Releasing Conifers in Riparian Areas: considerations, methods, and tree responses

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Definitions

- Release: a treatment designed to free young trees from undesirable, usually overtopping, competing vegetation (SAF 1998).

Treatments include: cleaning, liberation, and weeding

Definitions

- Cleaning: a release treatment made in an age class not past the sapling stage to free the favored trees from less desirable individuals of the same age class that overtop them or are likely to do so (SAF 1998).

Definitions

- Liberation: a release treatment made in a stand not past the sapling stage to free the favored trees from competition with older, overtopping trees (SAF 1998).

Definitions

- Weeding: a release treatment in stands not past the sapling stage that eliminates or suppresses undesirable vegetation regardless of crown position (SAF 1998).

Riparian Conifer Release

- Can include any of the treatments: cleaning, liberation, or weeding
- Key term in all definitions is “sapling”
- Right now it is generally referring to conifers suppressed by hardwoods.
- Could be used in Swiss needle cast Doug-fir infected stands to release other spp.
- Need to release planted conifers from overtopping vegetation will increase

The Setting

- Stands to be treated will generally have an overstory dominated by red alder, but could have a sizable component of bigleaf maple.
- Hardwood stands regenerated after harvesting of a mature or old-growth conifer stand along a stream corridor and floodplain terraces.

The Setting, cont'd

- Conifers suppressed by the hardwoods may be older or similar in age to the hardwoods.
- The rapid growth of juvenile hardwoods out grew conifer advance regeneration and seedlings after the timber harvest occurred.

The Setting, cont'd

- Conifer species composition, density, distribution, and vigor highly variable within and between sites.
- Each site will have different challenges.

Douglas-fir

- generally intermediate in shade tolerance
- low tolerance to flooded soils
- palatable to deer and elk
- susceptible to Swiss needle cast
- reach ages of 500-1,000 yrs; size 76 m tall common for old-growth, 150-180 cm diameter (Hermann and Lavender 1990)

Sitka Spruce

- native range typically restricted to coastal fog zone and riparian areas
- high shade tolerance
- tolerates periodic flooding and water logged soils in dormant season
- generally sustains low amounts of animal damage
- 2-20m tall trees susceptible to white pine weevil attacks
- reach ages 700-800yrs; may exceed 200 m height and 300 cm diameter (Harris 1990)

Western Redcedar

- high shade tolerance
- tolerates periodic flooding and water logged soils in dormant season
- young trees very palatable to deer and elk
- in determinant growth
- can survive being suppressed for long periods of time
- reach ages 800-1,000 yrs; size 60+ m, 150-300 cm diameter (Minore 1983)

Western Hemlock

- high shade tolerance
- tolerates periodic flooding and water logged soils in dormant season
- In determinant growth
- reaches ages 400-500 yrs; size 50-61 m, >100 cm diameter (Packee 1990)
- shallow rooting

Grand Fir

- high shade tolerance
- moderate tolerance to periodic flooding and water logged soils in dormant season
- generally sustains low amounts of animal damage
- reach ages of 250-300 yrs; size 43-61 m tall, 51-102 cm diameter (Foiles et al. 1990)

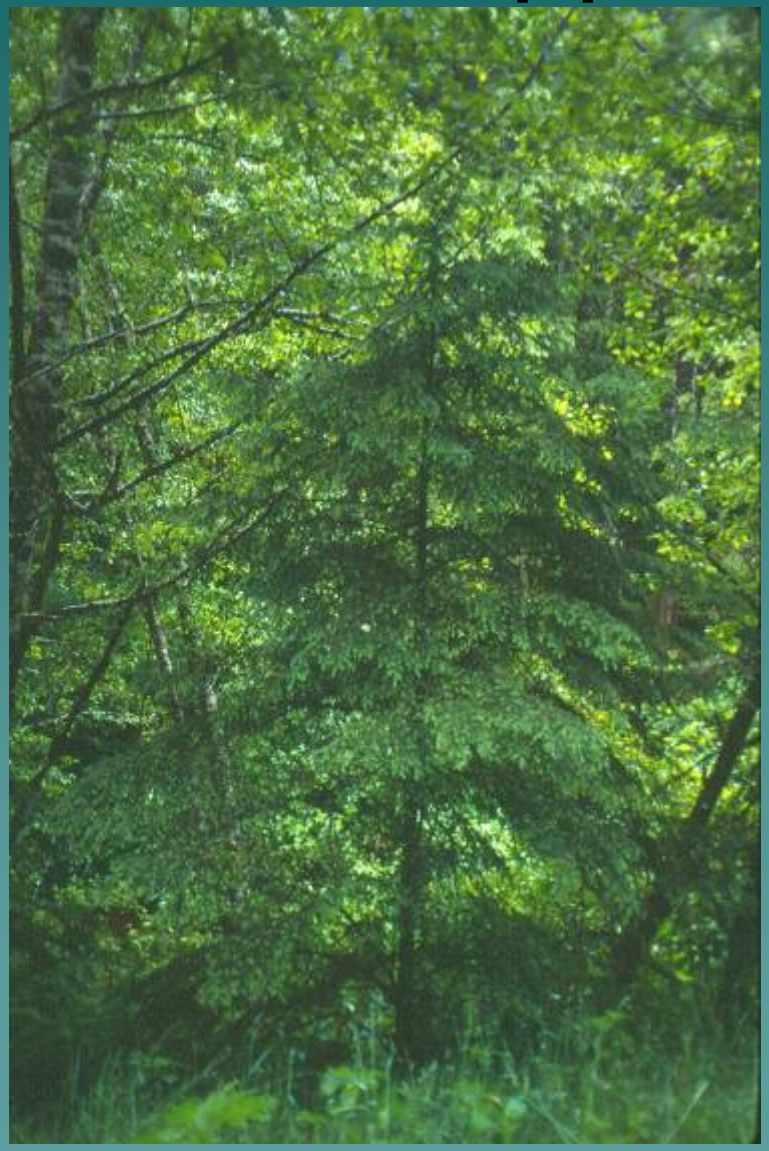
- Suppressed trees are understory trees overtopped and shaded by larger trees.
- The suppressed tree must compete for resources including light, nutrients, moisture.

What happens to a tree being suppressed?

Suppressed Trees

- rate of photosynthesis decreases
- needle morphology changes
- root growth and development is reduced
- lower root to shoot ratio
- capacity to acquire nutrients and water decreases

Suppressed Trees



- less energy put towards new growth
- stems become elongated
- height growth continues
- diameter growth rates decrease
- may not add growth rings

Candidates for Release

- Location
  - Long-term stability
  - Consider trees upslope or on small tributaries
- Tree vigor
  - Good crown and needle coverage (crown ratios >50%)
  - Low height: diameter ratio, particularly seedlings
  - No signs of disease
- Growth form
  - No "permanent" deformities, flat crowns, or severe leaning

What's been done

- Very few examples exist for riparian conifer release
- Most major conifer species in region have been successfully released in upslope areas

See handout for a summary

Adaptive COPE Riparian Conifer Release 1989-1997

- Suppressed trees chosen: Douglas-fir, western redcedar, western hemlock, and Sitka spruce
- 3 Overstory treatments – Untreated, Girdled, Felled
- Diameter of area treated ½ height of alder
- No Understory vegetation treatments
- Six sites monitored for seven years

(Maas-Hebner & Emmingham, OSU)

Methods for Release

- Directional felling of overtopping trees
- Girdling of overtopping trees
- Partial or total overstory treatment
- Treatment area variable depending on location and height of overstory

WA DNR Management Strategy

- Hardwood BA less than 50% and more than 25 "viable" conifers per acre available.
- Viable conifers have the following characteristics: DBH > 6" Live crown > 30 percent; Height to diameter ratio < 100; Free of root rot.
- Release activities also have to follow Forest Practice rules.

Felling Overtopping Trees

- May result in faster response in conifers, however, may also cause “shock”
- Fellers must be good to limit damage to conifers
- Can be done in conjunction with timber sales or other restoration work such as adding instream wood
- Will also “release” understory vegetation

Girdling Overtopping Trees

- Can be done with or without herbicides
- Timing is critical
- Incomplete girdles may not kill trees
- May take 2 to 5 years for trees to die
- May allow conifers to acclimate
- Provide short-term wildlife snags
- Dead trees may become hazardous

What happens to a tree after it’s been released?

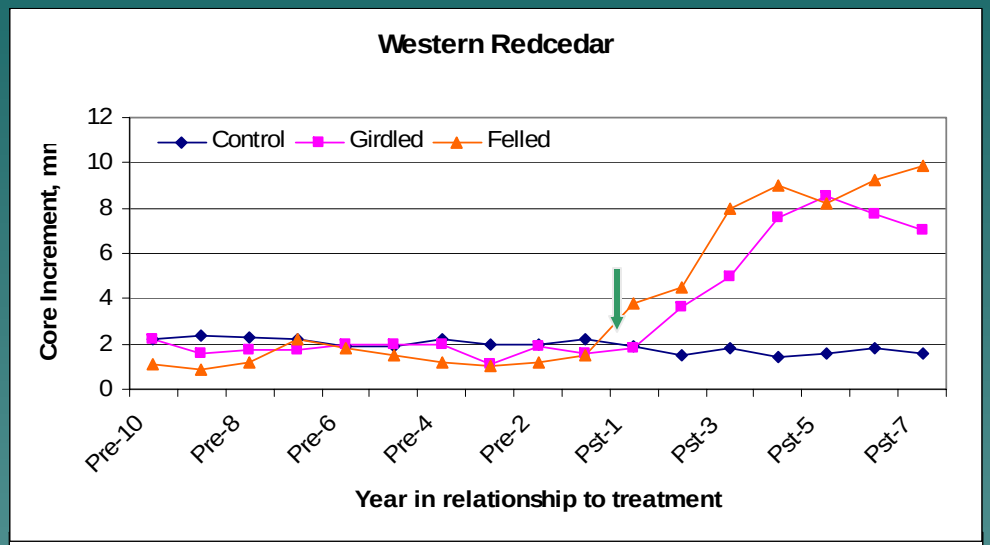
Tree Response

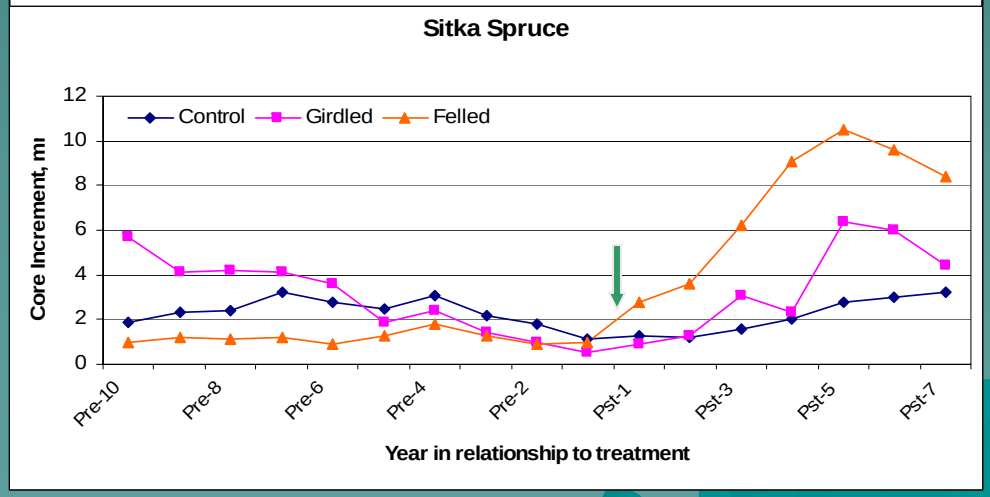
- Foliage must adapt to new microclimate and higher transportation demands
- Rate of photosynthesis increases
- Old foliage may be damaged by intense light environment and die
- Root growth increases to supply tree with more water and nutrients

Tree Response

- Cambium production increases
- Production on new phloem and xylem cells increases
- Leaf and crown area increases
- New branch length may decrease
- Stem diameter growth increases
- Height growth rates may not begin to increase for several years

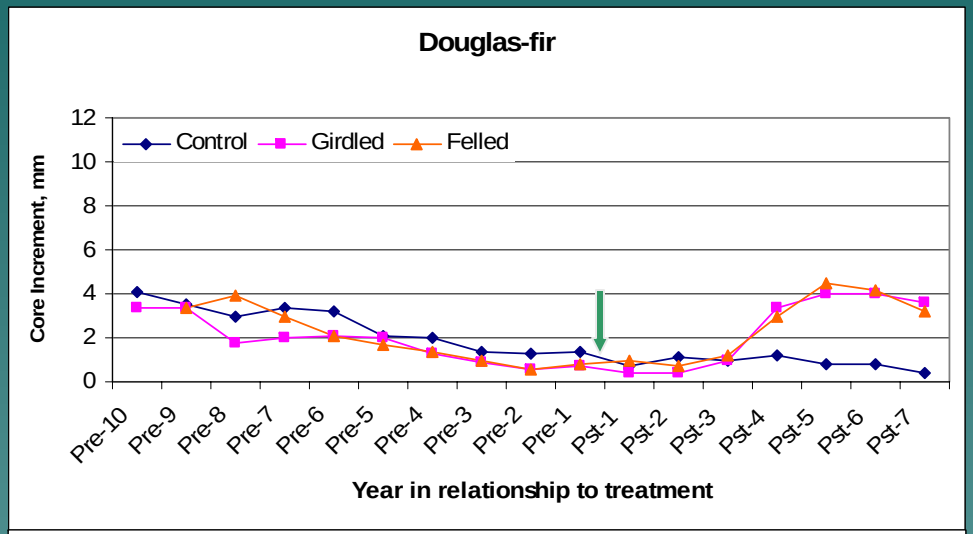
Tree Response - Diameter

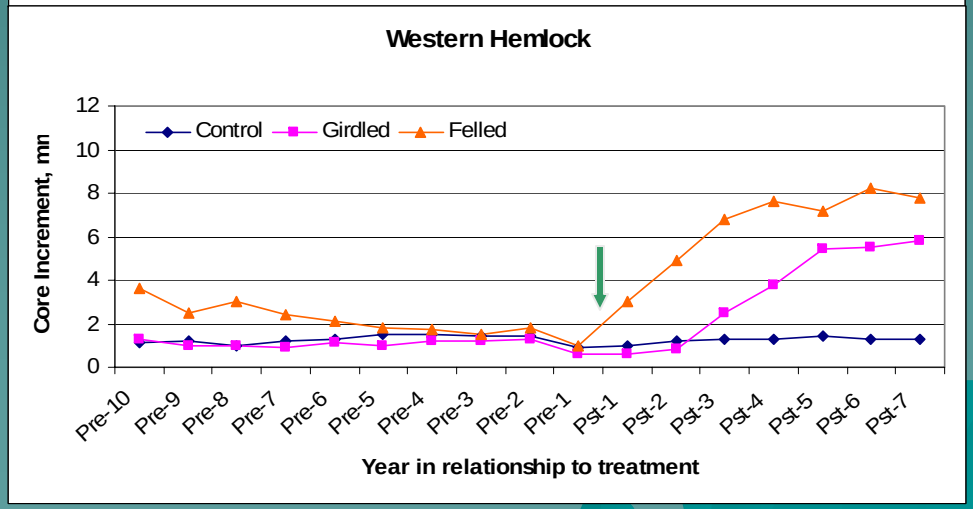




Data from Maas-Hebner & Emmingham, OSU

Tree Response - Diameter





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Other Considerations

- Conifers can be planted in the same openings made by release operations
- Openings may increase access and damage to conifers by elk and deer
- Girdled trees may fall during storms damaging conifers or endangering people
- White pine weevil attacks on Sitka spruce may increase

Monitoring

- Pre-treatment height growth may be determined for some conifer species
- Conifer survival; causes of death
- Damage to conifers from release shock, animals, or falling debris
- Increased incidence of disease and insects
- Tree growth – Diameter growth will respond before height growth

Monitoring

- Rate of death and decay among girdled trees
- Development of understory vegetation
- Changes in available light from adjacent overstory hardwoods, particularly if treatment was partial overstory removal
- Changes in growth in time of conifers- may indicate further need for release or thinning

Questions?