Prince George Forest Region

Forest Resources & Practices Team

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FOREST RESEARCH NOTE

Management of Sitka alder and Willow:
A Strategy to Minimize Loss of Habitat and Maximize Benefit to Long Term Soil Productivity

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Background

The age, size, species composition and arrangement on the landscape of different habitats is important to the ecological functioning of large areas. This arrangement may influence the distribution and persistence of populations, large herbivore foraging, the flow of sediment and nutrients and net primary production (Turner 1990). On boreal and sub-boreal landscapes fire has historically played a defining role in determining this large-scale arrangement on the landscape, but recently harvesting practices have replaced fire as the primary disturbance factor (Delong and Tanner 1996). Wildfire and other natural disturbances have such a profound effect on survival and regeneration of plant communities that often disturbance is key in maintaining diversity. Through conversion of non-commercial cover, control of disturbance intensity, and brushing and weeding, forest managers have the capability to affect the temporal and spatial arrangement of habitats dominated by vegetation which is currently not commercially valuable.

Many of the species that are adversely affected by our management practices play a critical role in maintaining forest productivity and providing wildlife food and habitat. In this document we outline some of the ecological benefits of willow and Sitka alder, how these species are currently being impacted by present practices, how we might alter management to minimize negative impacts on these species and how we might utilize these species to improve productivity of significantly impacted sites.

PHOTO 1. 30 year old willow stand (Prince George Forest District)

Distribution, Ecology and Current Impacts

Willow

Willows (*Salix* spp.) occur over the range of dry to very wet sties (subxeric-subhydric) but most reach their greatest abundance on moist to wet sites (suhygric-hygric) (Porter 1990). There are 42 species of willows in British Columbia with 14 present in the Sub-Boreal Spruce (SBS) zone of the central-interior plateau region. All are shade-intolerant and the upland species find optimal conditions for growth on disturbed sites where mature forest has been harvested or burned (Haeussler et al. 1990; Porter 1990). They often become dominant in areas that have a history of frequent natural fire. In a study by Zasada (1983) on artificial regeneration of trees and shrubs, moderately and heavily burned areas proved most desirable for germination of Salicaceae (willows and poplar) species, and severely burned seedbeds were most viable. Thus, willows are favoured by intense or repeated burns or other disturbances which expose mineral soil. Preliminary data from a study near Prince George (DeLong, unpublished data, Forest Renewal

Project OP96073-RE) indicate that mechanical mineral soil exposure provided the most suitable habitat for willow germination when compared to light or moderate burns.

Reduction in the extent and/or productivity of upland willow communities could have profound effects on wildlife forage availability, site productivity and ecological diversity on the landscape. Upland willow sites support an important plant community which provides the principal browse for moose, as well as food for deer, rodents, snowshoe hares and birds (Porter 1990). Willow leaf fall can return significant amounts of nutrients to a site. DeLong (unpublished data, Forest Renewal Project OP96073-RE) found that as much as 20 kg/ha/yr of nitrogen could be returned to the site by willow leaf fall.

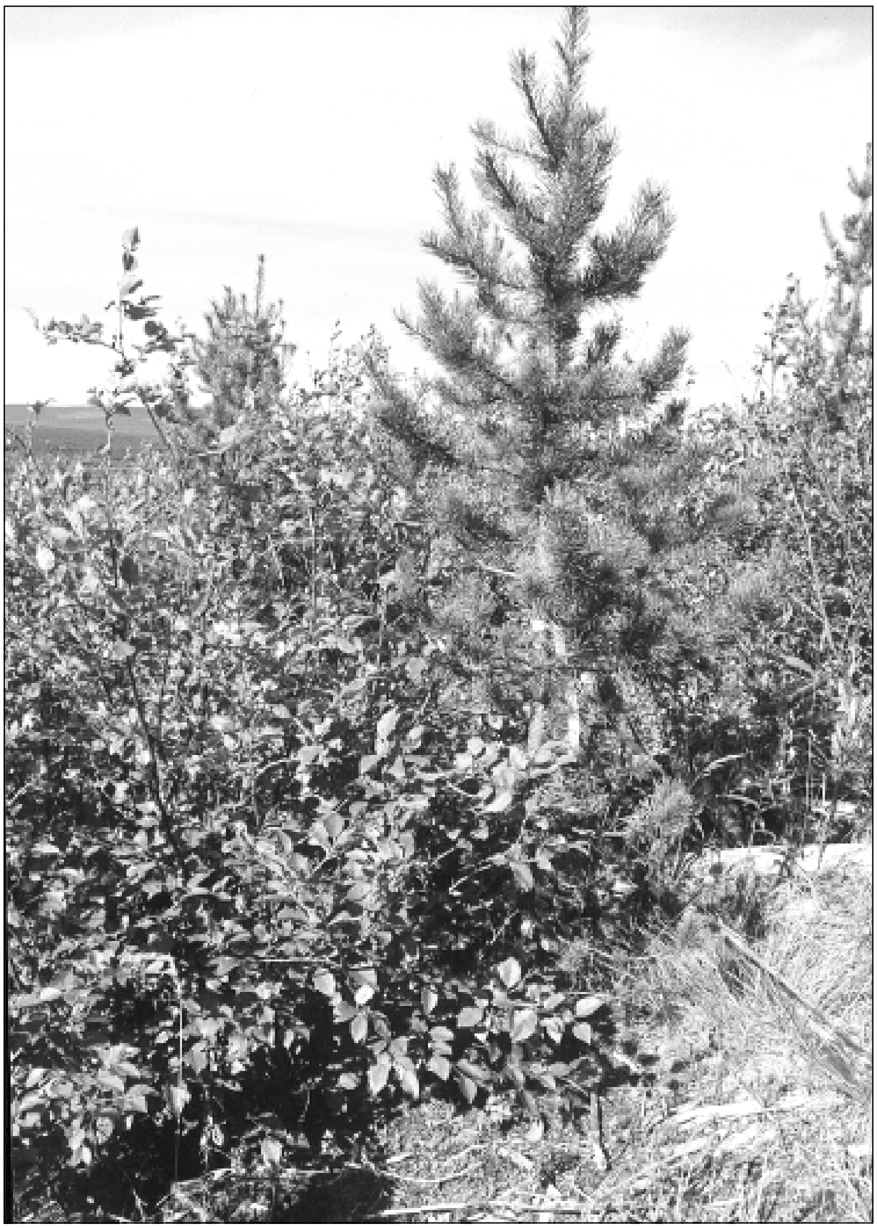

PHOTO 2. Sitka alder in 10-year-old naturally-regenerated lodgepole pine (Vanderhoof Forest District)

Management impacts on willow relate to brushing and weeding for improving conifer performance and lack of site disturbance related to current site preparation choices. After disturbance, willows may be in competition with conifer species, and thus are subject to brush control activities. Once commercial species are established they will overtop willows in time. Once overtopped the cover and vigor of willows can decrease rapidly due to their shade intolerance. As previously discussed, willows require significant mineral soil exposure to regenerate well. Current popular site preparation techniques such as light piling limit mineral soil exposure. With respect to upland willow, this may conflict with the current management intent to maintain the historic range of natural variability of habitats as inferred in the Biodiversity Guidebook (British Columbia Ministry of Forests 1995). Currently, successful willow regeneration appears limited on harvested sites (DeLong, unpublished data, Forest Renewal Project OP96073-RE) and tends to be restricted to road sides and abandoned agricultural land. In order to restore the historic spatial distribution of upland willow on the landscape it is suggested that we need to take a proactive approach (see Suggested Management Practices Section).

Sitka Alder

Sitka alder (*Alnus crispa* ssp. *sinuata*) is an important shrub component of both mature and young lodgepole pine stands throughout much of the interior of British Columbia. In drier portions of the SBS zone, Sitka alder can form fairly continuous understorey cover (20-50% cover), whereas in wetter portions of the SBS zone it tends to occur in moist pockets (swales) or on avalanche tracks. Sitka alder is a pioneer species which colonizes disturbed sites where mineral soil has been exposed (Haeussler et al. 1990). Being moderately shade tolerant and able to reproduce vegetatively through stump sprouts, Sitka alder will persist after disturbance and maintain vigor even under a closed forest canopy.

Although not a preferred browse species for ungulates, Sitka alder does provide food for snowshoe hares, squirrels and birds (Haeussler et al. 1990). As an actinorhizal species, Sitka alder has been shown to benefit site fertility through nitrogen fixation, with estimates from the Pacific Northwest ranging from 20 to 150 kg/ha/yr (Binkley, 1986).

Management impacts on Sitka alder are related to brushing and weeding for improving conifer performance and conversion of Sitka alder dominated sites to conifers.

Although Sitka alder has not commonly been the target of intensive brushing and weeding treatments there are numerous plantations that will not meet current free to grow regulations due to presence of abundant Sitka alder. Under guidelines in the 'Revised Establishment to Free Growing Guidebook' (British Columbia Ministry of Forests, draft), Sitka alder cover would be allowed to be present in only one quadrant of a 1 meter circular plot. Evidence from a number of studies suggests that this may be overly restrictive. In retrospective sampling of 6- to 10-year-old naturally regenerated lodgepole pine in the Montane Spruce Zone (MS), Simard (1990) found that lodgepole pine diameter growth was reduced only when Sitka alder cover exceeded a broad threshold of 10-35% cover. Later work by Simard and Heineman (1996) refined this estimate, observing pine growth responses when alder cover was reduced from 22% to between 15 and 18%. As well, the potential addition of N by fixation must be considered when vegetation management is considered for Sitka alder. For example, Sachs (1992) estimated annual N-fixation rates of 1.5 to 8 kg/ha/yr for Sitka alder in pine stands in the MS. Clearly the perceived need to remove alder to increase conifer performance over the short to intermediate term must be weighed against the long term benefit of increased site productivity and habitat diversity by maintaining it.

Currently there is a policy in place which instructs licensees to convert to conifer production any area < 4 ha which is deemed to be suitable to grow trees, but which is currently dominated by non-commercial brush. This policy is commonly enforced in the wet montane forests in the Prince George Forest Region where alder swales are common.

Proposed Management Practices

The following proposed management is based on the assumptions that we wish to maintain near-natural levels of habitat diversity, reduce operational costs, minimize negative impacts on the AAC, and enhance productivity of previously degraded soils.

Willows

Willows generally constitute a minor component of competing vegetation on most sites and are occasionally protected by herbicide-free buffers along water courses during chemical brushing and weeding treatments. However, during the course of site preparation and planting, small patches (i.e., <0.5 ha) of willow may be converted to coniferous cover. The simplest way to prevent this is to do detailed mapping of the harvest area prior to logging and map out these small inclusions as separate strata which will be taken out of the net area to be reforested. This may leave smaller inclusions that are not easily mapped but which could be dealt with during planting and surveying by instructing field personnel that these areas are not to be reforested. This strategy is only a partial solution since under this regime the spatial and temporal pattern of willow would become static. Under the natural fire regime the older willow communities would be rejuvenated and there would be opportunity for willow to occupy new sites. Willow sites could be potentially rejuvenated by site preparation activities (mechanical or fire) but the opportunity to occupy new sites is only likely to occur through significant mechanical disturbance. The greatest opportunity appears to lie in the establishment of willow on heavily impacted skid roads and landings, especially on finer textured soils where establishment of crop trees is difficult. Willows can be established by seeding, use of cuttings or through growing and planting seedlings. Collecting and cleaning willow seed is difficult, seed viability is very limited, and although seed germination is generally reported to be good it was unsuccessful in a recent trial conducted by DeLong on an upland site in the SBS (unpublished data, Forest Renewal Project OP96073-RE). Willow cuttings can be established relatively easily on sites hygric and wetter or subhygric sites during wet soil conditions. Survival on subhygric and drier sites is inconsistent (unpublished data, Forest Renewal Project OP96073-RE and pers. comm. John Przeczek, Interior Reforestation Co. Ltd.). The key to successful establishment of cuttings on upland sites is to use large calliper cuttings (> 1.5 cm diameter) at least 40 cm in length and plant them deep (approx. 7/8 of the cutting in the ground) (pers. comm. David Polster, Polster Environmental Consultants). Willow can be also grown as seedlings in nurseries where there is an adjacent natural seed source or from collected seed. Standard large calliper palettes (e.g., StyroBlock 60's 415, 515D, or 615) for container stock are just left out to collect the natural seed rain in the spring or collected seed is placed in the cavities. The cavities are weeded to one stem per cavity, and grown and stored in the same manner as other nursery seedlings. More research is necessary in order to determine the most effective manner to establish willow but the benefits of maintaining a critical component of habitat and enhancing soil productivity should provide the incentive for managers to pursue a variety of strategies.

Sitka Alder

In drier portions of its range, the key question is what level of Sitka alder abundance are the benefits of N addition offset the competitive interactions with crop trees? This is the primary focus of FRBC Project 96077-RE (Sanborn et al. 1997). Preliminary data from this study indicate that only 3 years after complete removal of Sitka alder, the nitrogen concentrations in pine foliage were significantly lower than in treatments which retained 15-45% alder cover. Until this project is at the stage that it can provide clear guidance it seems appropriate to have some flexibility in the amount of Sitka alder cover allowed within one metre of crop trees before treatment is required.

In the wetter portions of its range, the conversion of alder swales to coniferous production should be reviewed with respect to rate of loss of habitat, the cost effectiveness of the treatments and consequences to annual allowable cut. In the interim it is recommended that alder swales which contain no trees be taken out of the net area to reforest and ones which contain trees be considered for retention as wildlife tree patches.

In order to counterbalance existing and future loss of habitat, the use of Sitka alder to reclaim skid roads and landings which are unsuitable for regenerating crop trees is recommended. Sitka alder can be established by seeding, use of cuttings or through growing and planting seedlings. Poor germination rates indicate uncertain results for seeding. Propagation using hardwood cuttings in the spring or fall has been successful on wet sites. Previous success with establishing seedlings has been variable and planting during wet conditions is recommended. Sitka alder seedlings have been successfully established in demonstration plantings on rehabilitated roads at the Aleza Lake Research Forest (Sanborn et al. 1999, Res. Note # 18). Inoculation of these seedlings with the symbiotic N-fixing microbe, *Frankia*, was easily accomplished by watering the nursery containers with a suspension of pulverized alder root nodules.

For further information

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