IV. WILDLIFE

A. Introduction

The proposed action would occur primarily within the burned portion of the Big Creek drainage. Pre- and post-fire wildlife habitat conditions within the Big Creek watershed have been described to varying levels of detail in two previous documents: Big Creek Geographic Unit Summary of Findings from the Ecosystem Analysis at the Watershed Scale (USDA Forest Service 1998) and *Wildfires of 2001; Post Fire Assessment, Flathead National Forest* (USDA Forest Service 2001). However, it is useful to provide an overview of the habitat values within the Big Creek drainage as a whole, for context, while recognizing that the proposed action would only directly affect a relatively small proportion of the Moose Fire affected area within Big Creek.

The Big Creek drainage has provided a set of habitat values not observed in many drainages of its size. It has provided habitat for all of the ungulates (except mountain goat), carnivores, and most of the avian, small mammal, and amphibian species known to occur on the Flathead National. Examples include:

- Year-round range for white-tailed deer, mule deer, elk, and moose.
- Year-round habitat for grizzly bear, lynx, and wolverine.
- Older aged forest habitats for species such as pine marten, fisher and other forest interior habitat specialists such as northern goshawk.
- Seasonal habitat for gray wolves.
- A wide variety of forest cover types and successional stages that include: dry ponderosa pine and Douglas-fir; western larch dominated conifer mixes; lodgepole pine; spruce/subalpine fir; and whitebark pine. Some of these forest types provide specific habitat values for some species. For example, Clark's nutcrackers are highly associated with whitebark pine; flammulated owls are associated with Douglas-fir/ponderosa pine; pileated woodpeckers are associated with mature/older aged western larch, and >20 inch in diameter.
- Harlequin ducks and river otters have been observed in or near Big Creek.

The Moose Fire caused significant habitat changes in the lower half of the Big Creek drainage and the existing condition of the burned area is that of the "beginning" of a forested landscape cycle where, assuming no re-burns occur within the next 100 years, most of the land that was a "green" forest before the fire can be expected to produce another forest. However, not all acres are equal in their potential to receive, germinate, and grow conifer seeds, so variations in the continuity, coverage, and species composition of the next generation of forests should be expected. Similarly, many factors (e.g. disease, predation, weather-related mortality, human influences, etc.) affect which, when and how wildlife species re-occupy and persist in a regenerating post-fire landscape. Salvage logging, road closures, and decommissioning can be expected to affect wildlife recolonization, use, and persistence in various ways. How much and with what level of intensity the Burned area is managed could have a tremendous influence on which (and when) wildlife species would be successful at repopulating and persisting in the area. Those wildlife species that used habitat within the fire area should be expected to return when conditions are favorable and their habitat needs can be met.

The proposed action contains two basic kinds of forest management activities that can affect wildlife habitat and wildlife use of habitat: 1) removal of dead and dying trees, and 2) road restrictions and decommissioning. The methods of operation (i.e. ground-based versus helicopter) can also affect wildlife. Determining which wildlife species are likely to be affected by these actions determined this analysis. In this context, Table 3-32 provides a synopsis of historical and current management indicator species (MIS) distributions at the sub-basin (rivers), sub-watershed, and project area geographical scales and was used to determine which species to carry forward into the analysis.

Table 3-32: Postulated historic and known current presence and distribution of management indicator wildlife species within the Moose fire affected area, Flathead National Forest.

Species	ST[1]	Historical Presence[2]			Current Presence[2]			Habitat Comments/Issues Related to Project Area
		NFSB	SW	PA	NFSB	SW	PA	
Bald Eagle	T	Y	S	S	Y	S	S	An active nest exists on the North Fork Flathead River within the fire perimeter; fall big game hunter kills may provide a food source.
Grizzly Bear	T	Y	Y	Y	Y	Y	Y	Habitat security is relatively low. One grizzly bear was known to have perished within the Moose fire near Mud Lake.
Gray Wolf	E	Y	Y	Y	Y	Y	P	Wolves have denned in the area; continued low use is expected.
Canada Lynx	T	Y	Y	Y	Y	Y	Unl	Some areas of drier, non-habitat are embedded within the project area. Most of the burned area is currently considered unsuitable.
Peregrine Falcon	RD	P	Unl	Unl	Unk	Unl	Unl	No known nesting sites, current or historical, have been documented in or adjacent to the burned area.
Flammulated Owl	S	Y	Unk	Unk	P	Unk	Unl	The pre-fire project area contained potentially suitable habitat attributes; highly doubtful now.
Harlequin Duck	S	Y	P	P	Y	P	P	Ducks have been observed in Big Creek.
Common Loon	S	Y	N	N	Y	N	N	There is no known breeding habitat for this species within the proposed salvage area: Mud Lake is marginal habitat at best.
Townsend's Big-eared Bat	S	P	Unk	Unk	P	Unl	Unl	No known caves that can function as hibernacula or maternity roosts known in the project area.
Black-backed Woodpecker.	S	Y	P	P	Y	P	P	Expected beetle outbreaks would provide a good forage base to support a woodpecker population increase.
Wolverine	S	Y	Y	P	Y	Y	P	This wide-ranging species likely may continue to visit ungulate winter ranges in the area for possible carrion.
Fisher	S	Y	P	P	Y	P	Unl	Mature and old growth forests adjacent to streams are preferred habitat conditions; none of this habitat exists in the Moose burned area.
Northern Goshawk	S	Y	P	P	Y	Unl	Unl	Mature and old growth forests, especially in riparian areas are preferred habitat conditions; none of this habitat exists in the Moose burned area.
Northern Leopard Frog	S	Unk	Unl	Unl	Unk	Unl	Unl	This species occurs in/near water in nonforest habitats. Closest reports about 30 miles to the northwest; riparian areas are protected habitats.
Boreal Toad	S	Y	P	P	Y	P	P	Breeding habitat occurs in lakes, ponds, slow streams, and ditches.
Northern Bog Lemming	S	Unk	Unl	Unl	Unk	Unl	Unl	There is no known habitat for this species within the proposed salvage area; known required habitat is protected.
White-tailed Deer	MIS	Y	Y	Y	Y	Y	Y	Year round use occurs.
Elk and Mule Deer	MIS	Y	S	S	Y	S	S	Year round habitat habitats exist.
Old Growth Species	MIS	Y	Y	Y	Y	Y	N	Moose fire eliminated habitat suitability for all old growth species.
Snags & Down Wood	MIS	Y	Y	Y	Y	Y	Y	Large diameter snags are currently at adequate levels.

[1]**ST = Status**; **T**=Federally Threatened; **E**= Federally Endangered; **RD**=Recently delisted, likely to be listed as Sensitive; **S**=Forest Service Region 1 listed as Sensitive; **MIS**= Flathead National Forest Management Indicator Species
[2]**NFSB**=North Fork Flathead River Sub-basin; **SW**=Sub-watersheds (Big, Langford, Lookout, Hallowat Creeks); **PA**=Moose Project Area vegetation treatment sites; **Y**=Yes; **N**=No; **P**=Probable (based on known habitat requirements); **Unl**=Unlikely (based on known habitat requirements; **Unk**=Unknown; **S**= Seasonal.

The criteria used for determining which species ***not to*** carry forward into the analysis phase included: no habitat for the species; it was unlikely (based on known habitat requirements) that the species existed in the area; and potentially suitable habitat for the species within the project area would not be affected by the project (Table 3-33). The remaining species, whose habitats may be affected by the proposed project, were used for estimating effects from the proposed action.

Table 3-33: Species and rationale for not being included in the effects analysis for the Moose Post-Fire Project.

Species	Rationale
1) Peregrine falcon	No nesting habitat in or adjacent to the burned area, therefore each of the alternatives in this project would have "no effect/impact" on peregrine falcon or its habitat;
2) Flammulated owl	All proposed salvaging would occur in unsuitable habitat, therefore each of the alternatives in this project would have 'no impact' on population viability of flammulated owls;
3) Harlequin duck	No salvaging would occur in or near Big Creek riparian area, therefore each of the alternatives in this project would have 'no impact' on population viability of harlequin ducks;
4) Common loon	No suitable habitat occurred within the proposed salvage area;
5) Fisher	Burned forests are unsuitable habitat for fisher, therefore each of the alternatives in this project would have 'no impact' on population viability of fisher;
6) Northern goshawk	Burned forests are unsuitable habitat for goshawk, therefore each of the alternatives in this project would have 'no impact' on population viability of northern goshawks;
7) Northern leopard frog;	No project activities would occur in or near potential suitable habitat, therefore each of the alternatives in this project would have 'no impact' on population viability of leopard frogs;
8) Northern bog lemming	No suitable habitat occurred within the proposed salvage area, therefore, each of the alternatives in this project would have 'no impact' on population viability of bog lemmings;
9) Townsend's Big Eared Bat	No suitable habitat occurred within the proposed salvage area, therefore, each of the alternatives in this project would have 'no impact' on population viability of Townsend's big-eared bats.
(See project records Rs-6 through Rs-14 for more information on the above species)	

The forest plan lists the following as wildlife management indicator species: all threatened, endangered and sensitive species; and species commonly hunted. While the wildlife section of this DEIS does not contain a separate section titled Management Indicator species, each species that may occur within the project area, or for which habitat exists in the project area, is addressed.

No suitable habitat for old-growth-associated wildlife species (Project record Rd-2) currently occurs in or adjacent to proposed salvage sites. Similarly, migratory songbird habitat is associated with intact mid-late seral forests, which only exist in isolated patches within the Moose burned area, and would not be affected by the proposed action. The snag and down wood portion of this analysis (found later in this section) provides a discussion on the effects of the proposed salvaging on wildlife that depend on or use snags and down logs as habitat.

B. Threatened and Endangered Species

Grizzly Bear (Threatened)

Ursus arctos horribilis

1. Analysis Area and Information Sources

The project area is within the Northern Continental Divide Grizzly Bear Ecosystem (NCDE) and has been designated as Management Situation 1, which is identified as an area needed for the survival and recovery of the species, where management actions would favor the needs of the grizzly bear. Two spatial scales for analysis of effects were used: Bear Management Areas (BMA) and Subunits. The BMA is an area that ranges between 5,000 to 15,000 acres in size and is used for site-specific direct and indirect effects and for determining consistency with Forest Plan standards. Subunits are areas that approximate the size of a female home range (~30-50 mi^2), and are used for implementing Amendment 19 motorized access/security core objectives and for cumulative effects.

Data used in the analysis were from existing resource information sources, research literature, post-fire aerial photos and field visits. ArcView geographical information system was used for quantification of various habitat characteristics.

A Special Order is in effect that requires all users of National Forest lands within the NCDE to store food, garbage and other bear attractants in a bear resistant manner.

2. Affected Environment

BMA Characterization

The Moose Fire burned portions of twelve BMAs (refer to Map 3-6); however, proposed salvage logging activities would only occur in five of them. Given this, the description of the existing condition and effects analysis focused on those BMAs with salvage logging proposals.

The Moose Fire burned each of the BMAs to varying severity levels. (Table 3-34). Over 50 percent in each of three BMAs (Demers, Lower Big, Elelehum) burned at high to moderate levels, creating extensive areas devoid of "green" cover. It is not possible nor should it be expected, given the changed condition created by the Moose Fire, that all Forest Plan standards and/or guidelines related to grizzly bear habitat could be achieved in the short-term. It should be noted that Forest Plan standards form a strategy whereby management activities such as timber harvesting, not unplanned events such as wildfires, can be designed so as to avoid long-term adverse affects on forest resources. However, since there is no other formal strategy other than the Forest Plan and its amendments that provides forest management direction, the standards and guidelines were used to describe the existing environmental baseline (Table 3-35).

Table 3-34: Fire severity levels of forested stands within BMAs with salvage logging proposals.

BMA	BMA Size (acres)	% of BMA in Burn	Fire Severity Classes[1] (%)				
			High	Mod.	Low	Unburned	N.O.[2]
Demers	8,791	91	60	13	8	5	2
Lower Big	7,852	80	28	26	21	3	2
Elelehum	7,376	99	38	15	29	14	2
Hallowat	10,635	21	6	5	6	4	<1
Werner	7,406	20	5	6	7	2	<1

[1]High = complete consumption of duff/understory vegetation; 80-100% mortality of over-story canopy.
Mod. = significant reduction of duff/understory vegetation; 40-80% immediate mortality of over story.
Low = low to moderate duff reduction and large patches of unburned or lightly burned vegetation; immediate mortality of over story is less than 40%.
[2]N.O. = natural openings such as grassy parks and shrub fields that burned at a variety of severity levels.

Grizzly Bear Analysis Area Map 3-6

Table 3-35: Post-fire habitat relative to grizzly bear guidelines within BMAs.

BMA	Opportunity to Meet Standards and Guidelines					% BMA in Non-cover
	Cover[1] (%)	Security Area[2]	Activity Timing[3]	Distance to Cover[4]	Habitat Diversity[5]	
Demers	No	No	No	No	No	75
Lower Big	No	No	No	No	No	56
Elelehum	No	No	No	No	No	55
Hallowat	Yes	Yes	No	No	Yes	11
Werner	Yes	Yes	Yes	No	Yes	11

[1]At least 40%; [2]Adjacent 5000 ac area with <1 mi/mi^2; [3]No more than 3 consecutive years of major disturbance in 10 year period; [4]No point within harvest unit can be further than 600 ft to cover; [5]Achieve even distribution of forest successional stages.

Subunits

Motorized access was recognized by the Forest Plan in 1986 as a major factor affecting grizzly bear habitat security and has been confirmed by research conducted in the Swan Mountains of Montana (Mace and Waller 1997, pages 64-73). Wielgus *et al.* (2002, in press) demonstrated the tendency for grizzly bears to select against open roads in a 1986-1991 study in the Selkirk Mountains of northern Idaho and southern British Columbia.

Amendment 19 (1995) of the Flathead Forest Plan currently represents the most comprehensive programmatic strategy that addresses grizzly bear habitat security. The U.S. Fish and Wildlife Service (FWS) in their Biological Opinion for Amendment 19 put forth 'Terms and Conditions' with which the Forest is required to comply. The requirements were to gradually achieve motorized access objectives across the Forest in grizzly bear habitat. Amendment 19 established five and ten-year numerical motorized access density objectives were established.

As stated above, the subunit is the area in which the status of grizzly bear habitat security, as affected by motorized access, is evaluated and for determining cumulative effects. The activities contained in the Proposed Action and its alternatives are contained within two grizzly bear subunits: Lower Big and Werner (refer to Map 3-6). The status of these subunits relative to Amendment 19 is shown in Chapter 2. The five-year objectives were not met in either of the subunits; however, the Flathead National Forest is currently re-consulting with FWS on the Forest Plan. Therefore, the existing condition (environmental baseline) of both of these subunits is that, neither is currently providing the level of habitat security specified in Amendment 19.

Of the two subunits, only Lower Big burned enough to make a significant difference between pre- and post-fire habitat conditions (Table 3-36). Lower Big subunit is now significantly devoid of cover, which along with roads is an important determinant of grizzly bear habitat security. This may suggest that the Lower Big subunit is in greater need of habitat security than Werner and could indicate priorities for implementing Amendment 19 motorized access objectives.

Table 3-36: Fire Severity levels within grizzly bear subunits.

Subunit	Subunit Size (acres)	% of Subunit in Burn	Fire Severity Classes[1] (ac/ % of Subunit)				
			High	Mod.	Low	Unburned	N.O.
Lower Big	30,375	75	9,904/ 33	2,616/ 9	3,204/11	3976/ 13	2,755/ 13
Werner	28,640	13	960/ 3	824/ 3	871/ 3	993/ 3	57/ .1

[1]High = complete consumption of duff/understory vegetation; 80-100% mortality of over-story canopy.
Mod. = significant reduction of duff/understory vegetation; 40-80% immediate mortality of over story.
Low = low to moderate duff reduction and large patches of unburned or lightly burned vegetation; immediate mortality of over story is les than 40%.
N.O. = natural openings such as grassy parks, shrub fields, and seedling/sapling stands that were burned at various severity levels.

Post-fire Habitat Condition and Use

As was stated above, the existing condition of grizzly bear habitat within the burned portions of the Moose fire affected area is that of the beginning of the forest 'life cycle' and grizzly bears would use whatever forage and cover resources are available in the area. There has not been much research documenting grizzly bear response to and use of post-fire habitats; therefore, what has been documented was considered the best available science.

Data collected from radio-collared grizzly bears from 1989 to 1992, in response to the Yellowstone fires of 1988, showed that bears tended to avoid burned sites during 1989, but not during subsequent years. Based on 867 locations of 44 grizzly bears between 1989-1992, bears used burned habitats in proportion to their availability within their ranges (Blanchard and Knight 1993). Also, their pooled locations indicated avoidance of burned sites during 1989, especially by females with cubs-of-the-year, but not during subsequent years. The 1988 fires had no apparent harmful short-term affects upon Yellowstone grizzly bears, and were in fact likely beneficial, largely due to increased production of grizzly bear diet items such as forb foliage and tuberous root crops (*ibid*). Similar landscapes that have evolved with fire should be expected to undergo similar biological responses, and is what is expected for the Moose fire affected area.

Grizzly bear use was documented both during and after the Moose Fire. One grizzly bear was found dead near Mud Lake during fire activity; other grizzly bears were observed within the Moose fire affected area on the Coal Creek State Forest (Montana DNRC 2002; wildlife section). Last fall, grizzly bear tracks were observed adjacent to Big Creek. In early April (2002), grizzly bear tracks were observed on the Big Creek road near Hallowat Creek and nearby a moose carcass was found that had been fed upon by a grizzly bear (it may have been the same bear). All of this indicates that bears are continuing to use the Moose fire affected area and it should be expected that they would continue to use the area and find/use whatever forage resources are available to them. It is unlikely that those bears that had the Moose fire affected area, as part of their home ranges would abandon them unless they get displaced because of excessive human disturbance. There may likely be some predictable shifts in seasonal habitat use in response to available food resources. For example, bears may spend more time in or near ungulate winter ranges seeking out winter kill; and they may spend considerable time on the southerly slopes and riparian areas because these areas should be providing relatively high spring range values, especially in the first few years post-fire. During summer, habitat values should be expected to be relatively low as berry-producing shrubs may take a few years to recover. Bears may shift their use into "green" forests that have high densities of huckleberry and other berry-producing shrubs.

3. Environmental Consequences

Chapter 2 identified one significant issue related to grizzly bear: Issue #8 regarding the amount of road restrictions and decommissioning needed to provide adequate security for grizzly bear. The Issue Indicators for this issue is *miles of road proposed for decommissioning;* and *miles of road currently open to motorized access yearlong or seasonally changed to 'restricted' yearlong*.

In addition, the following Effects Indicators were used to focus the grizzly bear analysis and disclose relevant environmental effects:

- Whether Forest Plan standards/guidelines, and the FWS recommendation related to grizzly bear would be met.
- The potential loss of habitat values associated with dead trees.

Direct and Indirect Effects

Alternative 1 (No Action)

Since a large proportion of a grizzly bear's diet is plant material including roots/tubers, leaves of grasses and forbs, and a variety of berries, the post-fire condition of the Moose fire affected area should be expected to be relatively attractive to grizzly bears. Perhaps the Moose fire affected area won't be used much by grizzly bears during the first year post-fire (2002), as the Yellowstone study showed, but during subsequent seasons (approximately 10 years) the Moose fire affected area would produce increases in forage production. In this context, this alternative would provide a relatively disturbance-free (i.e. no salvage logging) landscape condition that grizzly bears could exploit.

As has already been documented, ungulate carcasses are going to be available to grizzly bears in the spring and bears should be expected to use the area during this time. Since ungulates probably had a relatively tough time surviving the winter because of low forage availability and absence of energy-conserving thermal cover, a relatively high level of natural mortality could occur. This means available meat for grizzly bears and other opportunistic meat-eaters.

This alternative would maintain the status quo of the overall habitat condition and most Forest Plan standards would not be met for affected BMAs (Table 3-35). Adequate habitat security, as defined by the full implementation of the ten-year objectives of Amendment 19, would not be implemented by this alternative. Unless the Forest moved to implement Amendment 19 through some other formal process, this alternative would result in a 'may effect – likely to adversely affect' the grizzly bear.

Alternatives 2, 3, 4 and 5

Salvage and Other Vegetation Treatments

Each of these alternatives would, through a combination of helicopter and ground-based equipment, remove trees burned by the Moose Fire. The numbers of acres vary by alternative, but generally are in the range (2147 – 3024 acres; see description of alternatives in Chapter 2) where it seemed feasible to evaluate effects as a whole rather than treatment site by treatment site. The proposed fuels reduction is expected to have a similar effect as dead-tree salvaging on grizzly bear habitat, and was treated as such.

Relative to Forest Plan standards, none of the alternatives would change the existing status as displayed in Table 3-35. However, relative to the concept of hiding cover/security, there may be some residual level of cover value that dead standing trees provide for grizzly bears, even though in terms of a definition of cover, the existing situation is not adequate to meet the Forest Plan expectation of what cover should be. Salvaging burned dead standing trees would reduce the residual levels of cover on the proposed treatment sites. The main issue with this is that the more visible to humans bears are, the more vulnerable they become to being illegally killed or mistaken for black bear during black bear hunting seasons. However, if a person was determined to kill a grizzly bear, the existing conditions in the Moose fire affected area are open enough to make it possible. The proposed alternatives may make this an easier possibility, but to what degree is unknown. Therefore, considering that snags would be left for other wildlife and ecological reasons, the net result of the proposed sites being absent of most of the current level of dead standing trees would be that the risk of mortality may be increased but is not expected to adversely affect grizzly bears or habitat potential.

The revised Biological Opinion on the Forest Plan (1989) recommended a "3&7" rule for Management Situation 1, "5&5" for Management Situation 2, that would guide activity scheduling by BMA. The "3&7" rule refers to human activities, especially timber sales, within BMAs that last longer than 30 days can only occur for a maximum of three consecutive non-denning years and then rest for seven; this, in theory, assures that only one litter of cubs out of a 10 year period would not get familiar with the mother's home range because of displacement. This rule is to be used until security core areas as per Amendment 19 are identified and effective on a site-specific basis (Project Record). In this context, there was a significant amount of human activity during the fire suppression efforts in August and September of 2001 and continued activities are scheduled to occur during 2002, such as mushroom

picking and other road decommissioning/watershed related work. This would leave only one non-denning season of salvage logging operations to be completed in order to meet the intent of the '3 and 7' rule. Alternative 4 would certainly fall into this category because winter logging would not be allowed, therefore more activities could occur during the non-denning season. Alternatives 2, 3, and 5 would allow winter logging that might facilitate the completion of salvage logging in only one non-denning season. This is uncertain because it is not possible to predict winter conditions, which can significantly influence whether salvage logging can or cannot be done, and winter logging is not a requirement of these alternatives. Therefore, it was assumed that a minimum of two non-denning seasons of logging operations would be needed to complete the proposed salvage project and this would not meet the intent of the '3 and 7' rule. This would have a displacement effect on grizzly bears.

A review of literature on dead trees, including the Grizzly Bear Compendium (1987), did not yield any information on burned dead-standing trees and grizzly bear habitat potential, indicating no obvious relationship. Occasionally one observes in the forest where bears have torn into older decaying logs apparently in search of invertebrate food resources, especially ants. However, the literature does not highlight logs as an important potential source of food for bears. This being the case, it could be concluded that the removal of a relatively small proportion of burned dead trees (when compared to what would be left within the Moose fire affected area) would have some but not significant effects on grizzly bears or grizzly bear habitat potential. If grizzly bears depend on dead trees for invertebrate proteins, then each of the alternatives would remove some of this potential food resource. However, given that the maximum number of acres to be treated represents less than 10 percent of the burned portion of the Moose Fire on National Forest land, this should not be significant. Additionally, the important riparian areas, which contain large-diameter standing and downed trees, would be left intact and available.

The proposed pheromone trapping (see Vegetation section for discussion of effects) is not expected to have negative affects on grizzly bears or their habitat. In general, this treatment is expected to minimize additional live-tree mortality from bark beetles and if this occurs, grizzly bear habitat cover losses would be minimized.

Subunits and Motorized Access/Security Core Habitat

The 10-year numerical motorized access objectives of Amendment 19 would be met in both subunits by three of the four action alternatives. Alternative 3 would fully meet the 10-year numbers in the Lower Big subunits but would not meet the numbers for security core acres and open road density in the Werner subunit (refer to Chapter 2); this would require a project specific Forest Plan amendment (see Chapter 2, Alternative 3 description). Each of the alternatives would have different effects on habitat availability and security, depending on which roads are restricted, the restriction device, and during what seasons. The alternatives would have specific effects on habitat availability and security on different areas within each of the subunits and are discussed below.

Alternative 2

Lower Big Subunit

- The Lookout Road #803 would be closed on a year round basis with a gate, just south of Big Creek. The area made more secure for bears with this closure is generally on northerly and relatively moist slopes, functions as late spring, summer and fall habitat. North-facing slopes provide moist conditions where huckleberry and other forage resources are more productive during the late spring, summer and fall as compared to the early spring value of the more southerly slopes to the north of the area. The restriction on this road would make these forage resources more available and would also provide protection from disturbance and potential illegal killing during both the spring and fall hunting seasons.

- Other motorized access restrictions involve changes from gates to berms. The importance here is that yearlong-gated roads allow for administrative use, but gates are sometimes vandalized and roads used illegally. This can reduce the effectiveness of the road restriction for providing the intended habitat benefits. Therefore, changing a road restriction device from a gate to a berm can provide a better opportunity for a closed road to provide habitat availability and security benefits for grizzly bears. In this

context, this alternative should be beneficial to bears because the miles of yearlong-gated roads would be reduced from the existing 34 to six miles.

- Salvage harvesting on approximately 796 acres in 22 units would occur in potential security core habitat. Sixty-five, 19 and 711 acres would be salvaged by cable, ground-based, and helicopter logging systems, respectively. This would decrease the amount of available security habitat for at least two seasons.

Werner Subunit

- The roads that would be more restricted with this alternative as compared to the existing situation involve the Werner Creek (#1655/5261), upper Big Creek (#316) and Werner Divide (#1658) roads. Restricting these roads would make summer and fall huckleberry habitats associated with these roads more available. These roads are mainly in higher elevations and the restrictions would have little influence on spring range habitat availability due to snow lingering on these roads (with or without road restrictions). The risk of mortality would be reduced during the fall big game hunting season.

- As discussed for Lower Big subunit, other restrictions involve changes from gates to berms and this would be beneficial for bears. The miles of yearlong-gated roads would be reduced from the existing 33 to nine miles with this alternative.

- Salvage harvesting on approximately 67 acres in two units would occur in potential security core habitat. Both of these units would be salvaged by helicopter logging systems. This would decrease the amount of available security habitat for one season.

Alternative 3

Lower Big Subunit

- This alternative would have the same motorized access effects as described for Alternative 2.

- Salvage harvesting on approximately 678 acres in 18 units would occur in potential security core habitat. Sixty-five, 19 and 593 acres would be salvaged by cable, ground-based, and helicopter logging systems, respectively. This would decrease the amount of available security habitat for at least two seasons.

Werner Subunit

- The roads that would be more restricted with this alternative as compared to the existing situation involve the Werner Creek (#1655/5261), Werner Divide (#1658) and Hallowat/Kletomus Creek (or Moose Lake) roads (#315/5207). Of these additional restrictions, the Hallowat/Kletomus Creek Road would make the most difference in terms of making habitat more available and increasing security. As was discussed for Alternative 2, the Werner Creek and Werner Divide roads are at higher elevations and would likely be closed by snow during the spring. The Werner Divide Road would continue to be seasonally open during the summer and early fall and would continue the reduced habitat availability during this time, but would provide security during the big game hunting season. However, the Hallowat/Kletomus Creek Road is partly in lower elevation spring range, adjacent to Hallowat Creek and gradually goes up to the higher elevation Moose Lake area. This road accesses important avalanche chutes in the Hallowat drainage's westerly slopes and a seasonal closure would provide meaningful habitat availability and security during the spring.

  The current yearlong motorized restriction of the upper Big Creek Road would change to a seasonal restriction to allow human access during the summer and early fall. This change in road restriction status would reduce habitat availability during this time period and would reduce non-motorized security in the area.

- As with Alternative 2, other restrictions involve changes from gates to berms and this would be beneficial for bears. The miles of yearlong-gated roads would be reduced from the existing 33 to eight miles with this alternative.

Alternative 4

Lower Big Subunit

- Significant habitat availability and security, when and where it is probably needed the most by bears, would be provided with this alternative on the strength of two access restrictions: a spring closure of the Big Creek Road (#316) at the junction with the Lookout Creek Road and to a lesser extent a year-round closure of the Elelehum Creek Road (#5272). Both of these roads are in low elevation habitats, where bears tend to be during the spring to feed on vegetation and any winter mortality of ungulates. The amount of security from potential mortality due to mistaken identity during the spring black bear season would be dramatically increased as compared to the existing situation, and the seasonal restriction of the Big Creek Road would be largely responsible for this benefit. The Elelehum Road already has a spring closure imposed on it; therefore, the benefits to be derived would be mostly during the summer and fall hunting seasons.

- As with Alternative 2, other road restrictions involve changes from gates to berms and this would be beneficial for bears. This alternative provides near-maximum habitat availability relative to roads restricted by gates by reducing the miles of yearlong-gated roads from the existing 34 miles to only one mile.

- Salvage harvesting on approximately 493 acres in 17 units would occur in potential security core habitat. Sixty-two, one and 431 acres would be salvaged by cable, ground-based, and helicopter logging systems, respectively. This would decrease the amount of available security habitat for at least two seasons.

Werner Subunit

- Seasonal motorized access restrictions of the Hallowat/Kletomus Creek and Big Creek roads would occur because of the restriction in the Lower Big subunit (lower Big Creek and Lookout Road junction). Similar effects discussed for the Lower Big subunit would also be realized in the Werner subunit. However, since the affected roads gradually go into higher elevations in the Werner subunit, the benefits to bears may not be as great as those expected for the Lower Big subunit.

- The effects of changing road restriction devices from gates to berms as discussed under Alternative 2 would also occur with this alternative. The miles of yearlong-gated roads would be reduced from the existing 33 to three miles with this alternative.

Alternative 5

Lower Big Subunit

- This alternative would have the same habitat benefits for grizzly bears as described for Alternative 2.

- As with Alternative 2, other road restrictions involve changes from gates to berms and this would be beneficial for bears. This alternative would reduce the number of miles of road restricted by gates from the existing 34 to six miles.

- This alternative would affect security core habitat the same as Alternative 2.

Werner Subunit

- As discussed in Alternative 3, seasonally opening Big Creek Road #316 would reduce non-motorized security in the area. However, a gate on a year-round basis would restrict the Hallowat Creek Road #315

and this would provide spring range benefits as described in Alternative 4. Additionally, this restriction would provide habitat availability and security benefits throughout summer and big game hunting season.

- The effects of changing road restriction devices from gates to berms as discussed under Alternative 2 would also occur with this alternative. The miles of yearlong-gated roads would be reduced from the existing 33 to 14 miles with this alternative.

- This alternative would affect security core habitat the same as Alternative 2.

Summary of Effects of Action Alternatives

Under each of the alternatives, the grizzly bear habitat environmental baseline would remain the same within the BMAs as displayed in Table 3-32. None of the alternatives would meet the intent of the "3&7" rule and therefore displacement of grizzly bears from disturbance areas should be expected. Alternatives 2, 3 and 5 would be relatively similar in their displacement potential; alternative 4 would have the least displacement potential because it proposes the fewest acres for salvaging, equating to the project being completed in a shorter time period.

The habitat value of standing dead trees to provide screening cover would be reduced by each alternative. Alternatives 2 and 5 would treat remove the same and most amount of standing dead trees; therefore the effects would be the same. Alternatives 3 & 4 would have the least effect on dead tree removal; alternative 3, because it proposes to leave larch of all size diameters it would be a better option for grizzly bears than alternative 4.

Alternatives 2, 4 and 5 would each meet the motorized access objectives of Amendment 19. However, alternative 4 would reduce the open road density below what is necessary and increase the amount of security core beyond that required by Amendment 19. In addition, a spring closure (April 14 – June 1) of the lower Big Creek road would facilitate security in spring range alternative 4. Alternative 3 would not meet the motorized access objectives of Amendment 19 in the Werner subunit and would require a project specific Forest Plan amendment (see Chapter 2, Alternative 3 description). Each of the alternatives would affect potential security core habitat by salvage harvesting.

Cumulative Effects

Alternative 1

Within the two grizzly bear subunits that comprise the cumulative effects analysis area, past management activities have altered habitat conditions in a considerable way. Probably the most significant management activity that has influenced grizzly bear habitat use has been the construction of roads. Roads have facilitated easy human access into grizzly bear habitat, both during the denning and non-denning seasons. The grizzly bear study in the Swan Mountains of Montana (Mace and Waller 1997) demonstrated relationships between roads and grizzly bear habitat use patterns. The basic message that these researchers came away with after ten years of radio-collared grizzly bear locations was that bears tended to avoid roads, especially those open to motorized traffic. Given the relatively large home range sizes of grizzly bears, it is probably unavoidable for any bear to not have any roads within their home ranges ('wilderness' bears may be an exception), as a result, the study showed a *preference fo*r habitat use away from roads, **not** *'no use'* of habitat adjacent to roads.

Another past and ongoing forest management activity that has and is expected to continue to affect grizzly bears is the special use permitted operations of the Big Mountain summer and ski resort area. While only the 'back side' of the ski area is within the Werner subunit, there are some summertime operations related to lift maintenance, etc. that can displace grizzly bears from otherwise usable habitat.

Mushroom picking is another forest activity with potential to displace grizzly bears from significant portions of the Big Creek drainage. This activity is currently occurring and is bringing hundreds of people to the Big Creek drainage. This alone may result in displacement of grizzly bears, or create a high potential for human-bear conflicts. Even with increased law enforcement, when there are that many people concentrated in grizzly bear habitat, it is highly probable that someone would make a mistake relative to food and food storage. An emergency road closure order

is in effect and this will reduce the open road density for both subunits to a level that meets Amendment 19 (19%); which will help reduce human distribution in the drainage. Since the lower elevation roads would remain open, bears may be displaced from spring range habitats by increased human presence.

Best Management Practices work is scheduled to occur beginning in 2002. The work consists of: improving road drainage on approximately 177 miles; upsizing culverts on 85 potential sites; and removal of fish barriers at eight sites. It is likely that work related to this project would take from three to five years to complete. Compliance with Amendment 19's motorized access restriction objectives in Lower Big and Werner subunits would not occur (see Biological Assessment, page 20-21, Project record Rt-1).

Spring black bear hunting is expected to continue in the Moose fire affected area and given the current lack of hiding cover, the risk of shooting of grizzly bears due to mistaken identity is possible. Administrative uses of closed roads, for reforestation or road-related work, may also affect grizzly use of the area. These and other activities such as routine road maintenance, watershed improvements, and trail reconstruction are foreseeable and scheduled to occur. Human use of the Big Creek drainage is expected to generally increase, at least in the short-term for activities such as firewood cutting and mushroom harvesting.

Considering the past incremental reductions in grizzly bear habitat and security as a result of the road-building program, the ongoing human activities as discussed above, and mostly because the motorized access density levels would remain at current levels, the implementation of this alternative would yield a determination of "may affect-likely to adversely adverse affect" the grizzly bear.

Alternatives 2, 4, and 5

In this part of the Whitefish Range, grizzly bears have had to contend with a wide array of human activities. Activities such as road building, timber harvesting, tree-thinning of plantations, spring black bear hunting, firewood cutting, berry picking, camping (Big Creek/Moose Lake Campgrounds and dispersed sites), mountain biking, motorcycle riding, hiking, big game hunting, gathering forest products and recreational driving all have effects on grizzly bears, especially on multiple use land. In addition to regularly occurring recreation activities, the associated disturbances associated with the Moose Fire suppression efforts and post-fire BAER (burned area emergency rehabilitation) activities probably had some level of displacement-effect on grizzly bears. However, given the condition of the post-fire landscape, there probably was not much of an attraction for bears to be within the burned landscape, so the displacement effect was probably low. All of these activities have and do occur within the Big Creek drainage, grizzly bears persist, and this is evidence of the ability of grizzly bears to adapt and share space with humans.

With regard to specific grizzly bear habitat modifications, similar past forest management activities have occurred within each of the two subunits. Timber harvesting has had a variety of habitat effects. Some effects have included the elimination of cover for security and thermal regulation, short-term decreases in huckleberry production, providing easier human access into grizzly bear habitat with associated road building for hauling out logs, and past timber harvesting has increased vegetation diversity. The hazard tree felling along roads that occurred during fire suppression activities probably reduced screening cover adjacent to roads to some extent. In the Werner subunit, the Big Mountain summer and ski resort has modified the natural habitat to create ski runs and with the associated human activity, a 'displacement' impact on grizzly bears has occurred. Other human activities that produce cumulative effects are described in the cumulative effects section for the 'no action' alternative.

Each of these alternatives (2, 4, 5) would salvage trees and make those parts of the landscape where trees would be removed more open. Bears using these sites for foraging purposes could become more vulnerable to being illegally killed. How much more vulnerable is unknown. Certainly, the further away from an open road the lower the mortality risk and probably the less need grizzly bears would have for cover. Nevertheless, as mentioned in the 'direct effects' section above, most of the proposed salvage sites do not meet hiding cover status, but the removal of dead standing trees would reduce the already limited cover in the short term (10-15 years), until forest regeneration provides hiding cover. Cumulatively, this would reduce the already limited amount of cover, however this mostly is true in the Lower Big subunit.

Habitat availability and security would be improved over a period of approximately seven years by each of these alternatives on the strength of additional motorized access restrictions. This would continue a recent forest-wide trend of providing more security for bears through motorized access restrictions. Although differences exist on which roads would be restricted between the alternatives, and this means different kinds of effects to bears (see 'direct effects' analysis section (above), the net cumulative effect would be that habitat availability and security would be improved and provided as per Amendment 19. Certainly, alternative 4 would cumulatively be most beneficial to bears because it would provide a higher level of habitat availability in both subunits than what the motorized access objectives that Amendment 19 prescribes.

There have been many forest management and recreational activities in the Big Creek drainage, which affect grizzly bears and their use of habitat. The Moose Fire displaced those bears that were able to get out of its way as it burned nearly 71,000 acres. It is unknown what the sum total of effects of associated fire suppression activities had on grizzly bears. It is likely that the expected large number of people engaged in mushroom picking is having some level of displacement effect on bears, although those effects will limited to late spring and early summer of this year. In addition, the proposed salvage harvesting may take as many as three years to complete and all of the motorized access objectives would not be met until after this occurs. Watershed restoration and reforestation activities would be occurring and many would involve the administrative use of restricted roads. Therefore, considering past incremental reductions in grizzly bear habitat and security as a result of the road-building program, the ongoing human activities as discussed above, and the existing level of motorized access density for the two subunits in this analysis, the implementation of these alternatives would yield a determination of "may effect - likely to adversely adverse affect" the grizzly bear.

Alternative 3

The same cumulative effects discussion for Alternatives 2, 4, and 5 would be applicable for this alternative. However, this alternative would not fully meet the motorized access requirements of Amendment 19 in the Werner subunit and proposes alternative numbers for social reasons. This alternative would provide improvement in habitat availability and security when compared to the existing situation, however, it would not meet the level of habitat security specified by Amendment 19. Considering the above discussion, the implementation of this alternative would yield a determination of "may effect - likely to adversely adverse affect" the grizzly bear.

4. Regulatory Framework

The project area lies within grizzly bear Management Situation 1 (MS1), as designated by the Forest Plan. The grizzly bear is listed as "threatened" in Montana and the Grizzly Bear Recovery Plan (1993) provides recovery goals and objectives for the grizzly bear. The Flathead Forest Plan (pages II-38 to II-42) provides management direction and standards and guidelines to guide project planning. The Interagency Grizzly Bear Guidelines (1987) provide additional guidance for habitat management. Amendment 19 to the Forest Plan provides standards for grizzly bear habitat management through motorized access and security core habitat standards and objectives. The Grizzly Bear Compendium (National Wildlife Federation 1987) provides published and unpublished information on most areas of interest regarding grizzly bears. A Special Order is in effect that requires all users of national forest system lands within the NCDE to store food, garbage and other bear attractants in a bear resistant manner.

5. Regulatory Consistency

The post-fire environment baseline (the existing condition) does not meet Amendment 19 grizzly bear habitat standards and some of the Forest Plan guidelines. In general, the proposed action is consistent with the Interagency Grizzly Bear Guidelines. The Flathead National Forest will be in formal consultation with the US Fish and Wildlife Service regarding this project. A biological opinion issued by the U.S. Fish and Wildlife Service would be necessary before any action alternative could be selected for implementation.

Gray Wolf (Endangered)

1. Analysis Area and Information Sources

The two subunit analysis areas used for grizzly bear were also used for the wolf because: 1) like grizzly bears, wolves have large home ranges; and 2) in the absence of formally defined/described analysis areas specific to wolves, the subunits were determined to be an appropriate scale for analyzing the effects/influence of this proposed project because they encompass seasonal and year round habitats of ungulate prey species. Since the wolves in the area that use the project area also use the Coal Creek drainage and the State (Department of Natural Resources and Conservation) will also be conducting salvage operations, the State Cyclone subunit (see Map 3-6) was included in the cumulative effects area.

Data used in the analysis were from existing resource information sources, research literature, post-fire aerial photos and field trips. ArcView geographical information system was used for quantification of various habitat characteristics.

The project area is within habitat that has been designated in the Flathead Forest Plan as Management Zone 1 (contains key habitat components in sufficient abundance and distribution on an annual basis to sustain a viable wolf population) (Forest Plan page II-43) and is in the Northwest Montana Recovery Area.

2. Affected Environment

The gray wolf has reemerged in northwestern Montana with pack activity documented in the North Fork of the Flathead River since the late 1970s. Wolves of the Whitefish Pack have denned and produced pups (1997) within the Big Creek drainage, and generally have roamed between north of Whitefish Lake and east into Glacier National Park. This indicates, at least for the one confirmed litter that was produced, that before the fire enough of their habitat requirements existed for reproduction to have occurred. However, it has not been documented that any other litters were produced in Big Creek, though it is suspected at least one other denning attempt occurred. The Whitefish Pack displaced the last survivor of the South Camas Pack, denned in Glacier National Park, and in 2001 produced at least one pup (Project Record). In 2002, the Whitefish Pack again denned in the Park and produced a litter of at least four pups (Tom Meier, pers. comm., 2002).

Ungulates (wild and domestic) are the primary prey species for wolves and wolf distribution is generally related to ungulate density. However, other physical habitat attributes can also be used to predict wolf presence. Boyd-Heger (1997) found that wolves appeared to select for landscapes with relatively lower elevation, flatter terrain, and closer to water and roads at both smaller and larger scales in the central Rocky Mountains. These appear to be the reasons that the Big Creek drainage was important to wolves before the Moose Fire. In addition, dense vegetation and a relatively low open road density within the Big Creek drainage have provided an apparently adequate level of habitat security. The Moose Fire changed the condition of two important habitat variables at least in the short term: ungulate availability and habitat security (open roads and vegetation cover).

The existing status of elk/mule deer and white-tailed deer habitat (see these sections for existing condition discussions) as well as motorized access/habitat security for grizzly bear (Table 3-35) should be considered the environmental baseline for gray wolf habitat. In general, the existing condition of ungulate habitat is one of lowered habitat capability because of lack of forage and cover due to the Moose fire. In terms of cover, the Werner subunit was only partially burned (13%) so most of it still had adequate levels of security cover; the Lower Big subunit was burned extensively
75%) and most of it is absent of cover. Because of the lack of cover, habitat security should be considered to be low in the Lower Big subunit.

First winter post-fire surveys in the Big Creek drainage yielded no evidence that wolves used the area.

3. Environmental Consequences

There are no Forest Plan standards for road density or vegetation cover related to habitat security for gray wolf habitat, therefore, the potential effects of these habitat variables relied on relevant research findings. The main Forest Plan standard for wolf protection related to logging activities requires no activities within one mile of known or suspected denning and/or initial rendezvous sites during denning season.

No significant issues related to the gray wolf were identified (refer to Chapter 2).

The following Effects Indicators were used to focus the gray wolf analysis and disclose relevant environmental effects:

- The effect on ungulate habitat.
- The change in habitat security.

(**MAP 3-7 WOLF MAP**

Direct and Indirect Effects

Alternative 1 (No Action)

This alternative would maintain the status quo of the overall habitat condition, which would mostly allow for natural recovery. Ungulate habitat carrying capacity would remain low but would increase with time as forage and cover resources replenish (see discussion of 'No Action' on elk/mule deer and white-tailed deer). Habitat security would generally be low in the short term, until vegetation recovery occurs sufficient to provide cover (10-15 years). Many of the roads open to motorized access in the analysis area are generally in the locations where wolves like to be (flatter terrain); the combination of this and lack of vegetation cover creates a relatively high risk of mortality level. Until vegetation cover returns, habitat security should be expected to be low.

Alternatives 2, 3, 4 and 5

Management activities associated with salvage logging in these alternatives that may affect ungulate availability/survivability would indirectly affect wolves. Each of these alternatives would affect ungulate habitat as discussed for elk/mule deer and white-tailed deer habitat (see appropriate sections that follow). The allowance of winter logging in these alternatives (except alternative 4) would add stress to wintering ungulates (as discussed below) and the disturbance associated with logging may cause potential wolf hunting use of the area during winter to either be curtailed or to occur during evenings or nights. However, because of the existing relatively low ungulate carrying capacity of the Moose fire affected area, wolf use is also expected to be low for the next few years. The potential effect on ungulate calving/fawning habitat is expected to be minimal because of the relatively low density of animals suspected in the area. Therefore, any potential indirect effects on wolves due to salvage operations during the calving/fawning time period (mid-May to mid June) would be expected to be minimal.

Reduction of residual hiding/screening cover value that standing dead trees provide, especially along the Big Creek Road, may result in increased hunter harvest of ungulates during the big game hunting season and thereby reduce prey base availability for wolves.

Each of the alternatives would improve habitat security for wolves and, therefore, at some level each would be beneficial for wolves because each would reduce the risk of mortality as wolves often use roads as travel corridors (Boyd-Heger 1997). Alternatives 2 and 5 would have the same level of habitat security related to roads (i.e. they would restrict the same roads in the same way) in the Lower Big subunit, however, different roads and mileages would be closed in the Werner subunit. Alternative 2 would reduce open road miles by approximately 11 miles and involves the closure of the currently open Werner Creek Road (#1655). This road accesses generally steep terrain except for the upper five miles on higher elevation. It may serve as a travel corridor but probably does not provide good hunting habitat.

Alternative 5 proposes to close the currently open Hallowat/Kletomus Creek roads (#315/5207) and seasonally open the upper Big Creek Road (#316) for summer recreational use. The trade-off that is made in this alternative is providing increased security in the drainage bottom near Hallowat Creek, where wolves tend to prefer to be, versus higher elevation relatively gentle terrain (upper Big Creek) that may be good hunting habitat for mule deer in the summer and fall. Both are important aspects of wolf habitat, however, Boyd-Heger (1997) found that wolves selected for lower elevation landscapes. Therefore, under Alternative 5 the closure of the lower elevation road (Hallowat Creek) would be beneficial for wolves.

Alternative 3 would have effects on ungulate habitat as discussed for elk/mule deer and white-tailed deer habitat (see these sections, which follow). In general, security for elk/mule deer would be reduced because the residual hiding cover value of standing dead trees would be reduced in the short term with salvage logging. This may make them more vulnerable during the hunting season and, if so, a higher hunter harvest of an already low population would indirectly affect wolves by reducing the prey base.

In terms of security, for the preferred lower elevation and flatter terrain habitat, there would not be much of a change from the existing situation. In the Lower Big subunit, both the Big Creek and Elelehum Creek roads would remain

open as they currently are and there would be no improvement of security in the important habitat adjacent to these roads; the Lookout Road would be closed year-round and this should be beneficial. In the higher elevation habitats of the Werner subunit, there would be a trade-off made in this alternative that would not favor wolves. The currently closed upper Big Creek Road (#316) would be opened up seasonally (July 1 – October 14) and the currently open Werner Creek Road (#1655) would be closed. Big Creek Road #316 accesses more gentle habitat, which wolves prefer, while the Werner Creek Road #1655 accesses steeper terrain that does not make for good hunting habitat.

Alternative 4 would have similar effects on ungulates, and indirectly wolves, as described for Alternatives 2, 3, and 5, except there would be no winter logging. Basically, ungulates would be more vulnerable to being harvested during the fall hunting season because of the reduction of dead-standing tree density (hiding cover), especially in the event that early deep snowfall forces animals down to lower elevations earlier than normal. This alternative disallows winter logging in order to help animals conserve as much energy as possible to survive the winter; and this would be beneficial given the low amounts feed within the winter ranges. Higher survivability of ungulates means a more available food source for wolves.

Alternative 4 would provide fairly good habitat security overall including a spring closure of roads in the high-value low elevation, gentle terrain habitats adjacent to Big and Elelehum drainages. This closure would occur at the junction of the Big Creek (#316) and Lookout Creek (#803) roads and would coincide with the time that wolves give birth to pups. Therefore, should wolves decide to den in the Big Creek drainage again they would have a good level of habitat security.

Cumulative Effects

Past forest management activities within the Big Creek drainage have apparently not been detrimental to wolf recovery, as evidenced by at least one successful denning attempt that produced pups. Past extensive road building and timber harvesting may have initially had negative effects on ungulate populations because of increased and more effective access by hunters. However, the conversion of mature forests into early succession habitats has generally provided increased levels of forage and higher population potential for ungulates. An increased emphasis on road closures over the last fifteen years has probably had a generally positive effect on ungulate survivability during hunting seasons.

As has been previously discussed, approximately 75 percent of the Lower Big subunit was affected by fire and most of the affected area is now devoid of vegetative cover. Only 13 percent of the Werner subunit was affected by fire and, therefore, most of it contains an adequate level of cover. The main wolf-habitat issues related to the absence of cover involve the effect on ungulates (prey base) and habitat security (risk of mortality). Absence of cover can result in lowered habitat security and when this is coupled with roads open to motorized use in preferred habitats, risk of mortality increases. However, if the prey base is low, wolf use of the area would also be expected to be low. Therefore, each of the alternatives could reduce the prey base by removing standing trees that might otherwise be useful in concealing animals during the hunting season, thus making them more vulnerable to being harvested. However, for most of the season, hunting regulations for deer and elk only allow males (bucks and bulls) to be harvested and since they constitute a relatively small proportion of the population, the potential reduction in prey base may not be significant.

In terms of habitat security, each of the action alternatives would provide improvement when compared to the existing situation. However, Alternative 4, on the strength of road closures in lower elevation gentle terrain habitats, would provide valuable habitat security until such time as vegetation cover returns. The other alternatives also improve habitat security albeit mostly in higher elevation, steeper terrain habitats that are not as preferred by wolves.

Within the State Coal-Cyclone subunit, under any of the action alternatives being considered by the Montana Department of Natural Resources and Conservation DEIS (Phase II) on the Coal Creek State Forest, cumulative risks of increased gray wolf mortality or decreased reproduction are expected to be minor. Additionally, the State does not expect denning or rendezvous sites to occur within their project area because of the existing habitat conditions produced by the Moose Fire.

Ongoing and foreseeable management actions in the Big Creek drainage are not expected to effect wolves positively or negatively unless they occur near denning or rendezvous sites; however, these wolf-activities are not expected occur within the Moose fire affected area. If it does, restrictions would be imposed to protect wolves. The proposed Moose Peak prescribed burn is foreseeable and would in the short-term reduce cover for ungulates, but these steeper slopes that the burn would occur on are not considered good foraging habitat and should have no discernible effects on wolves. Therefore, the above discussion considered, including past habitat modifications, the existing relatively low ungulate 'carrying capacity', and reasonably foreseeable actions, the determination is that the implementation of any of the alternatives is "may effect-not likely to adversely affect" the gray wolf or its habitat.

4. Regulatory Framework and Consistency

The gray wolf is listed as "endangered" in Montana, and the Northern Rocky Mountain Wolf Recovery Plan (1987) provides recovery goals and objectives for the gray wolf. The project area lies within gray wolf Management Zone 1 as designated by the Flathead Forest Plan and is contained within the Northwest Montana Recovery Area. It contains habitat components, particularly ungulate populations, necessary to support wolves. The Flathead Forest Plan provides management direction and standards to guide project planning.

Bald Eagle (Endangered)

1. Analysis Area and Information Sources

The area used for direct/indirect effects analysis was the North Fork Flathead River corridor within the fire perimeter (Project Record). For cumulative effects, the lower Big Creek drainage, from Hallowat Creek eastward, was used because this area encompasses all of the proposed salvage activities, the likely source of potential effects.

Data used in the analysis were from existing information sources, especially the "Wildlife Resource Assessment" contained in the Burned Area Rehabilitation Plan for the Moose Fire (Project Record).

Critical habitat was never designated for bald eagles. The Forest Plan prohibits disturbance-causing activities such as road construction and logging within one half mile of active bald eagle nests during the nesting period from February 1 – August 1.

2. Affected Environment

Approximately 10 miles of the North Fork River are within the Moose Fire perimeter and there is a bald eagle nest within this stretch (North Fork nest). The Moose Fire had no apparent affect on this nest site, which was first documented in 1997, and eagles nesting at this site produced one young in 1989 and 1999; it was inactive in 2000. Bald eagles were present during 2001, but reproduction was not confirmed (Project Record). A management plan has not been developed for this nesting territory and, therefore, primary use sites have not been identified. The Montana Bald Eagle Management Plan (1994; pg. 20-32) contains management guidelines that should be applied to nesting territories until a site-specific management plan is prepared and implemented. The plan provides habitat management guidelines within three identified areas that include habitat progressively farther away from the nest site: nest site area, ¼ mile radius from nest site; primary use area, ¼ - ½ mile from the nest; and home range, ½ - 2 ½ miles from the nest.

The main food source of bald eagles during the breeding season is fish, therefore habitat of most interest to bald eagles are areas near large bodies of water (lakes and reservoirs) and major river systems where they can use large-diameter, mature trees and snags for perching/foraging, nesting and resting/roosting. During the fall and winter, opportunistic foraging in upland habitats of the Big Creek drainage from hunter kills of big game and winter mortality of ungulates from a variety of sources may occur.
Considering the Moose Fire occurred at the end of the nesting season and both juvenile and adult bald eagles would have been able to leave the area, and effects to habitat were minimal, the Moose Fire and associated suppression and rehabilitation actions probably had minimal effect on the bald eagle (Project Record).

Human use of the North Fork occurs annually and there has been an observed increasing trend in use. Of importance to bald eagles is the amount of river use that occurs (rafts, kayaks, etc.) and may be a source of disturbance.

3. Environmental Consequences

No significant issues related to the bald eagle were identified (refer to Chapter 2).

The following Effects Indicators were used to focus the bald eagle analysis and disclose relevant environmental effects:

- The amount of habitat alteration within the habitat zone adjacent to the North Fork Flathead River.
- The probability that management activity would disturb nesting bald eagles and cause disruption of natural behavior.
- Adherence to Montana Bald Eagle Management Plan nest territory guidelines.

Direct and Indirect Effects

Alternative 1 (No Action)

This alternative allows natural processes to dominate the habitat recovery process within the North Fork bald eagle nesting habitat zone. Habitat changes would occur as nature would dictate and be expressed primarily by the falling of trees that were either killed or weakened by the Moose Fire and some time in the future would eventually fall to the forest ground. These fallen trees would obviously no longer be available for eagles as perch or potential nest trees. Additionally, if predicted beetle outbreaks do occur, existing live spruce or Douglas-fir trees may also be killed and they would function as snag habitat for some period of time before they too would fall to the forest ground. This may produce a 'snag-deficit' for a period of time until forest regeneration begins to produce suitable snags, probably in about 200 years.

Since no management activities related to tree salvaging would occur along the river corridor, disturbance would not be an issue to nesting bald eagles. Nest site, primary use, and home range areas would be unaffected.

Alternative 2, 3, and 5

Each of these alternatives would treat four different sites within the North Fork river corridor (that area between the North Fork road and the river): in three of these sites trees would be salvaged and in one thinning of live trees at Big Creek campground would occur. The immediate direct effect within the three tree-salvaging sites (units 67, 68, 69) would be the removal of large-diameter spruce and Douglas-fir trees on approximately 16 acres that potentially could be used as either perching or nest trees by bald eagles. Considering the relatively small proportion that the three salvage treatment sites represent when considering the corridor as a whole within the Moose fire area, perch or potential nest trees should not be a limiting factor. Other tree species such as cottonwood and larch remaining within the proposed units would still be available to meet the needs of eagles. The pheromone beetle treatments contained in these alternatives are expected to preserve living trees that could otherwise be attacked, weakened and eventually die.

The proposed tree thinning/fuel reduction sites at Big Creek Campground and adjacent to private land near Coal Creek would basically be inconsequential relative to potential effects on bald eagle habitat because of the small-diameter sizes of trees to be thinned out, and also due to the high human presence in the Big Creek site, which is not considered very usable habitat for eagles.

Since no proposed salvaging or fuels treatment would occur within one half mile of the North Fork nest, the Forest Plan standard which prohibits disturbance within this distance during the breeding and rearing season (February 1 – August 1) would not be an issue.

Alternative 4

This alternative would have similar effects on bald eagle habitat as discussed for the 'no action' alternative, which means natural processes would prevail. However, as discussed for the other action alternatives, the Big Creek fuel reduction treatment would still occur in Alternative 4, but the site is not considered very usable habitat for bald eagles anyhow because of the high human presence, therefore, the effect of thinning would be inconsequential. The pheromone beetle treatments contained in this alternative may help preserve living trees that could otherwise be attacked, weakened and eventually die. In this context, this alternative could help preserve living large-diameter trees on into the foreseeable future that would provide potential perch and nest trees for bald eagle use.

Cumulative Effects

Alternative 1

The North Fork of the Flathead River has been a designated Wild and Scenic River since 1976 and, because of this, management activities within the river corridor are/have been restricted and can only occur if the values for the designation can be preserved. What this has meant is that there has been very limited human-caused physical alteration of habitat within the habitat zone important to bald eagles. Therefore, this alternative would continue the generally unmanaged and relatively wild nature of the river corridor to continue to prevail with no human-induced physical habitat changes. If predicted beetle outbreaks do occur, however, remaining existing living spruce and Douglas-fir trees could be attacked, weakened and eventually die as part of the natural process. These trees too, would then eventually fall to the forest ground and become unavailable for bald eagle use. This could result in a condition where large-diameter dead trees, which eagles tend to select for to build nests and perch/forage, would be unavailable for a significant period of time.

As has been mentioned, the North Fork is a relatively popular river for a variety of river-related recreational pursuits, including fishing, floating (using a variety of crafts), and camping and, because of this, there may be disturbance-related impacts that may be affecting bald eagle behavior and use of the river that are occurring. However, this alternative would not cumulatively add or detract from the generally increasing trend of human recreational uses of the North Fork river corridor. Also, no other reasonably foreseeable actions that would occur within the river corridor are likely to affect eagle ecology and use of the North Fork nest site. Therefore, the determination is that the implementation of this alternative would have "no effect" on the bald eagle or its habitat.

Alternatives 2, 3, and 5

The North Fork corridor affected by the Moose Fire is mainly in federal land ownership (Flathead National Forest or Glacier National Park) and has experienced relatively few habitat changes induced by humans. Nine relatively small clearcuts were dispersed along the riverside of the North Fork road between 1985-1990 for the purpose of facilitating views into the park for people while driving. These views were created by converting relatively thick, small diameter and stagnant lodgepole pine stands into openings. They ranged in size from 2-10 acres and because of their forest condition; the conversions probably did not affected bald eagle habitat quality to any measurable degree. Other than this, the river corridor has pretty much undergone natural processes in terms of physical habitat changes. Within the Big Creek drainage, a wide variety of forest management activities have occurred including road construction, timber harvesting, prescribed burning, recreation facilities improvements, and fish habitat improvements. However, because most of these activities have occurred outside the primary interest area of bald eagles (rivers or lakes) during the breeding season, it is unlikely that they have had any discernible effects on bald eagle presence or absence in potential nesting habitat.

Since this project would be neutral in terms of adding to or taking away from the current recreational uses humans make of the river, none of the action alternatives would cumulatively be additive to this little understood potential impact on bald eagles in the North Fork.

Reasonably foreseeable actions are proposed to occur in upland sites and as such have little potential for impacting river resources, including bald eagles or their nesting habitat. Therefore, no adverse cumulative effects are

expected from such things as mushroom picking, trail maintenance/reconstruction, and road 'best management practices' work. Considering the estimated potential direct and cumulative effects from any of the alternatives analyzed, it is unlikely that any kind of a threshold would be crossed that would produce adverse effects on bald eagles or their use of the North Fork nest, therefore, the implementation of either of these alternative would result in a determination of "may effect - not likely to adversely affect" the bald eagle or its habitat.

Alternative 4

No cumulative effects are expected with implementation of this alternative. Therefore, the determination is that the implementation of this alternative would have "no effect" on the bald eagle or its habitat.

4. Regulatory Framework

The bald eagle is listed as "threatened" in Montana and the Pacific Bald Eagle Recovery Plan (1986) provides recovery goals and objectives. The Montana Bald Eagle Management Plan (1994) provides management guidelines to help conserve the species and its habitat. Critical habitat was never designated for bald eagles. The Forest Plan prohibits disturbance-causing activities such as road construction and logging within one half mile of active bald eagle nests during the nesting period from February 1 – August 1. The Flathead Forest Plan (page II-36) provides additional management direction and standards to guide project planning.

5. Regulatory Consistency

The action alternatives are consistent with Forest Plan standards and guides, and with the Endangered Species Act with regard to bald eagles.

Canada Lynx (Threatened)

1. Analysis Area and Information Sources

Previously established analysis units, in accordance with the Lynx Conservation and Assessment Strategy (Ruediger et al 2000), were used to assess the effects of proposed actions on lynx and lynx habitats. These units approximate the size of an area used by an individual lynx and encompass both preferred lynx habitat and areas not suitable for lynx. Although the watershed includes portions of four lynx analysis units (LAU), only two of those units (see Lynx Analysis Area Map 3-8) have proposed harvest activities that could affect lynx habitat. These two LAUs make up the analysis area for determining effects to lynx.

Data used in the analysis were from existing resource information sources, research literature, and post-fire aerial photos. Arcview geographical information system was used for quantification of habitat.

2. Affected Environment

Primary lynx habitat in the Rocky Mountains and on the Flathead National Forest includes lodgepole pine, subalpine fir, and Engelmann spruce. Secondary vegetation interspersed within subalpine forests; including cool, moist Douglas-fir, grand fir, western larch, and aspen, may also contribute to lynx habitat. Moist Douglas-fir types are considered secondary habitat that can provide red squirrels, an alternate prey species for lynx during periods when snowshoe hare (primary lynx prey species) densities are low. In Montana west of the Continental Divide, lynx habitat is contained in subalpine fir habitat types, generally between 4000 and 7000 feet. Cover types can be mixed species composition (subalpine fir, lodgepole pine, Douglas-fir, grand fir, western larch and hardwoods) as well as pure lodgepole stands (Ruediger et al. 2000)

Lynx prefer to move through continuous live forest and frequently use forested saddles, ridges, and riparian areas (*ibid*) during travels. They prefer to forage in areas that support their primary prey, the snowshoe hare. Vegetation characteristics that do so include a dense, multi-layered understory that maximizes cover and browse at both the

ground level and at varying snow depths throughout the winter (crown cover within the lower 15 feet in order to provide cover and food for hares to 6 feet high at maximum snow depths).

The Big Creek watershed encompasses both lynx analysis units and has features favored by lynx as described above. Only one lynx track detection (Moose Lake Road) has occurred during winter track surveys over the last five years within the Big Creek drainage (Project Record). Each unit is described below.

Lynx Analysis Map 3-8

Lower Big Creek LAU

The Lower Big Creek LAU is approximately 23,950 acres in size, of which 18,849 acres has been identified as suitable for lynx. The Moose Fire burned 91 percent of the suitable habitat across the analysis unit with 69 percent burning with a high or moderate severity. It was assumed that moderate and high severity fires created temporarily unsuitable habitat for lynx by killing most live trees. Although large burned areas with very high snag densities may be able to provide travel habitat in a cover-limited landscape, the extent of this use is unknown (Interagency Lynx Committee 1999).

Low severity fires affected approximately 21 percent of suitable lynx habitat and removed some understory cover but remaining vegetation continues to provide some overhead cover and features favored by red squirrels.

In summary, 69 percent of the habitat in this LAU is now unsuitable or at best marginal travel habitat and 21 percent may provide habitat for secondary prey species (red squirrel) for lynx. Unburned acres (10%) can be expected to provide some forage and limited den habitat potential. This analysis unit is not expected to support a lynx until shrubs and small trees revegetate in 10 –15 years, and snowshoe hares repopulate the analysis unit.

Upper Big Creek LAU

Upper Big Creek is 19,610 acres in size with 15,893 acres suitable for use by lynx. The Moose Fire burned hot enough to kill most trees on 632 acres (16%) of suitable lynx habitat. Approximately five percent of suitable habitats burned with low intensity fire but may continue to provide forage potential for lynx.

Approximately 16 percent of the habitat within this LAU is now unsuitable for lynx or at best marginal travel habitat that would recover as foraging habitat as shrubs and small trees revegetate the area in 10-15 years. The remaining acres of habitat are considered capable of providing adequate habitat for lynx (Big Creek Geographic Unit EAWS 1999) in this analysis unit.

3. Environmental Consequences

No significant issues related to the Canada lynx were identified (refer to Chapter 2).

The following Effects Indicators were used to focus the lynx analysis and disclose relevant environmental effects:

Adherence to applicable Conservation Measures contained in Lynx Conservation Assessment and Strategy (Ruediger *et al.* 2000), including:

- Management actions shall not change more than 15 percent of lynx habitat within an LAU to an unsuitable condition within a 10 year period
- Following a disturbance, such as windstorm, fire, or insects/pathogens mortality that could contribute to lynx denning habitat, do not salvage harvest when the affected area is smaller than five acres.
- Maintain denning habitat in patches generally larger than 5 acres comprising at least 10 percent of lynx habitat.

Direct and Indirect Effects

Alternative 1 (No Action)

Under this alternative there would be no harvest and burned areas would recover naturally into combinations of foraging and denning habitat as vegetation establishes and trees fall to create patches of cover across the burned area. It is expected that this alternative would provide a high level of den habitat material (i.e. downed logs). As tree seedlings and shrubs recover across the burned areas, snowshoe hares should begin to colonize the area

creating foraging habitat for lynx within 10-15 years. This habitat component would be expected to decline when trees and shrubs grow out of reach of hares, or until another disturbance occurs.

Under this alternative additional insect-killed trees are likely in the future but the long-term effects on this disturbance dependent species are not likely to be negative because additional beetle-killed trees would supply denning habitat material and increase conifer seedling and shrub habitat favored by snowshoe hare, a primary lynx prey species. All applicable lynx conservation standards would be met under this alternative. There would be no direct or indirect effects to lynx under this alternative.

Effects Common to All Action Alternatives

Selective timber harvest that leaves coarse woody debris and snags at Forest Plan standard levels is predicted to be adequate to retain woody material to supply denning habitat features for lynx across harvest units in suitable burned lynx habitat. Since the alternatives would only remove existing dead or dying trees, all other standards contained in the Lynx Conservation and Assessment Strategy would be unaffected.

Alternatives 2, 3, and 5

Under these alternatives harvest treatments would affect at most (Alternative 2) 16 percent of temporarily unsuitable (burned) lynx habitat acres. Approximately 15,894 acres would remain unaffected by harvest actions and remaining burned but unharvested acres (12,610) would provide extensive levels of downed woody debris for denning habitat across the analysis area. In most cases leave trees and coarse woody debris would be left in groups and range from 1 to 10 acres in size scattered throughout units. These patches when combined with untreated burned and unburned riparian areas would be sufficient to meet the intent of the Lynx Conservation Assessment and Strategy of maintaining suitable denning habitat in patches larger than 5 acres over at least 10 percent of the area.

All action alternatives would speed recovery of lynx foraging habitat by planting approximately 2000 acres with conifer seedlings. Because the area was so severely burned, seed sources for recovery are not available and planting is expected to speed recovery by five or more years, thereby enhancing production of cover, travel, and foraging habitat within lynx habitats.

Alternative 4

Under this alternative, riparian buffers and high snag retention levels are emphasized. This action alternative would retain a high level of coarse woody debris that would provide a high level of quality potential den habitat. The high level of woody debris would also provide habitat characteristics favored by small mammal prey species of lynx. Road closures would reduce potential disturbance in a now cover-limited landscape.

Since this action alternative treats the least number of acres as well as retaining more snags this alternative would retain the highest quality of lynx denning habitat over the greatest number of acres being treated.

Cumulative Effects

Cumulative effects on lynx have been varied. Timber harvest activities that clearcut forests temporarily removed both snowshoe hare and red squirrel habitat, thereby reducing prey densities. The harvests also regenerated the forest and provided the early successional forests needed by snowshoe hares. Shelterwood harvests and other selective tree removal methods opened the forest floor to sunlight, most likely stimulating shrub and conifer seedling growth that favored snowshoe hares, yet retained overhead mature cone producing trees needed by red-squirrels. Other human developments in lynx habitats such as the Moose Creek campground, hiking trails, and road development within the drainage probably had very minor direct effects because lynx are for the most part tolerant of human presence (Ruediger 2000). Indirectly however, snowmobile use of road systems packed the snow creating pathways for other predators to reach lynx prey species, previously excluded by deep snows. It is highly probable

that any additional reduction in the already limiting prey base of lynx could have reduced lynx survivability during an energetically demanding winter period.

Although timber harvests may not have had long-term consequential effects on lynx prey availability, the reduction over time of denning habitat proximate to adequate foraging habitat most likely reduced habitat quality for lynx. This is highly speculative however because lynx have been known to den under single tree stumps and shrubs (Ruggerio *et al*. 2000), or even root wads.

In summary, the effects of past management activities probably degraded habitats to some degree but in other cases served as a substitute disturbance while the agency was suppressing fires. Overall it is difficult to define past habitat characteristics for lynx on this landscape. However, given that southern lynx populations need to be replenished at times by migrating animals from northern populations (*ibid*) it is probable that past management actions have been slightly negative in their effects on lynx in this watershed, especially den habitat material recruitment and by indirectly improving access to prey species for competing predators. The proposed action alternatives however would mitigate any additional loss of denning habitat by retaining snags and coarse woody debris across all treated units. When combined with unharvested riparian zones and the remainder of the unharvested but burned watershed acres, this should provide an adequate quantity and quality sufficient to meet den habitat requirements for denning female lynx.

Action alternatives would not cause suitable habitat to become non-suitable and the project would improve habitat suitability by closing roads and speed recovery of foraging habitat by planting conifers. Displacement of lynx is not expected because lynx are not likely to utilize the burned areas until recovery of foraging habitat occurs. Although the effects of this project would not cumulatively affect lynx or lynx habitat and habitat would remain suitable, habitat would be affected. In some cases suitability would be improved by road closures. Therefore all action alternatives may affect but are not likely to adversely affect the Canada lynx.

4. Regulatory Framework and Consistency

The proposal meets conservation measures contained in the Lynx Conservation and Assessment Strategy (LCAS; Ruediger *et al*. 2000), and Flathead Forest Plan management direction and standards.

C. Sensitive Species

Sensitive wildlife species are those species identified by the Regional Forester for which population viability is a concern. Of the 12 Sensitive wildlife species (including the recently delisted peregrine falcon) on the Flathead National Forest (March 12, 1999) nine are not discussed further in this document because of a lack of habitat or lack of effects to their habitats. None of the alternatives would have direct, indirect, or cumulative effects on riparian and wetland wildlife species, and therefore there would be no impacts on the following species: ***common loon, harlequin duck, northern bog lemming, northern leopard frog***, or ***Townsend's big-eared bat***. Habitat for other sensitive species is not present within the Moose fire-affected area and, therefore, there would be no impacts on the following species: ***peregrine falcon*** (likely to soon become a Region One sensitive species), ***fisher***, ***flammulated owl,*** and the ***northern goshawk***. These nine wildlife species would not be discussed further in the body of this Environmental Impact Statement. The rationale for their exclusion is presented in Project records Rs-6 through Rs-14. The Biological Evaluation for Sensitive Wildlife Species has been incorporated into the text of this document, with a separate signature and summary page in the project file (Project record Rs-1).

Black-backed Woodpecker (Sensitive)

1. Analysis Area and Information Sources

Forest Service land within the Moose Fire (Project record Rd-3) was considered for the evaluation of direct and indirect effects on black-backed woodpeckers. This approximately 56 square mile area is large enough to include the home range of numerous pairs of black-backed woodpeckers and is representative of effects of fires, natural tree mortality, timber harvest, and firewood cutting across the landscape. The remaining area of the Big Creek drainage and the Moose Fire was added to the above for the consideration of cumulative effects. Data used in this analysis included pre-fire and post-fire aerial photography, stand exams, field surveys of snags and downed logs, fire severities, and road locations.

2. Affected Environment

The black-backed woodpecker (Project File Project record Rs-2) lives in boreal and montane conifer forests in Alaska, Canada, and the northern lower 48 states. The species is a rare to uncommon permanent resident of the region. Black-backed woodpeckers were reported in the Moose fire affected area in 2002. They were frequently observed in the 1988 Red Bench fire area 1 to 9 miles to the north, including nesting observations (Caton 1996). Immediately adjacent to the Moose Fire, over 10,000 acres of Glacier National Park burned in 1999 during the Anaconda Fire. This area is highly likely to still support high densities of black-backed woodpeckers.

In western Montana, black-backed woodpeckers appear to be strongly dependent upon one- to six-year-old burns (Hejl and McFadzen 2000; Powell 2000; Hitchcox 1996; Caton 1996; Hutto 1995). Black-backed woodpeckers apparently only exploit fires that burned at moderate or high severities, and that support high densities of bark beetles and borers (O'Connor and Hillis 2001; Hejl and McFadzen 2000; Powell 2000). In the Northern Rockies, black-backed woodpecker abundance correlates not to burn size but to the number snags remaining (Hutto 1995). It is possible that black-back populations reach *source* levels in recent burns, but may drop to *sink* levels in the time between large burns (Hutto 1995). Annual variability of fires is high, both in occurrence and size, and large fires are generally less frequent since the advent of effective fire suppression. Considering both the departure from historically available habitat and the increased interval between large fires, the black-backed woodpecker may be at risk in USFS Region One (Hillis, Jacobs, and Wright *in prep.*).

Hejl and McFadzen (2000) found that salvage logging can virtually eliminate black-backed woodpeckers from a stand, even when many of the fire-killed trees were retained. USFS Region One draft guidelines (unpublished) suggested that in areas of 2000 to 6000 feet elevation, 30 percent of burned areas should be left unsalvaged in a fire area of over 10,000 acres. In addition, Wisdom *et al*. (2000) recommended maintaining contiguous burned areas of at least 1.5 square miles, retaining snags in salvage units in clumps rather than evenly distributed, and avoiding post-fire salvage logging in portions of large burned forests for about 5 years.

Potential black-backed woodpecker habitat (Project record Rs-2) in the Moose fire affected area was considered to have moderate or high-quality potential as snag habitat (Project record Rd-3) and that burned at high or moderate fire severities. Close to 5,600 acres of potential black-backed woodpecker habitat was created by the Moose Fire on Flathead National Forest. This is 15.7 percent of the Moose fire affected area on Forest Service land. This habitat is almost entirely within the Big Creek drainage, with the largest and most contiguous areas in the downstream half.

Of over 26,000 acres that burned in Glacier National Park, the entire potential habitat for black-backed woodpeckers is expected to persist throughout the 6-year period.

3. Environmental Consequences

No significant issues related to the black-backed woodpecker were identified (refer to Chapter 2).

The following Effects Indicators were used to focus the black-backed woodpecker analysis and disclose relevant environmental effects:

- Acres and percent of habitat lost
- Number of large bocks unsalvaged
- Potential Black-backed Woodpecker Habitat across the Moose Fire area.

Direct and Indirect Effects

Alternative 1 (No Action)

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. Spruce beetle and Douglas-fir beetle populations would be expected to increase, creating more potential black-backed woodpecker habitat over a larger landscape. Within about six years, black-backed woodpecker populations would naturally decline in the burned areas, following the decline in beetle larvae. Other effects relevant to this species are disclosed in the Snag and Downed Wood Habitat section of this chapter.

Alternatives 2, 3, 4, and 5

Salvage harvest in potential black-backed woodpecker habitat (Table 3-37) would virtually eliminate black-backed woodpeckers from the salvage unit areas, even though many of the fire-killed trees would be retained (Hejl and McFadzen 2000). Based on research in the Northern Rockies (Hutto 1995), many of the leave patches within units may be too small for use by black-backed woodpeckers. The number of areas larger than 1.5 square miles was also tallied. Recommendations in Wisdom *et al.* (2000) appear to be met, due to the maintenance of large contiguous burned areas and the retention of snags in clumps in salvage units. In addition, all of the approximately 9000 acres of potential habitat created by the Moose Fire in Glacier National Park is expected to persist until naturally no longer usable by black-backed woodpeckers. See Project records Rs-3 and Rd-4 for more information, including additional effects of helicopter logging, cable logging, road construction, and firewood cutting.

Table 3-37: Effects of Salvage on Black-backed Woodpecker Habitat on National Forest System lands.

Alternative	Acres Habitat Lost	% of Habitat Lost	# Large Blocks Unsalvaged (>1.5 Square Miles)
2 & 5	2489 ac	44%	4
3	2236 ac	40%	5
4	1717 ac	31%	7

All action alternatives include measures to control bark beetle populations via trap trees, funnel traps, and pheromones. These efforts would likely reduce the black-backed woodpecker numbers to be produced on and adjacent to USFS lands in the Moose fire affected area.

Cumulative Effects

Effects Common to All Alternatives

Across the Interior Columbia River Basin, moderate or strong declines in unburned habitats used by black-backed woodpeckers were projected in nearly 70 percent of watersheds. The most widespread declines were in the northern and far eastern parts of the Columbia River Basin. Moderate or strong declines were projected in over 90 percent of watersheds within the Northern Glaciated Mountains (Wisdom *et al.* 2000). The natural pattern of beetle outbreaks has been altered through silvicultural and fire management practices. Silvicultural practices directed at maximizing wood production by harvesting trees before they are susceptible to bark beetle attacks, and salvage logging of beetle-infested, fire-killed, and wind-killed trees reduced the occurrence of beetles in some areas.

Elsewhere, fire management policies have lengthened natural fire regimes and allowed more frequent occurrences of beetles (*ibid*).

Potential black-backed woodpecker habitat on all ownerships across the Moose fire affected area is shown in Table 3-38. Fire suppression has been the greatest factor limiting the current distribution of potential habitat in this area. There have been very few wildfires since 1926, and none over 200 acres in size. In addition, past timber harvest and roading on Federal, State, and private land in the Big Creek drainage and the Moose fire affected area reduced the acreage of dense snag habitat later to be created by the Moose Fire (Project record Rd-3). The Moose Fire created about 1500 acres of black-backed woodpecker habitat in the Coal Creek State Forest (Montana DNRC 2002). This is currently being reduced to 924 acres by the Cyclone Ridge and Moose "Phase I" salvage efforts, with about 250 of these remaining acres proposed for salvage in an additional effort currently under analysis.

Table 3-38: Potential Black-backed Woodpecker Habitat across the Moose fire affected area.

Land Management Unit or Ownership	Potential Black-backed Woodpecker Habitat		
	Acres	% of burned area within unit	% of Moose Fire area
Flathead National Forest (U.S. Forest Service)	5603 ac	16%	~8%
Coal Creek State Forest (Montana Department of Natural Resources and Conservation)	924 ac	~ 10%	~1%
Glacier National Park (National Park Service)	~ 9000 ac	~ 35%	~13%
Private Land	<100 ac	<15%	<1%
TOTAL	~ 15,500 ac		~22%

See Project record Rd-4 and the Snag and Downed Wood Habitat section of the Moose Post-Fire Project EIS for more information about cumulative effects on snags, most of which are relevant to black-backed woodpeckers. The effects of most of these past actions and events are imbedded in the environmental baseline described above (Project record Rd-3). These effects would be cumulative to those discussed above for each alternative.

Boreal Toad (Sensitive)

1. Analysis Area and Information Sources

The area encompassed by the Big Creek watershed and the adjacent portion that drains directly into the North Fork of the Flathead River was used for the analysis of cumulative effects. This approximately 53,000 acre area is large enough to include the home range of numerous breeding pairs and can give a measure of potential population-level effects. It also is representative of effects of timber harvest, fires, and roading across the landscape.

2. Affected Environment

Boreal toads breed in lakes, ponds, streams, and road ditches, with a preference for shallow areas with mud bottoms. Adults are largely terrestrial in a wide variety of habitats, up to at least four miles from water. Historical data indicate that boreal toads were widely distributed and very common in Montana and other western states, but the species has apparently undergone severe population declines in the past 25 years (Currim 1996). There appears to be 121 acres of suitable wetland breeding habitat scattered throughout the Affected Area. Most of this (116 acres) is within the Moose fire affected area, and nearly all of it was burned over by the Moose Fire. All of Forest Service land in the Moose fire affected area is close enough to potential breeding ponds to be potential upland habitat for boreal toads. For more information, see Project File Project record Rs-4.

This species can be affected by fire, timber harvest and salvage, insect epidemics, and road construction and maintenance. Individual toads or tadpoles can be killed by wildfire or salvage or road construction/maintenance

activities. Compaction, changes in the amount and types of vegetative cover, and in the quantity and quality of water can all indirectly affect this species.

3. Environmental Consequences

No significant issues related to the boreal toad were identified (refer to Chapter 2).

The following Effects Indicators were used to focus the boreal toad analysis and disclose relevant environmental effects:

- Extent of activities that could cause direct mortality of boreal toads in terrestrial habitats

Direct and Indirect Effects

Alternative 1 (No Action)

This alternative would have no direct effect on boreal toads. See the Fisheries and Hydrology sections of this chapter.

Alternatives 2, 3, 4, and 5

Requirements of the Montana Streamside Management Zone (SMZ) Law would be followed for all treatments within or adjacent to wetland or riparian zones. This would include delineation of the boundaries of identified wetlands. Buffer zones of 50 to 100 feet (depending upon slope and stream class) would be identified around streams and riparian areas within units, with equipment restrictions in these areas as outlined under the Montana SMZ law. From 4800 to 6800 feet along Units 3, 8, 9, and 10 would be on a bench above to a 48-acre area of potential toad breeding habitat. Road 317 lies between the riparian area and the salvage units along most of this distance. No harvest or burning is planned close enough to these areas to alter the availability of downed wood recruitment in potential toad breeding habitat. None of the watershed or fisheries enhancement measures included in these alternatives are expected to have negative impacts on riparian habitat areas or the species using them. Roadside ditches that hold water long enough into the summer to provide breeding sites would not be protected unless they were associated with streams or other protected sites. These breeding sites would be vulnerable to seasonal dry-up and road maintenance, temporary construction, or road decommissioning. Individuals or site populations could be affected by either of these if they occurred while tadpoles were still dependent on water availability.

If adult boreal toads were present, individual mortality could occur during harvest or by vehicles, logging machinery, or road equipment. These activities are shown in Table 3-39. Such individual mortality would be infrequent and would not be expected to affect population levels of boreal toads.

Table 3-39: Extent of activities that could cause direct mortality of boreal toads in terrestrial habitats (Project record Rs-5).

Alternative	Acres in Units	Acres of Actual Salvage	Miles Temporary Road Construction	Miles Road Decommissioning
2	3721	~ 3000	0.9 miles	57 miles
3	3238	~ 2700	0.9 miles	56 miles
4	2493	~ 2150	0 miles	87 miles
5	3721	~ 3000	0.9 miles	56 miles

Cumulative Effects

Effects Common to All Alternatives

Past timber harvest, road construction and maintenance, fires, and fire-fighting have likely affected boreal toad habitat in this area. Periodic road maintenance, specifically cleaning out roadside ditches, has probably impacted individuals or site-specific populations of boreal toads if tadpoles were present and were still dependent on ditch water. A reasonably foreseeable Moose Fire BMP Project would improve road drainage and culverts throughout the Big and Coal drainages in 2002. This would further impact tadpoles, depending on the season and location of work. The Coal Creek Unit of the Montana DNRC is salvaging approximately 986 acres of burned habitat in the Cyclone Ridge and Moose I efforts. Up to 1202 acres are proposed for salvage under Moose II in the Moose fire affected area on state land. A total of up to 4 miles of temporary roads may be built on state lands to salvage this timber. About 100 acres were cleared for downhill ski runs in the Upper Big Creek drainage since the 1980s, with an additional 80 acres of clearing approved for the Chair 8 runs. In 1998, approximately 2000 acres were approved for prescribed burning near Moose Peak, but this would be reevaluated in 2002 or 2004. A reasonably foreseeable action would be measures to control weed species and is unlikely to affect toads. Fires probably rarely burn in this species' breeding habitat, although water quality and quantity varies after large fires upstream. Beaver dams also provide a flux of habitat availability; past beaver trapping may have affected habitat availability where beavers may not have recolonized. See the Hydrology/Fisheries sections of this chapter for more information about cumulative effects on these and similar habitats. The effects of most of these past actions and events are imbedded in the environmental baseline described above (Project record Rd-3). These effects would be cumulative to those discussed above for each alternative.

Wolverine (Sensitive)

1. Analysis Area and Information Sources

Wildlife observation records indicated that wolverine have been detected within the watershed in China Basin and the Hallowat drainage and within the burned analysis area prior to being burned. Since big game winter range is present in the watershed and summer habitat exists in the higher unroaded areas, the Big Creek watershed contained habitat components sufficient in abundance and distribution to sustain wolverine use, therefore, the watershed was used as the analysis area.

Data used in the analysis were from existing resource information sources, research literature, and post-fire aerial photos. Arcview geographical information system was used for quantification of habitat pertaining to big game winter range.

2. Affected Environment

Adult wolverines are mostly solitary animals and they range widely over a variety of habitats. Isolation from human impacts and a diverse prey base seem to be the most important habitat components. There seems to be little use in stands of dense young timber or in openings such as clear-cuts or wet meadows (Butts 1992). Home ranges are very large, averaging approximately 150 square miles in Montana. Wolverines feed primarily on rodents and carrion, although they are opportunistic and would consume berries, insects, fish, birds, and eggs when available. Ungulate carrion seems to be particularly important to wolverine in the winter and movements to lower elevations during winter may be to take advantage of ungulate mortalities on winter ranges (Butts 1992). In summer, wolverine in Montana traveled to higher elevation forests dominated by subalpine fir.

Prior to management actions (e.g., road building and timber harvesting) within the Big Creek watershed, wolverine had unlimited access to the variety of habitats within the drainage and most likely traveled from high elevation summer habitats in Hallowat and China Basin to low elevation winter big game ranges during winter periods. Past timber harvests altered habitat characteristics by reducing the amount of small mammal habitat (down logs/snags) and construction of roads, which allowed relatively easy access for trapping opportunities. These past management

activities have also had the dual results of providing early succession/foraging habitats for big game and easier access for hunters during hunting seasons.

The most far-reaching effect may have been the development of road systems and recreational trails and sites that improved access and promoted human use in remote areas such as roads into Hallowat and China Basins and the road leading to Moose Lake. This most likely had the biggest impact on lowering habitat quality for wolverine. Similar to lynx, the advent of snowmobile use into the drainage probably allowed other predators to access the area and thereby compete for resources during energy-demanding winter periods.

Another variable confusing the picture of pre-management wolverine populations and use is that of fire suppression. Prior to management, elk and deer populations were dependent upon natural disturbances to create openings that provided the early successional growth favored by foraging ungulates. Timber harvests to some extent replaced fire's role in creating the early seral vegetative foraging habitats.

In summary, past management actions that altered vegetative structure probably did not have appreciable effects on wolverine prey abundance because each manipulation of habitat diversified the prey base for wolverine by increasing some species and reducing others. On the other hand, the use of roads by snow machines and other motorized vehicles reduced the remoteness of the pre-managed landscape. This may have affected the behavior of wolverine perhaps affecting the energetic needs of the wolverine during critical periods of the year.

The recent Moose Fire burned a portion of a wolverine home range and created temporarily unsuitable conditions for a period of time until vegetation recovers and small mammals and birds begin to repopulate the burned area. It is assumed that big game populations have been temporarily impacted and would be lower than before the fire. Wolverine habitat continues to exist within the watershed and prey population diversity and quantity have been reduced temporarily until vegetation recovers.

Since studies of wolverine are few and inconclusive, it is difficult to determine the exact effects past management actions have had on wolverine within the Big Creek watershed. Generally, it is likely that unroaded remote areas are better than roaded and "heavily-used-by-humans" habitats, and activities that enhance the ungulate prey base are better than those that reduce the ungulate prey base.

3. Environmental Consequences

No significant issues related to the wolverine were identified (refer to Chapter 2).

The following Effects Indicators were used to focus the wolverine analysis and disclose relevant environmental effects:

- An assessment of effects on potential prey species of wolverine (big game) and on levels of potential disturbance (motorized access).

Direct and Indirect Effects

Alternative 1 (No Action)

Under this alternative short-term effects on potential carrion sources would be variable. Short-term effects of limited availability of forage (1-3 years) and loss of thermal cover may benefit wolverine because of potential over-winter mortality of big game animals. The potential mortality is entirely dependent on weather patterns that determine forage production levels (growing season precipitation) or/and winter caloric requirements of big game animals (extreme winter temperatures). This alternative would have no direct impacts on wolverine.

Since nearly all winter range for deer and elk was severely burned, additional losses of marginal thermal (see elk/mule deer section) cover that potentially could occur as a result of possible beetle outbreaks would be expected to be negligible in terms of effects on wolverine.

Since there would be no changes in the level of motorized access, the current level of road-use related disturbance/less effective habitat use by wolverine would continue.

Alternatives 2 and 3

These two action alternatives treat similar acres of winter range and would therefore have similar effects. The proposed removal of some woody material from winter range may impact big game use of that range because harvest actions may displace animals from range causing greater energy expenditures by deer and elk as they move away from the disturbance. This may lead to higher levels of mortality. Displacement caused mortality would, in the short-term, benefit wolverine by increasing available winter forage but excessive winter range big game mortality could cause reductions in local big game populations and in the long-term reduce winter carrion forage base for wolverine in the Big Creek area. The extent once again would be variable and highly unpredictable because winter mortality is dependent on winter and growing season weather conditions. Ungulate losses in any case are expected to be low.

Harvest activities would not be conducted in any wolverine denning habitats and would therefore not have any impacts on this habitat component. However, the presence of winter logging activities may create an unknown level of disturbance on big game winter ranges seasonally visited by wolverine. The effects of this disturbance are unpredictable but could be expected (if they occur) to cause some additional energetic need by wolverine. This need may be met by additional carrion if ungulates are negatively affected by winter harvest actions.

Under these alternatives road closures would improve habitat suitability for wolverine by reducing overall road density in the watershed. Therefore, alternatives 2 and 3 may impact wolverine prey species because the short-term harvest event may both provide additional carrion but may also in the longer term slightly reduce the ungulate prey base. The project may therefore impact individual wolverine or habitat, but would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Alternative 4

This alternative would have similar short-term effects on big game winter populations and wolverine winter carrion forage potential. In addition, the retention of higher numbers of snags may provide more hiding cover for deer and elk thereby reducing hunter caused mortality. Additional snag and coarse woody material on the ground would also improve habitat characteristics for small mammals and birds and should increase production and diversity of this prey base.

Long-term effects on wolverine would be lessened because this alternative closes portions of the Big Creek Road thereby reducing long-term, multiple-year disturbance on big game using winter range. The elimination of winter logging (short-term/one-time event) disturbance and closure of additional roads would further reduce the potential disturbance levels (to dispersing wolverine) in the Big Creek drainage.

The effect on wolverine by implementing this project may therefore impact individual wolverine or habitat, but is not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Alternative 5

This alternative would have similar harvest effects on wolverine (as discussed above) but the road systems scheduled for closure would limit access to known use areas of wolverine in the Hallowat and China Basin areas, thereby improving summer habitat quality for wolverine. Although this alternative is similar to alternatives 2 and 3 for total road density the roads closed under this alternative improve habitat for wolverine to a greater degree than other action alternatives. This alternative would have a beneficial impact on wolverine by reducing access into high

elevation habitats. Harvest activities may still have a negative impact on ungulate prey species as described above in the other alternatives. The effects of implementing this project may impact individual wolverine or habitat, but is not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Cumulative Effects

Cumulative effects on wolverine have been varied. Past vegetative manipulations probably had minor direct effects on this habitat generalist. However, past forest management harvest activities favored early seral conditions preferred by big game species, an important food source for wolverine. This successional plant stage provided the needed forage in a landscape where fires were being actively suppressed. The ebb and flow of vegetative structure caused by human harvest created a diversity of conditions: berry patches, ground and tree squirrel habitat and other foraging sources for wolverine.

Human developments such as the Moose Creek campground, hiking trails, and road development within the drainage probably had more far reaching effects by increasing human access into once remote areas. Roads that accessed high-elevation basins probably reduced habitat quality the most. Snowmobile use may also have had effects on winter prey species by providing pathways for other predators to access a limited winter wolverine prey base. It is highly probable that any additional reduction in the already limiting prey base could have reduced wolverine survivability during an energetically demanding winter period.

A past and ongoing forest management activity that has and is expected to continue to be an avoidance zone for wolverine is the special use permit that allows the operation of the Big Mountain summer and ski resort area. While only the 'back side' of the ski area is within the Big Creek watershed, there are some summertime operations related to lift maintenance, etc. that may also be an avoidance zoned from otherwise usable habitat.

Mushroom picking is another forest management activity that is expected to occur with potential to displace or influence wolverine use of the burned portions of the Big Creek drainage. This activity would occur in the spring/summer of 2002 and is expected to bring hundreds of people to the Big Creek drainage.

Best Management Practices work is scheduled to occur beginning in 2002. The work consists of: improving road drainage on approximately 177 miles; upsizing culverts on 85 potential sites; and removal of fish barriers at eight sites. It is likely that work related to this project would take from three to five years to complete.

Snowmobiling occurs throughout the Big Creek watershed and this recreational activity may be having displacement effects on wolverines. Copeland (1996) believed that over-snow vehicles and increased interest in winter recreation has likely displaced wolverines from potential denning habitat in Central Idaho.

All action alternatives would have similar effects on prey availability for wolverine and all action alternatives would improve habitat usability through additional motorized access restrictions. Alternative 4 would improve wolverine habitat the most because there would be no winter logging and motorized access restrictions would limit summer time access into known high elevation use areas. The environmental baseline during non-winter appears to be suitable to sustain wolverine use; winter recreational activities may be having displacement effects on wolverine. However, none of the action alternatives would have long-term adverse cumulative effects on wolverine or habitat suitability. Therefore, when combined with past, present, and foreseeable future actions, each of the alternatives 'may Impact individuals or habitat but would not likely result in a trend toward federal listing or reduced viability for the population or species."

4. Regulatory Framework Common to all Sensitive Wildlife Species

Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA, 1976) and Forest Service Manual 2670. Amendment 21 to the Flathead's LRMP has standards to conduct analyses to review programs and activities, to determine their potential effect on sensitive species, and to prepare a biological evaluation. It also states "adverse impacts to sensitive species or their habitats should be avoided. If impacts cannot be avoided, the significance of potential adverse

effects on the population or its habitat within the area of concern and on the species as a whole would be analyzed. Project decisions would not result in loss of species viability or create significant trends towards federal listing." Future conservation strategies for each species would present direction on maintaining habitat diversity and managing for population viability, as required by the NFMA and LRMP Amendment 21. The USDA Forest Service is bound by federal statutes (Endangered Species Act, National Forest Management Act), regulation (USDA 9500-4), and agency policy (FSM 2670) to conserve biological diversity on National Forest System lands. A goal in LRMP Amendment 21 is to "ensure that Forest Service actions do not contribute to the loss of viability of native species."

5. Sensitive Wildlife Species Regulatory Consistency

In accordance with FSM 2673.42, determinations have been made as to the degree of impact the proposed activities may have on sensitive species (Table 3-40 and Project record Rs-1). Along with Chapter 1, Chapter 2, and the sub-section above on each species, these determination statements meet the requirements of the Biological Evaluation for Sensitive Wildlife Species. These determination statements are for the segment of the population using the Affected Area, not the entire population. These statements are based on available information on the distribution, presence/absence from the project area, habitat requirements, and management strategies for these species, as well as the project design and location.

Table 3-40: Biological Evaluation Determinations for Sensitive Wildlife Species (Project record Rs-1).

	Alternative				
Sensitive Wildlife Species	**1**	**2**	**3**	**4**	**5**
Black-backed woodpecker	BI	MIIH	MIIH	MIIH	MIIH
Boreal toad	MIIH	MIIH	MIIH	MIIH	MIIH
Common loon	NI	NI	NI	NI	NI
Fisher	NI	NI	NI	NI	NI
Flammulated owl	NI	NI	NI	NI	NI
Harlequin duck	NI	NI	NI	NI	NI
Northern bog lemming	NI	NI	NI	NI	NI
Northern goshawk	NI	NI	NI	NI	NI
Northern leopard frog	NI	NI	NI	NI	NI
Peregrine falcon	NI	NI	NI	NI	NI
Western big-eared bat	NI	NI	NI	NI	NI
Wolverine	NI	MIIH	MIIH	MIIH	MIIH

NI = "No Impact."
MIIH = "May Impact Individuals or Habitat but would not likely result in a trend toward federal listing or reduced viability for the population or species."
BI = "Beneficial Impact."

D. Elk and Mule Deer

1. Analysis Area and Information Sources

The analysis areas used to determine direct, indirect and cumulative effects for elk and mule deer habitat included: 1) designated winter ranges (Management Areas 13 and 13A); 2) summer range habitat analysis units; and 3) fall or transition range (habitat generally between high elevation summer and lower elevation winter ranges that elk and mule deer use when snow begins causes them to migrate toward winter range). See Map 3-9.

Data used for the analysis were from existing information sources, post-fire aerial photos and winter field trips. ArcView geographical information system was used for quantification of various habitat characteristics.

2. Affected Environment

There is year-round habitat for elk and mule deer in the Big Creek drainage, but accurate population estimates for neither of these ungulate species in the drainage exist. However, during several field trips in the Big Creek drainage this past winter, no elk were observed while an average of 23 mule deer were counted on winter range; a report of 50 mule deer observed in January (2002) in Big Creek was received (Project Record).

During the formulation of Forest Plan standards for elk and mule deer, it was assumed that standards designed for elk would also be adequate for mule deer because they both tend to use similar habitats. Within the Big Creek mule deer are probably the more numerous than elk.

Elk (and mule deer) habitat management considerations at the project level includes providing habitat for elk to exist and reproduce and providing for human enjoyment (photography, viewing and hunting). Spring, summer and fall months are important periods of time for elk as this is the period of time when elk and mule deer give birth to and nurse calves and fawns; grow antlers; build body condition; accumulate fat for enduring the winter months; and endure the stress of the big game hunting season.

Summer Range

Elk summer range habitat analysis units (HAU) were determined for the Flathead National Forest, for the purpose of analyzing summer habitat effectiveness, by wildlife biologists from the Forest and Montana Department of Fish, Wildlife and Parks. Four HAUs were used in this analysis (Map 3-9)

The concept of habitat effectiveness (HE) is one that attempts to account for the major factors that are known to dictate/influence elk (and mule deer) use of habitats. A model has been used on the Forest to evaluate management actions on elk habitat. The model uses road density, cover, and the amount of livestock grazing to calculate an HE index value (Project Record). The resulting index value (%HE) provides a baseline which can then be used to compare the relative level of change that would occur based on land management proposals that could/would change important habitat variables known to influence elk habitat use (i.e. road density cover, livestock use). In this context Tables 3-41 and 3-42 show existing information on the HAUs that were affected by the Moose Fire.

Table 3-41: Moose Fire burn severity within elk summer habitat analysis units (HAU).

HAU	# Ac	# Ac In Burn (%)	Burn Severity Classes (ac)				
			High	Mod	Low	Unburned	N.O.
Hallowat	6031	2486 (41)	605	655	858	329	40
Kletomus	5563	3952 (71)	876	662	1228	1098	86
Lower Elelehum-Big Creek	6654	6648 (100)	3039	1428	1765	292	123
Langford-Big Creek	4624	4622 (100)	2473	1136	644	261	91

[1]High = complete consumption of duff/understory vegetation; 80-100% mortality of over-story canopy.
Mod. = significant reduction of duff/understory vegetation; 40-80% immediate mortality of over story.
Low = low to moderate duff reduction and large patches of unburned or lightly burned vegetation; immediate mortality of over story is les than 40%.
N.O. = natural openings such as grassy parks and shrub fields that were burned at various severity levels.

Table 3-42. Existing Habitat Effectiveness (HE) values within elk summer habitat analysis units (HAU).

HAU	% Cover[1]	Road Density[2]	HE Value (%)
Hallowat	45	0.6	62
Kletomus	43	0.5	45
Lower Elelehum-Big Creek	12	0.8	38
Langford-Big Creek	9	1.0	36

[1]Cover=accounts for both summer thermal and hiding cover.
[2]Road Density=a simple average of miles of open road during summer divided by area size.

As the above tables show, the HAUs with the least amount of cover tend to have the lowest HE values. For this area (i.e. the North Fork), the desired range of HE index value, consistent with the objectives set forth in the Montana Elk Management Plan (Montana Department of Fish, Wildlife and Parks 1992) is 70-100% within summer range analysis areas.

Security and Vulnerability During Hunting Season

Fall or transition range is habitat that elk and mule deer use when snow begins to cause them to migrate toward winter range. Where it occurs within the Big Creek drainage tends to be variable, depending highly on the amount of snow. In general, middle elevation forested habitats (4,500-5,500 feet) are the areas where elk will be until deeper snow packs 'push' them further down in elevation.

Under 'normal' conditions in northwest Montana, elk and mule deer security and vulnerability are probably at acceptable levels, especially considering the extensive amount of forest cover. Next to low or no-road density habitat, probably the greatest ally for big game in surviving the five-week general hunting season is the presence of cover. Without cover, elk and mule deer become highly vulnerable independent of whether hunters gain access to them by vehicle, horse, or hiking. Therefore, because of the significant lack of cover within the Moose fire affected area, security is relatively low and vulnerability to being harvested is high for bull elk and mule deer bucks during the hunting season. This situation is compounded if an early heavy snowfall drives animals down to the lower elevation, where hunters have easier access.

Elk Analysis Area Map 3-9

Winter Range

In contrast to the function of summer range, winter is the season when elk and mule deer encounter low amounts of forage, with minimum levels of nutritional value and digestibility, and their sole mission is survival. Their strategy for survival is fairly basic: minimize energy expenditure. This can mean different behaviors, depending on what they have to deal with in terms of forage and cover availability, presence of predators, and human-induced stresses. During severe winter weather, forage availability is often limited and elk seek thermal cover and minimize their movements as a way of conserving energy; in other cases, animals may move to areas where more potential forage exists.

The Moose Fire significantly affected two elk and mule deer winter ranges Map 3-9. In fact, the critical component of thermal cover was mostly eliminated in both winter ranges. The Forest Plan considers winter range to be acceptable when 30 percent of the area contains winter thermal cover (a stand of evergreen trees having a minimum height of 60 feet and a minimum crown canopy of 70%). The Big Creek winter range contains approximately 7 percent (25 acres) of marginal and somewhat questionable thermal cover while Demers winter range has no thermal cover remaining. In other words, both winter ranges were severely changed by the Moose Fire and though mule deer (and probably some elk, though not documented) use of the winter ranges occurred this past winter, it seems reasonable to conclude that use and numbers of animals has decreased, as compared to pre-fire use levels.

3. Environmental Consequences

The main Forest Plan goal for winter range is to: provide the size, age, diversity, and distribution of cover and forage suitable for elk and mule deer winter habitat. Considering that approximately 61 percent (~22,000 acres) of the National Forest portion of the Moose Fire burned at a severity level of high or moderate, which is basically forest stand replacing, there are no options for diversifying forest age classes, since in both winter ranges a single forest age class is expected to develop. The main effects of the Moose fire on elk and mule deer relates mostly to the resulting proliferation of quality forage (grasses, forbs, and shrubs) and the elimination of thermal and hiding cover. With the relatively high severity of fires that affected the area, the full benefits of increased quantities of forage are not expected to occur for several years and last for 15-30 years depending on local site conditions.

The main habitat-changing management activity that may occur is the removal of dead standing trees that provide some residual value as hiding cover. These effects are difficult to quantify, therefore, effects to winter range are presented in a qualitative context. Effects are discussed on habitat use that could be affected by management activities such as winter logging, and the value of standing dead trees as hiding/concealment cover. For summer range, effects were estimated by the change in habitat effectiveness between existing and that produced by the alternatives. Fall security and vulnerability during the hunting season was determined qualitatively.

Chapter 2 identified two significant issues related to elk and mule deer: Issue #6 relating to wildlife security during hunting season, and Issue #7 regarding use of winter range. The Issue Indicators for these issue are: *a comparison of summer habitat effectiveness values within affected Habitat Analysis Units; and potential effects of salvage logging and road management on security and vulnerability during the hunting season* for Issue #6, and *qualitative assessment of potential effects of winter logging and removal of trees on hiding and thermal cover* for Issue #7*.*

No additional effects indicators were identified.

Direct and Indirect Effects

Alternative 1 (No Action)

Winter Range

This alternative would mostly allow natural recovery of both Moose Fire affected winter ranges. Populations of elk and mule deer should be expected to experience some level of decline in numbers because the availability of forage has declined and cover has been eliminated. Gradually, as vegetation recovers, particularly the shrub component, mule deer and elk would be expected to more fully utilize winter range. However, in the short-term (1-3 years) winter range potential in terms of forage should be expected to be lower than the pre-fire level, with significant increases of forage in the longer term (3 + years).

Since there would be no disturbance effects on elk and mule deer from winter logging operations, all of their available energy would be devoted to surviving the winter and none would be devoted to avoiding disturbance. Standing trees could function as residual hiding cover, until such time as trees begin to fall to the ground and/or more effective vegetation hiding cover begins to develop (probably in 10 years).

The 25 acres of thermal cover identified as marginal quality vulnerable to being eliminated if predicted outbreaks of Douglas-fir bark beetles occur. Whatever live Douglas-fir trees are remaining could be attacked and killed, leaving no thermal cover of any quality. This may produce an unquantifiable, but probably minor, amount of winter stress-induced ungulate mortality.

Summer Range

All summer range HE values would remain the same (low) in the short-term until such time as vegetation re-growth begins to provide cover. The time frame for hiding cover to develop is expected to vary, depending on local site factors such as aspect and elevation. A reasonable time frame for hiding cover to develop could vary between 10-15 years, with cover being most effective in the 15-20 year time frame. The non-forest sites would likely remain in that condition and would become the main foraging sites when forest cover eliminates forage on the rest of the sites capable of growing forest cover.

Fall Range

Fall range would remain the same with security remaining low and vulnerability to hunting pressure remaining relatively high. Over the next 5-10 years, early fall snow events that would likely push animals to the lower elevations would make bulls and bucks highly vulnerable to being harvested during the hunting season because there would not be adequate cover.

Alternative 2, 3, 4 and 5

Winter Range

The consequence of salvaging standing dead trees on winter range to elk and mule deer relates to the concept of hiding cover. Depending on the density of trees, even standing dead trees can provide some level of cover and concealment that can help an animal avoid being shot or viewed. The implication being that if early deep snow packs in the next ten years occur, concurrent with the hunting season, animals would tend to concentrate in winter range and would be highly vulnerable to being harvested.

These alternatives would remove standing dead trees from both winter ranges and the net effect would be the reduction of the residual hiding cover value that dead trees provide. While not true hiding cover as in a green forest, each of the alternatives would produce more of an open condition in the winter ranges. While this may not be a concern during the winter, since dead standing trees are not expected to provide thermal cover, it may be a concern if early snowfall drives animals to winter range during the hunting season. With more open conditions resulting from salvage harvest, animals on the winter range during hunting season would be highly vulnerable to being hunter-harvested. This effect would be short term until revegetation provides hiding cover (10-15 years).

In the Big Creek winter range three forest stands contained in units 15, 16, and 70 appeared to retain some value as thermal cover. These stands contained sufficient live trees intermixed with dead that some level of winter thermal cover value may still be provided. Proposed helicopter logging of the dead trees within the units could reduce the potential value of the living trees if some of them have to be felled for safety reasons. Therefore, there is the potential for the proposed salvaging of dead trees in these units to affect the remaining thermal cover. However, as described in Alternative 1, the potential Douglas-fir bark beetle outbreak may kill those remaining live trees anyway.

Proposed road closures/decommissioning would have no net effect on winter range habitat since all of these roads would still be open to snowmobile use. The stress that is being put on wintering animals by snowmobile traffic adjacent to winter range would tend to have an even greater impact because of the existing low level of forage availability. Additional energy that animals would have to use during winter to avoid being stressed by humans should be viewed as a negative effect, especially given the condition of the post-fire condition of the winter ranges.

Winter logging would be a possibility with these alternatives (except Alternative 4) and the net effect would probably be a higher energy use level by wintering animals due to the disturbance activities associated with harvest and related activities. What this higher energy use level would result in is not easily predictable because there are too many other unknowns such as the severity of winter that can dictate whether animals would be stressed to the point where mortality could be an indirect result or animals move away from the disturbance zone. Based on field visits, it is known that mule deer are still using the Big Creek winter range; none have been observed on the Demers winter range. This may be due to the fact that the Demers area burned more severely than the Big Creek area and so a significant difference exists in forage availability between the two areas. Therefore, winter logging may have negative effects on wintering mule deer in the Big Creek winter range but probably not the Demers winter range. The effects would be temporal and would during suitable conditions in two winters.

Summer Range

The analysis showed that the salvage portion of these alternatives would make no difference within any of the HAUs in terms of overall habitat effectiveness, even though some hiding cover would be eliminated. However, the road management alternatives did create a few changes in HE values (Table 3-43). Only in the Hallowat HAU, the one that was burned the least by the Moose Fire, did the HE value improve enough to be above the desired 70 percent HE value, and this was on the strength of additional motorized access restrictions. Overall, summer range habitat effectiveness should not change as a direct result of removal of dead trees because what these animals really need is thermal cover to ameliorate the stress of summer heat and type of cover should not be expected to develop for many decades to come. However, because security is important to mule deer and elk, road closures to motorized use can be very beneficial. In this context, the road strategy of Alternative 5 provides substantial improvement over the existing situation in two of the four HAUs. Alternatives 2 and 3 provide no increases in habitat effectiveness, while alternative 4 does provide an increase in HE in the Lower Elelehum HAU.

Table 3-43: The change in HE values after implementation of each of the alternatives within affected HAUs.

HAU	Habitat Effectiveness (HE) Index Value (%)				
	Existing	Alt 2	Alt 3	Alt 4	Alt 5
Hallowat	62	62	62	62	78
Kletomus	45	45	45	45	60
Lower Elelehum	38	38	38	46	38
Langford	36	36	36	36	36

Fall Range

The management of cover and access is extremely influential in hunting success for big game animals. In general, each of the proposed salvage alternatives would create more open conditions than exist now and this would cause elk and mule deer to be more visible to hunters and, therefore, more vulnerable to being harvested. This effect is expected to last for approximately 10 years, when vegetation re-growth would provide hiding cover. Of course the natural tendency should be for mule deer and elk to want to stay in the higher elevations during the hunting season, however, the potential exists for early snow events to push animals to lower elevations. If this occurs in any of the fall seasons over the next ten years, a relatively high hunter harvest of mule deer bucks and any bulls should be expected.

The amount of motorized access is an important determinant of big game vulnerability and the alternatives do differ in this regard. Perhaps the most critical road that is expected to influence vulnerability of big game is the eight-mile length of Road #316 (main Big Creek road) in lower Big Creek that goes through the burned area. This road would remain open during the fall big game season under each of the alternatives and, therefore, vulnerability would generally be high regardless of the alternative selected. Each of the alternatives would provide similar levels of fall big game security in the lower elevations because they would each close important roads within the cover-limited burned area: the Lookout Road #803, which would be closed year-round, and the fall closure of Elelehum Creek Road #5272 would be maintained.

Cumulative Effects

With the exception of a prescribed burn on the Demers winter range in the mid-1980s that created open forage conditions, past vegetation management activities within the Big Creek drainage have not occurred within either of the two mule deer and elk winter ranges being analyzed for this project.

What has had an unknown, but probably increasing effect on winter range was the construction of the Big Creek Road (#316). This road has facilitated increasing winter motorized use levels, especially during the last 10 years. Since there has been very little specific monitoring to determine a) the trend in snowmobile use of this road and b) the net effect to wintering animals adjacent to this road, it is only possible to speculate on how mule deer and elk have responded to increasing levels of motorized use during winter. In this context, because the Demers winter range is relatively far removed from Big Creek Road 316, effects to wintering animals from motorized use in this area have been and probably would continue to be minimal. However, because animals winter adjacent to the road itself there may be effects on animals from winter motorized use of Big Creek Road 316 which have not been accounted for to date. It is difficult to know what these effects have been in the past, but certain assumptions can be discussed. Hunted animals are generally leery of humans and knowing that food resources are at their lowest during the winter, movements by animals to avoid human disturbance can cause use of vital, limited energy resources. The cumulative effect may be avoidance of otherwise useable habitat. The probable net cumulative effect from winter-motorized use on wintering animals is a combination of less overall habitat use, lowered fitness of animals during winter, and perhaps a slight reduction in numbers.

Mushroom picking is a forest management activity that is expected to occur and may have potential to displace or influence elk and/or mule deer use of the burned portions of the Big Creek drainage. This activity would occur in the

spring/summer of 2002 and is expected to bring hundreds of people to the Big Creek drainage and would be expected some level of impact on elk/mule deer.

Best Management Practices work is scheduled to occur beginning in 2002. The work consists of: improving road drainage on approximately 177 miles; upsizing culverts on 85 potential sites; and removal of fish barriers at eight sites. It is likely that work related to this project would take from three to five years to complete. None of this work would occur during spring, late fall or winter, therefore, for the most part no adverse impacts from this activity on elk/mule deer habitat would be expected.

Alternative 4 would not allow winter logging adjacent to the Big Creek winter range and this would maintain the current level of disturbance and effect to wintering animals, as discussed above, and no adverse cumulative effect would be expected. Alternatives 2, 3 and 5 would each allow winter logging operations and would probably have short-term adverse affects on animals wintering on the Big Creek but not the Demers winter range. What exactly 'adverse affect' means to wintering animals probably relates to increased levels of less overall habitat use (avoidance of disturbance), lowered fitness, and perhaps a slight loss of animals.

4. Regulatory Framework

Elk and mule deer are identified as Management Indictor Species in the Flathead National Forest Plan. The Montana Elk Management Plan (1992) contains goals, objectives and strategies for perpetuating and managing elk populations for public benefit, as well as other emphasis items.

5. Regulatory Consistency

Management Areas 13 and 13A allow for timber harvesting to improve or maintain the relationships of cover to forage and elk summer range habitat management direction relates to 'moist site' and security areas protection. In winter range, salvaging of dead and/or dying trees would not affect the status of thermal cover or forage relationship, and as the effects analysis showed, reducing the expected level of downed tree concentrations would result in more effective habitat utilization. Riparian area management and Amendment 19 motorized access restrictions will result in maintaining or improving summer habitat conditions consistent with Forest Plan direction.

E. White-tailed deer

1. Analysis Area and Information Sources

The analysis area for white-tailed deer consists of Forest Plan designated white-tailed deer winter range (MA-9) and unburned potential thermal cover in close proximity to MA-9 habitats. Data used in the analysis were from existing resource information sources, research literature, filed surveys, and post-fire aerial photos. Arcview geographical information system was used for quantification of habitat.

2. Affected Environment

White-tailed deer winter in mature forest that provides snow interception, and in riparian or upland sites (Mundinger 1984). The importance of dense coniferous forest habitat to this deer species during winter is well documented (Ozoga 1968, Wetzel et al. 1975) and connecting patches of thermal cover appear to be important.

Winter range for white-tailed deer within the analysis area is concentrated on the gentle slopes of the lower elevations (3300'-4000') of the Big Creek watershed. Approximately 869 acres of winter range including Douglas-fir, lodgepole pine, subalpine fir, Engelmann spruce, and white pine existed prior to the fires of 2001. Over 90 percent of this winter range burned with a moderate to high severity fire which removed all overhead thermal cover. Small patches of unburned or low severity burn exists mostly outside of the analysis area and outside of designated white-tailed deer winter range (MA-9), mainly along the North Fork of the Flathead River near the Big Creek Campground.

Deer use in the management area south of Big Creek was light prior to the fires due to a paucity of forage. Deer use within the designated portion of winter range after the fires has been similar. Deer use north of Big Creek was heavier than that south of Big Creek prior to the Moose Fire. White-tailed deer have been documented throughout the burned winter range but the only extensive use is within and adjacent to the campground along the North Fork of the Flathead River. A field survey completed in March revealed moderate use in the second growth western larch and lodgepole pine adjacent to the road (Project Record). This pattern appears to mimic past use records (early 1990s) that mention deer use was extremely heavy adjacent to the North Fork road in the more open overstory of Douglas-fir and western larch.

Adjacent unburned lodgepole pine stands and mixed lodgepole pine, spruce, and subalpine fir are currently not being used by wintering white-tailed deer.

2. Environmental Consequences

Chapter 2 identified one significant issues related to whitetailed deer: Issue #7 regarding use of winter range. The Issue Indicators for these issue are: *an assessment of potential effects to whitetailed deer winter habitat suitability: the quality of remaining cover; recovery of thermal cover; and disturbance.*

No additional effects indicators were identified.

Direct and Indirect Effects

Alternative 1 - No Action Alternative

Under this alternative there would be no short-term effect on thermal cover because there is currently no thermal cover within designated Big Creek white-tailed deer winter range. Alternative 1 would delay restoration of cover because there would be no planting conducted under this alternative.

Indirectly this alternative could decrease thermal cover in areas adjacent to winter range due to increased beetle activity. This could affect existing green tree areas currently being used (campground adjacent to winter range) by white-tailed deer. Some of the most heavily used cover patches in the campground area are small-diameter Douglas-fir trees. Beetles generally attack and kill larger size classes first, but even smaller size classes may be attacked at irregular intervals leaving dead and dying trees scattered amid live crowns. If trees continue to die remaining live trees should be able to utilize the now available nutrients and water and growth of lateral branches could mitigate thermal losses by providing increased snow intercepting and thermal retention properties. Since permanent year-round overhead thermal cover in the form of conifers is not expected to recover over the burned area for several decades, deer would be forced to utilize these adjacent unburned patches (such as the campground) for cover. The probability of losing additional thermal cover to beetles near the campground or river is described in the Vegetation of this chapter.

Downfall is also likely throughout a portion of the burned unharvested units in winter range. This could impede travel and/or use of certain areas effectively reducing winter range suitability. In Montana, Lyon et al (1985; pg 9) recommended that slash should be reduce to depths below 1.5 feet deep in clearcuts, otherwise elk use would be reduced by 50 percent. The applicability of this data to white-tailed deer in mixed conifer stands is not clear but it is expected that excessive down woody accumulations would reduce winter range habitat use to some extent. It is estimated that although 25 to 50 percent of the winter range has potential for high levels of down woody material accumulations, it is unlikely that this would occur all at once; rather, gradual accumulations of down logs would occur over several years.

In summary, the no action alternative is likely to reduce habitat suitability over a small portion of winter range and an unknown reduction in adjacent thermal cover from beetles may occur. It is also likely that faster forage recovery would occur because competing vegetation has been removed by fire. The availability of additional forage may mitigate for the shortage of thermal cover by allowing for a greater level of caloric intake.

Alternatives 2, 3, 4, and 5

These alternatives would have similar effects on white-tailed deer winter range habitats. Alternatives 2, 3 & 5 would treat approximately 240 acres (28%) and alternative 4 would treat approximately 229 acres (26%) of the severely burned acres of 869 total acres of white-tailed deer winter range. The irregular patches of dead trees and all live trees retained across winter range units would provide some level of habitat diversity. Since all trees are dead harvest actions would have no effect on thermal properties.

Removal of trees would reduce deep accumulations of debris that might impede ungulate movement through winter range and planting of winter range would speed recovery of thermal properties. Planting of winter range would speed recovery to thermal cover. Though each of the alternatives would allow winter logging (except alternative 4), and this would cause a stressful situation for winter deer, the overall expected net end result of all action of alternatives is to speed winter range habitat toward recovery of thermal cover.

Cumulative Effects

Past vegetation management activities within winter range were of the size and location that were intended to benefit white-tailed deer. Past and ongoing snowmobiling activity on the Big Creek road has probably produced some level of stress on wintering animals. Reasonably foreseeable actions such as mushroom picking and 'BMP' implementation, because they would occur during the non-winter period, are not expected to have any impacts on winter range habitat values.

Even though the Big Creek Campground is not designated winter range, field trips this past winter showed that deer were using the area where unburned green forest existed. Some of this has recently been affected by a recent windstorm. Thinning of the campground would be additive to the removal of available winter cover that occurred when the Moose fire burned the designated winter range.

Except for Alternative 4, winter logging would occur. In general, winter logging has some potential to disrupt deer use patterns on winter range but the extent of this is unknown. In one white-tailed deer disturbance study, deer that had access to timbered cover when snowmobiles were near did not flee (Richens and Lavigne 1978). Observations made during hazard tree removal in 2002 along roadway winter range did not appear to deter deer from using the area. It is expected that this one-time event would produce a stressful situation for wintering deer to and cause some additional energy use as deer move away from activity areas. Whether this would cause enough of a stress situation to cause mortality is unknown. However, if mortality does result as an effect from winter logging, the expectation would be that very few animals would die. More likely would be that wintering animals would move away from disturbance zones. Given that approximately sixty-eight percent of the burned winter range would remain untreated and could function as displacement habitat for deer, and the added stress of winter logging would be a relatively short-term (two winters), it is not expected that population viability would be a concern.

4. Regulatory Framework

White-tailed deer is identified as a Management Indictor Species in the Flathead National Forest Plan. The Forest Plan (III-35 to III-38) contains management direction and standards to guide project planning.

5. Regulatory Consistency

The Forest Plan contains a standard that encourages winter logging to better assure a continuous supply of winter food. However, the standard relates to a 'green' forest where it has been observed that deer tend to feed on lichen when trees are felled. Since the alternatives would not remove healthy live trees, this standard is not applicable in this situation.

A long-range activity schedule exists; however, it is out of date because the Moose fire totally changed habitat conditions. Because of the existing condition of the winter range, none of the alternatives would alter either of the two important habitat components (thermal cover and forage); therefore, it is believed that salvaging dead trees and planting trees for future thermal cover is consistent with winter range management.

F. Snags and Downed Wood Habitat

1. Analysis Area and Information Sources

National forest system lands within the Moose Fire (Project record Rd-3) was considered for the evaluation of direct and indirect effects on snags and downed woody material habitat. This approximately 56 square mile area (about 35,700 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 are contained within this area. The remaining area of the Big Creek drainage and the Moose Fire was added to the above for the consideration of cumulative effects.

Data used in this analysis included pre-fire and post-fire aerial photography, stand exams, field surveys of snags and downed logs, fire severities, and road locations (Project records Rd-3 and Rd-5, and Project Record Section J).

This analysis covered the standing and downed dead wood resource in terrestrial areas. See the Fisheries section of this document for consideration of "coarse woody debris" recruitment in aquatic systems. Also, see sections on Late seral/Old Forest and on Black-backed Woodpeckers in this chapter.

2. 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. 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 (Project record Rd-2).

Dead trees have many ecological roles in a landscape recovering from wildfire (Beschta *et al.* 1995). The number, species, size, and distribution of available snags strongly affect snag-dependent wildlife (Bull *et al*. 1997). Cavity-using birds can substantially reduce tree mortality and damage caused by forest pest insects (Torgersen, Mason, and Campbell 1990, Torgersen 1996, Bull *et al*. 1997). Too few suitable snags may limit or eliminate populations of cavity-using species (Thomas *et al*. 1979, Saab and Dudley 1998). Snags with old nesting cavities, broken tops, and decay are most likely to be used (Bull *et al*. 1986). The various species of cavity nesters all appear to use different microhabitats. Homogenously managed stands are likely to not provide habitat for many species (Hutto 1995b). Likewise, any one stand would not be expected to provide habitat for all cavity-using species.

Downed trees and other woody material are also critically important for many species. Downed logs and stumps are required for resting and denning, 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, American marten often den and forage in the under-snow cavities that occur under downed logs. All 13 of the Canada lynx dens found so far in the Seeley-Swan area are associated with abundant woody debris, usually large diameter logs. 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 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" (*ibid*).

Dead wood 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, appear to respond positively to the high densities of snags in burned forests and may depend on them. Hutto (1995) 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.

The snag and downed wood habitat over all ownerships in the Moose Fire Area has been influenced by human presence--introduced tree diseases, fire exclusion, timber harvest, firewood cutting, and roads (Project record Rd-3). About 20 percent of the 35,564-acre Analysis Area had commercial timber harvest or salvage prior to the Moose Fire. None of this harvesting was done after Flathead LRMP Amendment 21 (USDA 1999a) came into effect in January 1999, although the shelterwood and salvage units (8%) may have met the later Amendment 21 standards for snags and downed wood. Upstream of the Moose Fire in the Big Creek drainage, spruce beetles killed a great number of large spruce trees, most of which were salvaged in the 1950s and 1960s. Whitebark pine was historically a major species in most stands at the upper elevations in the Big Creek drainage, but mountain pine beetles and introduced blister rust have killed most of the whitebark pine trees.

Fire was the dominant disturbance in the watershed prior to the 1930s. Large larch snags still stand from fires between 1910 and 1926, yet few snags now exist where these fires overlapped. Fire exclusion had been effective for 80 years, and much of the area has not had a large fire since 1864. See the Vegetation and Fire sections of this document for more information.

Across the Moose Fire area, the overall availability of snag habitat is currently very high. On lands administered by the Flathead National Forest, the fire burned about 7500 acres at low severity, 6500 acres at moderate severity, and 16,000 acres at high severity (refer to Map 3-1). Most of the previously harvested areas also burned, killing the trees that had been left for seed trees or shelter and to provide a legacy of larger-diameter wood across the landscape. Of over 26,000 acres that burned in Glacier National Park, about 35 percent burned at high or moderate severity, and about 5 percent was unforested or in an early-seral stage. Another 60 percent was classed as either low severity or unburned. On state forest lands, high-severity fire changed forested habitat to open, snag-abundant habitat on approximately 3550 acres. On about 2940 acres, where mixed-severity fire occurred on state lands, the snag density increased. The remaining approximately 250 acres of mixed severity fire on state lands were in early-seral condition prior to the fire. About 20 percent of the 650 acres of private land that burned was in a forested condition before the Moose Fire, with about equal representation of low, moderate, and high severity fire (Project record Rd-3). All national forest system lands in the Moose Fire area are currently closed to firewood cutting. This closure order is expected to be lifted in spring 2003.

Snag Habitat

Snag habitat conditions in burned areas were modeled by first looking at pre-fire vegetation conditions (Table 3-44 Project record Rd-3). Areas with a potential to become high quality snag habitat were assumed to have had more than 10 per acre of western larch, Douglas-fir, or black cottonwood trees or snags over 18” Diameter Breast Height (DBH) before the Moose Fire. Areas with a potential to become moderate quality snag habitat were assumed to have more than 20 per acre of western larch, Douglas-fir, or black cottonwood trees or snags over 9” DBH.

Table 3-44: Snag habitat quality potential on national forest system lands in the Moose Fire area.

Snag Habitat Potential	Acres	Percent of Analysis Area
Moderate-quality	7900 acres	22.2%
High-quality	5239 acres	14.7%

The ranges of snag numbers are given in Table 3-45 for forests burned by the Moose Fire. These were based on adding the expected pre-fire snag survival to the number of new snags expected to have been created by the Moose Fire. In most areas, it was estimated that two thirds of the pre-fire snags were destroyed by the Moose Fire. However, snag habitat potential is likely to be the same as the pre-fire situation in the potential high-quality snag

areas that had low-severity fire. This is because tree species that happen to also be resistant to windthrow are not likely to be killed at this severity level, nor are many existing large snags expected to be destroyed. On the other hand, in stands that are dominated by pole-sized trees, nearly all the trees end up dying soon after fire. In many stands, an additional 40 percent of the Douglas-fir trees over 14" DBH are expected to be killed by Douglas-fir beetles (See the Vegetation section of this document and Appendix B, Post-fire mortality estimation guidelines, for more information on the potential for insect-killed trees).

Table 3-45: Snag habitat quality in burned areas of national forest system lands within the Moose Fire area.

Snag Habitat Description			Acres	% of Analysis Area
Quality Potential	**Fire severity**	**Snag Habitat and (Live) Recruitment Tree Description**		
High	Low	Same as pre-fire condition. 1 to 3 snags/ac >18" DBH; 10 to 30 recruitment trees/ac.	1,116 ac	3.1%
High	Moderate	40 to 70% of Douglas-fir and larch >16" DBH are dead. 5 to 22 snags/ac >18"; 3 to 18 recruitment trees/ac.	1,277 ac	3.6%
High	High	90% of Douglas-fir and larch >16" DBH are dead. 10 to 28 snags/ac >18"; 1 to 2 recruitment trees/ac.	2,261 ac	6.4%
Moderate	Low	30 to 40% of Douglas-fir and larch >9" DBH are dead. 7 to 25 snags/ac >9"; 12 to 42 recruitment trees/ac.	1,255 ac	3.5%
Moderate	Moderate	70 to 80% of Douglas-fir and larch >9" DBH are dead. 15 to 49 snags/ac >9"; 6 to 12 recruitment trees/ac.	872 ac	2.4%
Moderate	High	100% of Douglas-fir and larch >9" DBH are dead. 21 to 61 snags/ac >9"; 0 recruitment trees/ac.	1,193 ac	3.3%
Small-diameter	Low, Mod, or High	20 to 100% of all trees >5" DBH are dead, with the lower mortality levels due to patchy burning patterns in some stands. >150/ac snags >5".	14,980 ac	42.1%
TOTAL			**22,954 ac**	**64.5%**

Several areas within the Moose Fire's perimeter were not burned, totaling 5295 acres. Snag habitat conditions in these unburned areas are extremely varied. Little of it is expected to have significant numbers of larger-diameter snags (Table 3-46). See Project record Rd-3 for more details about the snag resource in these stands.

Table 3-46: Snag habitat quality in unburned areas of national forest system lands within the Moose Fire area.

Snag Habitat Description			Acres	% of Analysis Area
Quality Potential	**Fire Severity**	**Estimated Average Snags per acre**		
High	Unburned	1 to 3 per acre >18" DBH	592	1.7%
Moderate	Unburned	1 to 3 per acre 9 to18" DBH	376	1.1%
TOTAL			**968**	**2.7%**

The third of the Analysis Area not accounted for in Tables 3-45 and 3-46 above is mostly unburned pole-sized stands, seedling/sapling stands without a significant overstory, or other non-forested areas such as shrubfields, rock, rivers, and wetlands. Such areas often make little contribution towards snag habitat. In addition, 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 30 larger trees left per acre, and post-fire surveys (Project record Rd-3) revealed that 25 to 100 percent of them are now snags.

Downed Wood Habitat

Many areas burned by the Moose Fire are currently low to very low in large downed wood habitat, especially where timber was harvested before the fire. The area probably does 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. Downed log habitat modeling was based on pre-fire vegetation and fire severities, generally occurring 20 to 50 years after the fire (Project record Rd-3). This is because the newly created snags would fall over time (Lyon 1984, Harrington 1996) and the rate varies by species, age, pre-fire vigor, type and extent of fire injury, exposure to wind, slope position, soil moisture, water table depth, etc. Wind buffering by neighboring snags or trees helps keep a snag standing, as do the interconnected roots of neighboring snags. 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 since the fire killed these trees, unless salvaged or cut for firewood they 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. Areas of high-quality downed log habitat typically had pre-fire overstories averaging 16" DBH or larger that burned at moderate or high fire severities. Also included were stands with large spruce that burned at low severity, since high mortality levels are expected in these trees. Larger Douglas-fir and western larch are typically not killed by low-severity fire, although, as noted above, insects and disease may kill them a few years after the fire. Areas of moderate-quality downed log habitat had 9 to 16" overstories with at least 20% canopy cover, and with a fire severity level of low, moderate, or high. The sizes, species, and condition of downed wood varied dramatically within and between stands, forest types, seral/structural stages, and fire regimes. The average predicted values are given below in Table 3-47. These are not indicative of historical conditions, as they reflect many years of fire suppression, tree harvest, and firewood cutting across the landscape.

Table 3-47: Downed wood habitat conditions in burned areas of national forest system lands within the Moose Fire area (total 30,000 acres burned area).

Post-fire Downed Wood Habitat	Fire Severity			Total
	Low	Moderate	High	
Moderate-quality	1995 ac	1623 ac	2127 ac	5745 ac
High-quality	200 ac	1295 ac	2290 ac	3785 ac

For downed wood habitat in unburned areas, we used data collected in a drainage 10 miles to the west and ecologically very similar to Big Creek (Table 3-48 and Project record Rd-3). In unburned conditions, "late" seral-structural stage corresponds to the areas of high-quality downed log habitat described above before the fire; "mid" seral-structural stage corresponds to the areas of moderate-quality downed log habitat. Downed log surveys for old growth delineation in the Big Creek drainage were reviewed as a further check. Most of the burned areas currently have much less than these amounts.

Table 3-48: Downed wood habitat conditions extrapolated to unburned areas of national forest system lands within the Moose Fire area (total 5,300 acres unburned area).

Down Wood Habitat Class	Assumed Average Tonnage	Acres
Mid-seral/structural forest	19.7 tons per acre (>8 tons per acre 11 to 30" DBH)	538 ac
Late-seral/structural forest	30.9 tons per ac (>17 tons per acre 11 to 30")	539 ac

3. Environmental Consequences

Chapter 2 identified one significant issue related to snags and down wood habitat: Issue #4 regarding snag and down woody material levels. The Issue Indicators for this issue are: a) acres and percentage of high and moderate snag potential areas treated, and b) acres and percentage of high and moderate down wood habitat potential areas treated.

In addition, the following Effects Indicators were used to focus the analysis and disclose relevant environmental effects:

- Vulnerability to loss of snag habitat on national forest system lands due to firewood cutting, by modeled snag habitat quality and fire severity.
- Total acres salvage in burned moderate- and high-quality snag and downed wood habitat areas.
- Acres of timber salvage relevant to snag habitat across the analysis area, in acres and percent of each type.
- Acres of Timber Salvage Relevant to Larger-diameter Downed Wood Habitat across the Analysis Area, in acres and percent of each type.

Direct and Indirect Effects

Alternative 1 (No Action)

The effects of the no action alternative on wildlife would vary over time. In the short term, this alternative would favor species associated with recent burns and the resulting large numbers of snags and woody debris. Black-backed, three-toed, and hairy woodpeckers would find an abundance of habitat and would excavate cavities for many secondary cavity nesters such as mountain and western bluebirds, kestrels, and mountain chickadees. 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 coarse woody debris for denning, feeding, and dispersal would increase, especially as vegetation recovers. As the new forests mature and age, the remaining large snags and downed logs would again make the Moose Fire area highly suitable for pileated woodpeckers, brown creepers, northern flying squirrels, southern red-backed voles, and many of the other species identified as old-growth associates (Flathead Forest Plan Amendment 21, USDA 1999a; Warren 1998).

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. Spruce beetle and Douglas-fir beetle populations would be expected to increase, with many of the surviving Douglas-fir trees killed by beetles over the next few years. This would create 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 and Douglas-fir would likely still be standing after 50 years. By that time, some of the trees that were not killed by the Moose Fire would have become snags, but most of the trees would still be too small to be of significant value as snags.

The moderate and high-quality downed wood habitat areas are expected to have large amounts of large downed wood in 15 to 50 years (Project record Rd-3). Most areas modeled as high-quality downed wood habitat are expected to have 150 to 200 tons per acre of larger-diameter downed trees. The exception would be some areas of riparian spruce bottoms along Big Creek that already have 80 to 200 tons per acre down. Moderate-quality areas are expected to eventually have 100 to 150 tons per acre of larger-diameter downed trees. Soil conditions would be likely to improve as the organic matter from the logs incorporated (See 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/Fuels section of this chapter. Under this alternative, ecosystem function would move in the direction of historical ecological cycles.

Preliminary research suggests that about half of the snags within 200 feet of roads are felled for firewood, especially when vegetative cover has been removed (Bate, p.c. 2001). Firewood cutters can easily access standing or downed dead trees in about 6 percent of the analysis area, where over 2000 acres of forest are within 200 feet of roads that are either open yearlong or seasonally (Project record Rd-3). Many of the larger new snags created by the Moose Fire are vulnerable to firewood cutting, totaling over 600 acres. Most of these areas are along Roads 316 (Big Creek road) and 317 (Coal Creek road) and the North Fork Road, with smaller areas on Roads 5272 and 803 (Elelehum and Lookout Creeks). After the temporary, road closure (signed in April 2002) is lifted, this will be over 900 acres, which the additional acres along Road 803 (Lookout Creek). No additional motorized access changes are planned with implementation of Alternative 1. This would leave snag and downed wood habitat

vulnerable to firewood cutting as shown in Table 3-49. Across the Analysis Area, this would leave approximately 40 miles of roads open to motorized use in summer or yearlong.

Table 3-49: Vulnerability to loss of snag habitat on national forest system lands due to firewood cutting, by modeled snag habitat quality and fire severity.

Alt.	Total miles open roads	Total acres w/in 200' of open roads	High-quality snag habitat		Moderate-quality snag habitat	
			Unburned/ low severity	Moderate/ high severity	Unburned/ low severity	Moderate/ high severity
1	35.8	2008	237 ac	292 ac	197 ac	117 ac
1 (w/o temp. closure)	40.1	2084	237 ac	300 ac	230 ac	152 ac
2 & 3	34.4	2007	237 ac	291 ac	197 ac	117 ac
4	30.3	1907	231 ac	291 ac	153 ac	77 ac
5	31.7	1939	190 ac	272 ac	195 ac	117 ac

Firewood cutting is prohibited within 300 feet of any stream, river, or lake across the Flathead National Forest (Project Record Rd-6). This should protect snags and downed wood along Big, Langford, and Kletomus Creeks, as well as the North Fork of the Flathead River. In addition, the highest-quality snags near open roads in the fire area will be marked as protected wildlife trees in summer 2002.

Direct and Indirect Effects Common to All Action Alternatives

In all action alternatives, all live trees would be left standing wherever possible. In addition, all western larch over 18" DBH would remain. If live trees, unmerchantable trees, or specified snags require felling for logging access or safety, they would be left on site. No snags or logs would be salvaged from the Riparian Habitat Conservation Areas (RHCAs) in any alternative. Abundant amounts of downed wood in the 12 or 14" diameter and smaller sizes would be expected after salvage. Within salvage units, larger-diameter downed wood habitat would come from (1) unmerchantable material; (2) dead trees left in groups or as individuals; (3) live trees; and (4) downed material that existed before the fire. In most units, log length yarding would be required so that unmerchantable material is well distributed, rather than brought into a landing for piling and burning. Trees felled during the logging operation but not removed from the site would be left as intact as possible (no lopping), although some limbs may be removed to get the slash closer to the ground to hasten its decomposition. After salvage, units with over 30 tons per acre of slash material would be evaluated for reduction of the fine fuels (jackpot burning, excavator piling, and burning). This would be unlikely where the slash is discontinuous or of large diameter. Because of the variability within stands that existed before the Moose Fire, and the variability in the way the fire burned, there would be considerable variation in the amounts and arrangements of snags and coarse woody debris. Large snags left within 200 feet of open roads in salvage units would be designated and signed to protect them from firewood cutting. This would mostly apply to western larch over 20" DBH, but additional snags may be marked in areas where large diameter snags are scarce. See Appendix A and B of this document and Project record Rd-4 for more details about the snag and downed wood prescriptions. These features are design criteria for all action alternatives, in recognition of the extent of past actions in the Analysis Area and of the value of large snags and downed wood.

Fuel reduction planned adjacent to private land should have little effect on snag and large downed wood habitat in the short term, and a positive effect over the long run. This is because the larger-diameter material would be retained, and because growth rates of remaining trees would accelerate.

All action alternatives include measures to control bark beetle populations via trap trees, funnel traps, and pheromones. Thus, fewer new snags would be expected over the larger landscape in the next few years, as described in the Vegetation section.

As in Alternative 1, most mammal and bird species that use snags and coarse woody debris for denning, feeding, and dispersal would increase over time as vegetation recovers.

Alternative 2

About 3000 acres of timber salvage would occur within 3721 total acres of harvest units. About 3326 acres of moderate or high-quality snag habitat (Tables 3-50 and 3-51) are in salvage units. Because this proposal targets the salvage of larger-diameter burned trees, salvage would occur in 42% of the larger-diameter snag habitat available over all national forest system lands in the Moose Fire area. About 2,797 acres in salvage units have the potential to become moderate or high quality large downed wood habitat (Tables 3-50 and 3-52). This is 29% of available larger-diameter downed wood habitat. Helicopter logging would occur on 2031 acres, requiring felling of additional snags and other hazard trees in and near units and an estimated 10 to 15 landings. In general, this would require felling of hazard trees within 1.5 tree lengths, with additional distance required for landings needing clearing for a flight path. Cable logging would occur on 886 acres, requiring felling of all trees, live or dead within cable corridors, as well as the felling of nearby hazard trees. A total of less than one mile of temporary road would be constructed for timber salvage in Units 3, 8, and 9. All of this would pass through modeled high-quality snag habitat and modeled potential high-quality downed wood habitat, nearly all of which burned at high severity. All live or dead trees would be cleared from the road corridor; nearby hazard trees would be felled.

Table 3-50: Total acres of salvage in burned moderate- and high-quality snag and downed wood habitat areas. (Note that many areas of snag habitat are also downed wood habitat).

Alt.	Moderate or high-quality burned snag habitat (7974 ac)		Area with potential as moderate or high-quality downed wood habitat (9,530 ac)	
	Acres	Percent	Acres	Percent
2 & 5	3326 ac	42%	2797 ac	29%
3	2866 ac	36%	2415 ac	25%
4	2211 ac	28%	2295 ac	24%

Table 3-51: Acres of timber salvage relevant to snag habitat across the analysis area, in acres and percent of each type.

Alt.	High-quality Snag Potential			Moderate-quality Snag Potential		
	Low Fire Severity	Moderate Fire Severity	High Fire Severity	Low Fire Severity	Moderate Fire Severity	High Fire Severity
2 & 5	246 ac	393 ac	848 ac	591 ac	597 ac	651 ac
3	239 ac	372 ac	839 ac	382 ac	502 ac	532 ac
4	277 ac	287 ac	621 ac	301 ac	377 ac	432 ac

Table 3-52: Acres of Timber Salvage Relevant to Larger-diameter Downed Wood Habitat across the Analysis Area, in acres and percent of each type.

Alt.	High-quality Downed Wood Potential			Moderate-quality Downed Wood Potential		
	Low Fire Severity	Moderate Fire Severity	High Fire Severity	Low Fire Severity	Moderate Fire Severity	High Fire Severity
2 & 5	10 ac	398 ac	855 ac	533 ac	487 ac	514 ac
3	10 ac	377 ac	846 ac	336 ac	401 ac	445 ac
4	10 ac	292 ac	628 ac	256 ac	302 ac	370 ac

Several trees and mostly smaller snags would be left in many of the salvage units. In addition to the leave trees described for all action alternatives above, about three-quarters of the units would have un-entered leave patches. This would comprise 10 to 60 percent of the acreage within these units. Additional snags would be left in Snag and Coarse Woody Debris Prescription Groups A.2, A.3, B.1, B.2, and D (refer to Appendix A), most of which had high fire severity (Project record Rd-4). These range from removing only beetle-infested Douglas-fir and spruce to leaving a minimum of 8 trees or snags per acre over 14" DBH. These prescriptions apply to 71 percent of the high-quality snag habitat and 25 percent of the moderate-quality snag habitat. Few of the large (over 18" DBH) deeply scorched Douglas-fir trees would remain in most of the salvage units, despite the lower probability of these trees contributing to Douglas-fir beetle populations (refer to bark beetle section in this Chapter). See Project record Rd-4

and Appendix A of this document for more information about effects analysis methods and the snag and downed wood prescriptions.

Units 25, 38, 50, and 60 all were past seed-tree or shelterwood units that were later burned by the Moose Fire. According to field estimates, all or nearly all of the younger (seedling and sapling) trees in these 193 acres were killed by the fire, leaving less than 30 large overstory trees per acre. The areas now appear to have 3 to 15 large snags per acre and 2 to 21 live trees per acre. The prescription for these areas would leave all live trees (see Appendix B), all larch snags, and all trees, snags, and logs over 18" DBH (Appendix A). This is because these stands lack any live or dead trees to contribute additional snags or downed wood for many years. In addition, most of the units are nearly surrounded by past regeneration harvest. Much of this was clear-cutting done in the 1960s and the Moose Fire 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.

Units 13, 47, 61, 64, and 65 are high-quality snag habitat that is largely surrounded by past timber harvest areas. Additional snags would also be left in these units to provide long-term snag and downed wood values for many wildlife species, particularly those identified as old-growth associates (Flathead Forest Plan Amendment 21, USDA 1999a). These species are known to persist in landscapes that have a natural or human-caused ebb-and-flow of habitat values. However, 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. Units 2, 3, and 66 are also high-quality snag habitat with a large amount of past timber harvest nearby, but these units all have prescriptions that would retain most of their large snags and future downed wood.

Compared to the situation after the temporary closure is lifted, 77 acres of moderate- and high-quality snag habitat would be protected.

Alternative 3

About 2700 acres of timber salvage would occur within 3238 acres of harvest units (Project record Rd-4). About 2866 acres within these salvage units were modeled as moderate or high-quality snag habitat (Tables 3-50 and 3-51). This is 36 percent of larger-diameter snag habitat available over national forest system lands in the Moose Fire area. About 2415 acres in salvage units have the potential to become moderate or high quality large downed wood habitat (Tables 3-50 and 3-52). This is 25 percent of available larger-diameter downed wood habitat. Helicopter logging would occur on 1,548 acres, requiring felling of additional snags and other hazard trees in and near units and up to 15 landings. Dropping harvest in inventoried roadless would drop 483 acres from the proposal, and steep helicopter units would be limited to areas of concentrated burned trees. Cable logging, temporary road construction, and salvage of former shelterwood units (25, 38, 50, and 60) would be as described for Alternative 2. The salvage in high-quality snag habitat that is largely surrounded by past timber harvest areas (units 13, 47, 61, 64, and 65) would also be the same as in Alternative 2.

In addition to the leave trees described for all action alternatives above (Appendix A and B), about 65% of the units would have un-entered leave patches. This would comprise 10 to 60% of the acreage within these units. Additional snags would be left in Snag and Coarse Woody Debris Prescription Groups A.2, A.3, B.1, B.2, and D (see Appendix A), most of which had high fire severity (Project record Rd-4). These range from removing only beetle infested Douglas-fir and spruce to leaving a minimum of 8 trees or snags per acre over 14" DBH. These prescriptions apply to 45% of the high-quality snag habitat salvaged and only 28% of the moderate-quality snag habitat. In the remaining 1,725 acres, snag and downed wood habitat may be less than optimal for some wildlife species. Few of the large (over 18" DBH) deeply scorched Douglas-fir trees would remain in salvage units, despite the lower probability of these trees contributing to Douglas-fir beetle populations.

As in Alternative 2, long-term snag and downed wood values may be insufficient for some wildlife species within many salvaged units. Also in common with Alternative 2 is the fact that, compared to the situation after the

temporary closure is lifted, 77 acres of moderate- and high-quality snag habitat would be protected from firewood cutting, via the closure near the Glacier Institute.

Alternative 4

About 2150 acres of timber salvage would occur within 2,493 acres of harvest units (Project record Rd-4). About 2295 acres within salvage units were modeled as moderate or high-quality snag habitat (Tables 3-50 and 3-51). This is 28 percent of larger-diameter snag habitat available over national forest system lands in the Moose Fire area. About 1858 acres in salvage units have the potential to become moderate or high quality large downed wood habitat (Tables 3-50 and 3-52). This is 24% of available larger-diameter downed wood habitat. Helicopter logging would occur on 1,286 acres, requiring felling of additional snags and other hazard trees in and near units and up to 15 landings. Dropping harvest in inventoried roadless areas and the wild and scenic river corridor, as well as the expanded RHCA buffers would drop 1,228 acres from the proposal. Steep helicopter units would be limited to areas of concentrated burned trees, although some parts of units 3, 8, and 9 were changed to helicopter units when the temporary roads were dropped from this alternative. Cable logging would occur on 594 acres, requiring felling of all trees, live or dead within cable corridors, as well as the felling of nearby hazard trees.

Units 25, 38, 50, and 60, all of which were past seed tree or shelterwood units that were later burned by the Moose Fire, were dropped from this alternative. The current condition of these units would not change, leaving all snags and downed logs that were originally left to provide seed and shelter for growing trees, and a legacy of larger-diameter wood on the sites for ecosystem function. Most of the units are nearly surrounded by past regeneration harvest. Much of this was clear-cutting done in the 1960s and most of it was burned with moderate or high severities, leaving few live trees to provide large snags and downed wood in the future.

In this alternative, all larch, live or dead, would be retained, standing wherever logging safety considerations allow or left on site. In addition, all large-diameter Douglas-fir that present the lowest bark beetle risk would be retained. These snags are over 18” DBH and are deeply charred, with tree crowns totally consumed. This additional retention of larch and Douglas-fir snags is expected to address concerns about salvage, particularly in high-quality snag habitat that is largely surrounded by past timber harvest areas (units 13, 47, 61, and 65).

In addition to the leave trees described for all action alternatives above (Appendix A and B), about half of the units would have un-entered leave patches. This would comprise 10 to 60% of the acreage within these units. Additional snags would be left in 100% of both the high- and moderate-quality snag habitat areas.

Approximately 177 additional acres of snag habitat would be protected from firewood cutting, when compared to the situation after the temporary road restriction is lifted. This would be via the change in Road 5272 in Elelehum drainage from seasonally open to closed yearlong with a berm, the closure in the Lookout drainage, and the closure near the Glacier Institute (Project record Rd-4). Most of the firewood access change would involve moderate quality snag habitat, with an approximately equal representation of fire severities.

Under Alternative 4, long-term snag and downed wood within the salvaged units would likely be sufficient for wildlife, even when considering landscape scales. As the new forests mature and age, the remaining large snags and downed logs in the units and across the Moose Fire area would again make the area highly suitable for old-growth associated species and other users of snag and downed wood habitats.

Alternative 5

Effects of timber salvage and temporary road construction would be as described above for Alternative 2.

Compared to the situation after the temporary road closure is lifted, approximately 145 additional acres of snag habitat would be protected from firewood cutting, via the change in the upper portion of the Moose Lake Road (5207) from open yearlong to closed yearlong with a berm, the closure in the Lookout drainage, and the closure near the Glacier Institute. Most of the firewood access change would involve moderate quality snag habitat, with about half of this in low or moderate fire severities.

Cumulative Effects

Effects Common to All Alternatives

Across the Interior Columbia River Basin, densities of large-diameter snags (>21 inch DBH) have been reduced in roaded areas with 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).

Past timber harvest and roading on Federal, State, and private land in the Big Creek drainage and the Moose Fire area reduced the acreage of dense snag habitat later to be created by the Moose Fire (Project record Rd-3). Proposed and ongoing salvage, prescribed burn projects, and firewood cutting are expected to reduce this further.

On the Coal Creek State Forest, salvage of approximately 986 acres of burned habitat has occurred in the Moose Fire area under Moose "Phase I." Up to 1202 acres will to be salvaged under Moose "Phase II" in the Moose Fire area on state land (Alternative D of the state EIS).

About 100 acres were cleared for downhill ski runs in the Upper Big Creek drainage since the 1980s, with an additional 80 acres of clearing approved for the Chair 8 runs. In 1998, approximately 2000 acres were approved for prescribed burning near Moose Peak; this would be deferred to 2005 or beyond, and will be reassessed to consider changed conditions and new information. Fire suppression efforts in 2001 for the Moose Fire affected snag and downed wood habitat through fireline construction and hazard tree felling along roads. Open roads continue to provide access for firewood cutters, decreasing snags, although the chance of firewood collection is greatly reduced when roads are bermed or decommissioned. The Moose and Big Creek campgrounds and the Glacier Institute are expected to continue to operate, leaving snags and downed wood in short supply nearby. The cumulative effects area includes about 26,000 acres of Glacier National Park burned by the Moose Fire, where timber salvage and firewood cutting is precluded.

Insects and diseases would continue, sometimes modifying stand conditions drastically. The potential of bark beetle-caused mortality in stands outside the burn perimeter may result in further actions in the future. It is unknown to what extent this would occur (See the Vegetation section of this chapter).

Some actions would have minor or negligible effects on snags and downed wood habitat. These include precommercial thinning, tree and shrub planting, Christmas tree harvesting, and noxious weed treatment. Road maintenance and the construction and maintenance of trails would cause some hazard trees to be felled and fallen trees to be cleared from travel ways.

The effects of most of these past actions and events are imbedded in the environmental baseline described above (Project record Rd-3). These effects would be cumulative to those discussed above for each alternative.

4. 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. Current direction is provided by the Flathead's Forest Plan Amendment 21 (USDA 1999a). Sufficient vegetation structure is to be retained, including large diameter trees, in timber harvest areas other than personal-use firewood permits. To comply with Amendment 21, the retention amount must be 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. 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 Late seral/Old Forest section of this chapter.

5. Regulatory Consistency

A site-specific analysis of snag and downed wood was done for the Moose Post-Fire project in accordance with Amendment 21 (Project record Rd-3). Therefore, the minimum numerical standards for snags offered in Appendix A (page 27) of Amendment 21 do not apply to this project. Site-specific prescriptions for snags and downed wood are given in Appendix A and B of this document. Features common to all action alternatives contribute to snag and downed wood habitat conditions at landscape scales. These include retention of all material in Riparian Habitat Conservation Areas and contiguous unroaded areas, signing of high-quality snags along roads, and log-length skidding. In consideration of all direct, indirect, and cumulative effects described above, all alternatives comply fully with Amendment 21 of the Flathead's LRMP.