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MULTIPLE-USE OPPORTUNITIES OF INTERIOR DOUGLAS-FIR FORESTS

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ABSTRACT

Although interior Douglas-fir can be downright schizophrenic in its biological behavior, this species is absolutely predictable in providing multiple resources such as timber, water, wildlife cover and forage, recreation, and esthetics. Douglas-fir excels in collective resources—not totally lacking any of them, but not outstanding in any of them, either—just a good all-around contributor.

The widely disparate biological behavior of Douglas-fir can be attributed to its two ecological roles—sometimes climax and sometimes seral. Such behavioral polarity affects its susceptibility to insects and diseases, and consequently how it can be managed for its multiple resources. For example, where climax, Douglas-fir is highly vulnerable to budworm; but where seral, it is little affected. Douglas-fir forest resources, modest individually but impressive collectively, are largely a function of its ecological niche. Below Douglas-fir lie warm-dry forests and above lie cold-wet forests, where individual resources are more pronounced but less balanced than in Douglas-fir forests.

Keywords: Interior Douglas-fir, multiple-use, interior West, insect and disease, succession

INTRODUCTION

Interior Douglas-fir is one of the most versatile conifers in the West. This country-cousin of the coastal form of Douglas-fir occupies many ecological niches throughout its extensive range. As a result, it presents a host of management opportunities and challenges. This paper describes the multiple-use opportunities of managing these forests. I will discuss some of the ecological factors that influence the behavior of this species, some of the past management factors, some insect and disease factors, and some multiple-use aspects of management and how they relate to these factors.

ECOLOGICAL FACTORS

Interior Douglas-fir wears two successional hats, one seral and the other climax. It is not totally unique in this characteristic—ponderosa pine on dry habitats and Engelmann spruce on wet habitats behave similarly. But this characteristic likely has a greater effect on management of interior Douglas-fir than it does with any of its counterparts in the West. This schizophrenic behavior on the various ecological habitats where interior Douglas-fir grows affects the options available to forest managers. Because these seral/climax characteristics affect regeneration success and stand development of the species, they ultimately dictate species composition and structure in the forests. These widely disparate successional roles are also decidedly related to the incidence and effect of insects and diseases.

Where seral, interior Douglas-fir usually occupies a codominant or dominant position in the canopy, is mostly even-aged, and normally comprises a small proportion in these mixed-conifer stands. It competes directly with other seral species such as western larch, lodgepole pine, Engelmann spruce, and western white pine. Under these conditions, Douglas-fir is usually succeeded by subalpine fir, grand fir, white fir, or cedar and hemlock depending upon the geographic area and ecological habitat. These are usually productive sites for Douglas-fir and they grow rapidly.

Where interior Douglas-fir is climax, species composition and stand structure are substantially different from where it is seral. Over much of its range, Douglas-fir is climax with the seral component, mostly ponderosa pine, and to a lesser extent western larch, lodgepole pine, and other species. Depending upon the stage of successional development, interior Douglas-fir occupies all four positions in the canopy—suppressed, intermediate, codominant, and dominant. As stands grow older and succession proceeds, stands become increasingly dominated by Douglas-fir. These stands are usually on low to medium quality sites, and Douglas-fir grows correspondingly slower than on the sites that support Douglas-fir in a seral role.

Thus in brief, site conditions that place Douglas-fir in a seral or climax role dictate the character of the forests in species composition, stand structure, and stand density.

PAST MANAGEMENT FACTORS

If one were to choose a forest type that has seen the most abuse, interior Douglas-fir would likely get the dubious prize. Two primary factors—intensive fire control and partial cutting practices—have shaped the character of most existing interior Douglas-fir forests (Schmidt and Larson 1989). Intensive fire control for much of this century substantially reduced the frequency of surface fires. Prior to intensive control, surface fires periodically removed Douglas-fir from the understory, favored the more seral, fire-resistant associated species such as ponderosa pine and western larch, and resulted in more open-grown forests. They essentially interrupted the succession process. Prior to intensive fire control, surface fires occurred at intervals of 20-50 years. Once fire was largely excluded,

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seedlings and saplings typically developed into multilayered stands of predominately Douglas-fir on sites climax for Douglas-fir. This also occurred, but to a much lesser extent, on sites that are seral for Douglas-fir.

Partial cutting practices also strongly influenced the character of today's Douglas-fir forests. Unfortunately, partial cuttings for much of this century were essentially 'logger's choice' in which the biggest and best of the seral species were removed with little or no provision for regeneration and subsequent stand culture. These activities usually resulted in a decided shift toward more shade tolerant species and stands that had little or no growth potential. Seral species such as ponderosa pine, western larch, and white pine declined under past partial cutting practices because they were the most valuable species to harvest and the stand and site conditions following harvest seldom met their regeneration requirements. They needed more light and less competition from other trees and associated vegetation.

In general, the drastic reduction of natural fires and past partial cutting practices accelerated the successional processes and resulted in present stands composed of a larger proportion of climax species than found in the original virgin forests. Over much of its range Douglas-fir is that climax species.

INSECTS AND DISEASE

Interior Douglas-fir forests can be downright hospitable to many insects and diseases, and some of the past management practices just described have made them even more hospitable. Lack of periodic fires and improper partial-cutting practices have created stands composed primarily of shade-tolerant, insect-and-disease-prone species, and multilayered stand structures that are favorable for many significant insect and disease problems. Insects such as western spruce budworm, tussock moth, Douglas-fir beetle, and various cone and seed insects are major problems in regeneration and stand development of Douglas-fir (Mason *et al.* 1989). Disease problems are primarily dwarf mistletoe, root rots, and needlecast. Dwarf mistletoe is strongly related to past management practices, and it now appears that root rots are too. All of these insects and diseases affect management choices aimed at enhancing multiple-use values.

MULTIPLE-USE MANAGEMENT

Douglas-fir forests are extremely valuable because of their collective resources of timber, water, wildlife, range, and recreation. They are not totally lacking in any of these major resources, but they are not outstanding in most of them either. They are just a good all around contributor to the total resource base.

Douglas-fir forest resources, modest individually but impressive collectively, are largely a function of ecological amplitude, fire history, past management practices, and insect and disease influences. The following sections briefly describe these resources and their relationship to these three factors.

Timber

For many years interior Douglas-fir has accounted for more of the annual timber harvest than any other species in the Northern Rockies. It is a good overall timber producer mainly because it is a component of many ecological habitats and it occupies extensive acreage in the West. It is moderate in productivity and usually grows at an annual rate of about 50-100 cubic feet per acre (Schmidt and Larson 1989). This varies substantially, however, because of different ecological conditions that influence site productivity, past management practices that have shifted species composition and stocking levels, and insect and disease conditions that can substantially reduce growth and increase tree mortality.

Douglas-fir can be successfully grown for timber with both even- and uneven-aged management depending upon its successional role and ecological habitat and the management objectives for the total resource complex. In general, even-aged methods of clearcutting, shelterwood, and seed tree can be used successfully where Douglas-fir is seral. Where Douglas-fir is climax, uneven-aged methods of individual tree or group selection, or the even-aged method of shelterwood can be used satisfactorily.

Douglas-fir has been king of the Christmas trees in the West for many years. From the Northern Rockies alone over 100 million Douglas-fir Christmas trees have been harvested in the last 50 years, enough to encircle the earth five times if laid end to end. Christmas tree production peaked in the 50's and 60's and has declined since then, but there is still an active demand for Douglas-fir Christmas trees. Most trees come from natural stands on medium quality sites where height growth is not excessive. Needlecast and budworm have been a problem for growing Christmas trees in some years and locations. Christmas tree production has gradually shifted from natural interior Douglas-fir to cultured trees of other species, particularly Scotch pine.

Water

Moderate precipitation and temperatures in interior Douglas-fir forests limit the effects of stand treatments on water yields from these forests (Swank *et al.* 1989). The higher elevation zones that usually include Douglas-fir in its seral role have some potential for redistribution of snow and for manipulation of water yields. But where Douglas-fir is climax in the lower elevation zones there is relatively little opportunity to manipulate water yields. The reason of course is the greater amounts of precipitation and relatively less evapo-transpiration in the higher, cooler elevation zones as opposed to the warmer lower elevation areas of Douglas-fir habitat where nearly all of the water is used by vegetation before it reaches the lower soil depths. Because of this, effects of past practices and insects and disease are relatively modest with respect to changes in water yields.

Douglas-fir occurs on a wide spectrum of soils and parent materials. Consequently, there is a wide variation in soil stability and erosion potential. Some soils such as those on the granitics of the Idaho batholith can be highly erosive, but most of the areas supporting Douglas-fir are relatively stable.

Wildlife

Interior Douglas-fir forests are a haven for a wide variety of wildlife. The wide diversity of habitats provided by these forests under both seral and climax conditions provides both early and

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late successional stages of vegetation for ungulates such as elk, deer, moose, and mountain sheep, and their predators such as mountain lion, bear, bobcat, and coyote. A wide variety of birds and smaller mammals, too numerous to list here, are commonly found in these forests. Some of these are described in other papers of this symposium.

These forests provide some of the key forage, along with visual and thermal cover for most of the above species—sort of a tree for all seasons for wildlife. Past management practices, fire history, and insect and disease conditions profoundly affect wildlife habitat. This triumvirate dictates species composition, lateral and vertical stand structure, and stand density, all of which determine the availability and type of food and visual and thermal cover for most wildlife species. Dense and multistoried stands provide cover but little forage for most of the ungulates, while the open-grown stands provide just the opposite—a lot of forage but little cover (Thomas and Radtke 1989). Fire frequency is also key to much wildlife habitat because early successional stages of vegetation are usually productive for many wildlife species. Insects and diseases can improve or reduce favorable habitats for wildlife. For example, insects and disease may kill some trees that prove valuable as perching sites for some birds and at the same time reduce stand density enough to stimulate understory vegetation for wildlife forage. Some birds also feed directly on tree-damaging insects and on disease organisms such as the dwarf mistletoe seeds.

The wide elevational and geographical range of interior Douglas-fir enables transitory animals and birds to spend most of their life in Douglas-fir forests. Some animals such as elk move up and down the mountains in response to seasonal phenological changes.

Range

Most of the interior Douglas-fir forests produce moderate amounts of forage for domestic stock. Without relatively frequent fire or timber harvesting, the succession of trees tends to crowd out forage plants important for their range values, in both seral and climax Douglas-fir habitats (Pearson *et al.* 1989). Insects and disease generally tend to increase the amount of forage for domestic stock by reducing tree stand densities.

Historically, this forest type has had a lot of grazing because much of it occurs on gentle and accessible terrain. For a number of economic, social, and biological reasons domestic stock use has generally declined.

Recreation

Douglas-fir forests provide important recreation values. Its hardiness makes it a good species in intensively used areas. It's green all year, esthetically pleasing, and grows well with a variety of other species. Visual management is of major importance in the management of forested recreation areas, and Douglas-fir provides the foreground and background views as well as the canopy for intensively used areas (Tlusty and Bacon 1989).

Perhaps Douglas-fir's biggest shortcoming in recreation areas is its susceptibility to insects and disease. These can decrease its esthetic appeal and its ability to survive in heavily used recreation and visual areas where silvicultural practices that could be used to reduce insect and disease losses have to be limited to less visually disruptive tactics. Uneven-aged management is usually practiced in recreation areas to provide continuous green cover, but some insect and disease problems can be anticipated for reasons described earlier.

SUMMARY

Douglas-fir forests provide something for nearly everyone regardless of a person's interests and needs. The multiple-resources in this forest type are perhaps more evenly balanced than in any other forest type. As a result, multiple-use management has some of its greatest opportunities here. Other forest types often have certain resource values that dominate all other resources present on the area. For example, some forests may have predominant watershed and wildlife values and others may be particularly important for their timber values. But, interior Douglas-fir forests generally aren't totally predominate in any single resource but provide the broad base of resources needed for true multiple-use management. In brief, the interior Douglas-fir forest type:

- Excels over most of its counterpart forest types in its collective multiple-use resources.
- Provides some of all of the conventional multiple-use resources.
- Has a relatively evenly balanced set of resources.
- Has been heavily influenced by past fire control and harvesting practices that discriminated against seral species.
- Is heavily affected by serious insect and disease problems often compounded by management activities in the past.
- Has some of the greatest potential for true multiple-use management over a broad geographic area.
- May serve well in demonstrating the increasing emphasis in preserving and enhancing biological diversity and site productivity, in landscape scale of forest management, in adapting to changing social values, and in making long-term management adjustments in response to changing social values.

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