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## ADVANCES IN SITE PREPARATION

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### Abstract

Site preparation activities allow land managers to achieve diverse reforestation goals by eliminating or reducing problems such as planting constraints and vegetation competition. Methods such as mechanical treatments, burning and forest herbicide application can be used singly or in combination to achieve seedling survival and growth objectives.

### Keywords

Reforestation, Herbicides, Burning, Scarification

### Introduction

The site preparation phase of the reforestation continuum provides valuable opportunities to prevent problems and achieve numerous silvicultural goals. Land managers will never have another opportunity to modify the future plantation environment unconstrained by the presence of crop trees. Site preparation activities are oriented to provide many benefits to the forest manager including:

- Planting spot creation and planting facilitation
- Fuel Management
- Animal habitat modification and control
- Vegetation control or reduction
- Soil amelioration

While discussion of discreet activities during the site preparation phase is common, the procedures that are done link the harvesting with the resulting young stand and influence many downstream results. Some critical links that are influenced during site preparation include:

- The type and amount of herbicide release treatments

- Uniformity of seedling spacing
- Time to first thinning and type
- Animal movement and habitat
- Seedling growth and development

Current site preparation tools include mechanical methods, burning and herbicides. While these treatments have been used extensively in the past, new strategies for reforestation such as fall planting and alternate species have altered the timing and way they are used.

### Mechanical Treatments

Mechanical methods include cat piling or scarification, excavator piling, and subsoiling. Of these treatments, excavator work offers the most flexibility on steeper ground and season of use as well as organic matter and vegetation manipulation. Cat scarification often results in cleaner sites, but on more limited ground. While planting may be easier on these sites with many woody plants eliminated, more planting spots may not necessarily be created (Kelpsas, 1978). Subsoiling can reduce soil compaction but does little for slash or vegetation. Traditional timing in late summer for these methods may need to be adjusted to accommodate fall planting that is being done in September and October.

All mechanical methods stimulate weed seed germination and set plant communities along a different successional path than treatments that do not disturb soil. Species such as thistles (*Cirsium*) may be more difficult to control and may require additional spring

herbicide treatments after planting to minimize plant competition. Landowners can avoid these plant communities by using the minimal amount of soil disturbance necessary to achieve objectives.

These methods combined with herbicides can result in high-performing plantations. Fall applications of Oust along with Accord and/or Escort immediately after machine work can result in weed-free sites the next year. Additional spring treatments of Velpar, Transline, 2,4-D or atrazine may be necessary for complete weed control. In addition, little is known about seedling/stock type root development in recently subsoiled or scarified soil and subsequent herbicide or fertilizer applications.

### Burning

The use of fire has historically been an important site preparation tool in the Pacific Northwest. Slash and woody plant reduction and the resulting planting efficiency have contributed to its popularity. Stein (1995) found site preparation treatments using burning gave the best seedling growth performance in the Oregon Coast Range. Burning constraints, mainly in the form of smoke management and reduced burn days have had a tendency to focus site preparation efforts on mechanical and chemical methods.

When burning is allowed, pre-burn herbicide applications have been very useful to facilitate the treatment. Several methods are commonly used depending on whether the burn is in the spring or fall. Spring burns can ben-

efit from a summer herbicide treatment that targets woody plants and herbaceous plants in the preceding year. These treatments have been centered on products like Accord, Arsenal, Chopper or Escort. At times Oust herbicide has been added to eliminate the development of green herbaceous fuels in the spring. Fuel conditions inside the unit in the spring can be much lower than outside allowing managers to burn in a safer and more complete manner. In addition, these herbicide treatments would be sufficient to provide good brush and weed control in case a burn cannot be completed and the unit is planted as is.

Spring burns preceded by a spring herbicide treatment can be burned more efficiently because of dead herbaceous material in the unit. Usually this is some type of glyphosate application that targets green grasses and weeds and browns some brush. Fall burns can also benefit from a spring to mid-summer application of the same herbicides to brown and control plants before burning.

Fall planting may require earlier burns and perhaps an adjustment of herbicide timings. How early we can push herbicide applications and still get adequate sprout control is somewhat uncertain, but early full leaf-out in late May is probably a threshold for herbicide uptake and translocation with products containing glyphosate and imazapyr.

### Herbicides

Chemical site preparation is becoming increasingly common as burning is re-

duced. While chemical site preparation does little for slash reduction, costs are lower than for burning and mechanical work. In addition, plants that are encouraged by soil disturbance or fire such as groundsel (*Senecio sylvaticus*), deerbrush (*Ceanothus integerrimus*), snowbrush (*Ceanothus velutinus*) or thistles are generally discouraged by straight chemical site preparation. Increased planting of conifer species other than Douglas-fir (*Pseudotsuga menziesii*) has raised the importance of reducing plant competition before planting since many conifers are less tolerant to herbicide release treatments containing products like Accord, Garlon, Velpar, and 2,4-D.

Common herbicide treatments include summer and fall applications of Accord, Arsenal, Chopper, Oust and/or Garlon followed by spring planting. These combinations have resulted in much reduced plant competition and excellent seedling environments in the first growing season. Table 1 gives common forest herbicides and target vegetation.

Fall planting has required adoption of other strategies to provide optimum seedling growth. Spring applications of Accord, Escort, Oust or atrazine can control vegetation and store soil moisture for seedlings planted in the late summer or fall. Unlike spring planting technology, data gaps exist for alternate species tolerance to soil active herbicides and how soon we can plant after herbicide treatment. Table 2 provides major site preparation prescriptions. Since herbicide labels change frequently users should follow the label in hand before using any product.

Table 1. Forest herbicides and target vegetation

Herbicide	Target Vegetation
Accord, Glypro, Roundup Arsenal	Deciduous brush, grasses, forbs, bracken fern Maples, deciduous brush/trees, hardwood injection, forbs
Atrazine, Conifer 90 Chopper	Grasses and some forbs, suppression of germinants Maples, madrone, tanoak, deciduous brush and trees
2,4-D	Alder, madrone, manzanita, thistles and forbs
Escort	Blackberries/Rubus species, ferns, deciduous brush
Garlon	Blackberries, Scotch broom, evergreen brush, forbs
Oust	Grasses/forbs, suppression of Rubus sp. and germinants
Transline	Thistles and forbs, elderberry
Velpar	Grasses/forbs, snowbrush or manzanita on dry sites

Table 2. Common site preparation prescriptions

Herbicides and rate per acre of product	Application season
Accord 2-4 qts	spring or summer
Accord 2-4 qts + Oust 3 oz	spring or summer
Accord 2-4 qts + Arsenal 2-8 oz + Oust 3 oz	summer
Accord 2-4 qts + Escort .5-2 oz	spring or summer
Accord 2-4 qts + Arsenal 2-8 oz + Escort .5-1 oz	summer
Chopper 32-48 oz	summer
Chopper 32 oz + Accord 1-2 qts	summer
Chopper 32 oz + Escort .5-1 oz	summer
Garlon 1.5-3 qts	spring or summer
Garlon 1.5-3 qts + Oust 3 oz	spring or summer
Oust 3 oz (can be added to any mix)	spring or summer

### Timing and Coordination

The timing of nearly all site preparation activities is dictated by logging and its completion date. Application of herbicides and burning as well as fall planting are especially impacted by time of logging completion. Currently land managers work around these constraints by carrying units over for a year or planting them without the benefit of a full site preparation strategy. As the site preparation-planting continuum becomes more complex, greater coordination with the harvesting phase will be necessary.

### Literature Cited

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