

Incense Cedar Growth Studies and Observed Mortality at Blodgett Forest Research Station

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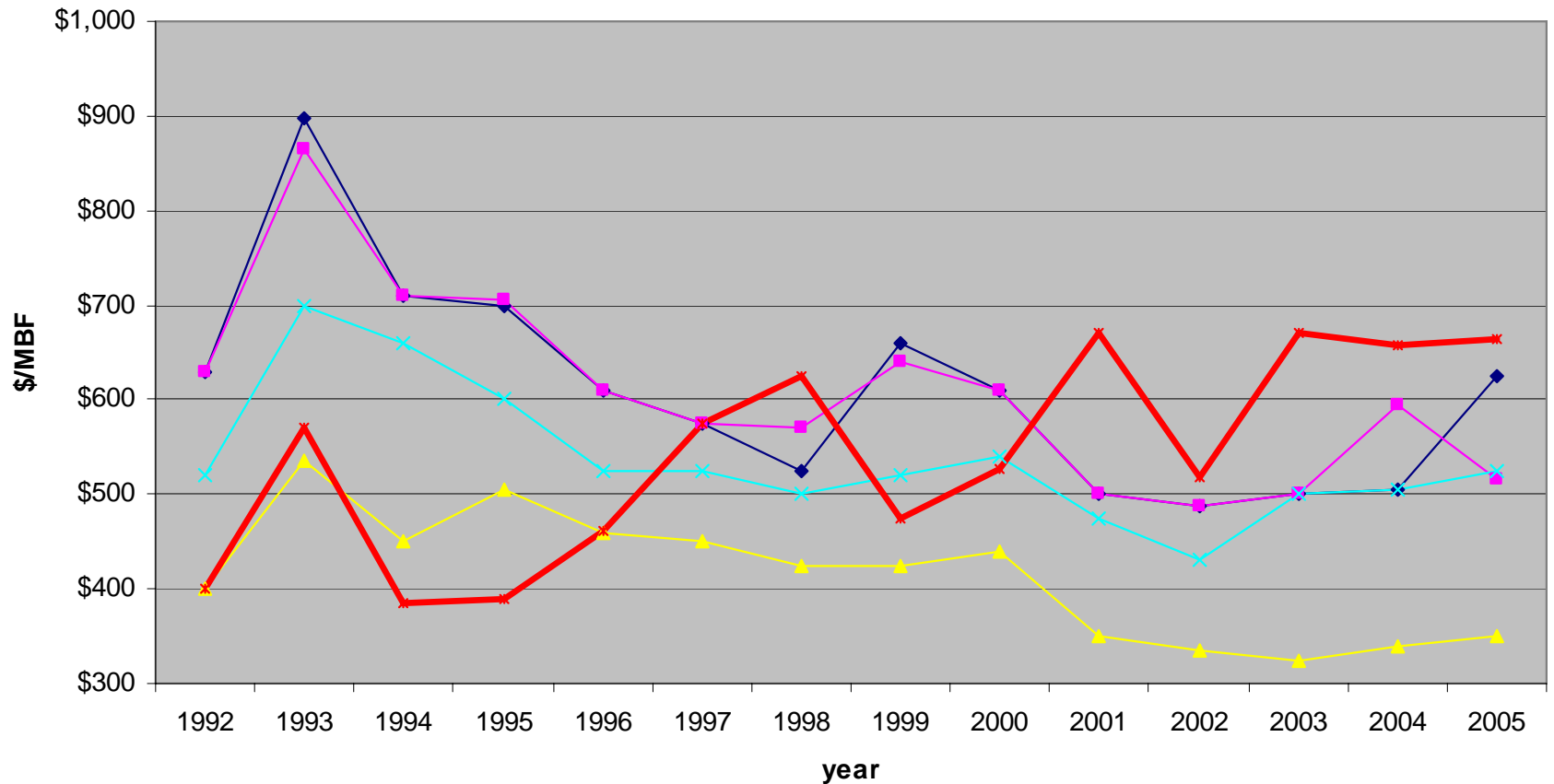
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Why are we discussing Cedar?

- Redwood Substitute?
- Cedar Properties
- Increased Value

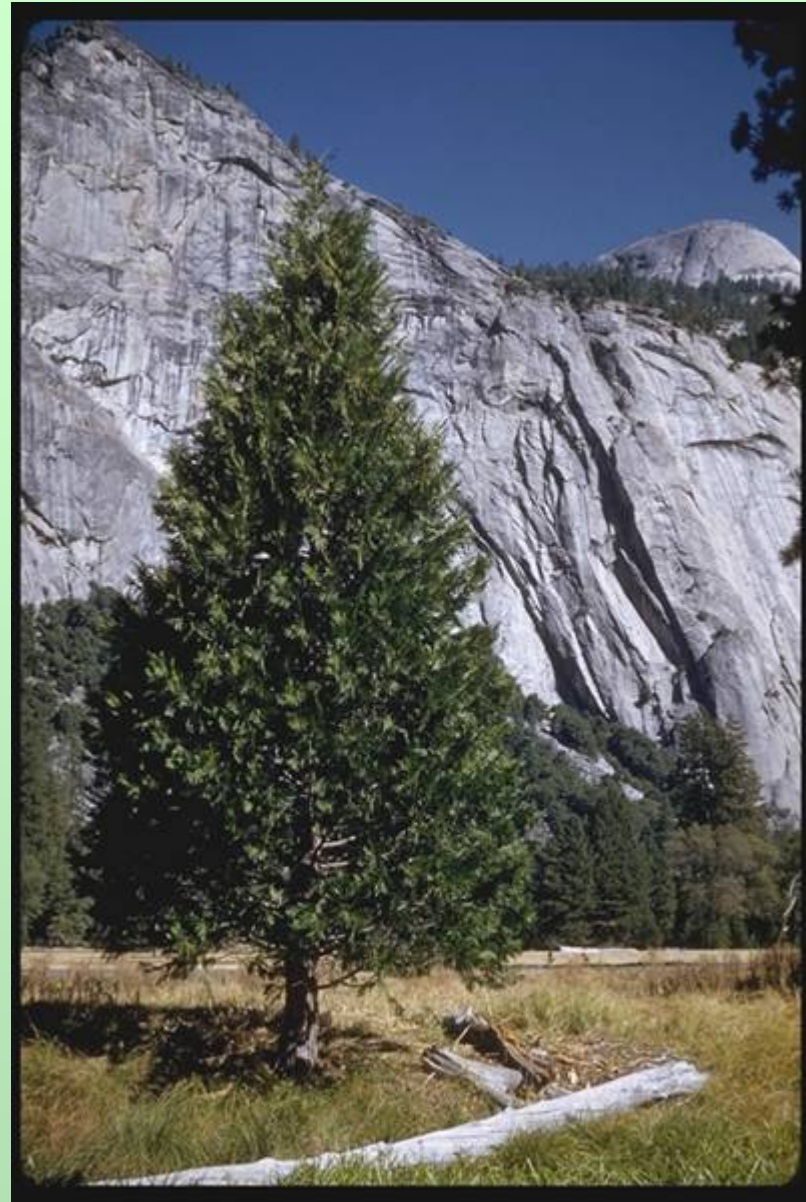
Timber Prices (delivered)



Legend: PP (dark blue diamond), SP (magenta square), WF (yellow triangle), DF (cyan cross), IC (red cross)

Incense-Cedar Recap:

- IC is a common associate in western mixed conifer forest types
- Range: Northern Oregon to Baja Mexico and from the fog belt to the desert fringe and even in west-central Nevada
- Generally found on Western Slopes where dry summer conditions exist
- Seeds are produced most years, but large seed crops occur only every 3 to 6 years.
- IC can establish in relatively low light conditions, but stagnates quickly. It needs fairly open conditions to grow at its best.
- Its Wood is used primarily for exterior uses - due to its high decay resistance - and for pencils. Smaller amounts are used for chests, jewelry boxes, and other interior products due to its aroma and insect repelling properties.



Damaging Biological Agents:

Diseases:

HEART ROT:

- Pocket Dry Rot (Pecky Rot): *Tyromyces amarus*

ROOT ROTS:

- Annosus Root Rot: *Heterobasidion annosum*

Maybe:

- Shoestring Root Rot: *Armillaria* sp.
- Laminated Root Rot: *Phellinus weirii*

RUSTS:

Gymnosporangium libocedri

MISTLETOE:

- Phoradendron juniperinum* subsp *libocedri*

Insects:

Many different species are found in IC but few cause significant damage.

- Cedar Bark Beetles: *Phloeosinus* spp. 6 species
 - Wood Borers: Flathead Cedar Borer: *Chrysobothris nixa*,
Amethyst C. Borer: *Semanotus amethystinus*, Western C. Borer: *Trachykele blondeli*
 - A cone sawfly, *Augomonoctenus libocedrii* can damage cone crops
- Many Scale Insects



Pecky Rot

- Cause of most defect in Incense-cedar
- Very common in Older trees (>150 years)
- Infects through wounds (Fire, limbs, scars)
- Unlikely to be a concern in managed plantations
- Very Uncommon in (<100 year old trees at Blodgett and Whitaker's Forest)



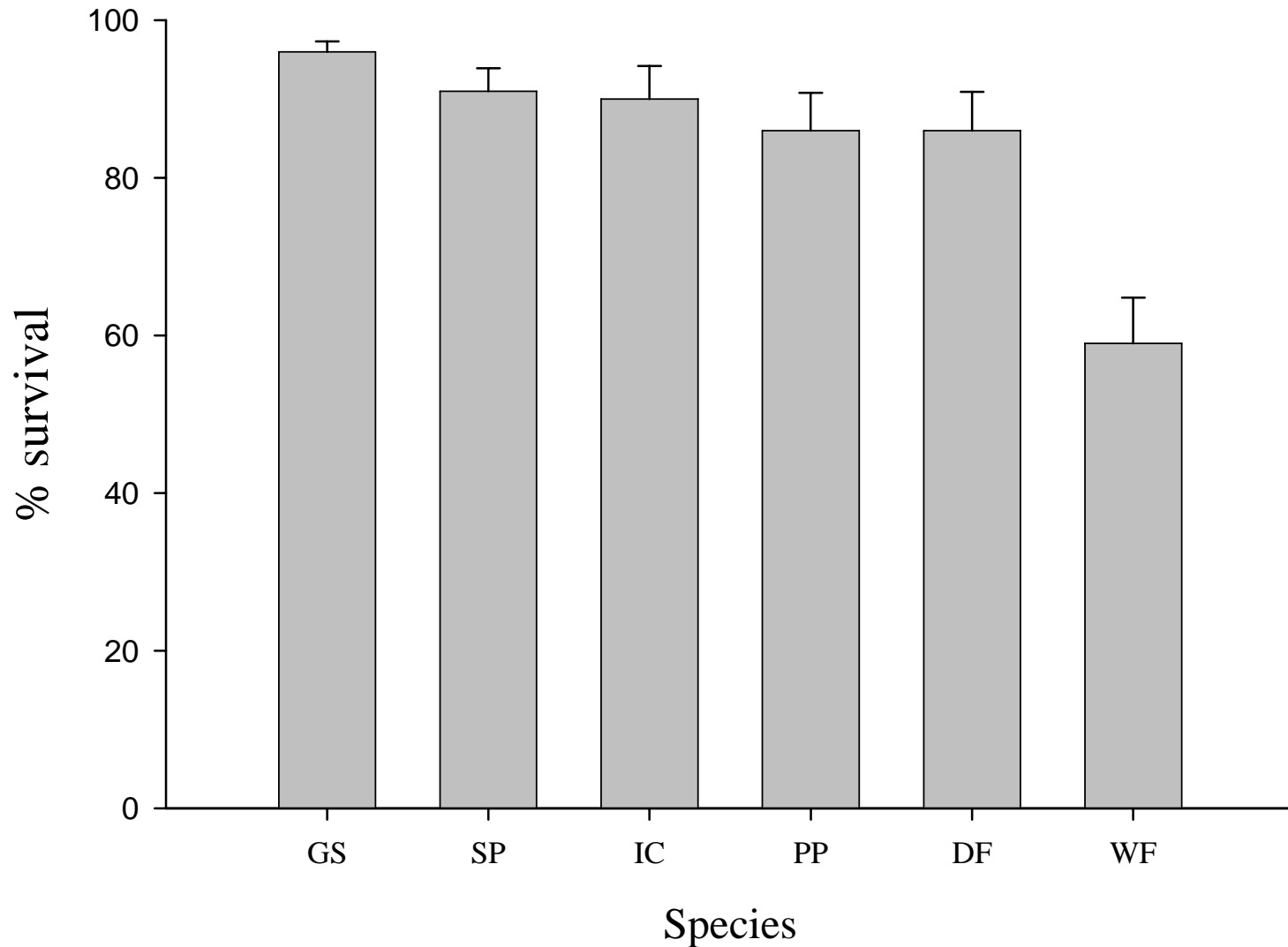


The most common cause of Mortality in > 6" DBH IC at Blodgett Forest is Physical Damage usually from Snow Breakage

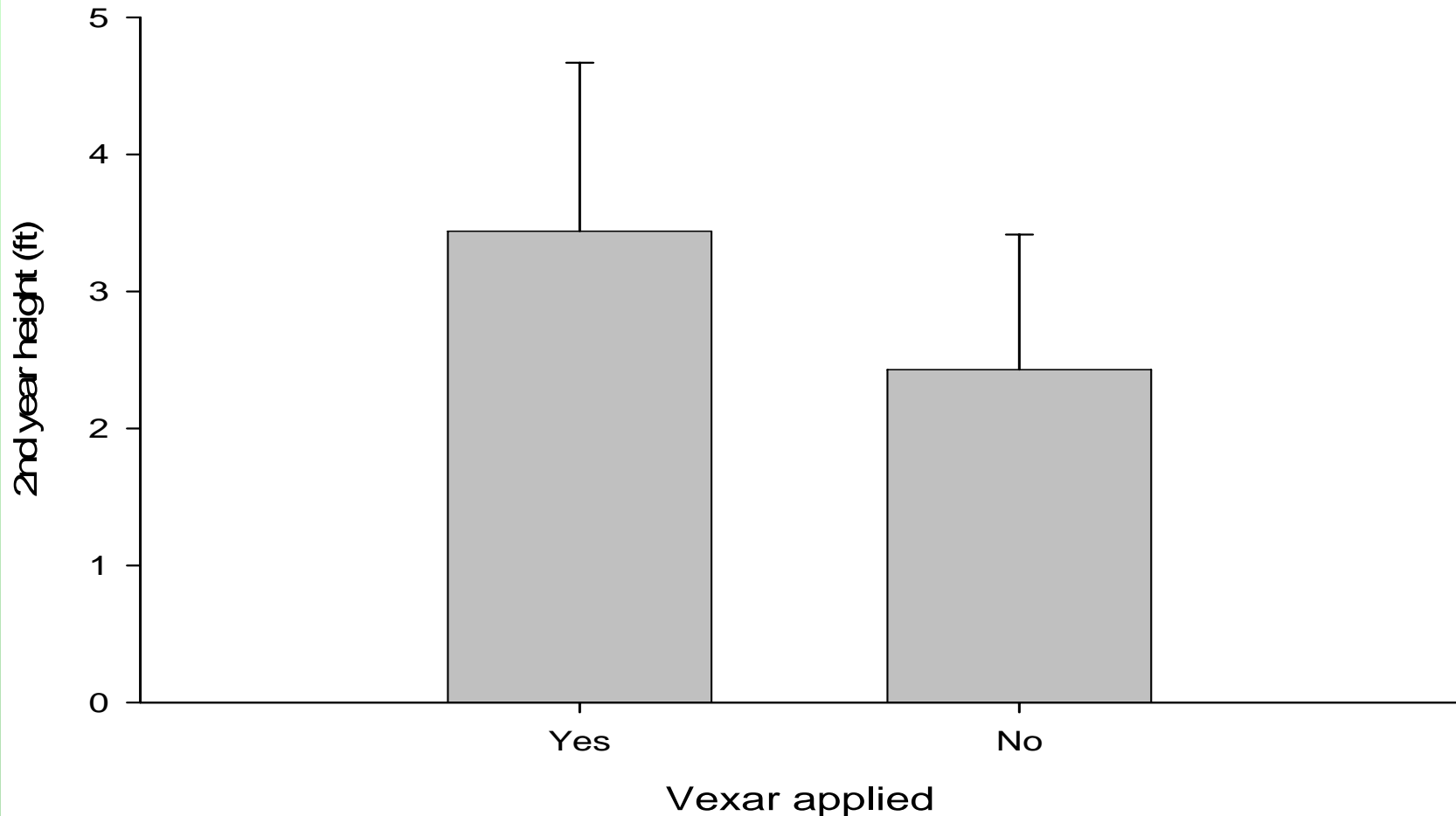


The most common cause of mortality in seedlings in plantations is poor planting stock or heavy browsing. In natural stands; high competition and drought stress.

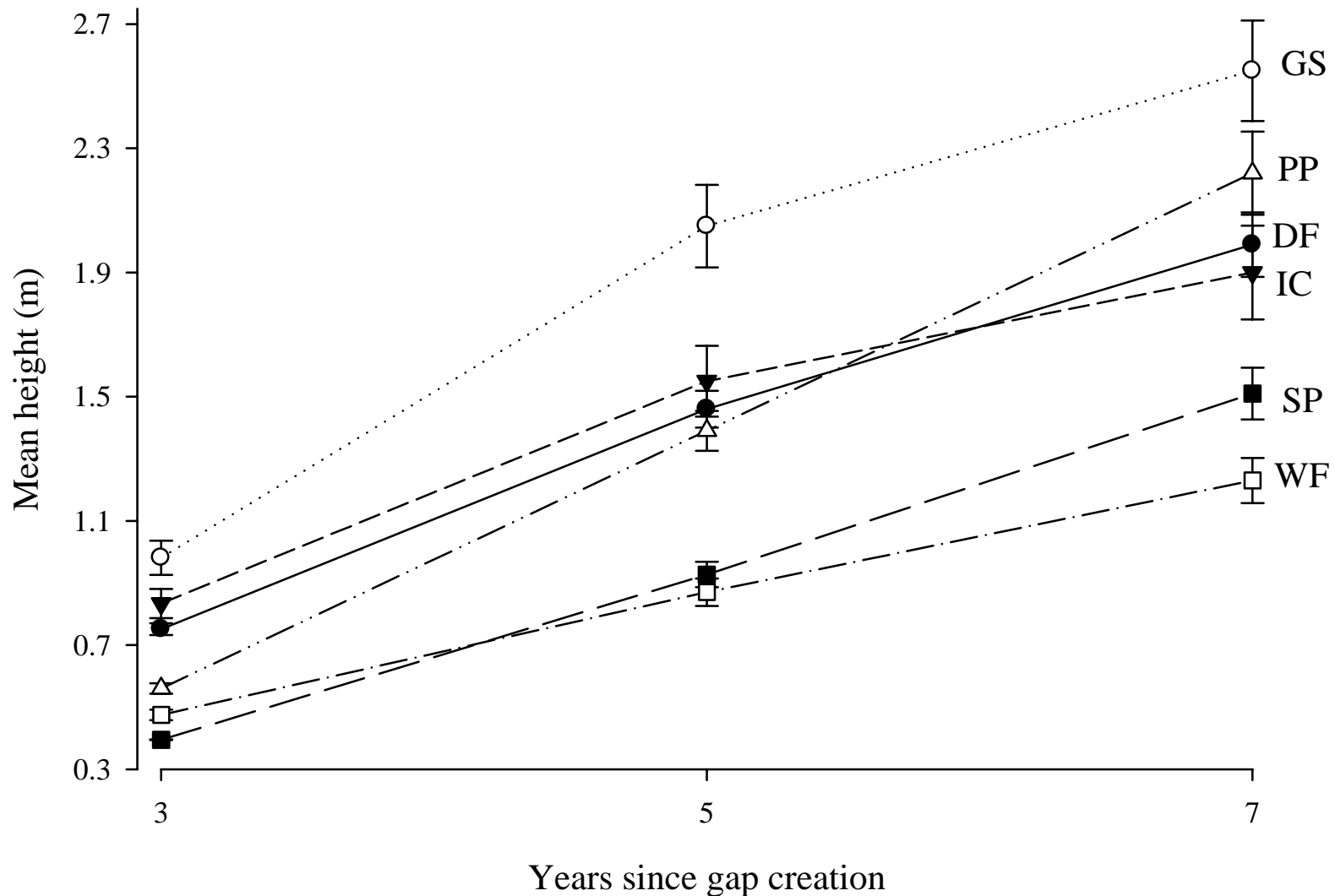
Second year survival in 12 group selection openings at Blodgett Forest Research Station, CA. Whiskers are 95% confidence intervals of the means.



Effect of vexar tubing on early growth of incense cedar within group selection openings at Blodgett Forest Research Station, CA. Whiskers are standard deviations from the means. T-test difference of the means $p < 0.001$. Vexar placement resulted in a mean growth increase of 1.01 feet, or 42% over two years.



Early growth trends in experimental gaps at Blodgett Forest Research Station, CA. Values are overall means from gaps (n=12). DF = Douglas-fir, GS = giant sequoia, IC = incense cedar, PP = ponderosa pine, SP = sugar pine, WF = white fir.





Gap size effect on IC growth

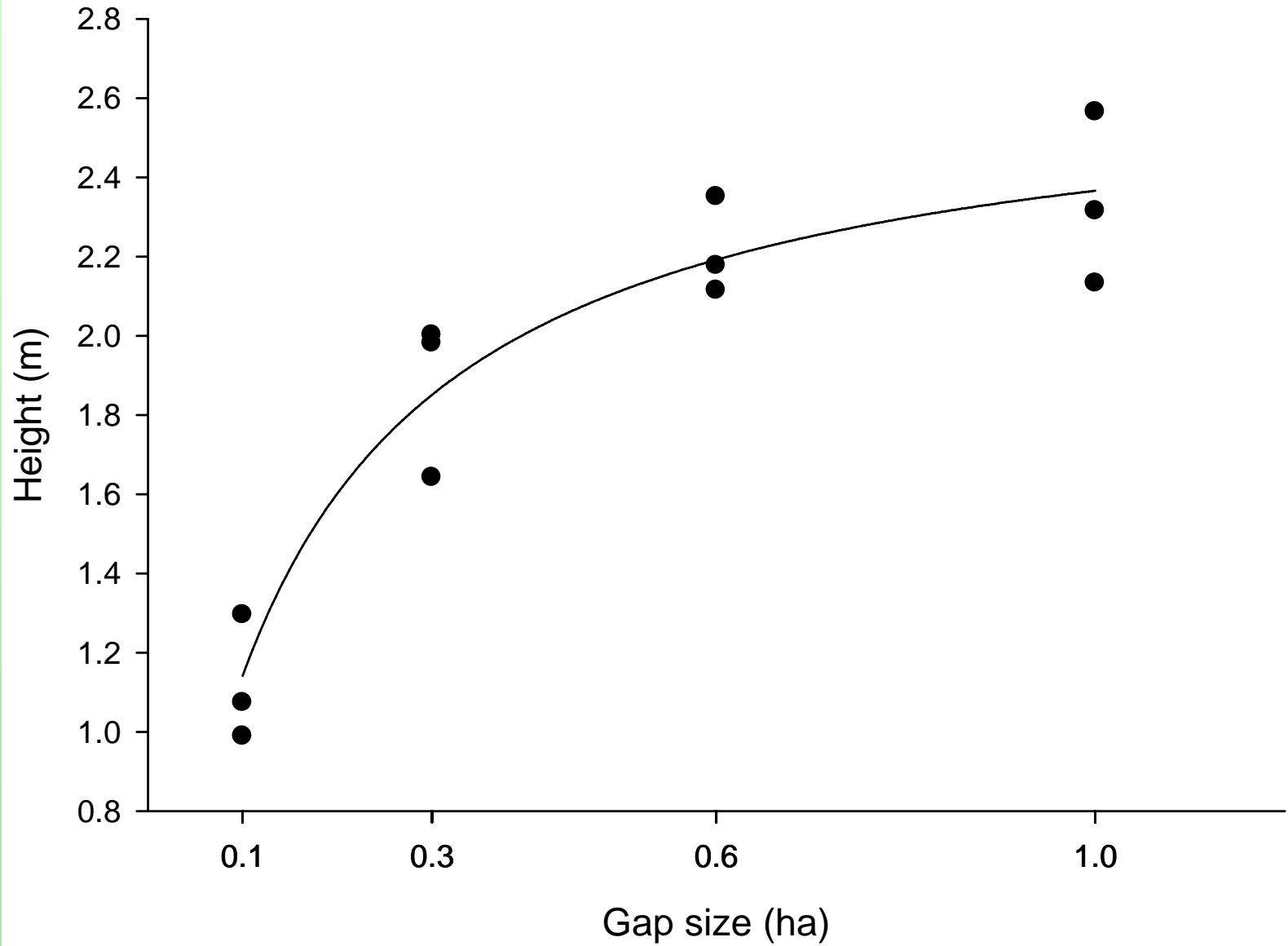
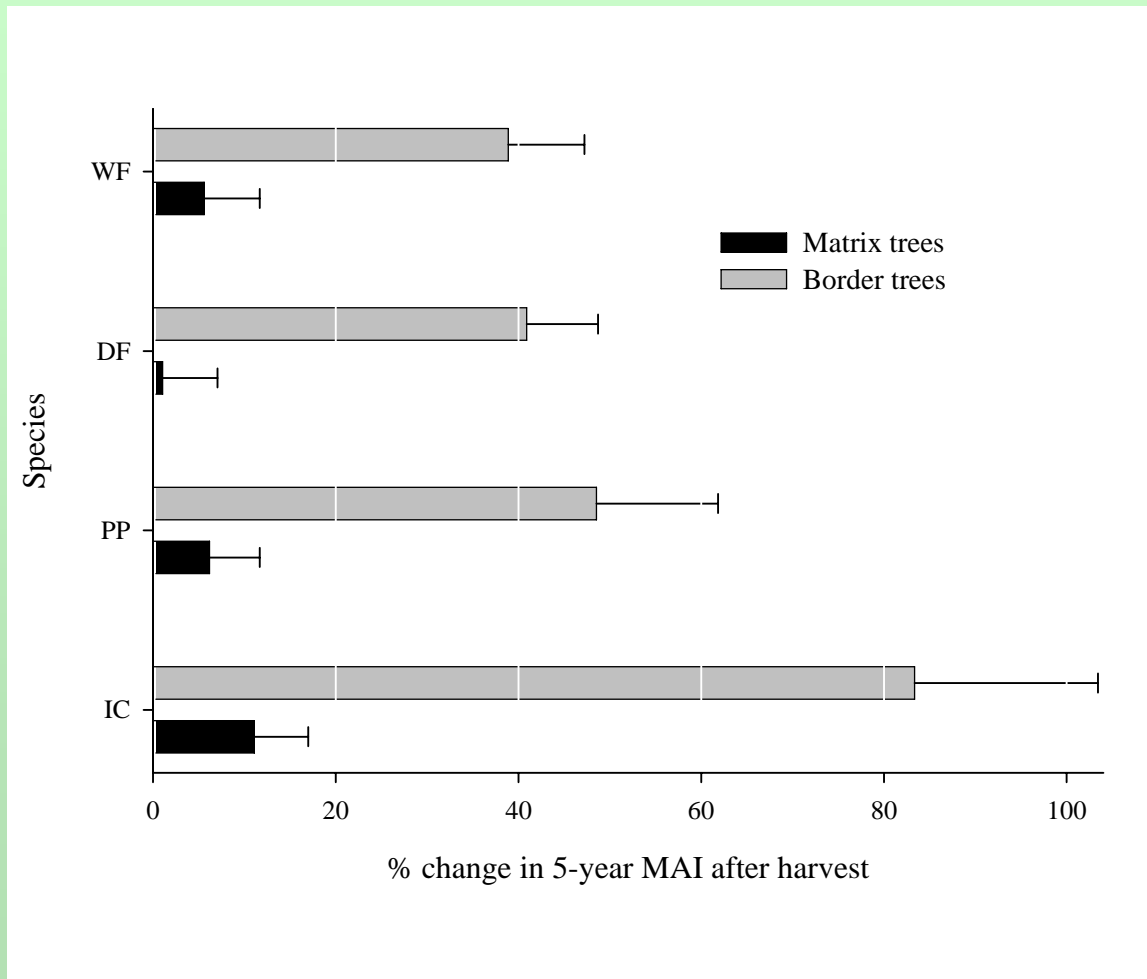
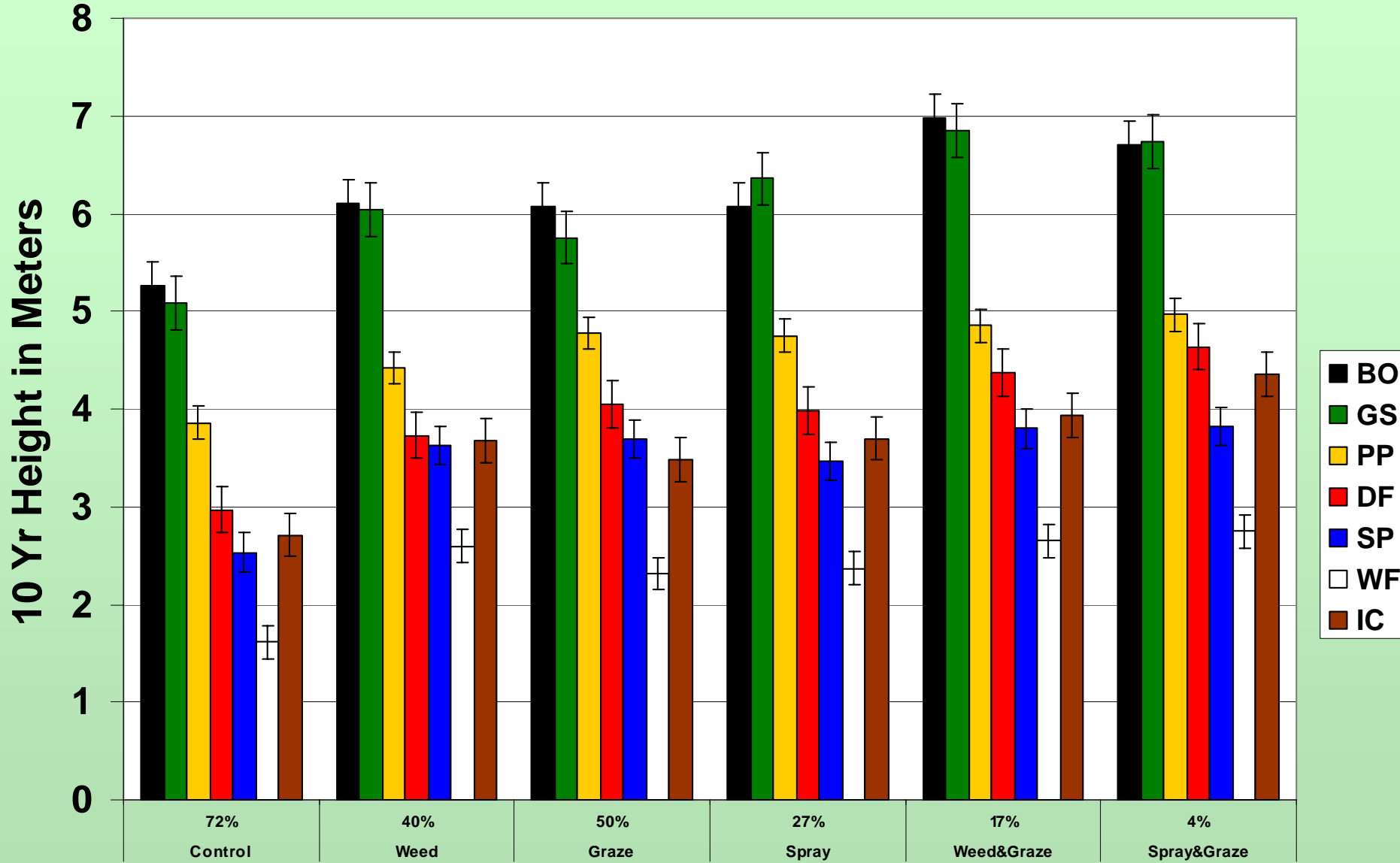


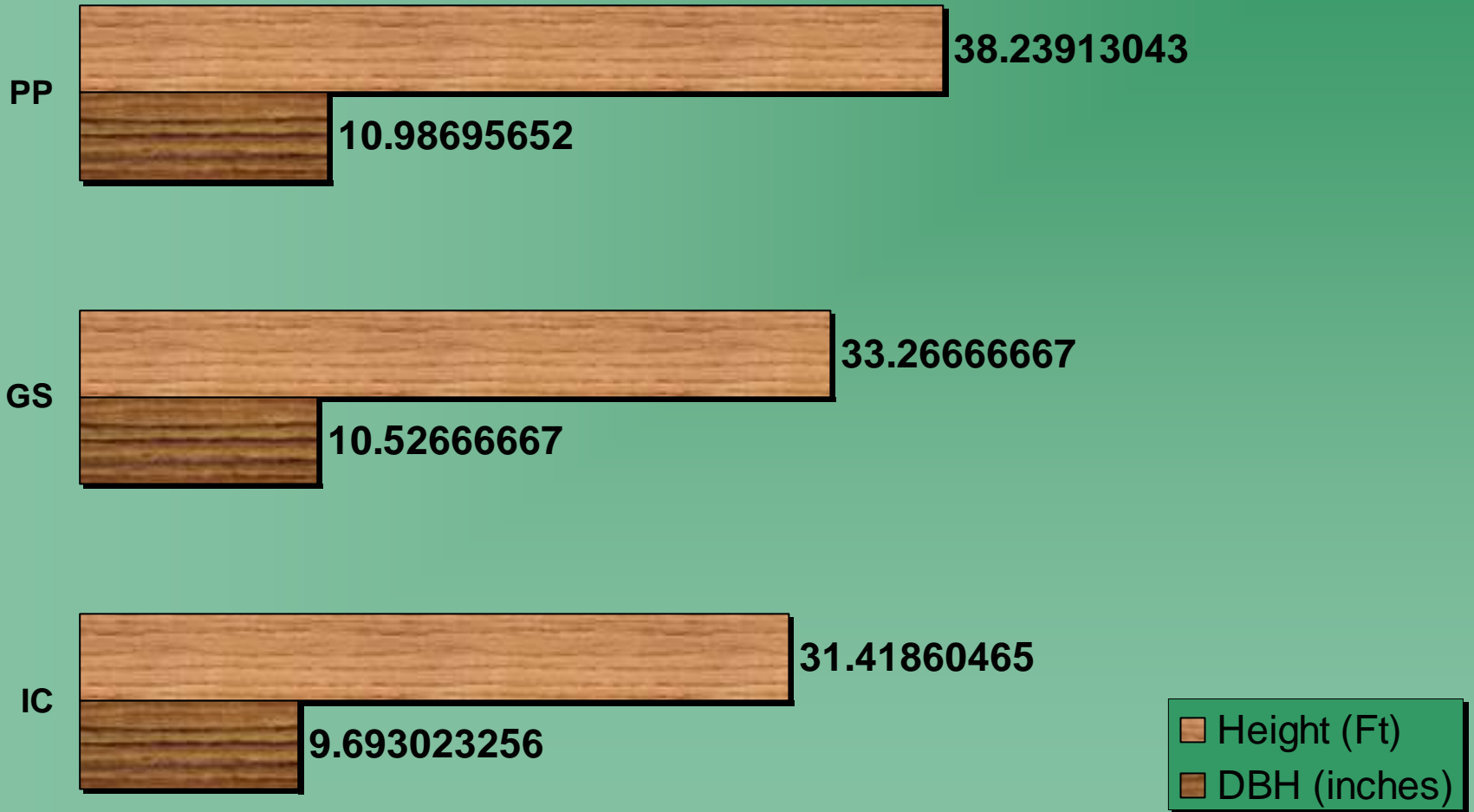
Fig. 6. Effect of gap creation on the release of mature trees growing on the edges of gaps. Over the five year period following gap creation, IC had a higher relative growth response than any other species.



Vegetation Control Effects Species Height



20 Year Old Plantation



Other observations about Incense Cedar over the past 20 years:

- Incense Cedar “Survives” in low light and dense canopy conditions, but it only grows well in relatively open, low density stands (similar densities to Pines)
- IC retains a high potential to “Release” even after decades of suppression. Cedars with greater than 50% live Crowns existing in the lower canopy of a stand have released both diameter and height within a couple years of overstory canopy removal.



Releasable



Not Releasable



ALSO:

Planting stock is very important for initial growth/survival. BFRS has had the greatest consistent success with 1-0 container stock. Bare-root stock is often too large or too small.

Initial observations from pruning studies indicate that taper may be modified through pruning.

Browsing is a major concern for early tree growth in IC (both deer and rabbit)

IC grows best at lower stand densities, similar to those desired for rapid Ponderosa Pine Growth.

Research at Blodgett has shown that suppressed ICs play host to a scale insects that is a major component of the diet of many over-wintering song birds in the Sierra Nevada

Final Thoughts:

- Incense-Cedar is an interesting and potentially valuable addition to plantation and other management systems.
- When kept vigorous, it has very few natural enemies that may cause defect or death over a “normal” commercial stand rotation.
 - However, Long term growth information in managed stands and plantations is very limited and more work needs to be done.
 - If adding Incense-Cedar to a plantation, soil active herbicide options may need to be re-examined.

