SNAGS AND DOWNED WOOD HABITAT

Analysis Area

All lands within the boundaries of the Beta, Doe, Blackfoot, and Ball Fires (Exhibit Rg-2) were considered for the evaluation of direct and indirect effects on snags and downed woody material habitat. This approximately 49 square mile area (about 32,000 acres) is large enough to include the home range of numerous wildlife species using snag and downed woody material habitats and is representative of effects of fires, natural tree mortality, timber harvest, and firewood cutting across the landscape. All of the actions proposed in the alternatives that could directly or indirectly affect this resource are contained within this area. The remaining area on the west side of Hungry Horse Reservoir was added to the above for the consideration of cumulative effects, totaling approximately 270 square miles (about 172,900 acres; Exhibit Rg-2). A larger-scale assessment was also conducted to address population viability concerns (Exhibit Rg-5).

Information Sources

Data used in this analysis included pre-fire and post-fire aerial photography, stand exams, field surveys of snags and downed logs, post-fire old growth surveys, post-fire walk-through surveys, fire severities, road locations, and Northern Region Vegetation Mapping Project (R1-VMP) data (Exhibits Rd-3 and Rd-5, and project record section Q).

This analysis covered the standing and downed dead wood resource in terrestrial areas. See the Fisheries section of this document for consideration of large wood recruitment in aquatic systems. Also, see sections in this chapter on Old Growth Habitat and Old Growth Associated Wildlife Species and on Black-backed Woodpeckers.

Affected Environment

General Dead Wood Habitat

Snags, broken-topped live trees, downed logs, and other woody material are required by a wide variety of species for nesting, denning, roosting, perching, feeding, and cover (Bull et al. 1997). DecAID (Marcot et al 1999) lists 57 wildlife species plus four species groups associated with snags and 20 wildlife species associated with hollow living trees. These lists are for eastside mixed conifer forests of the Rocky Mountains with an open canopy; other wildlife species would be associated with closed canopy forests such as what was present prior to the fires. It is estimated that about one third of the bird and one third mammal species that live in the forests of the Rocky Mountains use snags for nesting or denning, foraging, roosting, cover, communication, or perching. On the Flathead National Forest, at least 42 species of birds and 10 species of mammals are dependent on dead wood habitat for nesting, feeding, or shelter (Exhibit Rd-2). In addition, large snags and downed wood play central roles in diverse ecosystem processes and functions such as nutrient recycling, shelter for growing trees, and habitat for wildlife and fish (Rose et. al 2001).

This reliance on dead wood habitat occurs at a variety of scales, from large landscapes to small patches of individual snags or downed logs. The more mobile species that depend on dead wood habitat include black bears, Canada lynx, wolverines, marten, fisher, bats, woodpeckers, and small owls. Less mobile species that depend on dead wood include snowshoe hares (the primary prey of Canada lynx), red-backed voles (the primary of prey of marten, fisher, boreal owl, northern goshawk, and several other species), shrews, bryophytes, lichen, fungi, and protozoa (Bull and Blumton 1999, Raphael and Jones 1997; Brown et al. 2003). Bunnell et al. (2002) state that "dispersed retention of trees and snags strongly favors secondary cavity nesters and increases their abundance above that found in mature or old-growth forests." Many cavity excavators benefit further from leave patches in addition to dispersed retention of snags and trees (Saab and Dudley 1998, Bunnell et. al 2002). The scientific literature contains a wide variety of recommendations for desired densities of dispersed large snags and amounts left in patches (Agee 1998, Saab and Dudley 1998, Bull and Holthausen 1993, Bull 1994, Marcot et al. 1999, Lyon et al. 2000, Bunnell et al. 2002, Brown et al. 2003).

Species that use dead wood in the post-fire environment appear to use species-specific microhabitats. Homogenously managed stands are likely to not provide habitat for many species (Tobalske et al. 1991, Hutto 1995b, Saab and Dudley 1998, Lyon et al. 2000, Saab et al. 2002, Brown et al. 2003). Likewise, any one stand would not be expected to provide habitat for all cavity-using species. Vegetation and snag conditions are naturally diverse across a forested landscape, including the West Side Fire areas. Maintaining this diversity would provide a wide variety of habitat conditions for bird, mammal, reptile, and amphibian species, as well as for a great variety of invertebrates and plants. Maintaining ecological diversity at all scales is the "key to retaining resilience" to future stresses or changes (Franklin et al. 1989).

Standing and downed dead trees have many ecological roles in a landscape recovering from wildfire (Beschta et al. 1995). Deadwood habitat management in post-fire situations differs from that of green forests in several ways. Often, few or no green trees exist to replace snags that fall over time. Snags in such stands would not become available again until a new forest develops that has trees that are large enough and with sufficient decay. Some species, such as black-backed woodpeckers and olive-sided flycatchers, appear to respond positively to the high densities of snags in burned forests and may depend on them. Hutto (1995b) found that 15 species of birds were more frequently found in post-fire habitats that in any other major cover type in the northern Rockies.

In the West Side Fire areas, the snag and downed wood habitat has been influenced by human presence--introduced tree diseases, fire exclusion, timber harvest, firewood cutting, and roads (Exhibit Rd-3). About 15 percent of the land in the 31,600 acres in the fire areas had commercial regeneration timber harvest prior to the fires (33% of the suitable timber base). Another six percent had non-regenerating timber harvest, which included some timber salvage. None of this harvesting was done after Flathead Forest Plan Amendment 21 (USDA 1999a) came into effect in January 1999, although the shelterwood and salvage units may have met the later Amendment 21 standards for snags and downed wood. *Whitebark pine was historically a major species in most stands at the upper elevations in the South Fork of the Flathead River drainage, but mountain pine beetles and introduced blister rust have killed most of the whitebark pine trees. All areas burned in 2003 are currently closed to firewood gathering until timber salvage activities are completed.

Prior to the West Side Fires, much of the surrounding area had not experienced a significant fire event for the last 75 to 100 years, and perhaps as long as 250 years in some portions of the project area. Although fire starts occur frequently from summer lightning storms, fires greater than one acre have been rare since 1929. Large larch snags still stand from some of the past fires. See the subsections on "Snag Habitat" and "Downed Wood Habitat", as well the Vegetation and Fire sections of this document for more information.

Snag Habitat

The number, species, size, and distribution of available snags strongly affect snag-dependent wildlife. Bull et al. 1997, summarized the needs for snag distribution where the objective is to provide viable populations of primary and secondary cavity nesters. This includes providing large-diameter snags where available, snags in a variety of structural classes, and snags in every 5 to 25 acre stand and in clusters if available. Too few suitable snags may limit or eliminate populations of cavity-using species (Raphael and White 1984, Thomas et al. 1979, Saab and Dudley 1998, ICBEMP 2000). Snags with old nesting cavities, broken tops, and decay are most likely to be used (Bull et al. 1986). The larger the diameter of the snag, the less the nestlings are crowded and the better they are protected from weather and predators. Cavity-using birds have been proven to substantially reduce tree mortality and damage caused by forest pest insects (Beebe 1974; Otvos 1979; Torgersen, Mason, and Campbell 1990; Torgersen 1996; Bull et al. 1997). The presence of snag-dependent species is also beneficial for many kinds of wildlife that are not strongly associated with snags.

Large-diameter snags are an especially important component of a burned landscape. Although smaller creatures can use many sizes of dead trees, larger birds and mammals require larger snags, and the larger the snag is, the more species can use it. The pileated woodpecker builds cavities that are then used for years by many other species, but it has very low nestling survival in any snag or tree smaller than 20" DBH. Large snags (especially western larch and ponderosa pine) remain standing longer, increasing the chance that suitable decay conditions will develop for cavity-using species. Wind buffering by neighboring snags or trees helps keep a snag standing, as do the interconnected roots of neighboring snags.

Research has shown that for these fire areas western larch and to a lesser extent Douglas fir snags are the tree species that will be predominately used by cavity-using birds and mammals. Both are resistant to windthrow and have preferred decay characteristics. Historically, large-diameter western larch has been harvested because of its high value as a timber commodity and for fuel wood. In these fire areas, western larch is the most valuable species for a suite of vertebrates. Large diameter western larch is strongly selected by many species of cavity-using wildlife because it provides some of the most suitable nest and roost sites, owing to the characteristics of the wood and its decay patterns (McClelland 1979, Bull et al. 1997). Specifically, western larch is much more susceptible to heart rot making it easy to excavate while retaining a very durable outer shell. Smaller-diameter snags do also get some use as nest habitat. However, their greatest value in the post-fire environment is for feeding habitat, particularly when high densities of smaller-diameter snags are available.

Across the West Side Fire areas, the overall availability of snag habitat is currently high (Table 3-86). Snag habitat conditions in burned areas were modeled by first looking at pre-fire vegetation conditions and then applying vegetation fire severities (Exhibit Rd-3). The 2003 West Side Reservoir Fires burned about 7900 acres at low severity, 9300 acres at moderate severity, and 13,000 acres at high severity. Much of this is smaller diameter material or is made up of tree species that typically get less use as nesting snags. However, many large-diameter western larch and Douglas-fir snags exist (Exhibit Rd-3). Moderate or severe fire burned most of the stands that had been previously harvested by clearcutting, seedtree, or shelterwood methods. These stands typically had 5 to 15 larger trees left per acre for seed trees or shelter, and post-fire surveys revealed that 25 to 100 percent of them are now snags. Over 1000 acres were left unburned within the fire perimeters (10% of Beta, 4% of Doe, and 3% of the Blackfoot Fire). Little of this is expected to have large numbers of larger-diameter snags, although snag conditions in the low intensity burn areas are quite varied. Unburned pole-sized stands, seedling/sapling stands without a large amount of overstory, or other non-forested areas such as shrubfields, rock, rivers, and wetlands, make little contribution towards snag habitat.

Table 3-86. Estimated Densities of Large Western Larch and Douglas-fir Snags Killed by the West Side Reservoir Fires of 2003. Based on pre-fire stand-exam data and vegetation fire severities (Exhibit Rd-3).

	Beta/Doris Fire Area	Blackfoot/Doe Fire Area	Ball Fire Area
Acres with stand exam data	2401 acres	6312 acres	3933 acres
% of area with zero per acre Larch or Douglas-fir 21"+ DBH	28.5%	26.6%	14.5%
% of area with > 0 to < 7 per acre Larch or Douglas-fir 21"+ DBH	60.1%	52.0%	70.6%
% of area with 7 to < 16 per acre Larch or Douglas-fir 21"+ DBH	10.5%	16.3%	13.9%
% of area with 16 to < 22 per acre Larch or Douglas-fir 21"+ DBH	0.0%	3.1%	0.9%
% of area with > 22 per acre Larch or Douglas-fir 21"+ DBH	0.8%	1.3%	0.0%
Highest Density of fire-killed Larch or Douglas-fir 21"+ DBH in Fire Area	18.9 snags/acre (20 acres)	31.5 snags/acre (12 acres)	17.1 snags/acre (36 acres)

In 2003, another five large fires burned from 6 to 28 miles from the West Side Reservoir Analysis Area. These fires--Robert, Rampage, Little Salmon Creek, Mid, and Harrison Fires--encompassed 126,000 acres of mostly Flathead National Forest and Glacier National Park. Over half of this is not under consideration for salvage. Wilderness and roadless areas in the

West Side Reservoir Analysis Area are also not being considered for salvage, but most of this area naturally supports few or no large larch or Douglas-fir trees.

In the Westside Reservoir area, tree species that are resistant to windthrow are also unlikely to be killed by low-severity fire. In addition, many existing large snags are not typically destroyed by low-severity fire. On the other hand, in stands that are dominated by spruce or sub-alpine fir or by pole-sized trees of any species, nearly all the trees die soon after fire. In all but the most severely burned areas, additional spruce and Douglas-fir trees could be killed by bark beetles in an epidemic situation (see the Bark Beetle section of this document and Appendix E for more information on the potential for insect-killed trees).

Downed Wood Habitat

Downed trees and other woody material are critical for many species. In the Pacific Northwest, 47 vertebrate species respond positively to down wood (Bunnell et al. 2002). Downed logs and stumps are required for denning and resting, are vital for hunting below the snow in winter (Buskirk and Ruggiero 1994), and are also used as travel cover, particularly when living plant cover is absent. For instance, marten often den and forage in the under-snow cavities that occur under downed logs. All Canada lynx dens found so far in Northwest Montana are associated with abundant woody debris, usually large diameter logs. Winter wrens do most of their feeding underneath suspended logs (Stewart, et al., 2004). Several amphibians and reptiles make use of large woody debris for shelter and breeding sites (Bull et al., 1997). Many ant species that need large-diameter downed logs prey on defoliating insects such as western spruce budworm (Torgersen and Bull 1995). Longer and larger-diameter downed trees are generally most important because they can be used by a far greater range of species. In addition, they provide stable and persistent structures as well as better protection from weather extremes. A variety of sizes and decay classes are needed in downed wood "in order to conserve functional processes that foster sustainable forest ecosystems" (Torgersen and Bull 1995).

Many areas burned by the fires are currently low to very low in large downed wood habitat, especially where timber was harvested before the fire. Such areas probably do not currently provide habitat for species like the marten, which appear to depend on living forests that are rich in large downed wood (Bull and Blumton 1999, Buskirk and Ruggiero 1994). Due to the fire, this situation would change dramatically over time, as described in the Direct and Indirect Effects sections below. Some areas in the fire area probably had high amounts of larger downed wood prior to the fire, due to the advanced age and the late successional stage of many stands (i.e. over 250 years since last major fire). Over time, stands experience varying degrees of mortality as individual trees succumb to insects, diseases, blowdown, or any number of other factors.

Downed log habitat modeling was based on pre-fire vegetation and fire severities, generally occurring 20 to 50 years after the fire (Exhibit Rd-3). The newly created snags would fall over time (Lyon 1984; Harrington 1996; Stewart, et al., 2004) with the rate varying by species, age, pre-fire vigor, type and extent of fire injury, exposure to wind, slope position, soil moisture, water table depth, etc. Field inventory of current downed log conditions in most of the burned areas would not provide information of value for this analysis, as fire-killed trees have only just begun to fall. It was assumed that, unless salvaged or cut for firewood, most of them would eventually be full-length downed logs. Once a log is on the forest floor, its size seems to be much more important than its species. For downed wood habitat in unburned areas, we used data collected in a drainage 28 miles to the northwest and ecologically very similar to the West Side Reservoir area (Exhibit Rd-3). Mid-seral/structural (pole-sized) forests averaged 8 tons per acre of 11 to 30 inch diameter downed logs; late-seral/structural forests averaged 17 tons per acre. Most of the burned areas currently have much less than these amounts.

Environmental Consequences

Effects on snags and downed wood habitats and the species that use them relate directly to one issue discussed in Chapter 1. This is Issue #1, “Not enough snags are being left on the landscape”. The issue indicators used involve: average density of large larch and Douglas-fir after salvage across salvage units that support these trees, and percent of area with high densities of large larch and Douglas-fir after salvage. Three other issues are also related to snag and downed wood habitats. Issues #9 and #10, regarding salvage of possible, recruitment, and burned-up old growth, are important due to the many ecological connections between dead wood habitats and old growth habitats. Issue #5, which includes open road density standards, is relevant due to the vulnerability of snag and downed wood habitats to firewood cutting.

Direct and Indirect Effects

Alternative A (No Action)

The effects of the no action alternative on wildlife that use dead wood as habitat would vary over time and space. In the short term, this alternative would favor species associated with recent burns and the resulting large amount of snag and downed wood habitat and insectivorous prey (Hutto 1995, Saab and Dudley 1998, Smith 2000). Black-backed, three-toed, and hairy woodpeckers would find an abundance of habitat and would excavate cavities for many secondary cavity nesters such as bluebirds, kestrels, and chickadees. These and other species would best be able to respond to any future insect outbreaks under the No-Action Alternative. As snag attrition occurs and vegetation succession proceeds, the abundance of bird species associated with the recent burn would decline. Mammals and birds that use large standing or downed dead trees for denning, feeding, security cover, and dispersal would increase as vegetation recovers. As the new forests mature and age, the remaining large snags and downed logs would again make the West Side Reservoir Fire areas highly suitable for pileated woodpeckers, brown creepers, northern flying squirrels, southern red-backed voles, boreal and saw-whet owls, and many of the other species identified as old-growth associates (Flathead Forest Plan Amendment 21, USDA 1999a; Warren 1998). This would be particularly true in areas that were old growth habitat before the fires, due to the abundance of pre-fire tree decay allowing for easier excavation and the structural complexity of the habitat. Table 3-87 displays the estimated density of large-diameter western larch and Douglas-fir killed by the 2003 West Side Reservoir Fires.

Table 3-87. Estimated Existing Density of Fire-Killed Large Western Larch and Douglas-fir Snags Across Fire Areas. Based on pre-fire stand-exam data and vegetation fire severities (Exhibit Rd-3).

Fire Area	Number per Acre of Fire-killed Larch and/or Douglas-fir that are 21+" DBH	Percent of Each Fire Area
Beta/Doris	0 per acre	28.5%
	> 0 to < 7 per acre	60.1%
	7 to < 16 per acre	10.5%
	16 to < 22 per acre	0.0%
	> 22 per acre	0.8%
Blackfoot/Doe	0 per acre	26.6%
	> 0 to < 7 per acre	52.0%
	7 to < 16 per acre	16.3%
	16 to < 22 per acre	3.1%
	> 22 per acre	1.3%
Ball	0 per acre	14.5%
	> 0 to < 7 per acre	70.6%
	7 to < 16 per acre	13.9%
	16 to < 22 per acre	0.9%
	> 22 per acre	0.0%

In this alternative, no additional snags would be felled except where they pose a serious threat to human safety, such as along trails and near administrative sites. No additional downed logs would be removed. This would leave snag and downed wood habitat to continue with relatively natural processes, along with future fire suppression and firewood cutting. Some of the fire-stressed trees would continue to die and bark beetle populations would be expected to increase, creating more snags over a larger landscape, as described in the Vegetation section of this chapter. In most areas, the bulk of the fire-killed trees are expected to be down within 15 to 50 years. Many of the larger, wind-throw resistant snags such as western larch would likely still be standing after 50 or 100 years. By that time, some of the trees that were not injured by the 2003 Fires would also have become snags, but most of the trees would still be too small to be of significant value as snags.

Alternative A would provide for the greatest number of snags for primary and secondary excavators. All existing snags would be available in several size classes with differing densities. In some areas, snag levels retained would be higher than 17 snags per acre, so snags levels would likely be above four soft snags per acre after 15 years. It is expected that the large diameter snags would remain standing for 20 to 30 years. This alternative provides the greatest opportunity to provide snag numbers that meet 100% population potential in the short term and long term. For more information related to cavity nesting birds, see the Black-Backed Woodpecker and Neotropical Migratory Bird sections of this chapter.

Research indicates that about half of the snags within 200 feet of roads are felled for firewood, especially when vegetative cover has been removed (Bate and Wisdom, draft 2004; Exhibit Rd-7). Large western larch, ponderosa pine, and Douglas-fir snags are very rare along open roads in northwest Montana. Firewood cutters using cable and winch systems can easily access standing or downed dead trees in about five percent of the analysis area, where forests are within 200 feet of roads that are either open yearlong or seasonally (Exhibit Rd-3). Firewood cutting is prohibited within 300 feet of any stream, river, or lake across the Flathead National Forest (Exhibit Rd-6). This should protect snags and downed wood along the creeks flowing into Hungry Horse Reservoir, as well as along the reservoir itself. In addition, many of the highest-quality snags near open roads in the fire areas were marked as protected wildlife trees in summer 2004.

As snags begin to fall, down wood levels would greatly increase thereby increasing denning, nesting, and feeding habitat for down wood dependent species. In the long term, the levels of down wood would exceed the standards and guidelines of Amendment 21. The areas that were mature and old growth forests before the fires are expected to have large amounts of persistent, large downed wood in 15 to 50 years (Exhibit Rd-3). Some areas of riparian spruce bottoms already have extensive blowdown. Soil and nutrient-cycling conditions would be likely to improve as the organic matter from the logs incorporated (Brown et al. 2003, Steward, et al. 2004; See also the Soils section of this chapter). Downed logs, shading from snags, and lack of seed sources may delay the regeneration of new trees in some stands. The intensity of a future fire would increase as snags fall and new understory growth contributes more fine fuels, as described in the Fire and Fuels section of this chapter. Under this alternative, ecosystem function would move in the direction of historic ecological cycles.

Direct and Indirect Effects Common to All Action Alternatives

The Action Alternatives would salvage some of the burned areas while leaving a diversity of conditions and working with variations in pre-fire vegetation and fire severities. The site-specific snag prescriptions for the West Side Reservoir Fire areas were based on field data on the availability of live and dead trees; fire severities; scientific literature; and experts in post-fire ecological processes, silviculture, timber salvage systems, and safety. These features are design criteria for all action alternatives. This is in recognition of the current conditions and the extent of past actions in the analysis area and certain elements of the proposed salvage. For example, most of the burned-up old growth habitat would be salvaged, as would many acres of burned whitewood forests that have few or no large larch or Douglas-fir trees or snags.

The prescriptions are detailed in the alternative descriptions in Chapters 1 and 2 of this document and Exhibit Rd-8, with specifics about the rationale for each aspect of the prescriptions. In summary, all live trees and snags designated for retention would be left standing wherever possible in all action alternatives. Leave patches would be retained in some units to ensure that some of these snags remain in units. They will also provide post–fire salvage leave patch habitats, which have been shown to have higher use and nest success as opposed to individual snags left scattered across the landscape (Saab and Dudley 1998, Bunnell et al. 2002). High-quality wildlife snags left within 200 feet of an open road would be signed and painted to protect them from firewood cutting; most other snags within this road corridor would be salvaged. Elements that vary by alternative are discussed in separate sections below.

All management practices and natural processes have negative effects on some species and positive effects on others. Leaving a full range of diverse conditions within all of the fire areas is the way to ensure that all pieces will remain. In order to manage for all wildlife species in post-fire habitats, research has shown the landscape should be managed for a variety of snag densities across the burned area (Saab and Dudley 1998, Saab et al. 2002). To mimic historic or "natural" conditions, a mix of clumps and more widely distributed snags should occur within and among stands. Successful management and conservation of snag-using wildlife depend upon maintaining a sufficient number of large-diameter snags on a continuing basis.

All action alternatives would use the default Amendment 21 course woody debris standards for Moist Potential Vegetation Groups in the salvage harvest units. This would be provided by un-merchantable pre-fire down wood, un-merchantable material left standing, later windfall of leave trees and snags, felled hazard or un-merchantable trees, and unentered leave patches. These standards may retain adequate numbers and distribution of large downed logs for most wildlife species. It should be noted that the log distribution would be highly variable across both fire landscapes due to pre-fire variations in vegetation, as well as the variation in fire severities. See Exhibit Rd-8 and the features common to all alternatives in Chapter 2 for more information.

Salvage harvest activities between May and August may have direct effects on individual cavity-nesting birds. Snags with existing cavities would be retained wherever it is safe to do so, however some would be removed for safety reasons. If a cavity-nesting bird were to be using the snag at the time of salvage operations, the nest and/or birds could be destroyed. Noise from the various proposed activities may impact juvenile dispersal, or may cause premature displacement of young or cause young to be prematurely abandoned. This would be expected to be limited. Although little is known about the effects of salvage logging in stand replacement fires on nest success of cavity nesters, it is expected that salvage of snags under this alternative could have negative effects on the occurrence and numbers of some species.

All action alternatives would also plant new trees in specific areas both inside and outside of salvage harvest units allowing snags to become available sooner than otherwise. The planted trees would begin to provide canopy closure sooner than if trees were to regenerate naturally. Construction of one mile of trail could require clearing of a relatively small amount of downed trees and felling of hazard trees.

Alternatives B and C

Under Alternatives B and C, approximately 4900 and 3900 acres of timber salvage, respectively, would affect densities of large and small deadwood habitat (Tables 3-88 to 3-90, below). Helicopter logging would occur on 2860 to 3513 acres, requiring felling of additional snags and other hazard trees in and near units and an expected 46 to 52 helicopter landings. In general, this would require felling of hazard trees within 1.5 tree lengths, with additional distance required for landings which may also need clearing for a flight path. Skyline logging would occur on 690 to 785 acres, requiring felling of all trees, live or dead within cable corridors, as well as the felling of nearby hazard trees. Temporary road construction would not require felling of snags other than occasional hazard trees, as this will occur only on former road templates. Other effects are as described above for all action alternatives.

Table 3-88. Acres by Snag Emphasis Level across Fire Areas, Alternatives B and C. See Exhibit Rd-8 and the alternative descriptions and tables in Chapter 1 and 2 for unit-specific information.

Snag Emphasis Level	Beta/Doris Fire		Doe Fire		Ball Fire		Blackfoot Fire	
	Alt. B	Alt. C	Alt. B	Alt. C	Alt. B	Alt. C	Alt. B	Alt. C
High (1)	598 ac	1274 ac	312 ac	312 ac	1351 ac	979 ac	734 ac	601 ac
High with an edge on open road (1 & 3)	1398 ac	423 ac	0 ac	0 ac	0 ac	0 ac	200 ac	161 ac
Moderate (2)	96 ac	114 ac	63 ac	58 ac	388 ac	263 ac	708 ac	592 ac
Moderate with an edge along open road (2 & 3)	39 ac	22 ac	0 ac	0 ac	0 ac	0 ac	139 ac	127 ac
Low (3)	82 ac	26 ac	0 ac	0 ac	0 ac	0 ac	20 ac	0 ac

In addition to the live and dead retention trees described above for all action alternatives, most of the units in Alternatives B and C would have dispersed larch and Douglas-fir trees and un-entered leave patches (Table 3-88; alternative descriptions and tables in Chapters 1 and 2; Exhibit Rd-8). The retention tree diameters would be higher in the Blackfoot and Doe Fires. This is due to the greater number of large trees existing in these fire areas (Table 3-A). The number and density of remaining western larch snags would vary considerably between salvage units due to natural pre-fire variations in vegetation, stand site potential, burn severity, logging systems, and safety concerns.

Table 3-89 provides the percent of all lands with and without high densities of large-diameter western larch and Douglas-fir. High density was defined as 16 or more per acre of live or dead trees 21” DBH or greater. There is relatively little difference in this index in any of the fire Areas when comparing Alternatives B and C to the No Action alternative, with the exception of the nearly 20% reduction in high-density large snag habitats in the Beta/Doris Fire Area.

Table 3-89. Percent Across Fire Areas With and Without High Densities of Live and Dead Large Western Larch and Douglas-fir, by Alternative (Exhibit Rd-4).

Fire Area	Alternative A	Alternative B	Alternative C	Alternatives D and E
Beta/Doris	4.5% with 95.5% without	3.7% with 96.3% without	4.3% with 95.7% without	1.5% with 98.5% without
Blackfoot/Doe	10.2% with 89.8% without	8.7% with 91.3% without	9.6% with 90.4% without	8.4% with 91.6% without
Ball	7.7% with 92.3% without	6.8% with 93.2% without	7.6% with 92.4% without	3.4% with 96.6% without

Table 3-90 displays the estimated densities of live and dead large western larch and Douglas-fir snags within the boundaries of the Proposed Action units, assuming that these are deemed safe to leave standing. This accounts for snags as they would remain in the various "snag emphasis level" areas, and includes snags that would be left in unentered patches. As expected, Alternatives B and C would increase the percent of unit acres that have fewer than seven large trees or snags per acre. There would be relatively little change in the proportion where these trees are either lacking or abundant (>22 per acre), with the exception of a halving of the area with high densities in the Blackfoot Fire with Alternatives B and C.

Table 3-90. Estimated Density of Live and Dead Large Western Larch and Douglas-fir Snags in Salvage Units, by Alternative. Based on pre-fire stand-exam data (Exhibit Rd-4).

Fire Area	Number per Acre of Larch and/or Douglas-fir that are 21+" DBH After Salvage	Percent based on Proposed Action Units			
		A	B	C	D and E
Beta/ Doris	0 per acre	24%	28%	23%	28%
	> 0 to < 7 per acre	36%	56%	51%	57%
	7 to < 16 per acre	36%	14%	21%	16%
	16 to < 22 per acre	4%	3%	5%	0%
	> 22 per acre	0%	0%	0%	0%
Blackfoot/ Doe	0 per acre	7%	8%	7%	18%
	> 0 to < 7 per acre	21%	49%	44%	49%
	7 to < 16 per acre	55%	32%	32%	23%
	16 to < 22 per acre	10%	8%	12%	8%
	> 22 per acre	7%	3%	4%	2%
Ball	0 per acre	5%	7%	6%	8%
	> 0 to < 7 per acre	38%	42%	39%	72%
	7 to < 16 per acre	43%	40%	40%	19%
	16 to < 22 per acre	12%	9%	12%	1%
	> 22 per acre	2%	2%	3%	0%

Table 3-91 displays the average densities of large larch and Douglas-fir that would remain after salvage, based on the areas that support these trees within the Proposed Action unit boundaries. These are both live and dead trees, due to the concern for recruitment of large snags over the rotation of the stands. Alternative B would fail to leave an average of at least seven per acre of these large trees across the Beta Fire area. Alternative C would leave an average of seven or more across all fire areas, due to excluding salvage from possible or recruitment old growth forest.

Table 3-91. Average Density, by Fire Area, of Live and Dead Large Western Larch and Douglas-fir that are 21" DBH or greater in Salvage Units that Support These Trees, by Alternative (Exhibit Rd-4).

Fire Area	Alternative A	Alternative B	Alternative C	Alternatives D and E
Beta/Doris	7 per acre	6 per acre	7 per acre	4 per acre
Blackfoot/Doe	11 per acre	7 per acre	9 per acre	6 per acre
Ball	10 per acre	8 per acre	10 per acre	5 per acre

Unsalvaged areas around the units, in and adjacent to riparian areas, and in roadless areas would provide sufficient habitat for black-backed woodpeckers and other species that rely on dense, severely burned post-fire habitat. For more information, see the Black-Backed Woodpecker section of this chapter.

Some units were past seed-tree or shelterwood units that were later burned by the West Side Reservoir Fires. Several of these stands lack any live or dead trees to contribute additional snags or downed wood for many years. In addition, many of the units are nearly surrounded by past regeneration harvest. Much of this was clear-cutting done in the 1960s and 70s. The 2003 West Side Fires burned most of it at moderate or high severities, leaving few live trees to provide large snags and downed wood in the future. These trees were originally left to provide seed and shelter for growing trees, and to function as larger-diameter wood for a healthy ecosystem.

Alternatives B and C would retain the largest-diameter western larch and Douglas fir snags dispersed in the salvage units. However, in Alternative B, the unentered leave patches would typically be located within and adjacent to linear and patchy riparian areas, in and around archeological sites, in and around sensitive plant species areas within and adjacent to units, and in blind leads and other inoperable areas. Alternative C would drop many areas of possible post-fire old growth habitat and recruitment old growth that would typically provide the best areas for snag patches within the units.

Changes to public motorized access vary between Alternatives B and C. Such access would decrease in Alternative C. This would protect additional acres of snag habitat from firewood cutting, allowing more snags to be retained in salvage units along roads that would be open under Alternative B. Most of the reduction in the "low" snag emphasis level (Table 3-88) is due to this change.

Under Alternatives B and C, long-term snag and downed wood within the salvaged units would likely be sufficient for wildlife, even when considering landscape scales, although cavity nesters could be slightly less able to respond to insect outbreaks due to the removal of snag habitat. As the new forests mature and age, the remaining large snags and downed logs in the units and across the West Side Reservoir Fire areas would again make the area highly suitable for old-growth associated species and other users of snag and downed wood habitats. Particularly in Alternative C, the variety of patch sizes and composition is expected to help retain habitat for the needs of the diverse species that have various habitat needs, which include home range size and territories.

Alternatives D and E

Alternatives D and E salvage most of the units and acres proposed in Alternative B, but with fewer snags retained scattered in units and in unentered leave patches, as discussed below. Similarly, there would be less large down wood habitat available over the long term. Approximately 5300 acres of timber salvage would affect densities of large and small deadwood habitat (Tables 3-92, below, and 3-88 through 3-91 above). Helicopter logging would occur on 3760 to 3804 acres, requiring felling of additional snags and other hazard trees in and near units and an expected 52 helicopter landings. In general, this would require felling of hazard trees within 1.5 tree lengths, with additional distance required for landings which may also need clearing for a flight path. Skyline logging would occur on 871 to 875 acres, requiring felling of all trees, live or dead within cable corridors, as well as the felling of nearby hazard trees. Temporary road construction would not require felling of snags other than occasional hazard trees, as this will occur only on former road templates. Other effects are as described above for all action alternatives or Alternatives B and C.

Table 3-92. Acres by Snag Emphasis Level across Fire Areas, Alternatives D and E.

Snag Emphasis Level	Beta/Doris Fire		Doe Fire		Ball Fire		Blackfoot Fire	
	Alt. D	Alt. E	Alt. D	Alt. E	Alt. D	Alt. E	Alt. D	Alt. E
High (1)	1791 ac	598 ac	312 ac	312 ac	1335 ac	1351 ac	936 ac	734 ac
High with an edge on open road (1 & 3)	195 ac	1398 ac	0 ac	0 ac	0 ac	0 ac	206 ac	200 ac
Moderate (2)	131 ac	96 ac	63 ac	63 ac	404 ac	388 ac	600 ac	708 ac
Moderate with an edge along open road (2 & 3)	50 ac	0 ac	0 ac	0 ac	0 ac	0 ac	42 ac	139 ac
Low (3)	16 ac	82 ac	0 ac	0 ac	0 ac	0 ac	9 ac	20 ac

Refer to Tables 2-5, 2-6, and 2-9 for unit-specific information and Exhibit Rd-4.

The deadwood prescription in Alternatives D and E were altered to leave fewer dispersed trees and unentered leave patches (Table 3-92; alternative descriptions and tables in Chapters 1 and 2; Exhibit Rd-8). Only the largest diameter western larch and Douglas fir snags would be retained in the salvage units, with many other large larch and Douglas-fir salvaged (Table 3-90, above). As expected, Alternatives D and E would increase the percent of unit acres that have fewer than seven large trees or snags per acre. There would be a dramatic decline in the amount of area with high or moderately high densities (>16 per acre) of these trees in the Beta/Doris and Ball Fire Areas. Alternatives D and E would fail to leave an average of at least seven per acre of these large trees across any fire area (Table 3-91, above). Table 3-89, above, shows that Alternatives D and E would reduce the areas with high densities of large, live or dead larch and Douglas-fir by about 20% in the Blackfoot and Doe Fire Areas, by about 60% in the Ball Fire Area, and by about 70% in the Beta/Doris Fire Area.

Changes to public motorized access vary between Alternatives D and E. Such access would decrease in Alternative C. This would protect additional acres of snag habitat from firewood cutting, allowing more snags to be retained in salvage units along roads that would be open under Alternative D. Most of the reduction in the “low” snag emphasis level (Table 3-92) is due to this change.

In many salvaged units, long-term snag and downed wood values would be less than optimal for some wildlife species; particularly those identified as old-growth associates (Flathead Forest Plan Amendment 21, USDA 1999a). Potential stand-level effects become important when one considers them in combination with the cumulative effects of past timber harvest, timber salvage, road construction, firewood cutting, and other factors discussed above and below for all action alternatives. Cavity-nesting species would be less able to respond to insect outbreaks due to the removal of a large amount of large snag habitat.

Cumulative Effects

Effects Common to All Alternatives

Throughout the Interior Columbia River Basin, densities of large-diameter snags (>21 inch DBH) have been reduced in roaded areas that have a history of timber sales (Hann et al. 1997; Hessburg et al. 1999; Quigley et al. 1996). Fire suppression efforts, salvage of fire-killed or insect-infested trees, beetle control efforts, firewood harvest, and prior harvest of extensive areas of dead and dying lodgepole pine and fire-killed trees have reduced the habitat potential for species that rely on dead and downed wood in northwest Montana (Harris 1999).

Across the Flathead National Forest, wildfires, insects, disease, and other natural processes have created innumerable snags and downed logs. Although some have been salvaged, others were left within and between cutting units. An extensive amount of dead trees also occur in wilderness and other areas that are not in the timber base. Bate and Wisdom (draft 2004; Exhibit Rd-7) studied snag resources in relation to roads and other indices of human access on the Flathead National Forest and found that stands with no history of timber harvest had three times the density of snags as stands that were selectively harvested, and 19 times the density as that in stands that had undergone a complete harvest. These results suggest that past timber harvest practices have substantially reduced the density of snags, and that snag losses have not been effectively mitigated under past management. The analysis for Flathead National Forest's Forest Plan Amendment 21 individually assessed the viability of old growth associated species and many others that use snags and downed wood habitat (USDA Forest Service 1999a)." See also Exhibit Rg-5.

Past timber harvest, roading, and reservoir filling in the cumulative effects area reduced the acreage of dense snag habitat later to be created by the 2003 West Side Reservoir Fires (Exhibits Rd-3 and Rd-9). Many thousands of acres of timber have been harvested on National Forest System land in the area since early in the last century Table 3-93). This harvesting has ranged from individual tree removals to complete clearcuts. The majority of these acres have regenerated into new young forests that have low levels of large-diameter snags. Several hundred miles of road have been built on federal land since the beginning of the last century. Along with trail construction, most of which took place prior to 1990, these travel routes require felling of a swath of potential hazard trees. The construction of Hungry Horse Dam and subsequent filling of Hungry Horse Reservoir in the 1950s has had a profound impact on snag and downed wood habitat in the area, inundating nearly 40 square miles.

Proposed and ongoing salvage, prescribed burn projects, and firewood cutting are expected to further reduce the availability of deadwood habitat. Open roads continue to provide access for firewood cutters, although the chance of firewood collection is greatly reduced when roads are bermed or decommissioned. Seven campgrounds, four boat launches, one work site, and numerous dispersed sites are expected to continue to de used, leaving snags and downed wood in short supply nearby. The situation is similar near the Heinrude Home Sites adjacent to Hungry Horse Reservoir and near Quintonkon Creek, where 19 home sites occupy the area.

Dispersed camping is nearly as popular and will continue. Short-term (less than three months), one-time opening of roads closed yearlong to public access for the purpose of firewood gathering. The cumulative effects area also includes about some areas burned by the West Side Reservoir 2003 Fires where timber salvage and firewood cutting is precluded.

Table 3-93. Pre-fire Harvest of Large-diameter Larch and Douglas-fir (Exhibit Rd-9).

Fire Area	Area with 4 or more per acre 17"+ Larch or Douglas-fir	
	Percent in 1940	1940's area harvested by 2001
Beta/Doris	73%	31% (1104 acres)
Blackfoot/Doe	48%	24% (2131 acres)
Ball	71%	26% (1520 acres)
Total	57%	26% (2845 acres)

Other actions have or are expected to directly affect snag habitat. Fire suppression efforts for the 2003 fires affected snag and downed wood habitat through fireline construction. In addition, hazard tree felling along roads in 2003 amounted to an expected 456 acres of wood product removal for the purpose of protecting firefighter and public safety. The removal of this material should be completed in 2004. A study designed to monitor the decay of western larch logs has been approved to take place in burned areas over the next several years, which may fell up to 400 apparently defect-free snags (Exhibit Rd-9). These snags will not be taken in any proposed salvage harvest units and will be taken in close proximity to roads. Individual snags will be taken in separate areas dispersed throughout both fire areas so the study is not expected to measurably affect snag numbers across the either fire landscape. Road maintenance and the construction and maintenance of trails would cause some hazard trees to be felled and fallen trees to be cleared from travelways. Some of the Burned Area Emergency Restoration activities in the post-fire environment, which will be completed in 2004, had some affects on deadwood habitat.

Some past, present, and reasonably foreseeable actions and activities would have minor or negligible effects on snags and downed wood habitat. These include precommercial thinning, tree and shrub planting, Christmas tree harvesting, noxious weed treatment, snowmobiling, trail riding, mountain biking, hunting, fishing, trapping, predator control, beaver control, high mountain lakes fisheries management, mushroom harvest, and periodic maintenance of fuel reduction zones.

REGULATORY FRAMEWORK

Pursuant to the National Forest Management Act, national forests must maintain habitat for viable populations of all native plant and animal species occurring in the planning area. A wide variety of wildlife species are dependent on the existence of standing snags and downed woody material (Bull et al. 1997). The Flathead's Forest Plan Amendment 21 (USDA 1999a) provides the current direction for snags and down wood material. Objective A4f is to "maintain appropriate tree species composition, size, and density of dead and defective trees and downed logs". Similarly, Objective A4h is to "provide sufficient retention of forest structure (large diameter live trees, snags, and coarse woody debris), to provide for wildlife movement through the matrix surrounding old growth forests." According to Standard H7 in Amendment 21, sufficient vegetation structure is to be retained in timber harvest areas consistent with native disturbance and succession regimes and provide for "long-term snag and coarse woody debris recruitment, essential soil processes, species habitat including feeding and dispersal habitat for small mammals and birds, and long-term structural diversity of forest stands". According to Vegetation Standard H7, the numerical standards offered in Amendment 21 do not apply when such a site-specific landscape analysis has been used to derive retention levels for this standard.

Additional standards given in Amendment 21 include managing for wildlife dependent on old growth. These are covered in the Old Growth Habitat and Old-Growth Associated Wildlife Species section of this chapter.

REGULATORY CONSISTENCY

A site-specific analysis of the past and existing condition snag and downed wood was done for the West Side Reservoir Post-Fire project in accordance with Amendment 21 (Exhibit Rd-3). Site-specific prescriptions for snags and downed wood are given in sections and tables in Chapters 1 and 2 of this document and detailed in Exhibit Rd-8.

The Forest Plan Objective and Standard for snag retention would be met in all alternatives (Exhibits Rd-3 and Rd-10). This is demonstrated by the following:

- All live trees would be excluded from harvest and would be left standing wherever safe to do so.
- All black cottonwood, quaking aspen, paper birch, and ponderosa pine snags would be left standing wherever safe to do so (few if any of these species are expected).
- Snags or trees >18" DBH with nest holes, broken tops, or pre-fire decay would be left standing wherever safe to do so.
- The largest-diameter western larch and Douglas-fir snags would be left dispersed across all units except where within 200 feet of roads open to public motorized use. The maximum diameters for removal were designated according to conditions in and around the salvage units (Exhibit Rd-8).
- Unentered leave patches would be left in all salvage units over 20 acres that were either severely or moderately burned or that had few large larch or Douglas-fir. Such patches would typically comprise riparian leave strips or areas that would be uneconomical for timber salvage. Although this is expected to be infrequent, additional areas would be excluded to bring a patch up to 15 or 25% if necessary, depending on the alternative selected.

The Flathead LRMP, as amended, has minimum numerical standards for downed woody material that would be met or exceeded in all harvest and burning units in all alternatives (Exhibits Rd-3 and Rd-10). This is demonstrated by the following:

- Except in limited situations, snags or live trees that are felled for safety concerns would be left on site.
- Wherever present, at least 32 downed logs per acre that are 9 to 20 inches in diameter and at least 20 feet long would be left evenly distributed across the units. If there are too few large enough logs, 6 to 9 inches in diameter logs may be substituted to reach this number of pieces.
- Wherever present, at least 15 downed logs per acre that are greater than 20 inches in diameter and at least 6 feet long would be left evenly distributed across the units.
- Site-preparation prescriptions would be designed to maintain as much of the larger downed material as possible and practicable.
- Unharvested dispersed and aggregated snags and live trees provide recruitment of future downed wood.

In addition, features common to all action alternatives contribute to snag and downed wood habitat conditions at landscape scales. These include retention of all material in contiguous unroaded areas and signing of high-quality snags along roads. In consideration of all direct, indirect, and cumulative effects described above, all alternatives comply fully with the snag and downed wood direction in Amendment 21 of the Flathead's Forest Plan. All alternatives would comply with NFMA direction that wildlife habitat be managed to maintain viable populations of existing native and desired non-native species well distributed across the planning area.

Additional standards given in Amendment 21 include managing for wildlife dependent on old growth. These are covered in the "Old Growth Habitat and Old Growth Associated Wildlife Species" section of this chapter.

This page left blank intentionally.