

Mechanical Site Preparation

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REMEMBER:

Guidelines help with *how* to manage,
not *whether* to manage.

These guidelines focus on *how* to protect the functions and values of forest resources during forest management activities. They do not provide advice on *whether* to manage or which management activities are needed.

Guidelines provide a *menu*, not a *mandate*.

Site-level resource management decisions are based on many different factors, including resource needs, landowner objectives, site capabilities, existing regulations, economics and the best information available at any given time. No one will apply all of the guidelines related to a particular activity. Instead, the landowner, resource manager or logger will consider many different factors in determining which combination of guidelines provides the best “fit” for a particular site at a particular time. The intent of having multiple guidelines is to provide decision-makers with as much flexibility—and as much choice—as possible in taking steps to effectively balance forest management needs and resource sustainability.

General guidelines and *activity-specific* guidelines
are closely related.

Frequent references from activity-specific guidelines back to the general guidelines will make it easy for landowners, resource managers, loggers and others to consider all of the related guidelines—both general and specific—that apply to a particular management activity.

Guidelines are supplemented from time to time
by “Additional Considerations.”

The guidelines are supplemented from time to time by “Additional Considerations,” which provide additional guidance to further promote the sustainability of forest resources.

INTRODUCTION

Site preparation on forest lands is the practice of altering site conditions to favor the establishment, survival and growth of a desired tree species, browse or other vegetation. Site preparation can be accomplished through mechanical means, prescribed fire, the use of herbicides, or any combination of these approaches.

Mechanical site preparation accomplishes two goals:

- It facilitates planting, direct seeding and natural regeneration.
- It provides partial initial control of vegetation competing with crop trees for light, water and nutrients.

Common mechanical site preparation techniques include patch scarification, row scarification, raking, disking, bedding, roller chopping and shearing. Herbicides are often applied in conjunction with mechanical site preparation, to increase control of competing vegetation.

The guidelines in this section focus on mechanical site preparation. For chemical use, either in conjunction with or in place of mechanical site preparation methods, refer to the guidelines in *Pesticide Use* for additional information related to non-mechanical site preparation methods. For prescribed burning, refer to the guidelines in *Fire Management*.

The Benefits of Guidelines

Benefits to cultural resources: Mechanical site preparation guidelines can minimize disturbance of cultural resources that may not have been affected by harvest activities, particularly if harvest was conducted during the winter. Guidelines address soil disturbance and erosion concerns in particular.

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Benefits to forest soils: Mechanical site preparation guidelines can minimize excessive exposure of mineral soil, compaction or rutting of soil, removal of surface soil, increased erosion, and impacts on the nutrient balance of the site. By maintaining good soil conditions, guidelines can help assure that the goals of site preparation are accomplished (favoring the establishment, survival and growth of a desired tree species).

Benefits to riparian areas: Mechanical site preparation guidelines can minimize alterations of vegetation within the riparian area. That vegetation is important for providing inputs of coarse woody debris and fine litter to water bodies; retaining nutrients, sediment and energy; bank and shoreline stabilization; maintenance of moderate water temperatures through shading; and wildlife habitat. Guidelines for retaining vegetation can also have a positive impact on aesthetics, wood products and recreation.

Benefits to visual quality: Mechanical site preparation guidelines can reduce both the visual impacts of site preparation activities and also the duration of time that the effects of these activities are visible.

Benefits to water quality and wetlands: Mechanical site preparation guidelines can protect water quality and wetlands. Guidelines can minimize potential erosion, runoff and resulting sedimentation that may occur as a result of site preparation practices that expose or compact mineral soil on erodible slopes or in areas where the prepared site is located adjacent to open water or wetlands. Guidelines that address equipment operations and maintenance can help protect water quality.

Benefits to wildlife habitat: Mechanical site preparation guidelines can help to maintain ground cover, shrubs, woody debris, snags, naturally regenerating tree seedlings and other live trees important to wildlife on a site.

Considerations

- ❑ Maintaining good soil condition is critical to accomplishing the goals of site preparation (to favor the establishment, survival and growth of a desired tree species). Practices that result in excessive exposure of mineral soil, compaction or rutting of soil, or removal of surface soil should be avoided. If soils are negatively impacted in the process of site preparation, then the “advantage” of the site preparation is reduced either through poor establishment, poor survival or, more often, lowered growth and productivity.
- ❑ Properly planned harvest operations should include consideration of mechanical site preparation needs. Site preparation methods that minimize the potential for surface erosion should be evaluated prior to implementation of site preparation operations.
- ❑ Selecting the appropriate technique, intensity and timing of a site preparation activity is important in maintaining the soil productivity of a site. Heavy equipment should be operated on a site when adverse soil impacts are unlikely.
- ❑ Mechanical site preparation techniques and intensity for a given site should be determined by soil/site conditions, crop tree species and site preparation objectives. Specific site conditions (including soil characteristics, topography, vegetation, access and distance to surface water) dictate what techniques may work best or provide the best operating window for any given site. Some sites may be planted with no site preparation other than removing the overstory.
- ❑ Practices that result in exposure of mineral soil or soil compaction on erodible slopes should not be used where surface erosion or runoff is likely to result in sedimentation of water or wetlands. For sources of information and planning assistance, see *Resource Directory*.
- ❑ Activities that disturb soil, such as disking, scarification, rock raking and shearing, may not be appropriate within cultural resource areas.
- ❑ Contour preparation methods can minimize erosion, as well as the cost of remedial action or repair.

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- ❑ Site preparation methods vary considerably, depending on the desired regeneration species.
- ❑ Every site preparation method has a different cost. For any method being considered, costs (both short-term and long-term) should be balanced against effectiveness of the method in attaining visual quality objectives.
- ❑ Composition and condition of the original stand can impact the regeneration method chosen for a particular site.

Design Outcomes To Maintain Soil Productivity

Site preparation activities should be designed and implemented to achieve the following beneficial outcomes regarding soil productivity:

- Soil in a condition that favors the establishment, survival and long-term growth of the desired tree species
- Displacement of only enough soil as needed to effectively accomplish tree establishment
- Site preparation techniques employed so that surface soils 1) remain intact; 2) are only displaced a short distance (such as in scalping); or 3) are incorporated (such as in disking)
- Slash dispersed on the site, rather than piled or windrowed, where appropriate
- Site preparation practices employed so that they avoid funneling water (such as furrowing, scarification and scalping on the contour)



Have you identified
your goals and objectives?

See *Identifying Goals and Objectives*
in General Guidelines.

Have you conducted a site inventory?

See *Conducting a Site Inventory*
in General Guidelines.

PLANNING

IMPORTANT! Review General Guidelines:

- Incorporating Sustainability into Forest Management Plans
- Maintaining Filter Strips
- Managing Riparian Areas

Planning and Design Considerations

UConsider alternative methods of site preparation, such as non-mechanical, or combinations of mechanical and non-mechanical methods, to accomplish site preparation goals while minimizing disturbance. Examples include:

- Utilizing harvest operations to accomplish preparation goals. For example, full-tree skidding can be used for preparation of black spruce or jack pine seed and can

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eliminate the need for additional re-entries, trafficking or site disturbance, especially on steep slopes.

- Chemical treatments, prescribed burning and hand scarification should be given serious consideration as alternatives to mechanical site preparation, especially on steep slopes, highly erodible soils, or soils sensitive to additional trafficking.

U Design mechanical treatments of regenerating stands to protect reserve areas and structural habitat components retained in previous stand treatments.

U Favor practices that do not remove surface soils or only remove surface soils from the small areas in which an individual seedling will be planted.

U Favor practices that allow for dispersed slash or slash in small piles on the site, rather than piling or windrowing, where slash does not conflict with management objectives or reforestation.

U Select appropriate species and stocking levels for reforestation, and plan site preparation intensity accordingly.

U Plan for a diversity of tree species where possible.

U Design practices to avoid direct runoff of sediment into water and wetlands.

Timing and Intensity of Activities

U Enter a site the fewest number of times necessary, and avoid multiple passes of equipment over the same spot.

U Time site preparation activities and use proper equipment to minimize rutting and compaction of soils.

U Avoid shearing and raking operations on organic soils except under frozen conditions.

Reducing Visual Impacts of Mechanical Site Preparation

*In areas classified as most sensitive: **

- U** Use low-impact site preparation methods, such as patch or row scarification.
- U** Use spot or strip treatment of herbicides, rather than broadcast treatment applications.
- U** Initiate revegetation efforts as soon as possible.

*In areas classified as most sensitive or moderately sensitive: **

- U** Use land contours in site preparations.
- U** Avoid the effect of linear straight rows and resulting visual penetration immediately alongside travel routes or recreation areas.
- U** Avoid or screen windrows and slash piles.

*In areas classified as moderately sensitive: **

- U** Initiate revegetation efforts as soon as appropriate.

*In areas classified as less sensitive: **

- U** Follow standards and guidelines that best achieve integrated resource management objectives for the area.

*See Part 2, *Visual Quality: Visual Sensitivity Classifications* for information related to how classifications are determined and which Minnesota counties have developed visual sensitivity classification maps.

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Favor practices that allow for dispersed slash or slash in small piles on the site, rather than piling or windrowing. *Photo courtesy of Chippewa National Forest*

Selecting Application Methods

U To increase success of oak regeneration, use such pre- and post-harvest techniques as burning, stump sprout thinning or scarification.

U Consider targeted mechanical site preparation methods (low intensity, spot or band) in preference to broadcast applications. Regenerating oak, an important mast species, may warrant more liberal application.

U Use patch or row scarification as the preferred mechanical site preparation method for artificial regeneration when terrain or soil type necessitates minimal soil disturbance.

U If moving slash on-site is desirable, use equipment that minimizes soil disturbance.

OPERATIONAL ACTIVITIES

IMPORTANT! Review General Guidelines:

- Protecting Cultural Resources
- Managing Equipment, Fuel and Lubricants
- Protecting the Normal Flow of Streams and Wetlands
- Protecting Wetland Inclusions and Seasonal Ponds
- Retaining Leave Trees
- Providing Coarse Woody Debris

U Conduct on-site meetings with the contractor, landowner and resource manager prior to moving equipment onto a site. Such meetings can help assure common understanding of landowner objectives, contract specifications and site conditions.

Managing Slash and Windrows

U Where shearing or windrowing slash is necessary, avoid scraping soil material or forest floor into windrows or piles. Preferred practices include:

- Shearing and raking under frozen conditions
- Light raking, which only removes slash

U Avoid placing residues into wetland areas from operations on upland sites. Deposit residues in stable upland locations.

U Locate windrows and slash disposal piles so as to:

- Avoid cultural resources
- Minimize interference with natural drainage patterns

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- Be outside of filter strips, riparian management zones and leave tree strips. Refer to *General Guidelines: Maintaining Filter Strips* and *General Guidelines: Managing Riparian Areas*.
- Follow contours when possible to mitigate the effects of overland flow.

Protecting Resources

U Scarify or trench only the area necessary for seedling establishment and growth.

U Operate equipment following contours of the land where appropriate, as long as operator safety is maintained.

U Protect existing conifer regeneration less than 4 inches DBH in formerly mixed deciduous coniferous stands during site preparation. Clumps of conifer are preferable to scattered trees.

U Avoid operations during periods of saturated soil conditions when such operations may cause rutting, compaction or accelerated erosion.

Additional Considerations

K Consider scarifying the soil in the vicinity of conifer seed trees to enhance regeneration of these species.

K Consider maintaining the diversity of mast sources on the site, as well as some level of current production of mast sources. For example, maintain landings as openings or avoid machinery operation in pockets of fruit-producing shrubs.

POST-OPERATIONAL ACTIVITIES

IMPORTANT! Review General Guidelines:

- Post-Operational Activities and Followup Visits

U Regenerate site as soon as possible after site preparation.

U Evaluate success of site preparation methods relative to site conditions and silvicultural prescriptions.

U Monitor and manage the site to ensure success of establishment, so that the operation will not have to be repeated.

