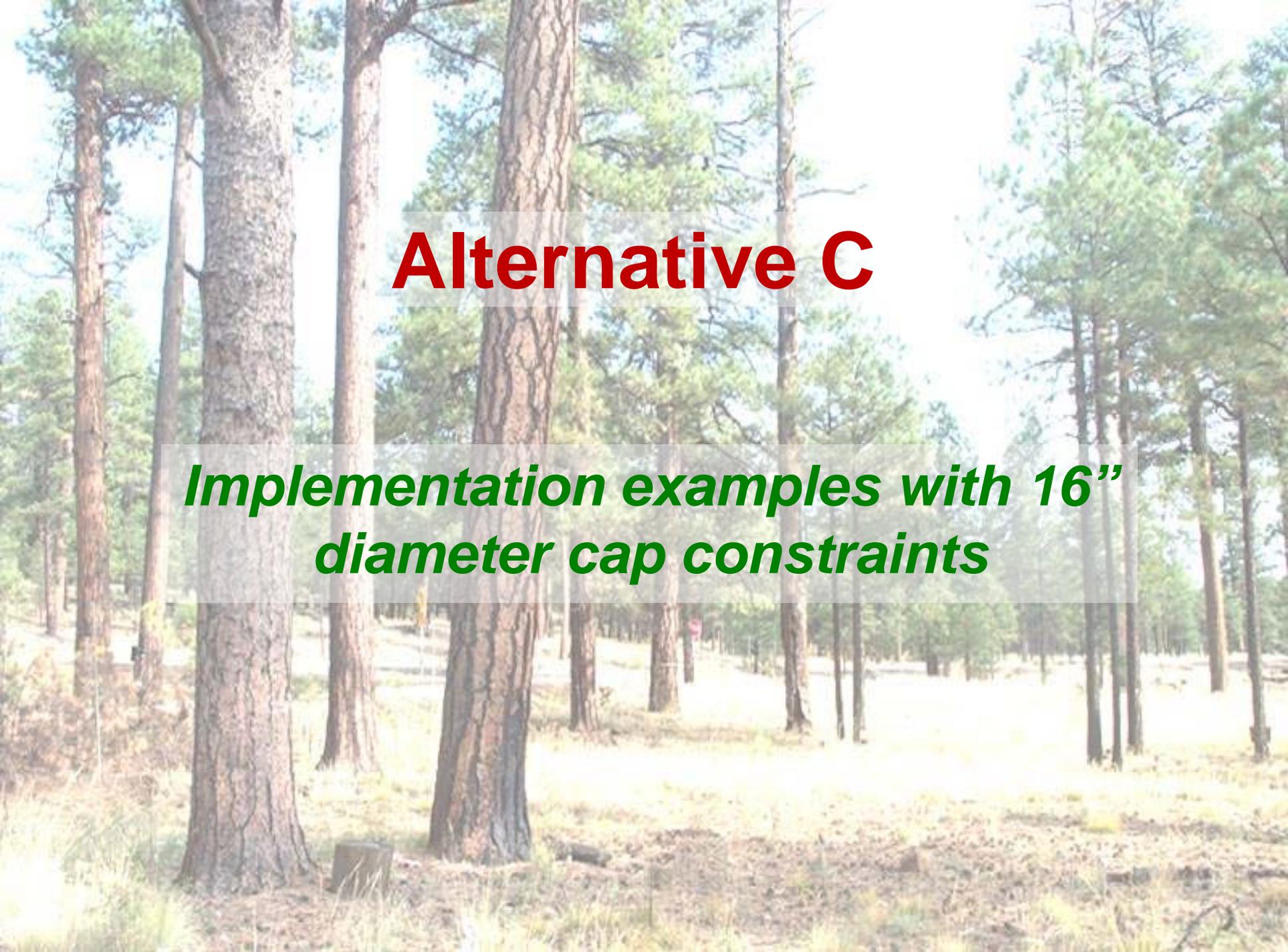
Uneven-aged structure was maintained and moved towards desired balance

Alternative B Summary of Effects

- ***Uneven-aged stands*** \approx 55% of forest area
 - Maintain existing uneven-aged stands (by creation of sufficient regeneration gaps).
 - Achieve target stand density, while progressing towards a balance of VSS classes (age/size structure).
- ***Mature even-aged stands, (VSS 4)*** \approx 15% of forest area
 - *Convert existing even-aged stands to uneven-aged structure (by creation of sufficient regeneration gaps).*
- ***Immature even-aged stands (VSS 1-2-3)*** \approx 30% of forest area
 - *Create desired openings throughout stand, and regeneration gaps where mature seed trees exist.*

Alternative B Summary of Effects

- ***In all stand conditions:***
 - Fully address and manage forest health issues such as stand density, dwarf mistletoe, forest genetics, and favoring development/regeneration of Southwestern white pine.
 - Fully manage to favor/regenerate forest species composition commensurate with the desired conditions.



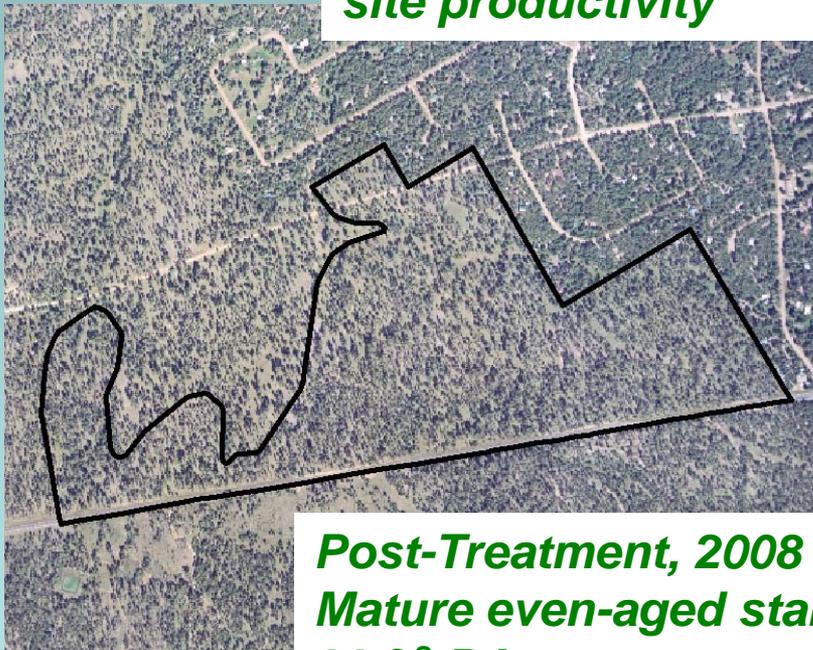
Alternative C

*Implementation examples with 16”
diameter cap constraints*

**Little Springs Project,
Black Mesa RD**



*Pre-Treatment, 2000
Uneven-aged stand,
High-density, high-
site productivity*

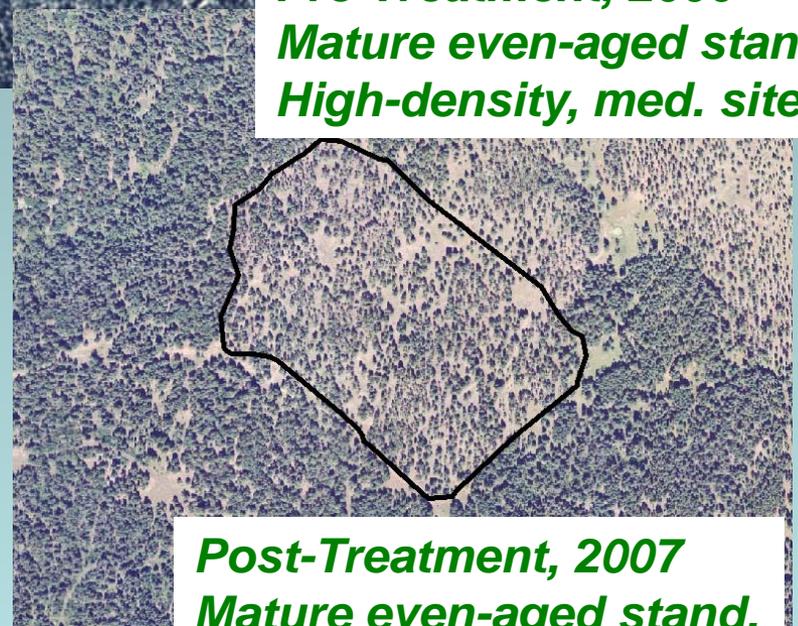


*Post-Treatment, 2008
Mature even-aged stand,
90 ft² BA*

**Mineral Project,
Springerville RD**



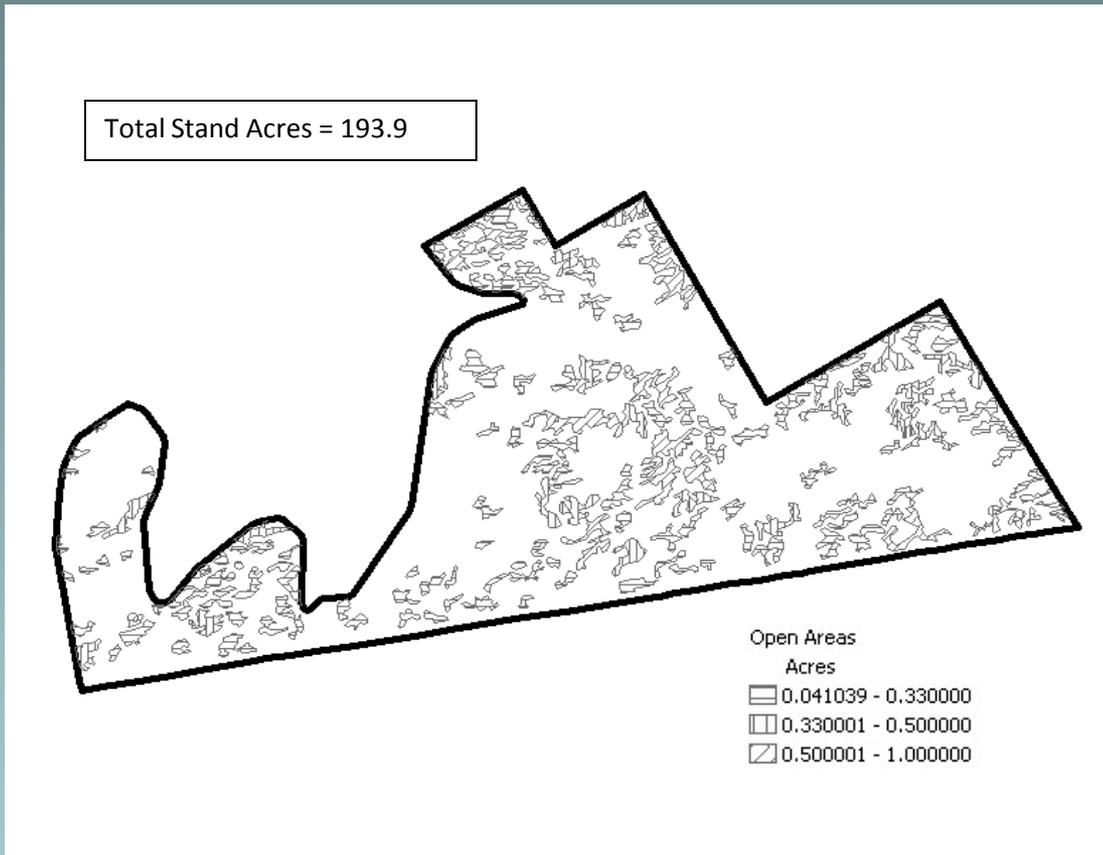
*Pre-Treatment, 2000
Mature even-aged stand,
High-density, med. site*



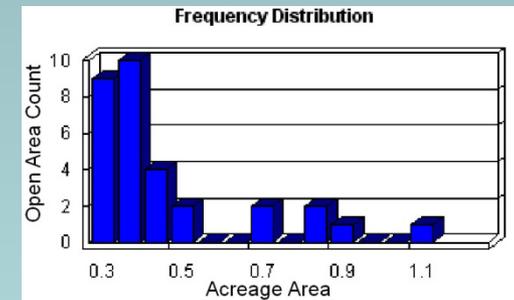
*Post-Treatment, 2007
Mature even-aged stand,
50 ft² BA*

Little Springs Project -Uneven-aged stand before treatment (adjacent to Rim Lakes EMA)

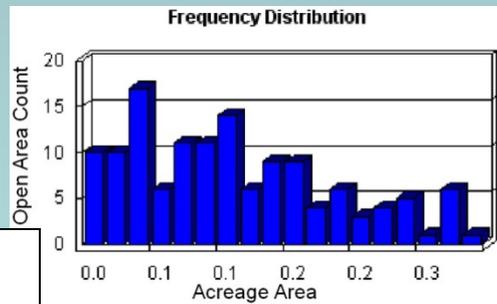
Regeneration gaps and stand openings (greater than 0.33 acre) were created on 8% of the treated area.



AREAS > 0.33 ACRE

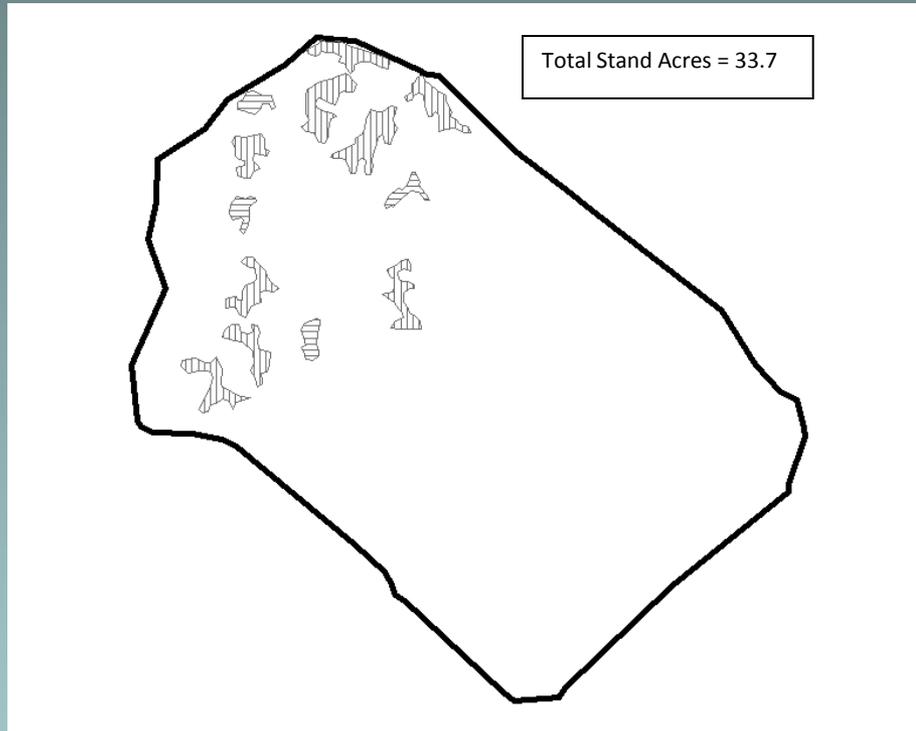


•Count: 31
Minimum: 0.331 acre
Maximum: 1.14 acre
Sum: 15.95 acres
Mean: 0.51 acre



AREAS < 0.33 ACRE

•Count: 133
Minimum: 0.041 acre
Maximum: 0.328 acre
Sum: 20.39 acres
Mean: 0.15 acre

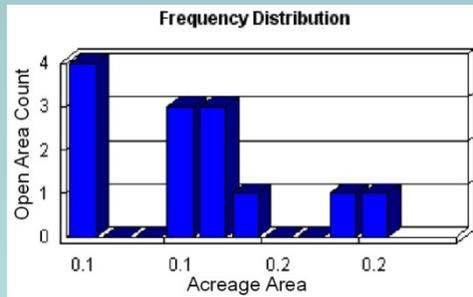


**Mineral Project Area,
mature even-aged stand
before treatment**

**Regeneration gaps and stand
openings were created on <1% of the
treated area.**

**None of the created openings were
>0.33 acre in size.**

AREAS < 0.33 ACRE



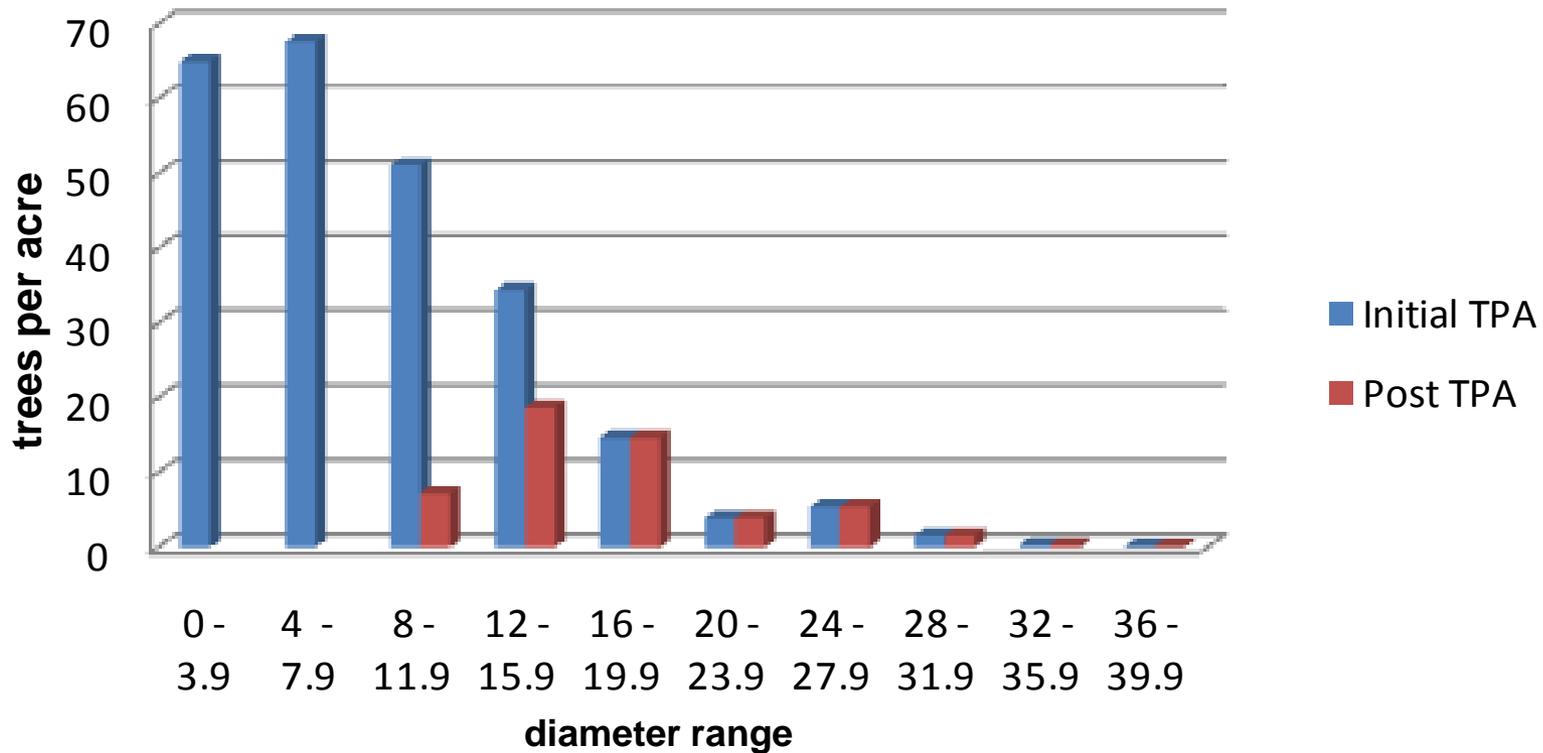
Count: 13
 Minimum: 0.064 acre
 Maximum: 0.225 acre
 Sum: 1.17 acres
 Mean: 0.19 acre

Count: areas > 0.33 = 0

Open Areas
 Acres
 0.064389 - 0.100000
 0.100001 - 0.330000

Little Springs Project, Black Mesa RD.

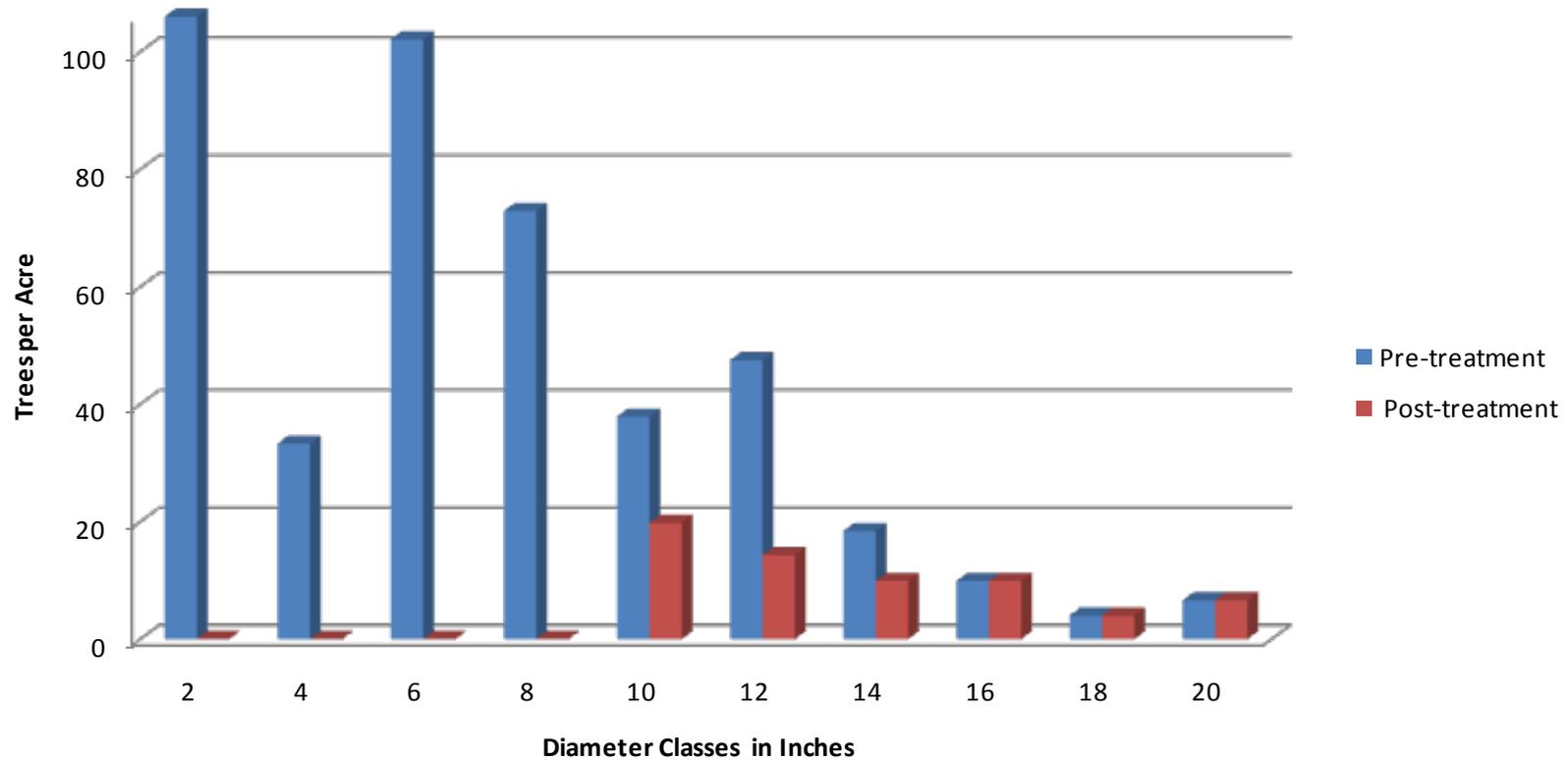
Pre & Post Treatment Comparison



*Pre-treatment uneven-aged stand structure was converted to mature even-aged stand.
Post-treatment BA = 90 ft²+ with few canopy gaps (fuels and bark beetle objectives not met).*

Mineral Project, Springerville RD.

Pre & Post Treatment Comparison



Mature 2-aged stand converted to one-aged stand. Post-treatment BA = 50-60 ft². Short-term fuels objectives met, but no canopy gaps, so treatment is short-lived (10 yrs.) .

Alternative C Summary of Effects

- **Uneven-aged stands \approx 55% of forest area**
 - Constraints limit creation of sufficient regeneration group openings to maintain all-aged structure
 - Constraints force a trade-off between forest structure and density. Uneven-aged forest structure is reduced or lost to meet density objectives (treated stands move towards even-aged structure)
- **Mature even-aged stands, (VSS 4) \approx 15% of forest area**
 - Constraints limit creation of sufficient regeneration group openings to initiate conversion of even-aged stands to all-aged structure
 - Constraints force a trade-off between forest structure and density. Forest age/size class distribution is reduced or lost to meet density objectives
- **Immature even-aged stands (VSS 1-2-3) \approx 30% of forest area**
 - Constraints seldom limit attainment of age/size/density objectives (may have minor effects on meeting forest health/species objectives)

Alternative C Summary of Effects

- *Achieve target stand density in most (but not all) treated stands.*
- *Reduce bark beetle hazard in most (but not all) treated stands.*
- *Partially reduce and manage dwarf mistletoe severity and extent in some stands.*
- *Partially achieve/manage towards desired stand structure and species composition in some stands (30% of the forested area).*

Diameter Caps for Thinning Southwestern Ponderosa Pine Forests: Viewpoints, Effects, and Tradeoffs

Scott R. Abella, Peter Z. Fulé, and W. Wallace Covington

ABSTRACT

Upper size limits of trees allowed to be cut, termed diameter caps, have resulted in polarization, litigation, and delays and alterations to thinning projects in many western forests. Using southwestern ponderosa pine forests as an example, we summarize viewpoints on caps, simulate effects of caps on thinning prescriptions, and provide examples of ecosystem-level tradeoffs of leaving extra trees during thinning projects. The importance placed on trees versus other ecosystem components primarily differentiates those who support caps and those who do not. We conclude that diameter caps may enhance some ecosystem components, such as densities of large trees, but they negatively impact many nontree components.

toration projects in western forests (Coughlan 2003).

Peer-reviewed scientific publications on diameter caps are rare (Larson and Mirth 2001, Coughlan 2003). We suggest that disagreements about caps are frequently based on personal opinion and may be concentrated on trees at the expense of other important ecosystem components. In this article

Key Points: Diameter Caps and Forest Restoration (Abella et. al)

- Removing young, large trees is sometimes necessary to restore openings***
- Retaining too many excess trees compromises other ecosystem components***
- Trees are inflexibly retained even if the results fail to achieve objectives***
- Leaving excess trees necessitates future heavy thinnings and multiple entries***
- Residual trees grow rapidly after thinning, so large trees accrue quickly***
- Trading young, large trees (goods for services) offsets project costs and funds follow-up management***