MANAGING COMPETING AND UNWANTED VEGETATION

METHODS INFORMATION PROFILE

Mechanical

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There are five primary methods for treating and managing competing and unwanted vegetation: manual, mechanical, prescribed fire, biological, and chemical. These profiles are intended to aid Forest Service project managers, workers, and the public in planning and performing vegetation management projects. Mechanical methods are discussed here.

Crawler tractors or low ground pressure tractors equipped with blades or mowing attachments are most commonly used for mechanical treatments.

Implementation

Mechanical site preparation uses tractors or other machinery with various types of blades to remove plants, their roots, and, sometimes, part of the top layer of soil.

Tractors with attached discs or chains are also used to remove unwanted vegetation for reforestation or revegetation. Machines can either partially or totally clear a site. Preparing spots for planting is called scalping, plowing a strip is called furrowing or contouring, and complete removal of vegetation is called scarification.

Tractors are also used to pile ummerchantable material which may produce a fire hazard or create difficult conditions for reforestation. When worldng away from mad surfaces, activities are timed to avoid high soil moisture content to prevent undue compaction.

Graders, tractors, and other machines use attached brush cutters for roadside brush control and generally travel on the road surface.

Cable systems can be used to yard unmerchantable material from timber harvest areas when it poses a fire hazard or impedes tree planting.

Slashbusters are used to mow down slash or unwanted vegetation. Successful uses in the Pacific Northwest for managing competing and unwanted vegetation includes mowing down unwanted trees before planting with disease resistant species.

Advantages

The cost of mechanical methods may be less than more labor intensive manual treatments and high efficiencies are possible. In many cases, the entire plant, including roots, is removed. Where rainfall is low or seasonal, mechanical methods have a wide treatment window.

Disadvantages

Intense disturbance of soil and ground cover is a major disadvantage, particularly during site preparation. In areas of high or year-roundrainfall, the window for treatment without inflicting lasting soil damage may be narrow or non-existent.

Mechanical treatment is relatively non-selective; although tractors can be maneuvered or the blade may be lifted to avoid specific areas, all plants within the path of the blade are likely to be affected.

Machines with tracks or wheels can only be used on relatively flat terrain. Although cable systems are commonly used for removal of logging debris on steeper slopes, their use for treating competing vegetation is rare at this time.

Effects on the Environment

Soil and Water

Tractor piling of slash or scarification for site preparation can cause soil compaction, puddling of water, and surface erosion. Disturbing the duff layer and removing organic material can lead to a reduction in site productivity.

Yarding of unmerchantable material involves removing residue which, if left undisturbed, would be available to decompose and supply organic matter and nutrients to the soil. This can affect nutrient cycling and long-term productivity.

Increased surface water runoff and sedimentation may result from mechanical treatment depending on type of soil. operating practices, slope steepness, and distance to the stream channel.

Vegetation

Mechanical methods can significantly affect site vegetation. Direct effects are generally limited to the time when activities take place. They may persist, however, if soils are compacted or if undesirable plants become established on disturbed ground.

Numerous trees andplants adapted for germination on exposed mineral soils may become established after mechanical treatment. This includes important conifer trees such as Ponderosa pine, lodgepole pine, and Douglas-fir. But noxious weeds and undesired brush or tree species, such as western juniper and read alder, are also welladapted to disturbed sites. Increases in these species may adversely affect timber or forage production and result in a need for further treatment.

Productivity may be increased after site preparation if desired species can be quickly reestablished on the disturbed site prior to the emergence of undesired plants.

Reports from Williams, Or. found that vegetation management along roadsides using manual, brushing, apropane flame cart, a steaming unit and a boiling water sprayer were effective to varying degrees, but none were economically practical. However, WM 50, manufactured in the Netherlands by Hoaf Apparatenfabriek, using in a radiant energy appears successful. Trials with WM 50 and tractor adaptations continue, (Siegel, 1993).

Wildlife and Livestock

Direct effects on soil-dwelling animals such as ground squirrels, pocket gophers and salamanders may be great with mechanical treatments. Groundnesting birds may also be affected in the spring.

Downed trees and slash provide important habitat for small mammals, birds, reptiles, amphibians, insects, and other invertebrates. Removal of this material can reduce populations of these species. It can also indirectly affect predator or prey populations by reducing their food sources.

For large grazing animals — deer, elk, and livestock — logging slash or natural accumulations of woody debris can impair access, reducing their use of an area. Removal or strategic placement of some of this material can improve access, allowing the animals to make better use of the forage. Partial or selective removal of debris can favor grazing by, some animals more than others.

Mechanical treatments may provide opportunities to improve habitat for grazing animals by providing a good seed bed for establishing high-quality mixes of grasses, legumes, and forbs.

Scenery and Cultural Resources

Mowing larger vegetation along roadside rightsof-way can sometimes leave a ragged, ungroomed appearance. Conversely, chopping or chipping of large debris is used to improve the appearance of vegetation treatments along roadsides.

Of the five approved methods of controlling unwanted vegetation, the use of off-road mechanical equipment poses the highest potential for damage to cultural resources.

Human Health Effects

The risk of any effect on human health from vegetation treatment is based on two factors. First, what are the hazardous characteristics of the tool that could cause illness or injury? Second, when and how would people be exposed to these hazardous characteristics?

The FEIS made quantitative, or numerical estimates of all known risks associated with each vegetation management tool and method. It also reviewed the quality of the scientific data that was used in malting these risk estimates. For individual projects, site-specific quantitative estimates need not be calculated in order to assess project risks. Rather, particular characteristics of the project should be identified that might expose either workers or the public to greater risks than those estimated in the FEIS. Then planners must identify mitigating measures, from the FEIS or elsewhere, and qualitatively describe how effective they would be in reducing particular concerns about exposure.

Whole body vibration from heavy equipment used in Canadian site prep operations was evaluated (Golsse, 1989). Factors which can contribute to d efficiency include acceleration levels. Use of tracked machines or wheeled units pushing implements which had higher vibration levels than wheeled slddders pulling implements.

Lower back pain associated with exposure to vibration from operating heavy equipment has also been rported as a potential human health effect, (Boshuizen et. al., 1990). However, it is diffiuclt to separate lower back pain due to vibration from that due to sitting. Comparing this potential health effect with potential health effects from sedentary indoor jobs would be speculative.

Hazard

Serious injuries to the operators of mechanical equipment and other workers in the vicinity can result if the operator loses control of the machine. The steepness, roughness, and soil type of terrain affect the severity of the hazard.

Accidents may occur when operating machines under conditions of poor visibility, when encountering a short headwall or roadcut, or when misjudging the slope. When machines overturn, operators may be seriously injured and flying debris can harm others. Such accidents are uncommon among experienced operators but they are difficult to eliminate entirely.

Workers can be struck by falling trees or by debris thrown by the equipment. The size and type of vegetation being treated can affect the seriousness of this hazard. In these circumstances, workers on the ground are at greater risk than the operator.

The noise of heavy equipment can cause hearing impairment.

Exposure

The equipment operator and ground crews are the only

individuals likely to be exposed to injury from mechanical equipment operating away from roads.

Risk

The most serious accidents involve the overtuming of machinery. Rolling or snapping vegetation can also cause injury. Risks to workers are proportional to the length of exposure, modified by terrain factors, and the type of vegetation being treated.

Risks to the general public from mechanical vegetation treatments away from roads is very low because the likelihood of exposure is remote. Risks from roadside brushing and mowing depend on road design factors that influence visibility and speed. Traffic control and warning systems can reduce these risks.

Quality of Information on Health Effects

The quality of data on health effects of mechanical methods is poor, there is no real evidence from forestry to substantiate the intuitive relationship between length of exposure and injury rate.

Measures for Reducing Environmental and Human Health Effects

Both rubber-tired and treaded tractors are prohibited on slopes exceeding 35 percent and on soils where there is a high potential for compaction and erosion. The only exceptions are in designated areas where adverse impacts can be avoided. The approval of a soil or water specialist is required.

- Buffer strips must be left along streams, lakes, and wetlands. The timing of mechanical treatments is crucial in minimizing the impact on soil and water.

- For roadside brushing, project risk plans should evaluate risks of accidents to other forest road travelers and reduce these risks through traffic and/or operational restrictions.

Information Sources

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Golsse, J.-M., and M.Fe Eng, 1989, Analysis of whole body vibration levls during site preparation, Technical Report NTR-90, Forest Engineering Research Institute of Canada.

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