Biochar Demonstration Site - *Pre and Post woody biomass harvest results*

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The project was designed in two phases

- Phase I
  - Literature review of pertinent scientific literature addressing woody biomass manipulations addressing ecological criteria to maintain site viability and ecological integrity.
  - A 27 page report available at: http://cemendocino.ucanr.edu/
- Phase II
  - Using the criteria and metrics identified through the literature search design a marking scheme to harvest woody biomass from a site while insuring the retention of existing ecological characteristics-
    - Basal hollows
    - Broken tops
    - Cracked bark
    - Down wood
    - Etc.

When thinking about plants…

- Due to the lack of fire and other constraints, air quality and TE species, thinning in certain instances, can be considered a surrogate management strategy that should be included in forest-wide planning (Agee 1993).

- Thinning generally increases forest light penetration generally creating favorable conditions for plant species. Cautionary note: excessive canopy removal can lead to invasion of unwanted species. (Nelson, C.R., Halpern, C.B., and J. A. Antos 2007).

- With VR…Thinning with skips and gaps between 20-25% of basal area while leaving 10% of the total area un-thinned; with about 15% in small canopy gaps resulted in both crown area and live crown ratio positively correlated with changes in basal area. (Comfort et al 2010).

When thinking about wildlife…..

- Thinning can increase structural complexity of young forests, subsequently increasing wildlife species diversity (Spies and Franklin, 1991; Hayes et al., 1997).

- A large body of work has been developed, particularly in the last 10–15 years (Kennedy and Fontaine 2009), which has shown that many wildlife species depend on fire-maintained habitats or pyrogenic structures, such as the snags, shrubs, and bare ground created by fires of varying severity (Hutto 2008).

- Songbird habitat evaluations on understory vegetation showed herbaceous cover consistently, but slightly, increased following thinning. Shrub cover decreased after thinning when pre-treatment cover was > 30% (Wilson and Puettman 2007.)

- Thinnings between 15-63% of basal area compared to un-thinned controls of 40-60 year old Douglas fir stands tended to homogenize total shrub and tall shrub cover across studies and sites.

- Because responses to habitat manipulations can vary greatly among taxa and among species within taxa, one should not make broad assumptions about “wildlife” as key habitat elements may need consideration in certain situations.

The challenge of competing goals

For *wildlife*……Variable density thinning is generally viewed as a positive action if the reduction is generally between 24-30% reduction in basal area (Carey and Wilson, 2001) ;

For *song birds*….Impacts were considered significant for those studies where > 66% of basal area or trees per hectare were removed during thinning (Christian et al., 1996; Norton and Hannon, 1997).

For *wildfire*…….Thinning forest structure by reducing overall tree density by > 60% and canopy bulk density by 50% has shown to reduced susceptibility to crown fire (Harrod et al, 2009).

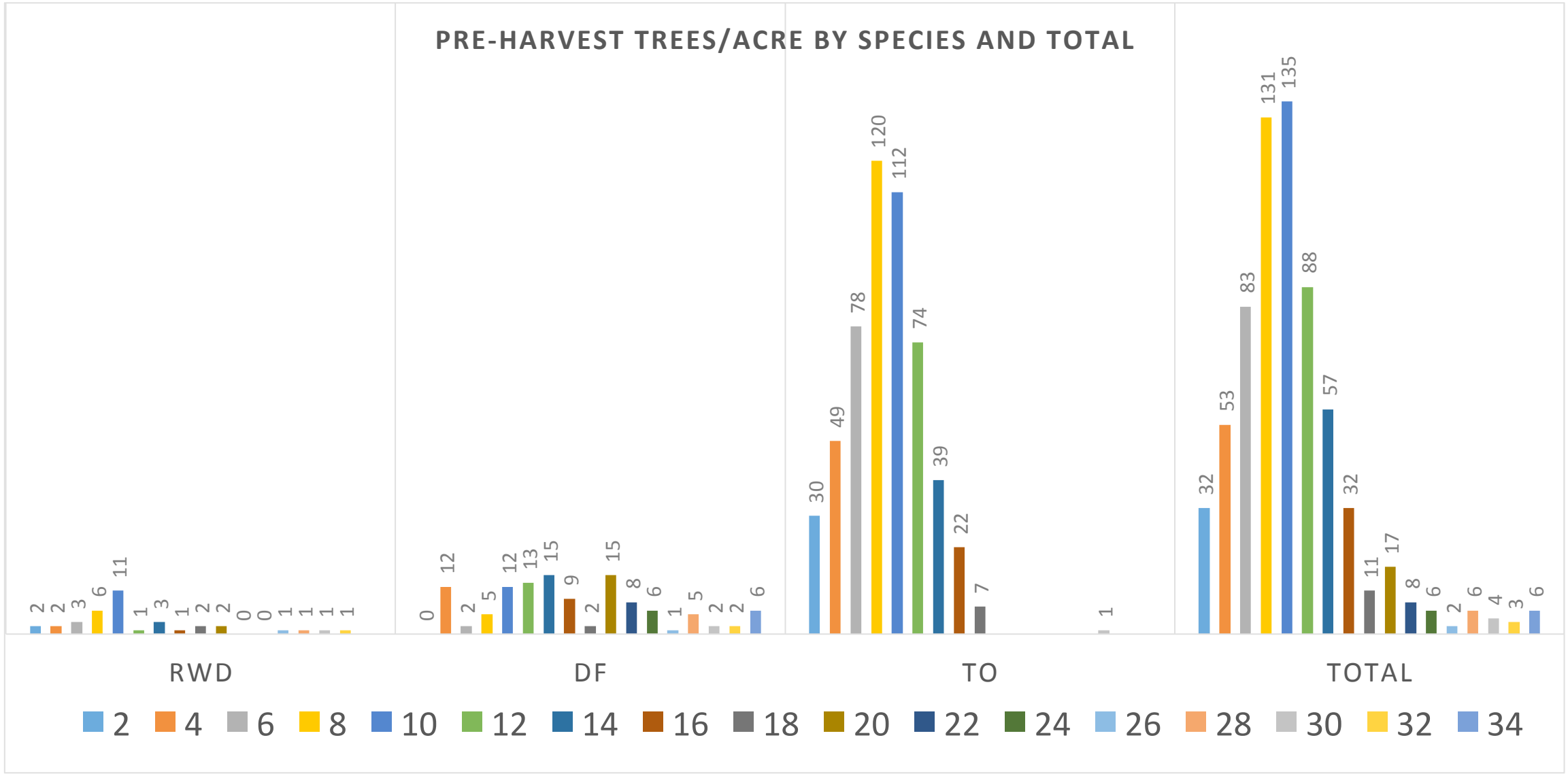
For *plants*…..In the northwestern U.S. and Canada, species richness of understory vegetation in thinned stands was similar to, or greater than, uncut control stands (Deal, 2001; Thomas et al., 1999).

For *plants*….Thinning generally increases forest light penetration generally creating favorable conditions for plant species. Cautionary note: excessive canopy removal can lead to invasion of unwanted species (Nelson, et. al. 2007).

The demonstration site criteria…

- As a demonstration site the selection criteria needed to consider:
  - Tanoak dominant stand,
  - Proximity of landing for processing,
  - Proximity to main haul road, chip truck access,
  - Easily accessible for education tours,
  - Relatively flat ground to accommodate tours.

Pre-harvest species and size distribution…



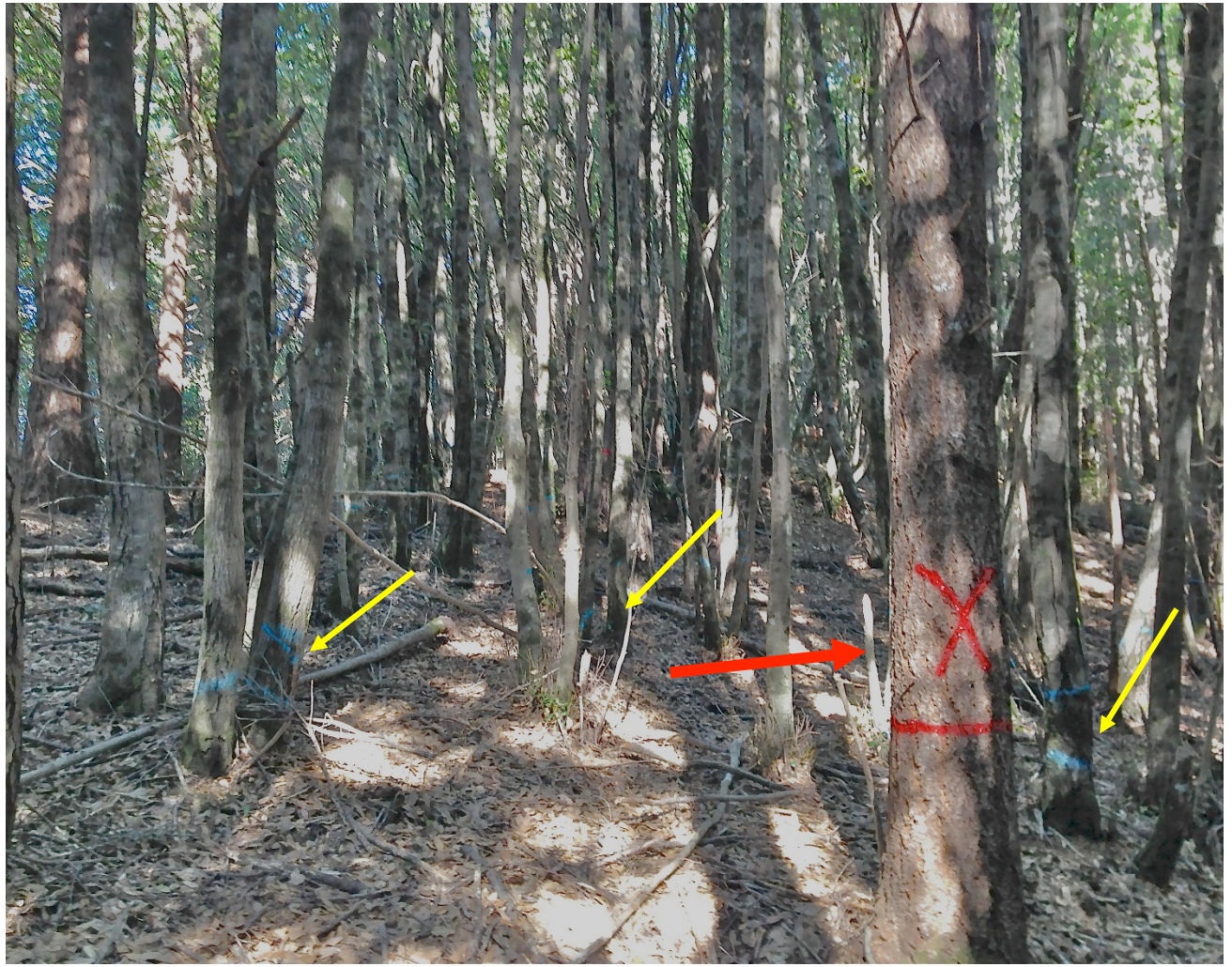
Marking guidelines

1. Only tanoaks were selected for harvest;
2. Tanoaks between 4-18” dbh could be marked;
3. Trees with obvious trunk hollows were to be retained;
4. Trees with broken tops were to be retained;
5. Any tree with structural anomalies e.g. cracked bark, nesting cavities etc. was retained;
6. Trees, that if removed, would disturb large downed logs would not be marked;
7. Appropriate trees (tanoaks) would be selected if their removal would benefit conifer release;

The mark…

Trees were marked using standard tree marking (blue) paint. Selected trees were “ringed” with paint at breast height and a blue “spot” was placed at the base to insure and validate only marked trees were harvested.

All trees were harvested using chainsaws with the aid of track skidders using a grapple attachment to move the trees to the landing. Trees were then stacked on the landing to facilitate future transport and handling.

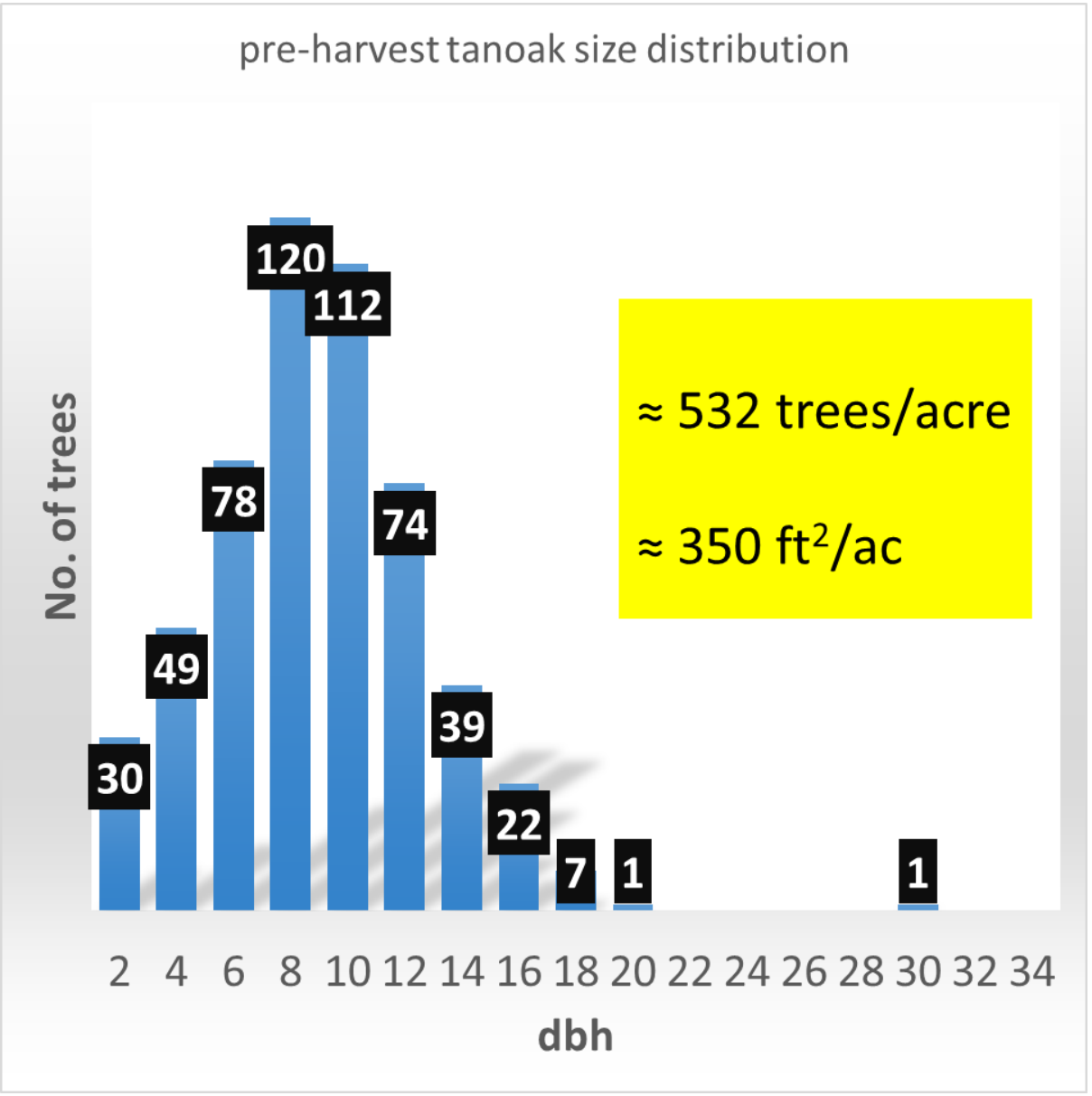


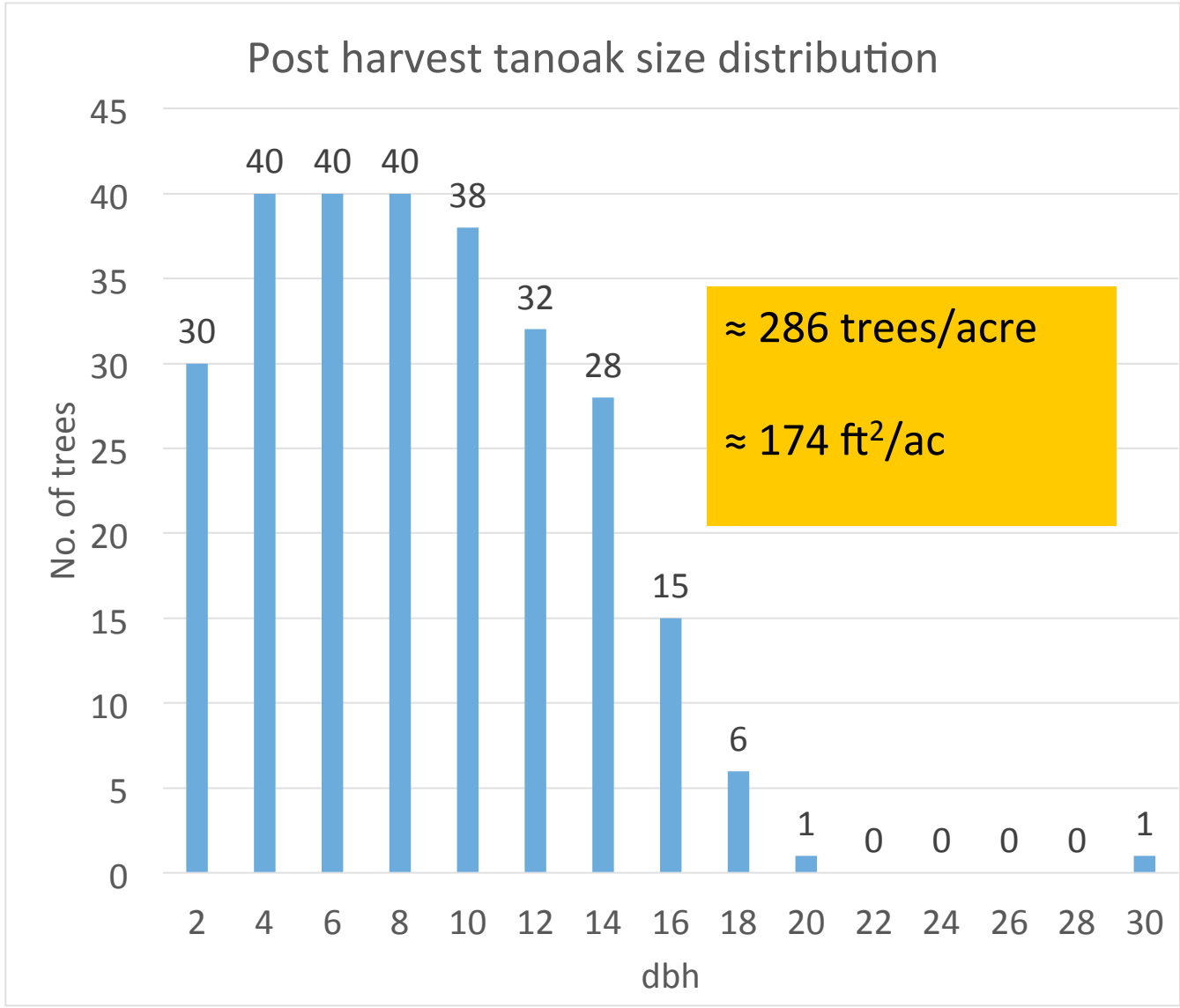
Results

Tanoak	Trees/acre	Range- dbh distribution	Basal area
Pre-harvest	532	2-30”	350 ft^2/ac
Post-harvest	286	4-30	174 ft^2/ac

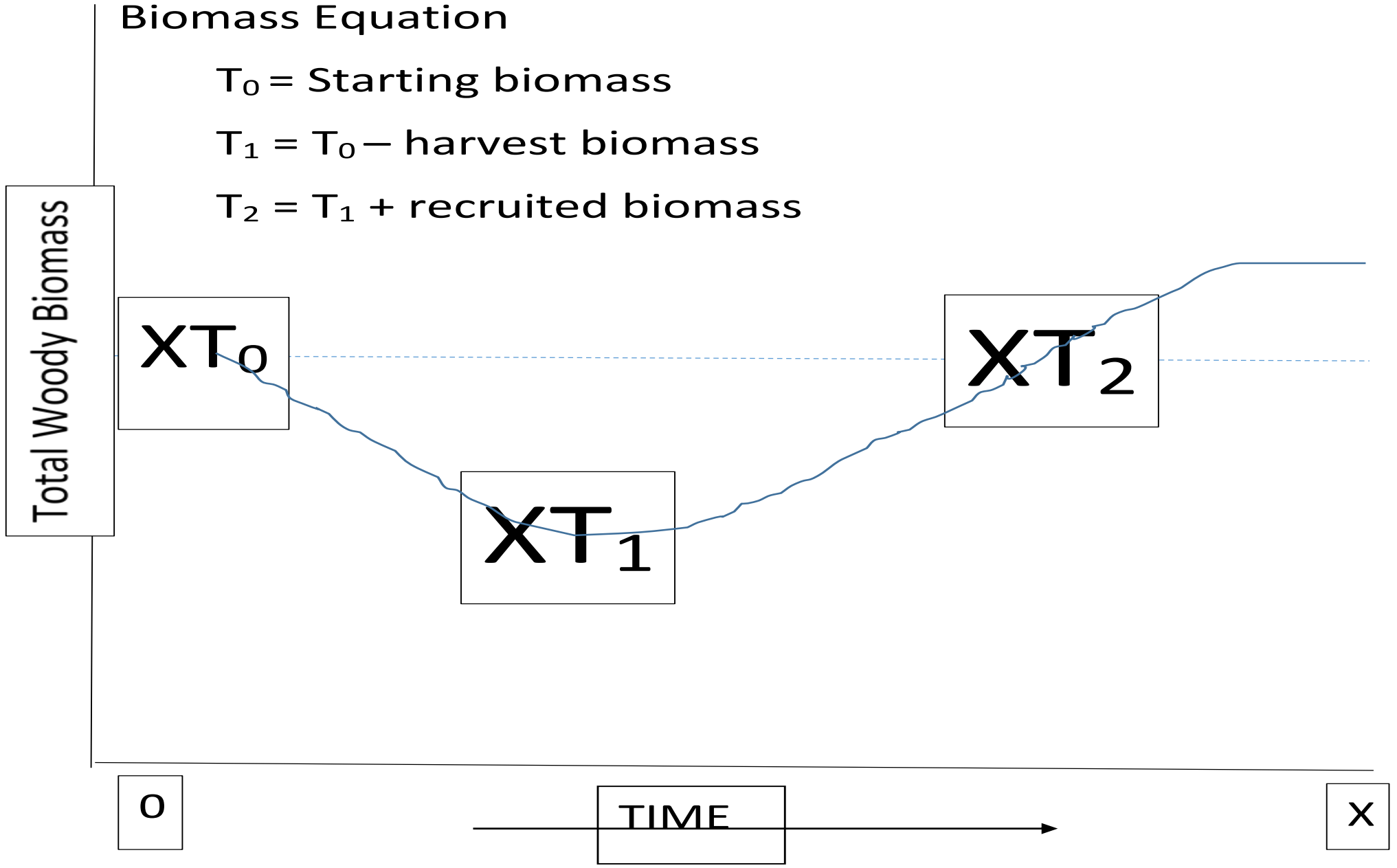
Size class	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
Pre-harvest	30	49	78	120	112	74	39	22	7	1	---	---	---	---	1
No. harvested	---	9	38	80	74	42	11	7	1	1	---	---	---	---	1
TO % change	0	-18	-49	-66	-66	-56	-28	-32	-14	0					0

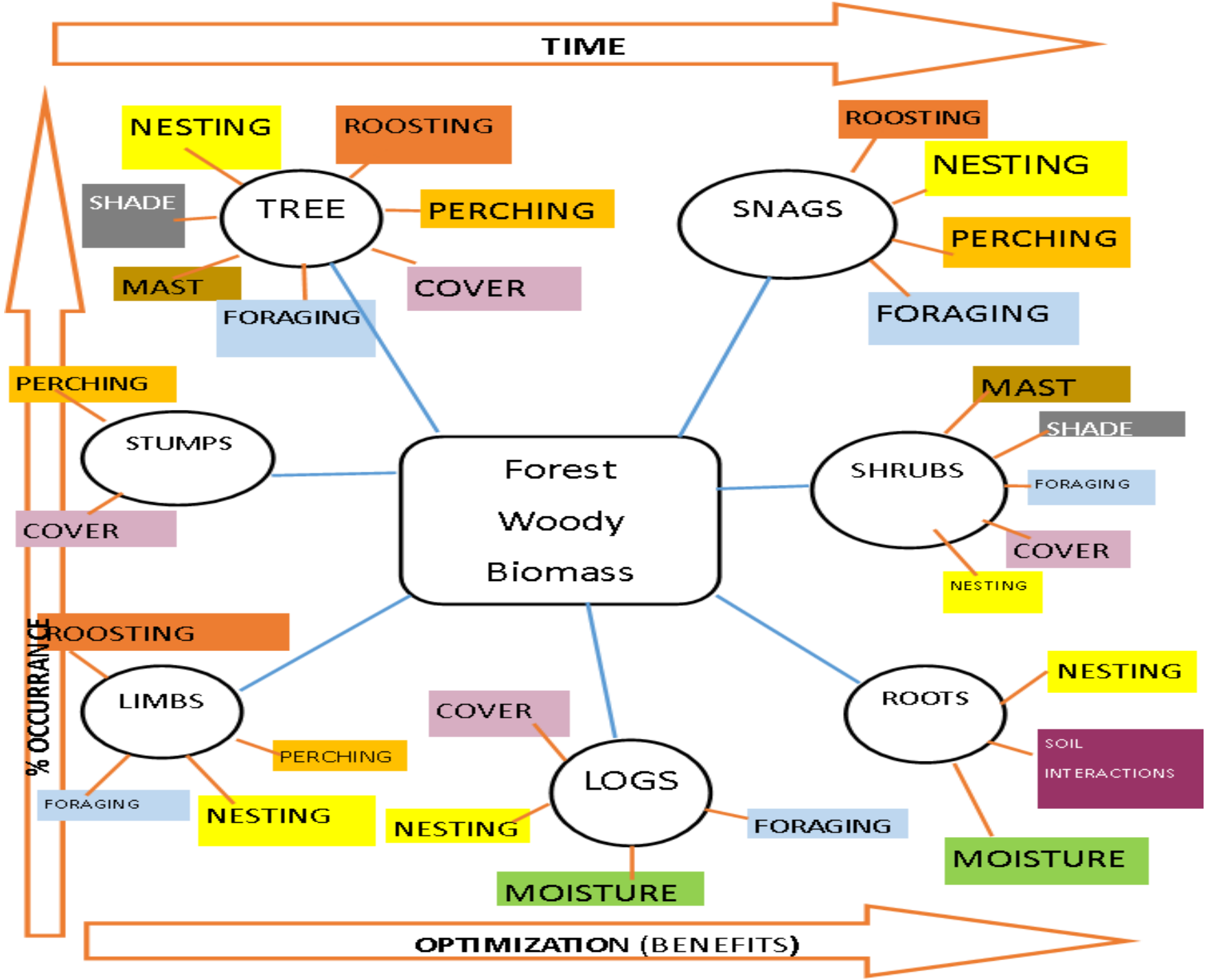
Pre and Post harvest stand comparison





What does the harvest look like?


Biomass Equation
T_0 = Starting biomass
T_1 = T_0 – harvest biomass
T_2 = T_1 + recruited biomass
Total Woody Biomass
XT_0
XT_1
XT_2
0
TIME
X


TIME
NESTING
ROOSTING
SHADE
TREE
PERCHING
MAST
COVER
FORAGING
ROOSTING
NESTING
SNAGS
PERCHING
FORAGING
PERCHING
STUMPS
COVER
MAST
SHADE
SHRUBS
FORAGING
COVER
NESTING
Forest
Woody
Biomass
% OCCURRANCE
ROOSTING
LIMBS
PERCHING
FORAGING
NESTING
COVER
LOGS
NESTING
FORAGING
MOISTURE
NESTING
ROOTS
SOIL
INTERACTIONS
MOISTURE
OPTIMIZATION (BENEFITS)

Questions?

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