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ECOLOGICAL GROUPS AND CONCEPTUAL THEMES

Snags and Deadfall

Many studies document widespread use of large standing dead trees (snags) and deadfall by wildlife. Snags and fallen trees in various stages of decay contribute much-needed diversity of ecological structures to terrestrial and aquatic habitats and are recognized as critical habitats for certain groups of terrestrial and aquatic organisms.

Deadfall. Decaying, fallen, or partially fallen trees and shrubs greatly diversify the ground level structural characteristics of terrestrial environs. Numerous wildlife species (particularly small mammals and birds) rely on this structure for cover, foraging opportunities, and thermal protection. It also contributes to long-term accumulation of soil organic matter and enhances conditions for regeneration of vegetation through seedling establishment. Diversity of soil properties and topography in turn affects forest regeneration processes that maintain long-term forest productivity. In contrast, when trees are harvested or dead and down materials removed, mineral and organic resources are forever lost from that ecosystem. Aquatic environments are also benefited by deadfall materials. The most productive habitats for salmonid fish are small streams associated with mature and old-growth coniferous forests where large pieces of organic debris and fallen trees greatly influence the physical and biological characteristics of such streams.

Snags. Standing dead trees provide critical nesting, feeding, shelter, communication, and denning/resting habitat for a variety of vertebrates, both avian and mammalian. Many birds, such as woodpeckers and flickers, forage invertebrates from snags in varying stages of decay. These same birds as well as others (e.g., kestrels, bluebirds) create and/or use cavities in the snags for nesting which, in turn, are used by other species such as pine martens for resting and denning activities. As snags decay, they eventually fall to the ground and function as deadfall materials described above.

Managing for Snags and Deadfall. Effective management of riparian areas should, in part, protect as much structural and compositional diversity as possible. Coarse woody debris constitutes much of the basic structure for the smaller streams and is critically important to larger streams and rivers as well. Litter from streamside vegetation provides the primary energy base of the aquatic community. A mixture of herbaceous and woody plant species of varying ages is desirable for perpetuating ground litter and larger structural inputs and maintaining multiple-canopy layers greatly contributes to structure and composition and to a more varied physical environment especially when both deciduous and evergreen plants are present. Streamsides may be protected by maintaining vegetated corridors, especially along large streams, and by establishing adequate setbacks. Prescriptions for managing riparian zones must include methods for maintaining needed tree structure, composition, and wind resistance over a long period in conjunction with treatments on adjacent lands.

Providing and maintaining a supply of coarse woody debris to the terrestrial and aquatic portions of the ecosystem is a major challenge in land management. There must be a continuous production of large trees, large snags, and deadfall into both terrestrial and aquatic environments to support the complex interactions among animals, living plants, and dead organic material. The practice of removing all large woody unmerchantable or otherwise unwanted material is ecologically undesirable and should be modified or eliminated.

We recommend leaving trees and snags greater than 15 inches d.b.h. whenever possible. Taller trees provide greater security against ground predators. In general, it is best to leave taller snags because, in time, tall snags become shorter and taller trees may reduce interspecific conflicts by allowing vertical segregation of species and activities. To provide a diversity of nesting and feeding habitat, snags of all tree species and in all states of decay should be left standing. Snags should be left in dispersed clumps rather than as single trees uniformly scattered over an area. The desirable density of snags depends upon habitat type, but 300-400 per 100 acres is recommended for many western forests.

Conserving snag-dependent wildlife requires planning for replacement of snags as they fall. Some live trees can be retained as sources of future snags. Saving trees with crown and upper stem defects, such as top rot, broken top, or fork, is desirable because they provide certain species of raptors with nest sites and are likely to contain some decay that produces desirable snags for cavity dwellers. Live trees may also be converted to snags by fire or girdling. One strategy may be to kill trees at intervals to provide a continuing source of snags through forest rotation. Thus, desirability of snags generally increases with diameter, proportion of stem covered by bark, height, and broken top.

Certain tree removal practices are generally incompatible with the preservation of snags and deadfall material and detrimental to snag-dependent wildlife. Timber stand improvements often call for the removal of dead or damaged trees or for thinning trees to maximize wood growth. Certain steps can be taken to improve these practices. Trees greater than 15 inches d.b.h., which otherwise would be removed, can be killed and left standing to provide snags. Damaged or unmerchantable trees less than 15 inches that will not have an adverse effect on growing stock can be left alive until they are 15 inches and then killed. In this way, snags can be created throughout a rotation cycle. For long-term management of trees on private land, the largest diameter trees should be killed at periodic intervals and left standing. If sufficiently large, these snags will remain standing during most of the next rotation. If a clearcut has no suitable residuals, or if most snags have fallen early in the rotation, snags can be created or existing snags can be conserved along the edge of the cut, preferably in small clumps. Snag longevity can be increased by conserving dead-topped or broken-topped live trees, or by killing only the top portion of selected live trees. Such trees do not rot at ground level. The roots are still alive, and these trees will provide nesting habitat much longer than a completely dead tree.

Uneven-aged management includes selective cutting or small patch cuts. Because mature trees are always present, natural mortality can produce new snags and the canopy will protect existing snags against windfall. When natural mortality is too low, snags can be created with minimum financial loss by killing dead, genetically inferior, diseased, or other unmerchantable trees.

The length of the rotation cycle is of critical importance under both even and uneven-aged silvicultural systems because rotation length determines tree diameter. At present, merchantable trees are 16 inches d.b.h. or larger, but as economic incentives for shorter rotations increase, as more mills accept smaller stock, and as other economic incentives stimulate shorter rotations, trees may be harvested when they reach only 12 inches d.b.h. These small diameter stands will not produce 15-inch or larger snags required for nesting unless selected trees or patches are allowed to grow beyond the rotation. On good sites, this means an extra 10-20 years; on poor sites trees may have to be retained an extra 50 years or more.

Retention of old-growth stands within managed compartments is an alternative to selected tree retention. Old-growth stands support a high density and variety of cavity-nesting birds and other forest wildlife, primarily because of the high number of large-diameter snags they provide. Retention of old-growth stands will mitigate the unavoidable losses of cavity-nesting bird habitat on intensively managed stands and should be encouraged as a high priority in the management of all forest wildlife.

Existing or planned developments within forested areas, such as the mountain foothills and along the Snake River riparian zone, should be required to assess the presence, density, and relative abundance of snags and deadfall material and determine how these may be affected by construction. If the abundance and diversity of these structures are reduced below some predetermined level, developers should be required to replace these important habitat features.

Major sources: Davis et al. (1983), Macer et al. (1988), Raphael and White (1984)
Other sources: Balda (1975a,b), Balda et al. (1983), Bormann and Likens (1979), Brawn et al. (1975), Bull (1978), Cline et al. (1980), Conner (1979), Evans and Conner (1979), Franklin (1989), Franklin and Forman (1987), Franklin et al. (1987), Harris (1984), Jackson (1979), Lindzey and Meslow (1976), Mannan (1980), Mannan et al. (1980), Marzluff and Lyon (1983), McClelland (1977), Norse et al. (1986), Oliver and Larson (1990), Robinson (1988), Rochelle and Bunnell (1979), Scott and Oldemeyer (1983), Thomas (1979), Thomas et al. (1976, 1978), Waring and Schlesinger (1985)