MANAGING COMPETING AND UNWANTED VEGETATION

METHODS INFORMATION PROFILE

Biological

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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. Biological methods are discussed here.

Biological methods of controlling vegetation include the use of pathogens which cause disease and insects which consume plants. The object is to introduce and manage the natural enemies of unwanted vegetation. Grazing by domestic livestock and cultural methods such as seeding and genetic adaptation are also considered biological controls.

Biological Agents

Insects and pathogens may be released selectively in order to weaken or kill specific noxious weeds. Noxious weeds are non-native plants that cause disease or are injurious to crops, livestock,or land. Noxious weed control requires close coordination with state agencies, county weed control programs, and federal agencies including the USDA Agricultural Research Service.

Biological agents are obtained through USDA biological control laboratories and biological control agent production facilities. These laboratories test new, non-native organisms for both effectiveness and unintended ecosystem effects before releasing them for use as biological control agents.

Grazing

Prolonged or forced grazing of cattle and sheep may be used to control both noxious weeds and the composition or amount of competing vegetation. This differs from the typical grazing program in that vegetation control, rather than animal weight gain or forage utilization, is the primary objective.

Cultural Methods

Seeding with a desirable ground cover is a preventive technique used on newly disturbed sites such as roadsides, rights-of-way, wildfire areas, and harvested areas. Timely seeding of beneficial grasses or fertilization of existing low brush may inhibit noxious weeds, taller brush and unwanted trees by stabilizing the disturbed area, crowding out the competitor, or even by emitting toxins detrimental to specific weeds, as small burnett appears to do with diffuse knapweed.

Replanting with stock developed from genetically superior seeds may limit the need for conifer release. Tree improvement work has focused on the principal commercial tree species of the Pacific Northwest.

Taking advantage of “naturals” left undamaged on a log-

ging site or seeded from adjoining mature stands to reforest a harvested area is another cultural method which can reduce the need to control competing vegetation.

Implementation

Biological Agents

Insect adults and larvae can damage noxious weeds by feeding on seeds and leaves, girdling roots, and forming galls. Once control has been accomplished, efforts are normally made to harvest the insects for redistribution. Selective release programs have been successful in local situations to control weeds such as St. Johnswort and tansy ragwort.

Host-specific insects successfully used in the Pacific Northwest include the flea beetle and cinnabar moth on tansy ragwort, seedhead weevils on yellow starthistle, root and stem boring moth larvae on Canada thistle and Scotch broom, and seedhead flies on diffuse knapweed. A complete listing is provided in Appendix G of the FEIS Managing Competing and Unwanted Vegetation.

Recent literture published since the FEIS indicates that a fungus, Botrytis cinerea Pers., can cause mortality in populations of Senecio vulgaris L.. plant related to the noxious weed, Tansy Ragwort (Senecio jacobea) (Hallett et. al.) Botrytis c. is most effective as a mortality agent when plants are first infected by a rust, Puccinia lagenophorae (Hallett, 1990).

In addition to the more common foliar applications of plant pathogens, Jones and Hancock, (1990), report potential use of soil borne fungi for weed control, especially those which produce phytotoxins. Soilborne fungi are cultured on nutrient amended peat moss. The fungus infected peat moss is then incorporated into the soil where weed control is desired. The fungus produces a steroid-like substance which is toxic to weed seedlings. Selectivity is achieved by incorporating the fungus-peat mixture at levels in the soil profile which affect weeds but not crop plants.

Gradng

Livestock may be considered when preferred or palatable species are a significant component of the vegetation to be controlled and the area is large enough to support the herd or band which is available. Site preparation and the release of seedlings can be facilitated by grazing. Careful coordination is required to avoid conflict with management and wildlife habitat management goals.

Cattle and sheep have been effectively used to control competing vegetation in rangeland Rehabilitation programs in eastern Washington and Oregon National Forests. They have also been used effectively for conifer plantation maintenance. Successful programs have been conducted on the Fremont and Siuslaw National Forests.

Joudonnais and Bedunah, (I 990), compared use of prescribed fire or cattle grazing on a rough fescue community to increase elk use. Both treatments were more successfull than the control to increase elk use during initail growing seasons following treatment, although each treatment resulted in differing effects.

Cultural

Through the PNW Region genetics program, the technique of genetic adaptation is being explored. Trees with the potential for fast, early growth are selected to be used as a seed source for replanting harvested sites. Faster growth of tree seedlings may reduce or eliminate the need to control competing vegetation. In addition, genetic diversity in native plant populations can be preserved, so locally adapted plants will be available for revegetating sites and reducing the need to control competing and unwanted vegetation.

Promoting reforestation from natural seedings may be an effective preventive cultural technique in some situations. The growth of desirable advanced seedlings, protected from damage during logging, or natural regeneration from adjacent stands may reduce the need to control competing vegetation.

Uneven and multi-aged forest management may present some options for controlling vegetation. Removing selected age classes while retaing upper canopy cover may keep competitors from gaining dominance on a site since many brush species require full sunlight for optimum growth. The remaining crop trees expand to take advantage of

space and resources made available by the harvest.

The terrain must be gentle in uneven-age stands to minimize soil disturbance and damage to the trees that are left. Otherwise, long-term damage caused by multiple entries could far outweigh benefits. Standards and guidelines dealing with the selection of harvest systems are included in Forest Plans and the Region Guide.

Advantages

Biological Agents

These controls can be effective when target plants are numerous enough to support a viable population of insects, nematodes, or pathogens, and when adequate numbers of those biological agents can be obtained. Often, a complex of three to five different insects is needed to control one plant species. Indications are that adverse environmental effects from these methods are minimal. These biological agents, as opposed to livestock, do not disturb the soil, nor do they appear to pollute the water. Effects on nontarget vegetation, wildlife, or human health have not been reported.

Gradng

The use of cattle and sheep can produce good results. In the proper mix of brush, weeds, and grasses, grazing can effectively control the vigor of undesirable vegetation. Grazing can be costeffective and may often be done in conjunction with existing range permits. On some nutrient deficient sites, the animals can be beneficial because they convert vegetation directly into an available source of nitrogen.

Cultural

Natural seedlings go through a rigorous natural selection process, and are uniquely and specifically adapted to the site. There are usually a number of different species present, adding to diversity and increasing the chances for survival of a healthy stand. In many cases, they grow faster than planted trees.

Using advanced regeneration has the same advantages as using naturals, but their older age and larger size can give them an increased advantage over competing vegetation.

Seeding with a desired ground cover can be very cost-efficient. Once a stable plant community is established, the site becomes self-sustaining.

Genetically superior seedlings not only grow faster, which may reduce the need to control competing vegetation, but may be more disease resistant and less prone to deformation.

Disadvantages

BiologicalAgents

Because all biological control methods involve the interactions of living organisms with each other and with the physical environment, they are inherently complex. Results may be varied or slow to show effects, and if one or more critical component in the ecosystem is lacking, a specific technique may be ineffective.

If the wildlife in an area contains predators of the introduced biological agent, establishment of that agent may be correspondingly more difficult. Effective control techniques are known only for invading non-native plant species. Sometimes it is dffficult to obtain the correct insect, and intensive monitoring is required for all projects.

While the introduction of host-specific insects is carefully studied and planned in advance, there is always a risk of disrupting natural ecosystems. However, no examples of extensive harm done to natural ecosystems by biological efforts to control noxious weeds are known.

Grazing

The disadvantages of grazing are similarly associated with the complexity of management and the need for careful monitoring. Timely project administration and experienced herders or riders are needed to control the duration and intensity of use. This is particularly true with sheep movement and bedding. Over-grazing can lead to erosion and water pollution.

Conifer seedlings are susceptible to browsing or trampling damage, especially during the spring. Livestock must be stricly controlled within ripaxian areas or on

soils subject to compaction in order to prevent damage to water and soil.

Water distribution and available can limit the effectiveness of using livestock to control vegetation. The quality and quanity of forage is also critical. To achieve release or reduce unwanted vegetation, livestock must be held in some areas much longer than normal. Forced grazing can adversely affect animal weights and marketability. Experience has shown that willing operators are not plentiful.

Cultural

The principal disadvantage-of using genetically adapted seedlings is the cost and time required to breed, develop, and test them. Besides favoring rapid growth, geneticists must conserve other adaptive traits such as resistance to insects, disease, and environmental extremes. Selecting for these traits may reduce the maximim possible growth rate.

For natural seedlings to be an effective means of biological control, a number of conditions must be met. Trees must produce a large seed crop, the seeds must survive depredation by insects, birds, and mammals, the climate must be favorable for seed germination and seedling growth, and the seeds must fall on a surface material that allows the seeds to germinate and grow. The right combination of all these conditions does not occur every year and is difficult to predict in advance. More extensive vegetation treatment may be needed if natural regeneration fails to occur promptly.

Stands composed of advanced regeneration trees may be diseased, suppressed, or damaged, and do not always represent a possitive opportunity.

Seeding disturbed areas with a ground cover may have unwanted effects. If the seed is not from a certified source, it may be significantly contaminated by noxious weed seeds. The seeds may be non-native species selected to be aggressive and might out-compete desirable native species, thus reducing bio-diversity. In burned or harvested areas, seeded ground vegetation may make replanting more dffficult or may become competitive to natural tree seedlings that are wanted for long-term reforestation.

Environmental Effects

Soils and Water

The use of biological agents is not expected to affect adversely soil or water. The seeding of disturbed sites with desired species can help prevent soil erosion and benefit water quality.

The main adverse effects on soils due to grazing are compaction of wet soils from trampling and surface erosion on steep hillsides due to loss of plant cover from overgrazing. These effects, however, do not usually occur when grazing is used specifically for vegetation management.

Grazing can increase sedimentation and fecal bacteria which degrade drinking water. If riparian areas are overgrazed, increased stream temperature and channel instability may result.

Rangeland

The utilization of predators, pathogens, and parasites as natural enemies to control noxious weeds has a very low potential to affect rangeland vegetation adversely.

Seeding with grass and legumes increases the quantity and quality of forage and can increase the land's carrying capability.

Grazing can change the ecosystem suitability of rangeland plant species. Overgrazing and poor distribution of livestock may damage more fragile vegetation, particularly in riparian zones. This can directly affect wildlife and increase pressure where livestock and big game compete for forage.

Properly timed and controlled grazing can improve habitat, keeping vegetation in a succulent, highly digestible condition for a longer period of time.

Wildlife

The use of biological and cultural methods has little potential to affect wildlife directly. The potential for indirect and cumulative effects is greater and varies with the technique used.

Plants targeted for control by biological agents are usually non-native, toxic to many wildlife species, or in competition with preferred forage plants. Removing them may increase the viability of dependent wildlife species.

The effect of seeding and planting on wildlife is generally positive. It can increase deer and elk populations by improving forage, thus increasing the carrying capacity of range and forest lands.

On transitory range, temporarily opened by fire or harvesting, these effects may last for between 10 and 20 years. Transitory ranges can often produce large quantities of forage for a relatively short period of time following stand disturbance. Seeding gasses, legumes and forbs will increase the length of time plantations provide habitat for species dependent on or preferring early seral stages. This is because invasion and dominance of a site by shrubs and other vegetation is impeded.

Grazing has the potential for direct, indirect, and cumulative effects on wildlife. The magnitude depends on the objectives, extent, and control of the activity. Potential direct effects include the displacement of resident big game by livestock, the transfer and spread of parasites and disease from livestock to wildlife, and attrition from or predator control measures which may be used to protect domestic animals.

Indirect effects include changes in habitat suitability, reduction of forage on summer and winter range and degradation of critical habitat, such as elk calving or deer fawning sites,wallows and water access.

Human Health Effects

Hazard

The FEIS made quantitative, or numerical estimates of all known risks associated with biological controls. It also reviewed the quality of the scientific data that was used in making these risk estimates. For individual projects, site-specific quantitative estimates do not need to be calculated in order to assess project risks. But the particular characteristics of the project should be evaluated to determine whether they might expose workers or the public to risks greater than those estimated in the FEIS. Then planners must identify mitigating measures, from the FEIS or elsewhere, and determine how effective they would be.

Cattle or sheep are normally held in a plantation or confined area long enough to afford heavy utilization of feed and to generate a release effect in the crop trees. The combination of livestock numbers and duration of grazing may result in relatively high volumes of fecal matter deposited on the site. This factor, as well as the tendency for animals to concentrate in draw bottoms and adjacent to live water, creates a potential for fecal contamination of surface waters.

No hazards to human health have been identified for other biological controls and cultural methods.

Exposure

Members of the public who consume surface water downs of biologically controlled sites may be exposed to fecal contaminants from grazing livestock or other pollutants. Becauseof the relative remoteness of application sites, pathogens are not likely to contribute significantly to major municipal g water supplies and, therefore, larger populations are not likely to be exposed.

Risk

There is a remote possibility that fecal contamination of surface waters could result in the spread of water borne diseases if animals were used to manage competing vegetation. Downstream monitoring will, be conducted in those projects where there is a question of potential human health effects.

Quality of Information on Health Effects

Little or no information exists on the spread of water-borne pathogens from vegetation management by biological methods, nor on the incidence of human illness that could be attribututed to them.

Measures for Reducing Environmental and Health Effects

- ALL Forest Service uses of biological contro l organisms will be in cooperation with the USDA Agriculture Research Service or under individual, approved state programs.

- Project planners will inform downstream water users who could be directly affected by biological contamination of surface water.

- Existing direction found in Forest Service Manual 2200 (Range Management) and 2500 (Watershed Management) provides for protection of resources during livestock grazing. Standards and guidelines in National Forest land and resource management plans address local conditions and measures necessary to minimize impacts on soils and vegetation due to trampling by livestock.

Strict control of livestock is required to prevent damage to desired vegetation. In addition to fencing the upslope water developments, supervision is also required to keep stock from concentrating in wet areas and overgrazing.

Livestock will be strictly controlled in the vicinity of wetlands and riparian areas to prevent trampling and the compaction of wet of riparian vegetation and streambanks. Specific management direction for protecting riparian areas, wetlands, and threatened, endangered, or sensitive plants is given in land and resource managment plans. Management techniques can include fencing, herding, sale distribution, and herd adjustment.

Stock tanks and methods to ensure amnila movement and dispersal within the treatment area should be employed when necessary.

Impacts on downstream domestic water users and water quality monitoring requirements must be incorporated into project plans.

The consequences of using genetically adapted seedlins selected for fast early growth will be evaluated for their long-term effect on the diversity of natural forest and range ecosystems. The evaluation should occur as part of the Region-level genetics program.

Information Sources

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