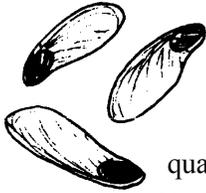


# UI Extension Forestry Information Series

## Cultural Methods to Stimulate Conifer Seed Production

*Randy Brooks*



Private forest owners rarely have access to genetically superior tree seedlings. Tree seed for reforestation of private lands is frequently collected with inadequate attention to seed tree quality, particularly if the focus is in getting cones.

Once a forest owner has identified superior trees based on phenotype (observable characteristics) these trees can be cultured in several different ways to help stimulate seed cone production. Cultural methods are typically practices that will improve tree growth or stimulate flowering and subsequent growth of flowers and fruits/cones. Cultural methods can be very effective for promoting seed cone production, but there are many external and internal factors that can affect results. Some external factors include climate and pests. Internal factors can include seed cone cycles (one good crop every few years) and genetics (how a tree will respond to cultural practices).

Forest owners can use plant growth regulators, fertilizers, root raking, pruning and/or thinning, irrigation and/or moisture stress, girdling, or some combination of the above methods to improve conifer seed production.

### Plant Growth Regulators

Plant growth regulators are hormone-like substances that have a chemical-like control over plant growth processes. Gibberellins are naturally occurring hormones that affect cell enlargement and cell division. Gibberellic acid (GA 4/7) has been used successfully to promote flowering and seed production in conifers (specifically larch). Gibberellic acid is mixed in a 95% solution of ethanol (ethyl alcohol) and then injected into the tree when lateral shoot elongation reaches about 70%, but before bud differentiation begins. Trees less than 12 inches DBH receive a 50 cc injection, while trees greater than 12 inches DBH receive a 100 cc injection of the mixture. A hole can be drilled about 1/4

inch into the tree and the mixture poured into the hole, or the mixture can be applied with a hypo-hatchet.

### Fertilizers

Mineral requirements of reproductive tissues are high. Limited nutrients can effect conifer seed cone production. Nitrogen (N) and phosphorous (P) promotes flowering in conifers. Specifically, N produces vegetative growth while P produces flower buds, fruit, and root development. Potassium (K) helps build strong healthy plants. Fertilizer application timing is critical. It must be applied before initiation of floral buds if immediate increased flowering is to result. For pines that require 2 years for cones to mature, spring application influences flowering in the subsequent year, and cones in the 2<sup>nd</sup> year. Application rates vary, but the average is about 100 pounds actual N per acre (typically ammonium nitrate), and about 250 pounds P (as P<sub>2</sub>O<sub>5</sub>) and 100 pounds per acre K (as K<sub>2</sub>O).

Fertilization can keep trees healthy while maximizing growth and vigor. However, it is recommended that a soil test be taken first to assess nutrient levels and perhaps take foliar samples as well to assess tree nutritional status. If adequate nutrient levels exist, the money spent on fertilizers may be wasted. Fertilizer applications in north Idaho can be difficult, depending on terrain and accessibility. If you are only interested in seed production, consider choosing a few phenotypically superior trees and fertilize those trees. Fertilization can have other benefits such as increased tree health, growth, and vigor. When used with a combination of crown release or irrigation, the results are often better than when fertilizers are used alone.

### Root Raking

Traumatic stress often induces heavier flowering and cone production. Increased flowering of woody plants has been stimulated by root raking (or root pruning).

CONTINUED ON PAGE 2

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This is accomplished by dragging sharp tines through the soil and cutting/severing the roots. This process can be accomplished on one or two sides of the tree, not necessarily all the way around a tree. The drawbacks are that heavy equipment is needed, and terrain may be limiting. Root raking can also kill smaller trees if damage is severe enough. Another drawback is that soil disturbance can lead to other problems such as soil erosion. The Idaho Forest Practices Act says that sediment must be kept out of streams.

### Thinning and Pruning

Vigorous, dominant trees produce more seed than intermediate or suppressed trees, and when competition is severe, suppressed trees fail to produce any seed. Residual trees left after thinning generally show increased flower and seed crops. Reasons for the increase are thought to be from more exposure to sunlight and less competition for resources such as moisture and nutrients.

Suppressed basal branches with only a few leaves/needles often consume more carbohydrates in respiration than they produce in photosynthesis for stem or fruit growth. Research has shown that within a tree crown the vigor of individual branches also influences fruit and cone development. Larger cones containing more seed tend to be produced on branches in the upper one-third of a tree.

When used in conjunction with each other, thinning and pruning select trees should be a cultural practice that is practical for any landowner looking to produce more seed.

### Girdling

Girdling involves removing, excising, or cutting a small, thin strip of bark containing the cambium and phloem from the around the stem, branch, limb, or scaffold of a tree. Doing so often stimulates reproductive growth because it impedes the translocation of carbohydrates and growth regulators in the phloem. Phloem transports materials down, while the xylem transports materials upwards. When downward transport of carbohydrates is blocked, they tend to diffuse back into the xylem and are translocated back up to, and concentrate in the leaves and tissues involved in reproduction. Girdling

trees in years when cone production is high does not increase overall numbers of cones. Girdling can increase cone production on individually treated branches. However, one must gain access to the upper third of the tree and this is often times difficult to do.

Girdling can be accomplished with a variety of tools, ranging from chainsaws, pruning saws, handsaws, or knives. Larger saws make it more difficult to control the cut, and care must be exercised in order to avoid cutting into the xylem, which would disrupt the flow of water upward, thus killing the tree. Special girdling knives are available that allow cutting between the bark and the xylem. Smaller wounds heal much faster than larger wounds.

Girdle the tree at breast height as the needles emerge. Only girdle about 60% around the tree, and on the opposite side as high as the diameter is wide. In other words, you will have two girdles on each side of the tree, one higher than the other, and barely overlapping. Do not girdle around the entire bole or the tree will be killed.

### Summary

There are a number of effects of different cultural practices to stimulate conifer reproductive growth. Some measures are more destructive than others, and may be better served on trees that are intended for harvest. A combination of practices may work better than an individual practice. Economics (cost/benefit ratio) must be examined, as well as damage to the tree.

### For more information

Applied Forest Tree Improvement, Zobel, Bruce and John Talbert. 1984. John Wiley and Sons, Inc., Publishers. 505 pages. ISBN 0-471-09682-2

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This article first appeared in Woodland NOTES, Vol. 15, No. 1.

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