



# Station Note

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## Guidelines for Releasing Advance Grand Fir from Overstory Competition

Dennis E. Ferguson and David L. Adams

### INTRODUCTION

Advance regeneration of shade tolerant conifers is commonly present under merchantable timber in northern Idaho. Overstory removal releases these trees to conditions of increased sunlight, moisture, and nutrients. If advance regeneration can adjust to the new environment and grow well, it stocks the site for the next rotation. Advance regeneration can shorten the rotation and reduce the need for site preparation and/or planting. However, if it is not able to adjust or if adjustment takes too long, the advance growth is occupying space better utilized by other trees. In the grand fir-cedar-hemlock ecosystem of northern

Idaho, advance grand fir (*Abies grandis* (Dougl.) Lindl.) regeneration is particularly widespread.

This note presents in condensed form the results of a study of advance grand fir regeneration following removal of overstory competition. The variable we studied was height increment following release. Annual leader growth was measured on grand fir regeneration released by past silvicultural treatment. Regeneration was defined as trees up to 3.0 inches dbh at the time of overstory removal.

### RESULTS

Figure 1 shows the general form of the release curve. The following variables helped to explain tree response to release:

- 5-year height increment of the tree just prior to release,
- age of the tree at release,
- height of the tree at release,
- logging damage to the bole,
- time since overstory removal,
- habitat type,
- interaction of slope and aspect,
- residual basal area in the overstory,
- number of other trees on a 1/300-acre plot surrounding the sample tree.

The authors are Forester, USDA Forest Service, Intermountain Forest and Range Experiment Station, Moscow, Idaho; and Professor and Chairman of the Department of Forest Resources, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow, respectively.

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A mathematical model was developed as a means of studying and displaying the relationships involved in release. It will be incorporated into the regeneration establishment phase of the Prognosis Model for Stand Development (Stage 1973), so that a land manager can evaluate how an inventoried stand would develop if released as compared with alternative silvicultural prescriptions.

Data analysis revealed relationships which are useful in deciding whether or not to depend on advance grand fir as a significant component of a new stand. Response to release is dependent on tree characteristics, site conditions, and physiological shock.

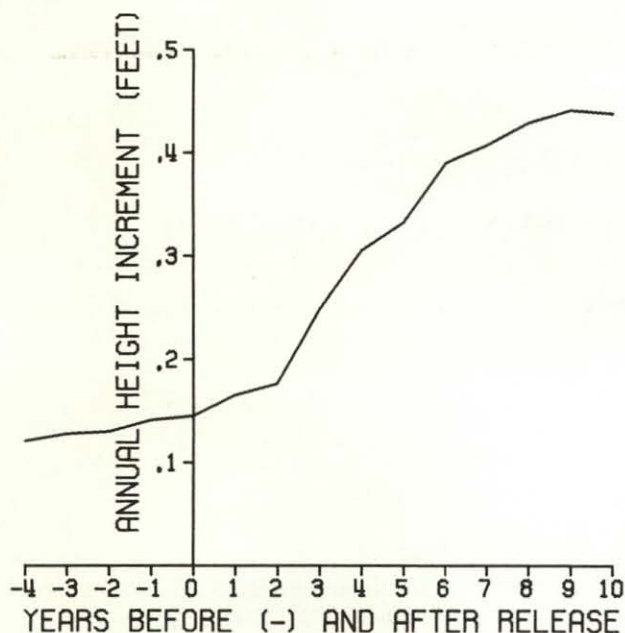


Figure 1. Average response curve for 250 grand fir trees released from overstory competition.

#### Tree Characteristics

- 1) The 5-year height increment prior to release is the best predictor of height increment after release. Trees growing slowly prior to overstory removal take longer to respond.
- 2) Younger trees respond more quickly to release than older trees.
- 3) Tall trees equally or more suppressed by the overstory do not respond as well as short trees.
- 4) Trees which received bole injuries during the logging operation are slow in responding to release.

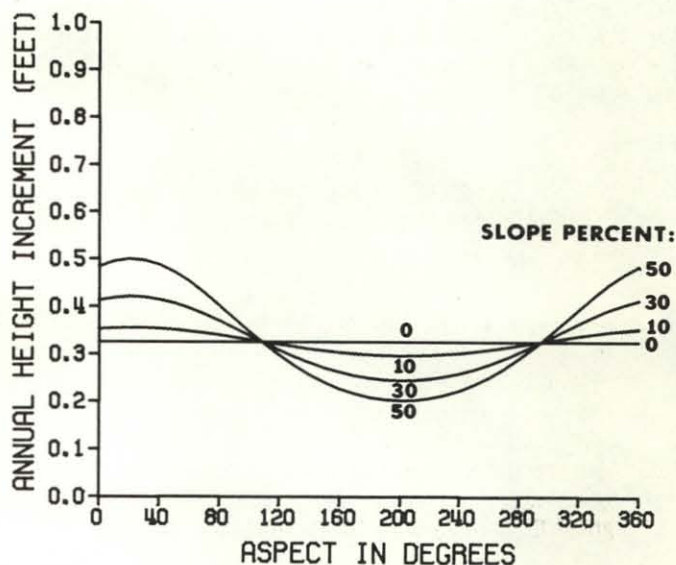


Figure 2. The interaction of slope and aspect and its effect on annual height increment 10 years after release.

#### Site Conditions

- 1) Response of released trees is significantly lower on the grand-fir/pachistima habitat type (Daubenmire and Daubenmire 1968) than on western redcedar or western hemlock/ pachistima habitat types.
- 2) Interaction of slope and aspect plays an important role in response. Progressively steeper slopes on northerly aspects help release, whereas increasing slopes on southerly aspects have the opposite effect (Figure 2). Southerly aspects are also associated with a higher probability that released trees will again become suppressed—this time by shrubs or other conifer regeneration.
- 3) Shade received from scattered residual overstory trees or other regeneration is beneficial to release, but detrimental to growth after the tree has adjusted to its new environment. Adjustment requires about 2 to 5 years.

#### Physiological Shock

Released trees have to make a tremendous adjustment when their environment is changed by overstory removal. Time is needed to develop sun needles. Shade needles may abscise prematurely due to sun scald or in an effort to conserve transpirational losses. The tree must build up crown and root volume to support normal growth.

The first opportunity to assess whether release was successful is the second growing season following overstory removal. The first year's growth is not a good indicator because the expansion of the terminal bud is more

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dependent on growing conditions in the previous year when the bud was set. Height increment the second year after release reflects the degree of physiological shock the tree has received.

### RECOMMENDATIONS FOR RELEASING GRAND FIR

1. Cedar and hemlock habitat types are good for release regardless of aspect. Grand fir habitat types are not recommended for release unless the aspect is northerly, or some residual overstory trees are left for shade, or the trees are not severely suppressed. Judge the degree of suppression by comparing the last 5 years' height growth of suppressed trees with that of grand fir trees growing freely on similar sites.
2. Severely suppressed trees or those on hot, dry sites need special consideration prior to release. A two-stage removal of the overstory is appropriate for these trees. Wait 2 to 5 years between cuttings.
3. Avoid damaging the regeneration during logging operations.
4. Release small, young trees. In general, tall, older trees will not respond as well or as quickly as short, young ones. Trees more than 30 years old should not be released. This corresponds well with results of other

studies which indicate that 40 years of suppressed growth can produce suitable entry courts for the Indian paint fungus, *Echinodontium tinctorium* (Aho 1977).

5. Following overstory removal, regeneration may be clumpy with planting needed between the clumps and along skid trails. Also, thinning may be necessary within the clumps. Wait 2 to five years after release to thin or remove large residuals. Choose leave trees according to height increment, looking especially at height increment 2 or more years following release. If possible, remove trees which have sustained logging damage.
6. Follow the progress of the stand after release. Shrub development may negate the effects of release and again suppress trees, especially on southern exposures.

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