3-3.3.7. Management Indicator Species – Birds

3-3.3.7.1. Black-Backed Woodpecker *(Picoides arcticus)*

The black-backed woodpecker is also a Region 2 sensitive species. The effects to this species are also evaluated in the Biological Evaluation (Appendix C).

Selection Rationale

The selection of MIS, including the black-backed woodpecker, is detailed in SAIC (2005). In the Black Hills, factors limiting population growth and distribution include fire suppression, salvage logging, and loss of late successional pine forest (Anderson 2003). Panjabi (2001) found this species occurring most frequently in recently burned habitat, and at lower densities in other forest types including late successional pine forest. Species is a year-round resident. Monitoring could enhance the ability to evaluate impacts from management on availability of snags in both complex mature coniferous forest and recently burned forest. Baseline data exist for black-backed woodpeckers from recent monitoring efforts with the Rocky Mountain Bird Observatory (Panjabi 2001, 2003, 2004, 2005). It should be effectively monitored through continuing this effort (Panjabi 2005). Black-backed woodpeckers were not chosen as an MIS because of concerns regarding species viability but to meet other broader management objectives. The black-backed woodpecker is selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on mature and late successional forest, burned forest, insects, and snagsto meet their needs.

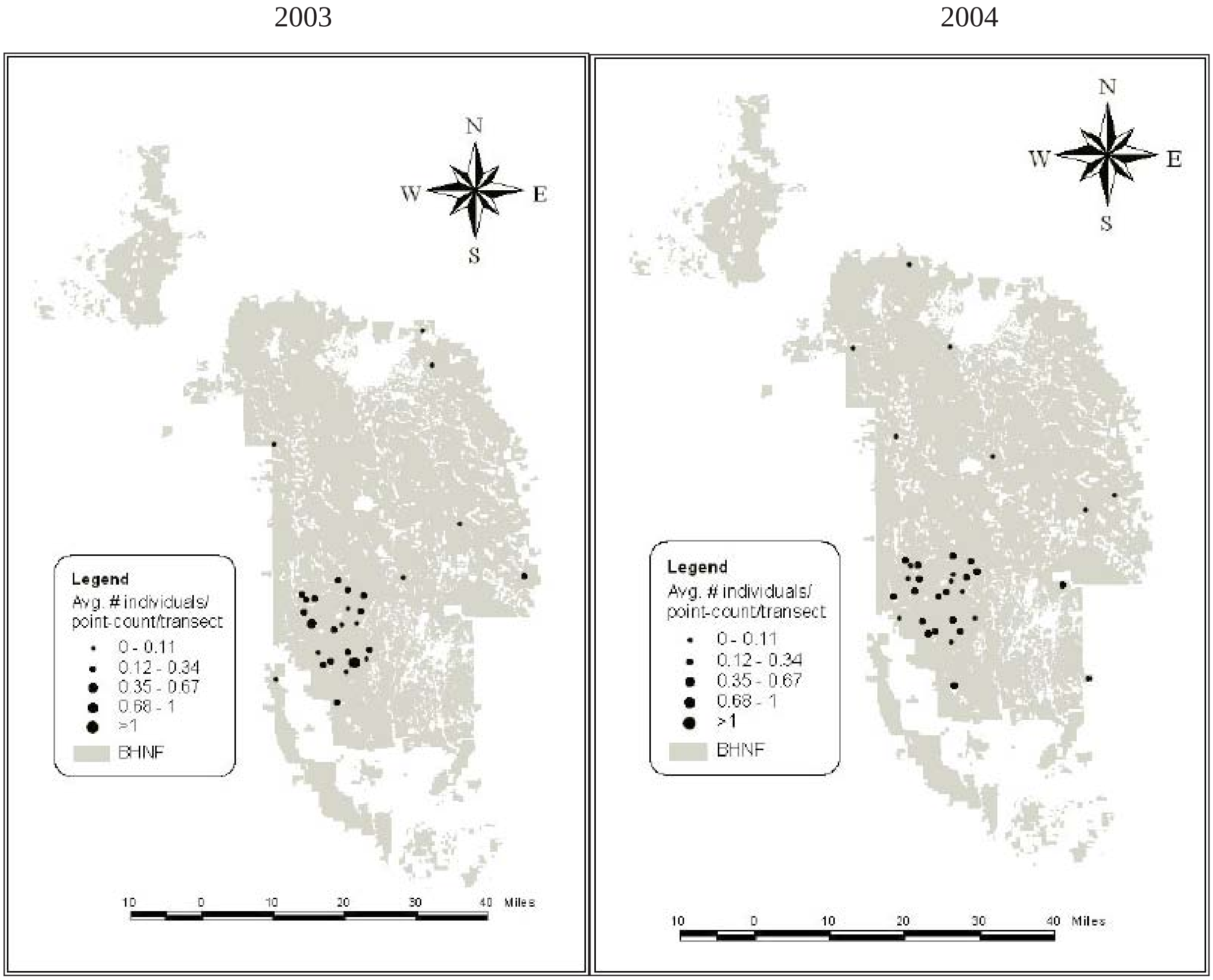
Affected Environment

Distribution and Natural History

The main range of the black-backed woodpecker is in the northern Rocky Mountains and across Canada (Dixon and Saab 2000). The Black Hills population is isolated from the main range by approximately 200 miles. In South Dakota, this woodpecker is known only in the Black Hills, where it is considered an uncommon year-long resident (SDOU 1991). In Wyoming, the species occurs in the northeastern portion of the state as well as in the Black Hills and Bear Lodge Mountains.

In the Black Hills, black-backed woodpecker distribution and abundance is closely associated with recent stand-replacing fires (Panjabi 2001, 2003, 2004, 2005) and insect out-breaks (Bonnet 2004, Rumble 2002). They also occur at much lower densities throughout the remainder of the Forest (Mohren 2002, Panjabi 2001, 2003, 2004, 2005).

Figure 3-15. General Abundance And Distribution Of Black-backed Woodpecker Observations Along Point Transects On The Black Hills National Forest In 2003 And 2004.



Source: Panjabi (2004, 2005)

Species-Habitat Relationships

In the Black Hills, black-backed woodpeckers are associated with ponderosa pine habitats that have high populations of their main prey: the larvae of wood-boring beetles, engraver beetles, and bark beetles (Anderson 2003). Recently burned pine forests and areas infested with mountain pine beetles are most preferred by black-backs. The species can also be found in forests that are relatively unaffected by beetles, but it is relatively rare in such places.

Black-backed woodpecker populations are often irruptive as they follow outbreaks of wood-boring beetles after fires (Dixon and Saab 2000, USDA Forest Service 2000b). Large movements have been noted across North America in response to changing habitat and insect conditions. Abundance peaks within the first few years after a fire but decreases as snags decay and beetles decrease.

In many areas, nest productivity of woodpeckers is higher in burned areas than unburned areas. This has led researchers to hypothesize that burned areas provide surplus birds to augment or repopulate areas where mortality exceeds reproduction (Vierling 2004, Hutto 1995). Thus, periodic fires may be important to sustaining black-backed woodpecker populations over long periods of time. Though burned forests are suspected to function as a source habitat, there is a lack of information on movements and mortality to support this.

Vierling (2004) studied habitat use by black-blacked woodpeckers in the Jasper Burn. Her results show black-backs selected areas with high snag densities and avoided areas with low snag densities (e.g., salvage-logged areas). These results are consistent with other research across the woodpecker's range (Anderson 2003). Vierling also found more nests in areas that had high pre-fire canopy cover (greater than 70 percent) than in areas with moderate pre-fire canopy cover (40 to 70 percent). This suggests that pre-fire vegetative conditions may influence post-fire use of an area by black-backed woodpeckers. Saab et al. (2002) noted the same trend in Idaho Douglas fir forests. Like its close relative, the three-toed woodpecker, fire suppression, late-successional harvest, and post-fire salvage logging can be detrimental to the black-backed woodpecker (Dixon and Saab 2000).

In unburned, uninfested pine habitat of the Black Hills, black-backs select mature or late successional pine stands with high canopy cover, high tree densities, and high snag densities (Mohren 2002, Panjabi 2001, Panjabi 2003, and USDA Forest Service 2000b). These conditions are found primarily in structural stages 4C and 5.

Black-backs also use sapling-pole stands with any amount of canopy cover (i.e., structural stages 3A, 3B, and 3C), but to a lesser degree than any of the other habitat structures mentioned thus far (Mohren 2002, USDA Forest Service 2000b). Mohren (2002) reported that black-backed woodpeckers avoid mature pine stands that do not have high canopy cover (i.e., structural stages 4A and 4B).

Black-backed woodpeckers nest in hard snags or live trees with diameters of 9 to 18 inches (Anderson 2003). They excavate nest cavities into the tree's sapwood and thus often prefer smaller diameter trees than other woodpecker species (Dixon and Saab 2000, Mohren 2002). Live nest trees generally have heart rot, which makes excavation easier (Anderson 2003, Mohren 2002). Ponderosa pine appears to be the most important nest tree in the Black Hills, as all recent studies report nests in only that species (Vierling 2004, Mohren 2002, Rumble 2002). The distribution, arrangement, and size of patches of snags needed are uncertain, but the literature suggests that snags should be clumped (Dixon and Saab 2000).

Mohren (2002) reported that the average snag density in unburned foraging habitat in the Black hills was 47 snags per acre. He found that black-backs selected for shorter snags (16.5-feet average) than available and small diameter snags (7-inch average).

Habitat Condition And Trend

Habitat conditions have been favorable for the black-backed woodpecker over the past few years due to numerous large fires and beetle outbreaks. Almost 175,000 acres have burned in the Black Hills over the past 5 years, with much of this occurring in ponderosa pine. In 2003, mountain pine beetles or pine engraver beetles killed almost 400,000 pine trees. Most of the insect-caused mortality occurred in individual or small groups of trees, but a few large areas of concentrated mortality also occurred. Substantial portions of these burned and infested areas currently provide suitable habitat for black-backed woodpeckers. See the Natural Disturbance Processes section of this chapter for supporting information about fire and insects.

Unburned pine stands infested with mountain pine beetles (bark beetles) are also important to black-backed woodpeckers. Rumble (2002) found that the density of black-backed woodpeckers in the heavily infested Beaver Park area was approximately seven times greater than what Mohren (2002) found across all habitats in the Black Hills. The core of the infestation had densities that were 32 times higher than the Forest-wide average; this is the highest density recorded on the Forest although it occurred over a fairly small, localized area.

In unburned, uninfested pine habitat of the Black Hills, black-backs select mature or late successional pine stands with high canopy cover, high tree densities, and high snag densities (Mohren 2002, Panjabi 2001, Panjabi 2003, USDA Forest Service 2000b). These conditions are found primarily in structural stages 4C and 5. There are currently 137,000 acres of pine in these two structural stages.

Population Status And Trend

In his baseline population study, Mohren (2002) estimated that approximately 1,200 backed woodpeckers occurred in the Black Hills during 2000, with an average Forest-wide density of one bird/883 acres (0.28 birds/km^2). The estimate applied across all habitat types on the Forest, excluding large recent burns, which did not exist. According to Mohren (2002), the Forest-wide density estimate was similar to what has been recorded in other unburned habitats across the species range. Since Mohren's first estimate was derived, several large fires occurred in the Black Hills, which has undoubtedly increased the black-backed woodpecker population.

Black-backed woodpeckers have been monitored on the Black Hills since 2001 in cooperation with the Rocky Mountain Bird Observatory (Panjabi 2001, 2003, 2004). The Forest is monitoring the black-backed woodpecker population within both burned and unburned habitats; data are provided in habitat descriptions below.

Table 3-19. Relative Density (birds/km2) of Black-backed Woodpeckers, 2001-2004

	2001	2002	2003	2004
Structural Stages 4C and 5[1]	ID	1.3	-	ID
Burned Area[2]	ID	6.9	3.6	3.38

Source: Panjabi (2001, 2003, 2004, 2005).

ID = Insufficient Data.

[1]Panjabi defines late successional as 4C and 5. Late successional habitat was not monitored in 2003.

[2]Jasper Fire – burned in 2000.

It appears that black-backed woodpecker densities peaked in the 2000 Jasper Burn during the second post-fire year when one bird per 36 acres (or 6.9 birds per km^2) were observed (Panjabi 2003). This is nearly 25 times higher than what Mohren (2002) found as a Forest-wide average. One year later, densities in the Jasper Burn had declined by nearly half (Panjabi 2004), but they were still much higher than what has been found in other habitats.

In unburned, uninfested pine habitat of the Black Hills, black-backs select mature or late successional pine stands with high canopy cover, high tree densities, and high snag densities (structural stages 4C and 5). Panjabi (2003) found one bird per 190 acres (1.3 birds per km$^{2)}$ in these types of stands, which is over five times higher than what Mohren (2002) reported as a Forest-wide average.

Direct And Indirect Effects

Ecosystem Approaches by Alternative

Alternatives 3, 4, and 6 contain a habitat objective for black-backed woodpecker habitat. In Alternatives 3, 4, and 6, Objective 200-11b strives to maintain habitat opportunities for black-backed woodpeckers across the Forest, as outlined in specific direction pertaining to conifer habitat, snags and recently burned habitat. Alternatives 1 and 2 do not contain a specific habitat objective for black-backed woodpeckers. Habitat objectives in Alternatives 1 and 2 are outlined in specific direction pertaining to conifer habitat and snag habitat.

Pine forests that are recently burned or infested with beetles provide the best habitats for the black-backed woodpecker. In the event that wildfires would occur, Objective 11-03 would guide value recovery (i.e., salvage logging) under Alternatives 3, 4, and 6. No value recovery would occur under Alternative 4; this would provide maximum potential habitat benefit to the black-backed woodpecker, as no habitat would be altered. In Alternatives 3 and 6, dead trees would be available for value recovery, excepting 50 percent of the recent (0 to 5 years) stand-replacing fire acreage Forest-wide, up to 10,000 acres unsalvaged in any given 5-year period. In Alternatives 3 and 6, highest priority to remain unsalvaged would be areas that had greater than 70-percent pre-fire canopy closure. In Alternative 6, stand-replacing insect infestations also contribute to the 10,000-acre area.

The amount and age of the unsalvaged areas were based on the black-backed woodpecker recommendations provided in the Wyoming Bird Conservation Plan (Nicholoff 2003). The Conservation Plan recommendations were intended to provide a continual supply of burned black-backed woodpecker habitat over at least 1 percent of the ponderosa pine landscape at any given time. The 5-year period is based on recommendations in Dixon and Saab (2000), which suggests avoiding post-fire salvage logging in portions of large burned areas for 5 years after fire. The assumption is that providing recently burned habitat over space and time would ensure long-term persistence of the species across the landscape.

Areas with greater than 70-percent pre-fire canopy cover were prioritized in Alternative 3 and 6 to ensure that the highest quality burned areas remain unsalvaged. Areas with greater than 70-percent pre-fire canopy cover have revealed more nests than areas with less cover (Vierling 2004, Saab et al. 2002).

Alternatives 1 and 2 do not provide specific direction for post-fire value recovery. In these two alternatives, post-fire value recovery is guided by the Forest-wide snag objective (Objective 211) and standards and guidelines (Standards and Guidelines 2301-2305).

Snags within unburned, uninfested (with insects) forest provide habitat for black-backs between fires and insect outbreaks, spatially and temporally. Alternative 1 manages for an average of 1.08 snags per acre across the conifer-forested portion of the Forest (Objective 211, Standard 2301). Alternatives 2 and 4 manage for two to four snags per acre in ponderosa pine forested types, averaged across the watershed, at least 25 percent of which are greater than 20 inches in diameter. Alternatives 3 and 6 manage for three snags per acre across the conifer-forested portion of the Forest, at least 25 percent of which are greater than 14 inches in diameter. Alternatives 3 and 6 also retain all snags greater than 20 inches in diameter unless they are a safety hazard (Standard 2301). In all alternatives, snag densities should be met across relatively large areas (e.g., watersheds or project areas), not necessarily every acre. This, combined with Objective 11-03 in Alternatives 3, 4 and 6, is expected to produce some areas with high snag densities and other areas with lower densities.

Mature and late successional pine stands (structural stages 4C and 5) are important to all three habitat types used by black-backed woodpeckers: burned forest (through risk of fire and pre-fire canopy cover); beetle-infested stands (through risk of infestation); and unburned, uninfested forest (through high canopy cover, high tree density, and high snag density). There are several objectives, standards, and guidelines that would affect the availability of these structural stages in each of the alternatives.

Alternatives 1 and 2 rely on a system of late successional areas (late successional management areas, late successional stands, non-development MAs) to provide structural stages 4C and 5 across the Forest. These late successional areas include MA 3.7, smaller scale stands identified in the RIS, and other MAs that provide late successional conditions such as wilderness; this objective is common to all alternatives. Wilderness (1.1A) and late successional (3.7) MAs make up about 3 percent of the Forest. In addition Objective 207 is designed to manage at least 5 percent of the forest for late succession.

The approach in Alternative 3 is based on a combination of late successional areas and structural stage objectives. Late successional areas include MAs 3.7 and other MAs that provide late successional conditions, such as wilderness. Alternative 3 also contains habitat objectives that provide dense mature and late successional habitat across other portions of the Forest (structural stages 4C and 5). In Alternative 3, Objectives 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204 (structural stage objectives) provide a desired condition in these MAs. These five MAs are designed to manage for 15 percent of the forested acres in preferred habitat (structural stages 4C and 5). MAs 4.1, 5.1, 5.4, 5.43 and 5.6 make up about 83 percent of the Forest.

The approach in Alternative 4 is similar to Alternatives 1 and 2 but includes additional mature forested areas where timber harvest would not occur (structural stages 4C and 5). Additional reserves in Alternative 4 provide a total of 185,000 acres (18 percent) of forested lands that would be managed as dense mature and late succession.

The approach in Alternative 6 is based on a combination of late successional areas and structural stage objectives. Alternative 6 also contains habitat objectives that provide habitat across the Forest though they are different than Alternative 3. In Alternative 6, Objectives 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204 (structural stage objectives) provide a desired condition in these MAs. These five MAs are designed to manage for 10 percent of the forested acres in dense, mature and late successional habitat (structural stages 4C and 5).

Effects Of Species-viability Management On Black-backed Woodpeckers

The black-backed woodpecker was not chosen as an MIS because of concerns regarding its viability but because of its link to particular features of the forest. However, Forest management direction focused on species viability has the potential to influence habitat for black-backed woodpeckers.

High snag densities preferred by black-backs (Mohren 2002) will most likely occur in stand-replacing fires and insect outbreaks. Objective 11-03 in Alternatives 3, 4, and 6 provides management guidance for retaining a portion of these conditions as they occur. Alternative 4 provides the highest likelihood these conditions will be maintained. In Alternatives 3 and 6, Objective 11-03 is consistent with Nicholoff (2003) and will likely provide sufficient areas of dense snags while allowing some post-fire value recovery. Alternatives 1 and 2 do not include Objective 11-03. However, Mohren (2002) found areas of higher snag density on the Forest even though there was not direction in the Forest Plan similar to Alternatives 1 and 2. There will likely be some areas on the Forest with higher snag densities under Alternatives 1 and 2, but the absence of Objective 11-03 leads to a higher level of uncertainty these conditions will exist.

Snags in unburned, uninfested forests provide habitat for black-backs between fires, spatially and temporally. Mohren (2002) reported that the average snag density in unburned foraging habitat was 47 snags per acre. Mohren's snag data included all size classes, and there was some selection for smaller diameter snags (mean = 7 inches). Forest Inventory Analysis data estimates a Forest average of 79 snags per acre in all size classes. RMRIS data (2004) estimate a Forest average of 85 snags per acre in all size classes. These are Forest averages and some areas likely have higher densities while other areas have fewer snags. These data were collected prior to the recent fires and insect outbreaks since 2000, which have contributed additional snags to the landscape. None of the alternatives propose a change to the management of smaller diameter snags (0 to 9 inches in diameter). As a result, overall snag densities will likely continue to exceed the amounts found by Mohren (2002).

Objective 211 provides direction for larger snags, which also contribute to black-backed woodpecker habitat. Alternative 1, which specifies only 1.08 snags per acre, would have the highest risk of not providing larger snags for black-backed woodpeckers across unburned, uninfested landscapes. Alternatives 2 and 4 would likely provide the least risk, since an average of four snags is specifically called for on north facing slopes. Alternatives 3 and 6, which call for three snags per acre, would have slightly more risk than Alternatives 2 and 4. However, the risk associated with any of the alternatives except Alternative 1 would be relatively small because some areas would have snag densities that exceed the prescribed average.

Although each of the alternatives varies in its snag-size requirements, this would likely have negligible effects on black-backed woodpeckers. This is because the species uses relatively small snags for foraging (5 to 12 inches dbh; Mohren 2002) and nesting (9 to18 inches dbh; Anderson 2003). All alternatives but Alternative 1 specify that all snags counting toward density objectives would be at least nine inches dbh and further promote that some would be at least 14 (Alternatives 3 and 6) or 20 inches (Alternatives 2 and 4).

Mature and late successional pine stands (structural stages 4C and 5) are important to all three habitat types used by black-backed woodpeckers: burned forest (through risk of fire and pre-fire canopy cover); beetle-infested stands (through risk of infestation); and unburned, uninfested forest (through high canopy cover, high tree density, and high snag density) (Mohren 2002, Panjabi 2001, Panjabi 2003, and USDA Forest Service 2000b). There are several objectives (Objectives 207, 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204) that would affect the availability of these structural stages in each of the alternatives. The **Table 3-20** below shows the expected availability of these structural stages if the objectives in each alternative are met (see Section 3-2.1.1, Forested Ecosystems). **Table 3-20** shows that Alternative 4 could have the most acreage in these structural stages, followed by Alternatives 3 and 6, respectively. Alternatives 1 and 2 do not have an objective for structural stage 4C, so the acreage is only structural stage 5. Alternative 1 also has a higher risk to the species because Guideline 3201 may allow for a continuous decline in habitat capability.

Table 3-20. Expected Ponderosa Pine Structural Stages 4c And 5 Acreage If Objectives 207, 4.1-203, 5.1-204, 5.4-206, 5.43-204, And 5.6-204 Are Achieved.

	Existing Condition	Alternatives				
		1	2	3	4	6
Acres	137,000	51,779[1]	51,779[1]	163,247	185,035	118,887

Source: Forest Resource Information System (see Section 3-2.1.1).

[1]Alternatives 1 and 2 do not have an objective for structural stage 4C. Acreage represents structural stage 5 only.

As discussed previously, the most important factors for woodpeckers are the availability of recently burned areas (unsalvaged), snags, and mature and dense late successional pine forest. Alternative 4 will likely provide the most potential habitat for black-backs by providing the most unsalvaged burned habitat (Objective 11-03), the most late successional and dense mature forest (Objective 207), and sufficient snags forest-wide (Standard 2301). Alternative 3 is slightly less beneficial to black-backs than Alternative 4, but still provides potential habitat by providing up to 10,000 acres of unsalvaged burned habitat, and increase in late successional and dense mature forests over existing conditions, and sufficient snags Forest-wide. Alternative 6 is similar to Alternative 3 except that is manages for less late successional and dense mature forests than currently exists. Alternative 2 contains sufficient Forest-wide snag direction, but does not include any direction for providing unsalvaged burned habitat or dense mature forests, which leads to less certainty in providing habitat for the species. Alternative 1 provides for the lowest snag densities (Standard 2301) and does not include direction for unsalvages burned habitat or dense mature forests, leading to the least certainty in providing black-backed woodpecker habitat.

Habitat fragmentation will not be limiting to black-backs. Black-backed woodpecker populations are often irruptive as they follow outbreaks of wood-boring beetles after fires (Dixon and Saab 2000, USDA Forest Service 2000b). Black-backs have adapted to take advantage of the sporadic occurrence of fire. They are highly mobile and able to colonize habitat, especially burned areas.

Black-backed woodpecker populations on the Forest are doing well due to the recent fire-and-insect activity over the last 5 years. Under all alternatives, populations can be expected to decline as these recent fires age. It is unreasonable to expect the level of recent fire-and-insect activity to continue over the long term. Some fires-and-insect activities will likely occur over time (see the Fire and Insect Sections, 3-7) separated by periods of low fire-and-insect activity. Black-backed woodpecker populations will likely follow a similar pattern. Populations will likely be similar to current levels during periods of high fire-and-insect activity. During periods of low fire-and-insect activity, populations will likely be similar to those found by Mohren (2002).

Effects Of Research Natural Area Management On Black-backed Woodpeckers

RNAs could be established with the implementation of Alternatives 3, 4, or 6. There are ponderosa pine community types in all candidate RNAs with the exception Lemming Draw. RNA establishment would preclude harvest within the RNA boundary. Ponderosa pine communities within the RNA would be allowed to go through natural succession, and in the absence of natural disturbance events such as fire or insect infestations, would eventually approach late-successional conditions, thus contributing to the conservation of black-backed woodpeckers.

In the absence of fire, timber stands within the RNA would tend toward a higher fire-hazard rating. There may be more stand-replacing fires in the short-term that provide black-backed woodpecker habitat.
In the event of natural periodic fire, it is reasonable to assume that vegetation communities within the RNAs would eventually return to conditions more like those that existed before the Forest was managed. Vegetation conditions historically supported fewer catastrophic, stand-replacing fires and more frequent low intensity burns than currently occur on the Forest.

Refer to the RNA section and Appendix G for candidate RNA locations and additional information on the size and composition of each.

Effects Of Fire-hazard and Insect-risk Management On Black-backed Woodpeckers

The effects to fire-hazard ratings are discussed in Section 3-7.1 Fire. Alternative 6 provides the greatest reduction of high or very high fire hazard followed by Alternative 3, Alternative 1, and Alternative 2. Alternative 4 provides the least reduction in fire-hazard rating. Fire-hazard reduction does not necessarily reduce the probability that a fire will occur. However, lower hazard increases the probability of lower fire intensity (surface fire versus crown fire) and easier control or containment should a fire occur. Fire activity and acres burned have been above average in recent years. The amount of severely burned acres is higher at present than normal and will not be sustained over time, regardless of the alternatives. The amount of severely burned acres will likely be less in the future (see Section 3-7.1 Fire). Burned habitat has the potential to be the lowest in Alternative 6, followed by Alternative 3, Alternative 1, and Alternative 2, due to efforts to reduce fire hazard that could lead to fewer stand-replacing fires. Burned habitat has the potential to be the highest in Alternative 4.

Wood-boring insects are an important food source for black-backs. Alternatives 1, 3, and 6 are expected to have the most acres of commercial timber harvest, followed by Alternative 4 and Alternative 2, respectively. There is an estimated range of precommercial or small diameter tree thinning among the alternatives. Alternative 6 has the highest estimated non-commercial thinning acres, followed by Alternative 3, Alternative 4, Alternative 1, and Alternative 2. As described above, the more thinning acres the lower the probability of insect mortality. Alternative 6 has the potential to reduce the probability of insects the most.

Summary

All alternatives will likely maintain habitat opportunities across the Forest (Objective 200-11b) through implementation of the strategies mentioned above. Black-backed woodpecker populations will likely decline from current levels under all alternatives because the above average amount of recent stand-replacing fires will not be sustained. Under all alternatives, there will be adequate habitat to maintain breeding populations well distributed on the Forest. Abundance is expected to exceed levels which would lead to any concern for viability. Populations may return to levels found by Mohren (2002) prior to the recent spike in acres burned by fire. Based on expected habitat changes, all alternatives would provide unburned habitat for the black-backed woodpecker within structural stages 4C and 5 (dense mature and late successional pine and spruce). Mature and late successional habitat will be distributed as patches at low abundance, and there may be gaps where this habitat is absent or only present in low abundance. However, the areas of mature and late successional habitat will typically be large enough and close enough to permit dispersal and interaction among subpopulations. Recently burned habitat will likely decline from recent highs and will likely be distributed as patches in low abundance. Woodpeckers are highly mobile and dispersal is not a concern between burned areas. Burned habitat will likely be lowest in Alternative 6, due to efforts to reduce fire hazard that could lead to fewer stand-replacing fires. All alternatives provide for snags distributed across the landscape. Alternative 1, which specifies only 1.08 snags per acre, would have the highest risk of not providing adequate snags for black-backed woodpeckers across unburned landscapes. The affects analysis is based on the following assumptions:

1. The conservation objectives and protective standards and guideline direction listed above for the various alternatives will be applied or implemented as written.
2. Activities will move conditions towards structural stage and late successional objectives for each alternative. The time required to reach these objectives is dependent on funding and forest growth rates, which are not included in this analysis. As a result, it may take two or more decades to achieve these objectives.

Cumulative Effects

Past activities are accounted for in the existing condition displayed under direct and indirect effects. Future Forest Service activities are included in the direct and indirect effects discussion. Other Federal and non-Federal activities are discussed here.

Mount Rushmore National Memorial, Jewel Cave National Monument, Wind Cave National Park, and Custer State Park likely provide additional suitable habitat in the Black Hills. These areas are managed somewhat differently than the Forest, particularly regarding timber and recreation. Each of these parks contains a substantial amount of late successional forests and provides the vegetative characteristics the black-backed woodpecker uses (e.g., snags). Recreational use may be higher in some portions of the parks than in most of the Forest, but the use is generally confined to roads and trails, leaving many suitable areas undisturbed for unaltered reproductive behavior.

Privately owned lands within and adjacent to the Forest boundary may also provide suitable habitat for the black-backed woodpecker. Fire-hazard reduction activities are likely to increase on some of these lands over the next 50 years in an effort to prevent loss of homes from wildfire. This could result in an additional loss of habitat (burned or unburned). However, the amount of area within these private lands is relatively small compared to what is on the Forest.

Alternative 4 is likely to have the least cumulative effects because it has a higher snag density requirement, maintains the most structural stage 4C and 5, and allows no value recovery of dead trees following a wildfire. Alternatives 3 and 6 is likely to have more cumulative effects than Alternative 4 because they allow some salvage of dead trees following a wildfire (Objective 11-03) and may result in less structural stage 4C and 5. Alternative 2 is expected to have more cumulative effects than Alternatives 3 and 6 because it does not include direction for maintaining dead trees following a wildfire and may result in less structural stage 4C and 5. Alternative 1 could result in the most additive effects from management activities on the Forest due to the lower snag density standard, the allowance for habitat capability to decline continuously (Guideline 3201), and the lack of direction on post-fire salvage (11-03).

Monitoring Approach

Monitoring will be designed to examine Forest-wide trends. Based on the language in 36 CFR 219.14f, project-level monitoring is not required.

Monitoring habitat elements such as snags, burned areas, insect infestations and forest vegetation will provide feedback on available habitat. The Rocky Mountain Bird Observatory (RMBO) established a bird monitoring protocol to sample bird populations in the Black Hills (Panjabi 2001). According to Panjabi (2001, 2003, 2004) this species should be effectively monitored with the existing RMBO protocol. Reporting will be on a 1- to 5-year frequency. Habitat will be monitored in general; however, when available, populations may be used as a strong indicator of management response. Monitoring of populations will be discretionary as provided by 36 CFR 219.14f. Any revision to the monitoring protocol will describe the relationship between habitat monitoring and populations.

3-3.3.7.2. Brown Creeper *(Certhia americana)*

Selection Rationale

The selection of MIS, including the brown creeper, is detailed in SAIC (2005). Preferred habitat of the brown creeper within the Forest is late successional ponderosa pine and white spruce (USDA Forest Service 1996a). Brown creeper is likely a late successional obligate or area-sensitive species. As such, management actions may directly affect habitat condition, quantity, and distribution (USDA Forest Service 1996a, USDA Forest Service 2002a). Panjabi (2001, 2003, 2004, 2005) found the highest relative density of this species in dense mature and late successional pine stands and in spruce stands. He also found them at lower relative densities in the pine forest in general. Monitoring could enhance the ability to evaluate impacts from management on abundance, distribution and condition of spruce and dense mature and late successional pine forest. Baseline data exist for brown creepers from recent monitoring efforts with the Rocky Mountain Bird Observatory (Panjabi 2001, 2003, 2004, 2005). It should be effectively monitored through continuing this effort (Panjabi 2005). The brown creeper is selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on a variety of spruce and late successional and dense mature pine conditions to meet their needs.

Affected Environment

Distribution and Natural History

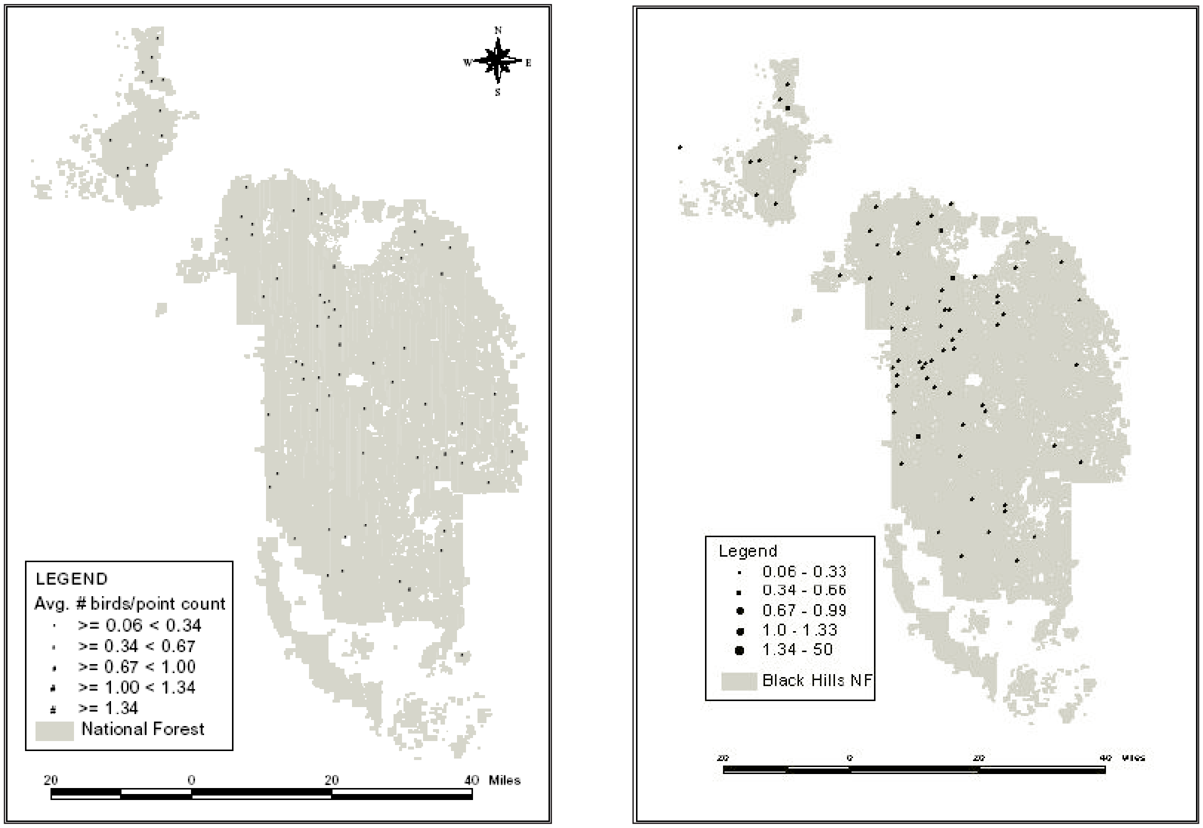
A thorough overview of the brown creeper's natural history and distribution is provided in the 1997 Revised LRMP EIS (USDA Forest Service 1996a, p. III-326 through III-329).

The brown creeper is found from Alaska and southern Canada south to Nicaragua (Bull and Farrand 1977). In the western states, the brown creeper is considered a year-round resident, retreating to lower elevations during the coldest months of winter (Kingery 1998). It is considered an uncommon resident of the Black Hills (USDA Forest Service 1996a, p. III-326), largely tied to late successional pine and white-spruce habitats (Panjabi 2003, 2004).

A small, well-camouflaged tree climber, the brown creeper (*Certhia americana*) is often observed scaling the bark of trees gleaning spiders, beetles, moths, and other insects from crevices and behind pieces of loose bark (Kingery 1998).

Figure 3-16. General Abundance And Distribution Of Brown Creeper Observations Along Point Transects On The Black Hills National Forest In 2001 And 2002.

2001 2002



Source: Panjabi (2001, 2003) Avg # birds/point-count.

Species-Habitat Relationships

The brown creeper is found most abundantly in mature, old growth coniferous and mixed-coniferous-deciduous forests. The preferred nesting habitat for this species is mature, old growth forest that is undisturbed and contains a closed canopy (Hejl et al. 2002, Wiggins 2005). Brown creepers tend to prefer dense, late successional coniferous, deciduous, or mixed habitats (DeGraaf et al. 1991). Panjabi (2001, 2003, 2004, 2005) has found that brown creepers are closely associated with dense mature and late successional ponderosa pine stands (structural stages 4C and 5) and white spruce in the Black Hills. They are also found in lower densities in other structural stages of ponderosa pine (Panjabi 2001, 2003, 2004, 2005). Evidence also suggests that this species is sensitive to the effects of timber management and forest fragmentation (Franzreb and Ohmart 1978, Keller and Anderson 1992, Crompton 1994, and Anderson and Crompton 2002).

Other important habitat requirements are areas of large trees (greater than 10 inches in diameter), loose bark, areas infested with bark beetles, and snags (DeGraaf et al. 1991, Peterson 1993, Kingery 1998, Wiggins 2005). Dead or decaying trees and snags provide substrate for nests and foraging. Nesting habitat generally contains trees that are larger than 9 inches dbh (Hejl et al. 2002 p. 15).

Habitat Condition And Trend

On the Black Hills, there are an estimated 185,000 acres (18 percent of the ponderosa pine acres) of structural stages 4C and 5 ponderosa pine on the Forest, which is about 800 acres less than the 137,207 acres estimated in 1995 (USDA Forest Service 1996a).

There are 25,414 acres of white-spruce stands estimated on the Forest, mostly at high elevations, on north aspects, and in cool canyon bottoms. This is 3,677 acres more than the 21,737 acres estimated in 1995 (USDA Forest Service 1996a). Some of this increase may be attributable to more accurate mapping techniques and recent inventories. It is believed that fire suppression during the last century has allowed spruce to increase in abundance, density, and maturity in the Black Hills, usually at the expense of quaking aspen (Parrish et al. 1996, USDA Forest Service 1996a). Spruce was estimated to have comprised about 15,000 acres of the pre-1900 forested land base (USDA Forest Service 1996a, p. III-139). Comparing this figure with today's estimate suggests there has been almost an increase in spruce in the past century.

DeBlander (2002) estimated 2.7 snags per acre over 11 inches in diameter and estimated 0.3 snags per acre over 19 inches in diameter. No definition of height is given. Forest Inventory Analysis (FIA) data estimates and average of over 7 snags per acre 9 inches dbh and greater exist on the Forest (1999 data). For more information on snag densities and forest conditions, see the Forested Ecosystem section in the EIS. Snags have increased since 1999 due to recent fires and insect outbreaks, but amounts have not been quantified.

Population Status And Trend

The brown creeper is ranked as nationally secure: (N5) (NatureServe 2004). In South Dakota, the brown creeper is ranked as state imperiled (S2) (NatureServe 2004) because the species is restricted to the Black Hills. In Wyoming, the species is ranked state apparently secure (S4) (NatureServe 2004).

Brown creepers have been monitored on the Black Hills since 2001 in cooperation with the RMBO (Panjabi 2001, 2003, 2004, 2005). Four years of data suggest the brown creeper is well distributed in low abundance throughout the Black Hills (Panjabi 2001, 2003, 2004, 2005). At least 90 percent of all brown-creeper observations in each of these years have occurred in white spruce and mature and late successional pine habitats (structural stages 4 and 5; Panjabi 2001, 2003, 2004). Relative densities in monitored habitats (Panjabi 2001, 2003, 2004, 2005) are shown in the table below.

Table 3-21. Relative Density (Birds/Km^2) Of Brown Creepers, 2001-2004

	2001	2002	2003	2004
Late successional[1]	20.4	10.9	-	14.1
White Spruce	8.6	14.9	7.3	-
Pine North[2]	ID	6.3	3.1	-
Pine South[3]	ID	4.4	4.2	-

Source: Panjabi (2001, 2003, 2004, 2005).
ID = Insufficient Data.
[1]Ponderosa pine structural stages 4C and 5. Late successional habitat was not monitored in 2003.
[2]Bearlodge and Northern Hills Ranger Districts.
[3]Mystic and Hell Canyon Ranger Districts.

Direct And Indirect Effects

Ecosystem Approaches By Alternative

Alternatives 3, 4, and 6 contain a habitat objective for brown creeper habitat. In Alternatives 3, 4, and 6, Objective 200-11a strives to maintain or enhance habitat for brown creepers across the Forest, as outlined in specific direction pertaining to spruce, ponderosa pine and snags. Alternatives 1 and 2 do not contain a specific habitat objective for brown creepers. Habitat objectives in Alternatives 1 and 2 are outlined in specific direction pertaining to conifer habitat and snag habitat. Specific direction pertaining to conifer and snag habitat is discussed below for each alternative.

The ecosystem approach in Alternatives 1 and 2 relies on a system of late successional reserves (late successional areas, late successional stands, non-development MAs) to provide brown-creeper habitat across the Forest (structural stages 4C and 5). These late successional areas include MA 3.7, smaller scale stands identified in the RIS, and other MAs that provide late successional conditions such as Wilderness; this objective is common to all alternatives. Wilderness (1.1A) and late successional (3.7) MAs make up about 3 percent of the Forest. In addition Objective 207 is designed to manage at least 5 percent of the forest for late succession.

The ecosystem approach in Alternative 3 is based on a combination of late successional reserve areas and structural stage objectives. Reserve areas include MAs 3.7 and other MAs that provide late successional conditions, such as wilderness. Alternative 3 also contains habitat objectives that provide brown-creeper habitat across other portions of the Forest (structural stages 4C and 5). In Alternative 3, Objectives 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204 (structural stage objectives) provide a desired condition in these MAs. These five MAs are designed to manage for 15 percent of the forested acres in preferred habitat (structural stages 4C and 5). The structural stage objectives also manage for 25 percent of structural stage 4 and 5 in larger diameter trees. MAs 4.1, 5.1, 5.4, 5.43 and 5.6 make up about 83 percent of the Forest.

The ecosystem approach in Alternative 4 is similar to Alternatives 1 and 2 but includes additional mature forested areas where timber harvest would not occur (structural stages 4C and 5). Additional reserves in Alternative 4 provide a total of 185,000 acres (18 percent) of forested lands that would be managed as dense mature and late successional forest.

The ecosystem approach in Alternative 6 is based on a combination of late successional reserve areas and structural stage objectives. Alternative 6 also contains habitat objectives that provide habitat across the Forest though they are different than Alternative 3. In Alternative 6, Objectives 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204 (structural stage objectives) provide a desired condition in these MAs. These five MAs are designed to manage for 10 percent of the forested acres in late successional and dense mature habitat (structural stages 4C and 5). The structural stage objectives also manage for 10 percent of structural stage 4 in larger diameter trees (tree size = very large, 16-inch dbh).

Table 3-22. Comparison Of Ecosystem Approaches To Providing Brown Creeper Habitat

	Alternative 1 No-Action, 1997 LRMP (Alternative G)	Alternative 2 No-Action, Phase I Amendment Direction	Alternative 3 Diversity Across the Landscape	Alternative 4 Phase I with Additional Mature Forest	Alternative 6 Reduce Fire Hazard and Insect Risk
General approach	System of late successional reserves (MAs 3.7, 1.1A, and select late successional stands).	System of late successional reserves (MAs 3.7, 1.1A, and select late successional stands).	A combination of late successional reserve areas (MAs 3.7, 1.1A, 2.2) and structural stage objectives (MAs 4.1, 5.1, 5.4, 5.43, and 5.6.)	Similar to Alternatives 1 and 2, but includes additional reserves (all structural stages 4C and 5).	A combination of late successional reserve areas (MAs 3.7, 1.1A, 2.2) and structural stage objectives (MAs 4.1, 5.1, 5.4, 5.43, and 5.6.)
Late successional Objectives	Manage for at least **5** percent late succession	Manage for at least **5** percent late succession	Structural stage objectives in MAs 4.1, 5.1, 5.4, 5.43, and 5.6 manage for **15 percent** of the pine-forested acres in structural stages 4C and 5.	Manage for at least 5 percent late succession. Additional reserves provide a total of **18 percent** of forested lands for late successional management	Structural stage objectives in MAs 4.1, 5.1, 5.4, 5.43, and 5.6 manage for **10 percent** of the pine-forested acres in structural stages 4C and 5.
Spruce Habitat	Conserve and manage white spruce.	Conserve and manage white spruce.	Maintain or restore mature and late successional (structural stage 4 and 5) spruce acres, except within 300 feet of buildings and where spruce has encroached into hardwoods.	Conserve and manage white spruce.	Manage for 20,000 acres of white spruce across the Forest.
Large Tree Component		Move towards or maintain an average minimum density of one large green tree (> 20 inches dbh) per acre within the associated watershed.	In MAs 4.1, 5.1, 5.4, 5.43, and 5.6, Manage for 15 percent of the structural stages 4 and 5 basal area in the 15 to 18.9” size class 10 percent of the structural stages 4 and 5 basal area in the 19+ size class.	Move towards or maintain an average minimum density of one large green tree (> 20 inches dbh) per acre within the associated watershed.	In MAs 4.1, 5.1, 5.4, 5.43, and 5.6, 10 percent of the Structural Stage 4 acreage will have a tree size of very large (16 inches diameter).

	Alternative 1 No-Action, 1997 LRMP (Alternative G)	Alternative 2 No-Action, Phase I Amendment Direction	Alternative 3 Diversity Across the Landscape	Alternative 4 Phase I with Additional Mature Forest	Alternative 6 Reduce Fire Hazard and Insect Risk
Snag Component	1.08 hard snags per conifer forested acre in all planning units In planning areas not meeting the minimum hard snag direction, all vegetation management projects designed to move hard snag densities toward this objective.	2-4 snags per acre > 10” dbh and 25-feet high, 25 percent of which are greater than 20 inches dbh. In watersheds not meeting the minimum hard snag direction, all vegetation management projects designed to move hard snag densities toward this objective.	Three hard snags greater than nine inches dbh and 25-feet high per acre, well dispersed across the Forest, 25 percent of which are greater than 14 inches in diameter. Retain all snags greater than 20 inches dbh unless a safety hazard. If snag densities within a Project Area are below snag objective, retain all snags unless a safety hazard.	2-4 snags per acre > 10” dbh and 25-feet high, 25 percent of which are greater than 20 inches dbh. In watersheds not meeting the minimum hard snag direction, all vegetation management projects designed to move hard snag densities toward this objective.	Three hard snags greater than nine inches dbh and 25-feet high per acre, well dispersed across the Forest, 25 percent of which are greater than 14 inches in diameter. Retain all snags greater than 20 inches dbh unless a safety hazard. If snag densities within a Project Area are below snag objective, retain all snags unless a safety hazard.

Effects Of Species-viability Management On Brown Creeper

The brown creeper was not chosen as an MIS because of concerns regarding its viability but because of its link to particular features of the forest. However, Forest management direction focused on species viability has the potential to influence habitat for brown creepers.

Table 3-22 shows the expected Forest-wide changes in brown creeper habitat and populations. This analysis assumes that late successional objectives and structural stage objectives are achieved for each alternative. Core habitat is defined as pine structural stages 4C and 5 and white spruce. Brown creepers may also use other pine habitat though at much lower densities (Panjabi 2001, 2003, 2004). Structural stages 3A, 3B, 3C, 4A, and 4B are used in this analysis to denote secondary forested habitat.

Alternatives 1 and 2 only contain objectives for structural stage 5 and spruce. There are no objectives in these alternatives for the other structural stages. The other structural stages will likely be present, but amounts are unknown. In Alternative 1 and 2, the figures in the table reflect only pine structural stage 5 and spruce. Alternative 4 only contains objectives for structural stages 4C, 5 and spruce. There are no objectives in alternative 4 for the other structural stages. The other structural stages will likely be present, but amounts are unknown. In Alternative 4, the figures in the table reflect only pine structural stages 4C and 5, and spruce.

A range of expected populations was also calculated using the relative densities of brown creeper from Panjabi (2001, 2003, 2004). The relative densities vary by year; therefore, a possible range of populations is given for each alternative in **Table 3-23**. The ranges for total estimated population in **Table 3-23** were shown for each alternative to facilitate alternative comparison. The numbers are based on habitat availability and relative density estimates (Panjabi 2001, 2003, 2004) and should be used for alternative comparison only. The population numbers should be viewed with caution because the relative density of brown creepers can fluctuate widely from year to year. Actual populations are dependant on many factors including weather, predation, insect populations (food), and disease. These factors can affect reproductive rates, survival rates, and mortality rates, which may result in differing populations in any given year.

Table 3-23. Expected Forest-wide Changes In Brown Creeper Habitat And Populations, If Late-successional And Structural Stage Objectives Are Achieved.

	Existing Condition	Alternatives				
		1	2	3	4	6
Core Habitat						
Ponderosa Pine (acres)[1]	135,891	51,779	51,779	163,247	185,035	118,887
Estimated population (pine)[2]	5,996-11,222	2,285-4,276	2,285-4,276	7,203-13,481	8,164-15,280	5,246-9,817
White Spruce (acres)	25,000	25,000	25,000	25,000	25,000	20,000
Estimated Population (spruce)	739-1,508	739-1,508	739-1,508	739-1,508	739-1,508	591-1,206
Estimated Total Core Population	6,735-12,729	3,023-5,784	3,023-5,784	7,942-14,988	8,903-16,788	5,837-11,024
Secondary Habitat						
Ponderosa Pine (acres)[3]	759,713	Unknown	Unknown	768,173	Unknown	812,532
Estimated Secondary Population (pine)	9,533-19,374	Unknown	Unknown	9,639-19,590	Unknown	10,033-20,721
Total Estimated Population						
	16,268-32,104	Unknown	Unknown	17,581-34,578	Unknown	16,033-31,745

Source: Forest Resource Information System. See Forested Ecosystem Section..

[1]Ponderosa pine structural stages 4C and 5. Alternatives 1 and 2 include only SS5, because there is no objective for 4C.

[2]Population estimates are based on relative densities from Panjabi (2001, 2003, 2004) expanded to acres of habitat.

[3]Ponderosa pine structural stages 3A, 3B, 3C, 4A and 4B. Alternatives 1, 2, and 4 do not contain an objective for these structural stages.

In the above analysis, core habitat is expected to increase in Alternatives 3 and 4. The expected amount of secondary habitat is unknown in Alternative 4, adding uncertainty to the total amount of habitat to be provided under this alternative. In Alternative 6, core habitat would decline, but secondary habitat will increase, making it similar to existing conditions (Total population estimate). In Alternatives 1 and 2, the expected amount of core habitat (structural stage 4C) is uncertain, as is the expected amount of secondary habitat. This results in a higher level of uncertainty that habitat will be provided across the Forest. Alternative 1 also includes Guideline 3201, which could result in an incremental decline in habitat capability. This contributes to the uncertainty of this alternative. Alternatives 3 and 6 are more likely to provide better distribution of this habitat due to the structural stage objectives in MAs 4.1, 5.1, 5.4, 5.43, and 5.6.

Objective 201 (hardwood restoration) targets hardwood conservation and restoration, which in many areas would require the removal of spruce to benefit aspen. For Alternatives 1, 2, and 4, the objective is to conserve or restore hardwood communities by 10 percent over 1995 conditions. For Alternatives 3 and 6, this amount is approximately doubled: 46,000 acres of aspen and 4,000 acres of bur oak are targeted for restoration during the life of the Plan. For Alternative 3, priority areas are those where conifers—including spruce—have outcompeted aspen adjacent to riparian areas that once supported beaver. Thus, under Alternatives 1, 2, 3, and 4, there is likelihood that some spruce would be removed but not in stands that are primarily spruce. (See the Forested Ecosystem section for a detailed analysis of effects on spruce.)

Objective 201 is balanced with Objectives 204 and 200-01, which are discussed above as resource conservation measures for spruce. To meet forest-structure diversity goals under species-viability management, new Objective 200-01 (Alternatives 3) calls for maintaining late successional spruce except where it has encroached into hardwoods or where defensible space is needed for fire protection (near buildings). Alternative 6 manages for 20,000 acres of spruce across the Forest (Objective 200-01). This is a 5,000-acre reduction in spruce habitat across the Forest. However, as shown in the above analysis, Alternative 6 is expected to provide more secondary habitat. As a result, total available habitat in Alternative 6 is expected to remain similar to existing conditions.

Snag management, Objective 211, manages for an average of 1.08 snags per acre under Alternative 1. Alternatives 2 and 4 manage for an average of two to four snags per acre well dispersed across the watershed. Under Alternatives 3 and 6, this objective manages for an average of three hard snags greater than 9 inches dbh and 25-feet high per acre, well dispersed across the Forest, 25 percent of which are greater than 14 inches in diameter. Standards 2301a, 2301c, 2301d, and 2301e provide for snags in pine and other forest types and require retaining snags in the largest size class available. Objectives 2301c, 2301d, and 2301e would be deleted under Alternatives 3 and 6 because these objectives are covered under structural stage objectives and under Standard 2301a. Standard 2302 and Guideline 2303 manage for meeting the minimum hard-snag direction and snags that are well distributed within the watershed, respectively under Alternatives 1, 2, and 4. These conservation measures are deleted under Alternatives 3 and 6 because they are covered under Objective 201 and Standard 2301. Alternatives 2, 3, 4, and 6 are consistent with current snag inventories and recent snag studies (see the Forested Ecosystem section). They will likely provide sufficient snags well distributed across the landscape. Alternative 1 manages for snag densities below these recent estimates and snag studies.

Large trees are also important for brown creepers because they provide deeper bark furrows, increasing the available forage area (Nicholoff 2003). Alternative 1 does not include direction for providing large trees on the landscape. Alternatives 2 and 4 contain direction (Guideline 2306 treated as a standard) to manage for an average of one 20-inch diameter tree, or the largest size class available, per acre within the associated watershed. This is designed to provide large trees that may become large snags. Alternatives 3 contains direction in the structural stage objectives (Objectives 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204) to maintain 15 percent of the structural stage 4 and 5 basal area in the 15- to 19-inch diameter class and 10 percent of the structural stage 4 and 5 basal area in the greater than 19-inch diameter class. This is intended to provide medium and large diameter trees and snags throughout the mature and late successional ponderosa pine type. Alternative 6 contains direction in the structural stage objectives (Objectives 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204) that 10 percent of the structural stage 4 acreage will have a tree size of very large (16 inches in diameter). Alternatives 2, 3, 4, and 6 will likely provide sufficient large trees well distributed across the Forest. Alternatives 3 and 6 offer the best prospect for maintaining large trees and snags across the Forest because of the large tree component in the structural stage objectives.

Brown creepers may be sensitive to habitat fragmentation. Alternatives 3 and 6 are more likely to provide better distribution of core habitat due to the structural stage objectives in MAs 4.1, 5.1, 5.4, 5.43, and 5.6. These objectives strive for appropriate structural stages in a diversity of sizes and shapes distributed across the Management Areas. Alternatives 1, 2, and 4 include core habitat objectives on a Forest-wide scale, which may be less likely to provide the habitat well dispersed. In all alteratives, secondary habitat, though supporting a lower relative abundance of brown creepers, will maintain sufficient connectivity between core habitats.

Effects Of Research Natural Area Management On Brown Creeper

RNAs could be established with the implementation of Alternative 3, 4, or 6. There are ponderosa pine community types in all candidate RNAs with the exception of Lemming Draw. RNA establishment would preclude harvest within the RNA boundary. Ponderosa pine communities within the RNA would be allowed to go through natural succession, and in the absence of natural disturbance events, such as fire or insect infestations, would eventually approach late successional conditions. These areas may contribute additional late successional habitat in the future.

Alternative 4 includes the most RNAs, followed by Alternatives 3 and 6, respectively. For RNA acreages and descriptions, see the RNA section in Chapter 3.

Effects Of Fire-hazard and Insect-risk Management On Brown Creeper

Fire-hazard treatments have the potential to affect brown creepers. Objective 10-01 strives for reduced fire hazard on the Forest. Brown creepers may be affected in areas where treatments occur. However, this objective offers sufficient flexibility to meet the structural stage objectives discussed above. On a smaller scale, such as within some areas of the WUI, there may be less preferred brown-creeper habitat (structural stages 4C and 5). Therefore, under Alternative 6 there may be increased fragmentation of brown-creeper habitat.

All alternatives manage for reducing fire hazard and insect risk. Alternatives 1, 3, and 6 are expected to have the most acres of commercial timber harvest, followed by Alternative 4 and Alternative 2. There is an estimated range of precommercial or small diameter tree thinning among the alternatives. Alternative 6 has the highest estimated non-commercial thinning acres, followed by Alternative 3, Alternative 4, Alternative 1, and Alternative 2. Precommercial activities remove smaller diameter trees, and will likely have little effect on the larger trees preferred by brown creepers.

Summary

Core habitat will be distributed as patches at low abundance, and there may be temporary gaps where core habitat is absent or only present in low abundance. However, the areas of core habitat will typically be large enough and close enough to permit dispersal and interaction among subpopulations across the Forest. Secondary habitat will be broadly distributed with high abundance across the Forest, allowing dispersal between core habitat areas.

All alternatives will likely maintain or enhance brown creeper habitat (Objective 200-11a) through implementation of the strategies mentioned above. Based on expected habitat changes, all alternatives would provide core habitat for the brown creeper within structural stages 4C and 5 (dense mature and late successional pine and spruce). Core habitat is expected to increase in Alternatives 3 and 4. The expected amount of secondary habitat is unknown in Alternative 4, adding uncertainty to the total amount of habitat to be provided under this alternative. In Alternative 6, core habitat would decline, but secondary habitat will increase, making it similar to existing conditions. In Alternatives 1 and 2, the expected amount of core habitat (structural stage 4C) is uncertain, as is the expected amount of secondary habitat. This results in a higher level of uncertainty that habitat will be provided across the Forest. Alternatives 3 and 6 are more likely to provide better distribution of this habitat due to the structural stage objectives in MAs 4.1, 5.1, 5.4, 5.43, and 5.6. Alternatives 2, 3, 4, and 6 are consistent with current snag inventories and recent snag studies and will likely provide sufficient snags well distributed across the landscape. Alternatives 3 and 6 offer the best prospect for maintaining large trees and snags across the Forest because of the large tree component in the structural stage objectives. Under all alternatives, there will be adequate habitat for maintaining viable populations for brown creeper. The affects analysis is based on the following assumptions:

1. The conservation objectives and protective standards and guideline direction listed above for the various alternatives will be applied or implemented as written.
2. Activities will move conditions towards structural stage and late successional objectives for each alternative. The time required to reach these objectives is dependent on funding and forest growth rates, which are not included in this analysis. As a result, it may take two or more decades to achieve these objectives.

Cumulative Effects

Past activities are accounted for in the existing condition displayed under direct and indirect effects. Future Forest Service activities are included in the direct and indirect effects discussion. Other Federal and non-Federal activities are discussed here.

Brown creepers could potentially use preferred nesting and foraging habitat in Custer State Park. Foreseeable actions over the next 50 years are unknown though management in Custer State Park will likely result in large trees because of the tourism emphasis. Human activity at Mount Rushmore National Memorial would have minor impacts to creepers although there is likely to be little suitable habitat.

Privately owned forestlands within the Forest boundary also provide potential nesting and foraging habitat. Resource management by companies and private citizens depends on a number of factors (e.g., desired goals, market prices, development potential) making it difficult to predict future trends. Landowners may treat forests for lumber or to reduce fire hazards, which could reduce habitat for brown creepers if late successional pine and spruce stands are treated over the next 50 years. It is assumed that urban development will continue on private lands. This will likely increase the importance of habitat located on NFS land over the next 50 years. These activities may reduce suitable habitat for brown creepers, which could lead to some reduction in brown-creeper numbers in the Black Hills.

It is foreseeable that more communities could be designated as ARC with fuel-reduction activities potentially occurring around them. It is uncertain how this will result in changes in placement or levels of treatments in brown-creeper habitat and how effects would be expected to change.

Based on expected habitat changes, all alternatives would provide core habitat for the brown creeper within structural stages 4C and 5 (dense mature and late successional pine and spruce). Alternatives 3 and 6 are expected to have the least cumulative effects. Core habitat is expected to increase in Alternatives 3 and 4. In Alternative 6, core habitat would decline, but secondary habitat will increase, making it similar to existing conditions. The expected amount of secondary habitat is unknown in Alternative 4, adding uncertainty to the total amount of habitat to be provided under this alternative. In Alternatives 1 and 2, the expected amount of core habitat (structural stage 4C) is uncertain, as is the expected amount of secondary habitat. This results in a higher level of uncertainty that habitat will be provided across the Forest. Alternatives 3 and 6 are more likely to provide better distribution of this habitat due to the structural stage objectives in MAs 4.1, 5.1, 5.4, 5.43, and 5.6. Alternatives 2, 3, 4, and 6 are consistent with current snag inventories and recent snag studies and will likely provide sufficient snags well distributed across the landscape. Alternatives 3 and 6 offer the best prospect for maintaining large trees and snags across the Forest because of the large tree component in the structural stage objectives. Alternative 1 has the highest potential cumulative effects due to the lower snag density and height standards and the potential for habitat capability to continuously decline (Guideline 3201).

Monitoring Approach

Monitoring will be designed to examine Forest-wide trends. Based on the language in 36 CFR 219.14f, project-level monitoring is not required.

According to Panjabi (2001, 2003, 2004) this species should be effectively monitored with the existing RMBO protocol. Suggested frequency of reporting is 1 to 5 years. Monitoring habitat elements such as snags, structural stages and spruce will provide feedback on available habitat. Habitat will be monitored in general, however, when available, populations may be used as a strong indicator of management response. Monitoring of populations will be discretionary as provided by 36 CFR 219.14f. Any revision to the monitoring protocol will describe the relationship between habitat monitoring and populations.

3-3.3.7.3. Golden-Crowned Kinglet *(Regulus satrapa)*

Selection Rationale

The selection of MIS, including the golden-crowned kinglet, is detailed in SAIC (2005). This species is closely associated with white spruce, particularly mature forest. It may be intolerant to changes on nesting grounds (USDA Forest Service 1981) and therefore a good indicator. Management actions may affect condition, quantity, and distribution of spruce habitat and associated species. This species is readily monitored with existing survey protocol (Panjabi 2001). Monitoring could enhance the ability to evaluate impacts from management on abundance, distribution and condition of spruce forest. Baseline data exist for golden-crowned kinglets from recent monitoring efforts with the Rocky Mountain Bird Observatory (Panjabi 2001, 2003, 2004, 2005). It should be effectively monitored through continuing this effort (Panjabi 2001). Golden-crowned kinglets are selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the forest to support species that rely on a variety of conditions in spruce habitat to meet their needs.

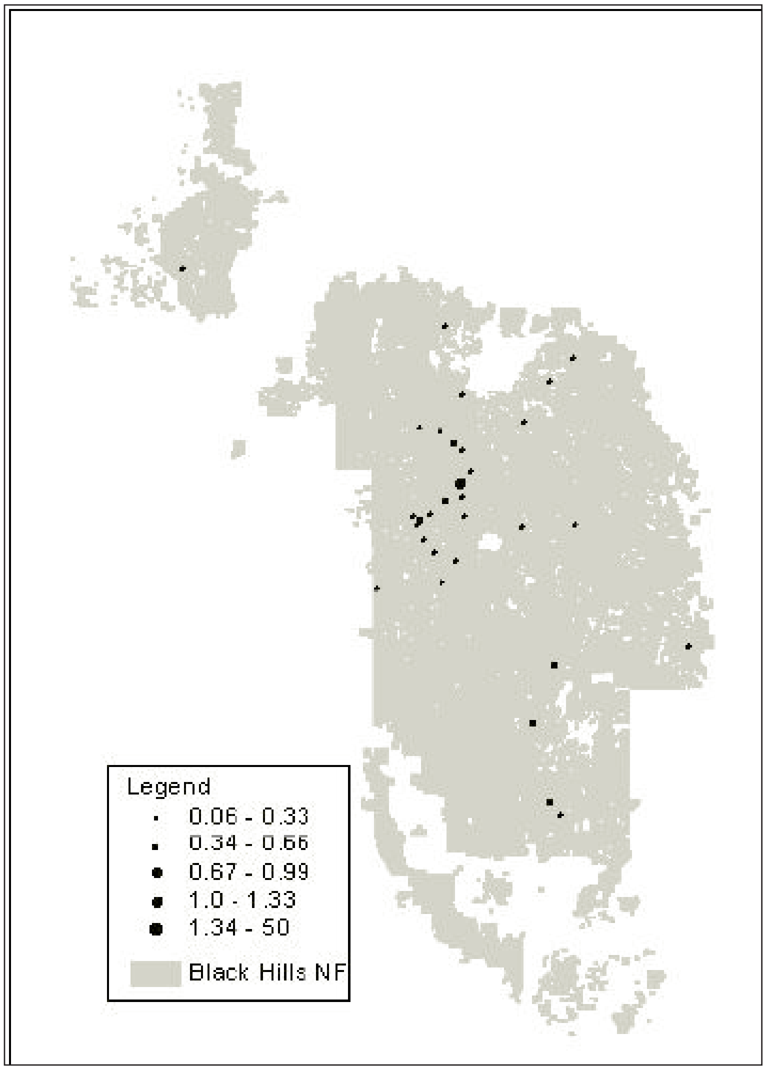
Affected Environment

Distribution and Natural history

The Revised LRMP BE (USDA Forest Service 1996a, Appendix H) and the Revised LRMP Phase I Amendment BE (USDA Forest Service 2001c) give a thorough overview of distribution and life history for the golden-crowned kinglet and are incorporated here by reference.

Golden-crowned kinglets that breed in the Black Hills are disjunct from their main breeding range across the boreal forests of Canada and in the Western United States. The golden-crowned kinglet is an uncommon permanent resident at higher elevations in the Black Hills, where they are found primarily in white-spruce forests (SDOU 1991; Panjabi 2003 p. 81). Golden-crowned kinglets are uncommon in winter in the Black Hills, but are common spring and fall migrants (SDOU 1991).

Figure 3-17. General Abundance And Distribution Of Golden-crowned Kinglet Observations (Avgerage Number Of Birds/point Count) Along Point Transects On The Black Hills National Forest In 2002.



Source: Panjabi (2003)

Species-Habitat Relationships

Golden-crowned kinglets are found primarily in white-spruce forests (SDOU 1991, Panjabi 2003). Panjabi (2003 p. 81) also found them in small numbers in mature ponderosa pine, aspen, and wet meadows, although these areas likely had a spruce component. Golden-crowned kinglets on the Black Hills are likely limited by the abundance, distribution and condition of spruce habitat.

Habitat Condition And Trend

Spruce habitat is naturally patchy and of low abundance on the Black Hills. White spruce occurs at high elevations, on north aspects, and in cool canyon bottoms of the Forest where it forms nearly even-aged climax stands (USDA Forest Service 1996a). Fire suppression during the last century has allowed spruce to increase in abundance and density in the Black Hills, generally at the expense of quaking aspen

(Parrish et al. 1996 p. 11). Spruce was estimated to have comprised about 15,000 acres of the pre- 1900 forested land base (USDA Forest Service 1996a p. III-139). In 1995, the spruce acreage was estimated at 21,737 acres on the Forest (USDA Forest Service 1996a). The white-spruce cover type now occurs on 25,000 acres on the Forest, an increase since 1995. Some of this increase may be attributable to more accurate mapping techniques and recent inventories. For more information on white spruce in the Black Hills, refer to the White Spruce Ecosystems section of this document.

Table 3-24. White Spruce Habitat Trends On The Black Hills.

	Pre- 1900	1995	2004
White Spruce Habitat (Acres)	15,000	21,737	25,000

Source: Pre-1900 and 1995: USDA Forest Service 1996a.
2004: Forest Resource Information System.

Population Status and Trend

The species population trend is increasing in eastern and central North America, and declining in the West (Sauer et al. 2003). Breeding Bird Survey data indicate that golden-crowned kinglets may be increasing in the Black Hills; however, data are based on few routes and lack statistical significance (Sauer et al. 2003).

Golden-crowned kinglets have been monitored on the Black Hills since 2001 in cooperation with the Rocky Mountain Bird Observatory (Panjabi 2001, 2003, 2004). Three years of data suggest this species occurs locally in the central and northern Black Hills and is moderately abundant in spruce habitat (Panjabi 2001, 2003, 2004). Golden-crowned kinglets were found almost exclusively in white-spruce habitat (Panjabi 2003). Panjabi (2001, 2003, 2004) reported breeding densities ranging from 18.5 to 58.59 birds/km^2 (47.9 to 151.8 birds per square mile) in white-spruce habitat.

Table 3-25. Golden-crowned Kinglet Relative Density (birds/km^2)

	2001	2002	2003
White Spruce Habitat	24.6	18.49	58.59

Source: Panjabi (2001, 2003, 2004).

Direct and Indirect Effects

Ecosystem Approaches By Alternative

Alternatives 3, 4, and 6 contain a habitat objective for golden-crowned kinglet habitat. In Alternatives 3, 4 and 6, Objective 200-11c strives to maintain habitat for golden-crowned kinglets across the Forest, as outlined in specific direction pertaining to spruce habitat (e.g., Objective 200-01). Alternatives 1 and 2 do not contain a specific habitat objective for golden-crowned kinglets. Habitat objectives in Alternatives 1 and 2 are outlined in specific direction pertaining to spruce habitat (Objective 204) as is discussed below for each alternative.

Under Alternatives 1, 2, and 4, Objective 204 calls for managing and conserving white spruce as well as lodge pole pine, limber pine, and Douglas fir. Objective 200-01 was established under Alternative 3 to provide for late successional stages within white spruce, favoring hardwood restoration where spruce has encroached upon hardwoods, and favoring spruce where it is encroaching into pine stands, especially where it improves connectivity between spruce stands. Spruce still may be treated where it occurs within 300 feet of buildings to provide for defensible space for fires. In Alternative 6, Objective 200-01 manages for 20,000 acres of spruce habitat across the Forest. In Alternative 6, spruce could be treated within 200 feet of buildings, where spruce has encroached into hardwoods, and for emphasis species management.

Effects Of Species-viability Management On Golden-crowned Kinglet

The golden-crowned kinglet was not chosen as an MIS because of concerns regarding its viability but because of its link to particular features of the forest. However, Forest management direction focused on species viability has the potential to influence habitat for golden-crowned kinglets.

Both spruce and aspen are recognized as a valuable component of diversity in the Black Hills. Therefore, several objectives are designed to obtain a balance between these critical resources. Objective 201 conserves and restores hardwoods, including aspen. Spruce may be removed in some areas to meet this objective. Under Alternatives 1, 2, and 4, the objective is to conserve or restore hardwood communities by 10 percent over 1995 conditions. For Alternatives 3 and 6, this amount is approximately doubled; 46,000 acres of aspen are targeted for restoration during the life of the planning period. Under Alternatives 3 and 6, priority areas are those where conifers, including spruce, have outcompeted aspen adjacent to riparian areas that once supported beaver colonies.

Guideline 2205 specifically addresses treatment requirements for Objective 201. For Alternatives 1, 2, and 4, no more than 10 overstory conifers per acre are to be left on site following treatment. Under Alternatives 3 and 6, all conifers would be removed and this guideline would be made a standard.

Spruce habitat has likely increased since historic times (Parrish et al. 1996) and has continued to increase some since 1995. The effects to the spruce ecosystem are discussed in Section 3-2.1.2 Forested Ecosystems earlier in this chapter and are summarized here. Alternatives 3 and 6 would have the largest direct impact, as more spruce would be removed under the more aggressive approaches to hardwood and riparian restoration. Alternatives 1, 2, and 4 would also directly remove spruce, but to a lesser extent. Overall, however, the amount of spruce (about 25,000 acres) is not expected to change into the future under Alternatives 1, 2, and 4, because only marginal changes at the edges of existing spruce stands are expected. These changes would result from direct management to benefit hardwoods or reduce fire hazard around buildings or from the natural encroachment of spruce in aspen stands. In Alternative 6, spruce habitat may decline from approximately 25,000 acres to about 20,000 acres (Objective 200-01), similar to estimates in 1995. This is largely due to treatments to increase aspen where spruce has encroached and for emphasis species management.

Using the relative density estimates from Panjabi (2001, 2003, 2004) and the acres of spruce habitat on the Forest, the current breeding population of golden-crowned kinglets on the Forest may range from 1,900 to 6,000 birds. The population numbers should be viewed with caution because the relative density of kinglets can fluctuate widely from year to year. Actual populations are dependant on many factors including weather, predation, insect populations (food) and disease. These factors can affect reproductive rates, survival rates, and mortality rates, which may result in differing populations in any given year.

In Alternatives 1, 2, 3 and 4, golden-crowned kinglet populations may decline in local areas around aspen stands or near buildings. However, the Forest-wide population is expected to remain stable over the long-term for Alternatives 1, 2, 3, and 4 because the amount and condition of spruce habitat is expected to remain stable.

In Alternative 6, spruce habitat may decline from approximately 25,000 acres to about 20,000 acres (Objective 200-01). This is largely due to treatments to increase aspen where spruce has encroached and for emphasis species management. This could lead to a decline in golden-crowned kinglet population numbers. However, habitat and populations are expected to remain at levels similar to that which was estimated in 1995. Golden-crowned kinglets were sustained at the 1995 habitat levels. Therefore, viable populations are expected to be maintained, though at a lower level than currently exists.

Spruce on the Black Hills is naturally distributed as patches at low abundance and there are gaps where spruce habitat is absent or only present in low abundance. However, the kinglets are mobile and disjunct areas of spruce habitat are typically large enough and close enough to permit dispersal and interaction among subpopulations across the Forest. Conditions similar to this are expected to be maintained under all alternatives. Therefore, fragmentation of spruce habitat is not expected to adversely affect the species.

Effects Of Research Natural Area Management On Golden-crowned Kinglet

White-spruce communities are present on the existing Upper Pine Creek RNA. This RNA will continue to exist under all alternatives. Two candidate RNAs also contain spruce communities, Canyon City and North Fork Castle Creek. The majority of the Canyon City candidate RNA is ponderosa pine forest, with white-spruce communities occurring along Rapid Creek and on the lower slopes of east aspects. North Fork Castle Creek candidate RNA has white spruce is found at the toe of slopes, along drainages, and on north aspects.

The direct effect of the RNA establishment on spruce would be conservation. However, RNAs would continue to be influenced by natural processes, such as fire, insects, and diseases. In the absence of management activities for fire, spruce may increase in density and canopy cover in these RNAs. Correspondingly, the likelihood of a stand-replacing fire in white spruce stands would increase. Likewise, some areas may succeed to white spruce in the absence of fire or management activities. Impacted areas would be current aspen stands or ponderosa pine sites favorable to spruce regeneration (e.g., higher elevations, north aspects, and canyon bottoms). In particular, spruce could encroach into aspen stands in the candidate North Fork Castle Creek RNA.

Refer to the Research Natural Areas section for candidate RNA locations and additional information on the size and composition of each.

Effects Of Fire-hazard And Insect-risk Management On Golden-crowned Kinglet

Objective 10-01 strives for reduced fire hazard on the Forest. Alternative 6 specifically includes an objective (10-01) to manage for a low-to-moderate fire hazard on 50 to 75 percent of the area within the WUI. Alternative 6 would manage the remainder of the Forest for 50 percent of the area in low-to-moderate fire hazard. In Alternative 3, Objective 10-01 manages for a low-to-moderate fire hazard on 50 percent of the area within the WUI.

Objective 10-01 offers sufficient flexibility to meet the spruce objectives (Objective 204) as well. These losses are expected to be balanced by the preference of spruce over ponderosa pine (Objective 204). Alternatives 1, 2, and 4 may also directly remove spruce, but to a lesser extent. Alternatives 3 and 6 would have the most potential to impact this species, as more spruce would be removed under the more aggressive approaches to fire-hazard reduction. Overall, the amount of spruce is not expected to change as a result of fire and insect management under any alternative, because only marginal changes at the edges of existing spruce stands are expected. These changes would result from direct management to reduce fire hazard around buildings. In Alternative 6, reductions in spruce habitat are largely due to treatments to increase aspen where spruce has encroached and for emphasis species management.

Summary

All alternatives will likely maintain golden-crowned kinglet habitat consistent with spruce objectives (Objective 200-11c) through implementation of the strategies mentioned above. Spruce habitat will continue to be distributed as patches at low abundance, and there may be gaps where spruce habitat is absent or only present in low abundance. However, the disjunct areas of spruce habitat will typically be large enough and close enough to permit dispersal and interaction among subpopulations across the Forest. Under all alternatives, there will be adequate habitat for maintaining viable populations for golden-crowned kinglets. The affects analysis is based on the following assumptions:

1. The conservation objectives and protective standards and guideline direction listed above for the various alternatives will be applied or implemented as written.
2. Activities will move conditions towards spruce objectives for each alternative.

Cumulative Effects

Past activities are accounted for in the existing condition displayed under direct and indirect effects. Future Forest Service activities are included in the direct and indirect effects discussion. Other Federal and non-Federal activities are discussed here.

Management of national and state parks adjacent to the Forest would have an unknown effect on golden-crowned kinglet populations. Wind Cave National Park and Jewel Cave National Monument likely contain little spruce habitat because they are located in the southern Black Hills where spruce is sparse or absent. Spruce occurs in Custer State Park, mostly at the north end near recreation sites. Management in Custer State Park will likely contribute to the conservation of this species over the next 50 years.

Privately owned lands within and adjacent to the Forest boundary may also provide suitable breeding and winter habitat for the golden-crowned kinglet. Resource management and conservation by private citizens and companies depends on a number of factors (e.g., desired goals, market prices, development potential), making it difficult to predict future trends in private forest structure and diversity. Landowners may treat forests for lumber or to reduce fire hazard, which could reduce habitat for golden-crowned kinglets if late successional spruce stands are treated over the next 50 years. It is assumed that urban development will continue on private lands. This will likely increase the importance of habitat located on NFS land over the next 50 years. These activities may reduce suitable habitat for this species, which could lead to some reduction in kinglet numbers in the Black Hills.

It is foreseeable that more communities could be designated as ARC, with fuel-reduction activities potentially occurring around them. It is uncertain how this will result in changes in placement of, or levels of, treatments in kinglet habitat, and how effects would be expected to change.

In Alternatives 1, 2, 3, and 4, potential golden-crowned kinglet population declines in local areas around aspen stands or near buildings could add to effects off-Forest. However, the Forest-wide population is expected to remain stable over the long term for Alternatives 1, 2, 3, and 4 because the amount and condition of spruce habitat is expected to remain stable. Alternative 6 has the most potential for cumulative effects because spruce habitat may decline from approximately 25,000 acres to about 20,000 acres (Objective 200-01). This is largely due to treatments to increase aspen where spruce has encroached and for emphasis species management. This could lead to a decline in golden-crowned kinglet population numbers. However, habitat and populations are expected to remain at levels similar to that which was estimated in 1995.

Monitoring Approach

Monitoring will be designed to examine Forest-wide trends. Based on the language in 36 CFR 219.14f, project-level monitoring is not required.

According to Panjabi (2001, 2003), this species would be effectively monitored with the existing Rocky Mountain Bird Observatory (RMBO) point-count protocol. For flexibility, the suggested frequency of reporting is 1 to 5 years. Habitat will be monitored in general, however, when available, populations may be used as a strong indicator of management response. Monitoring of populations will be discretionary as provided by 36 CFR 219.14f. Any revision to the monitoring protocol will describe the relationship between habitat monitoring and populations.

3-3.3.7.4. Grasshopper Sparrow *(Ammodramus savannarum)*

The grasshopper sparrow is also a Region 2 sensitive species. The effects to this species are also evaluated in the Biological Evaluation (Appendix C).

Selection Rationale

The selection of the grasshopper sparrow as a MIS is detailed in SAIC (2005). This species selects larger patches of open grassland types (Slater 2004). Within grasslands of suitable size, they prefer grassland habitat of intermediate height and avoid grasslands where vegetation less than 10 cm in height (Slater 2004). They require some taller vegetation such as tall grasses, forbs, or shrubs, to use as singing perches (Slater 2004). Baseline data exist for grasshopper sparrows from recent monitoring efforts with the Rocky Mountain Bird Observatory (Panjabi 2001, 2003, 2004, 2005). It should be effectively monitored through continuing this effort (Panjabi 2005). Because of its association with intermediate and taller vegetation, grasshopper sparrow habitat and/or population trends likely be a good indicator of prairie grassland habitat condition. The grasshopper sparrow is selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of grasslands to support characteristic grassland species that rely on a variety of grassland conditions to meet their needs.

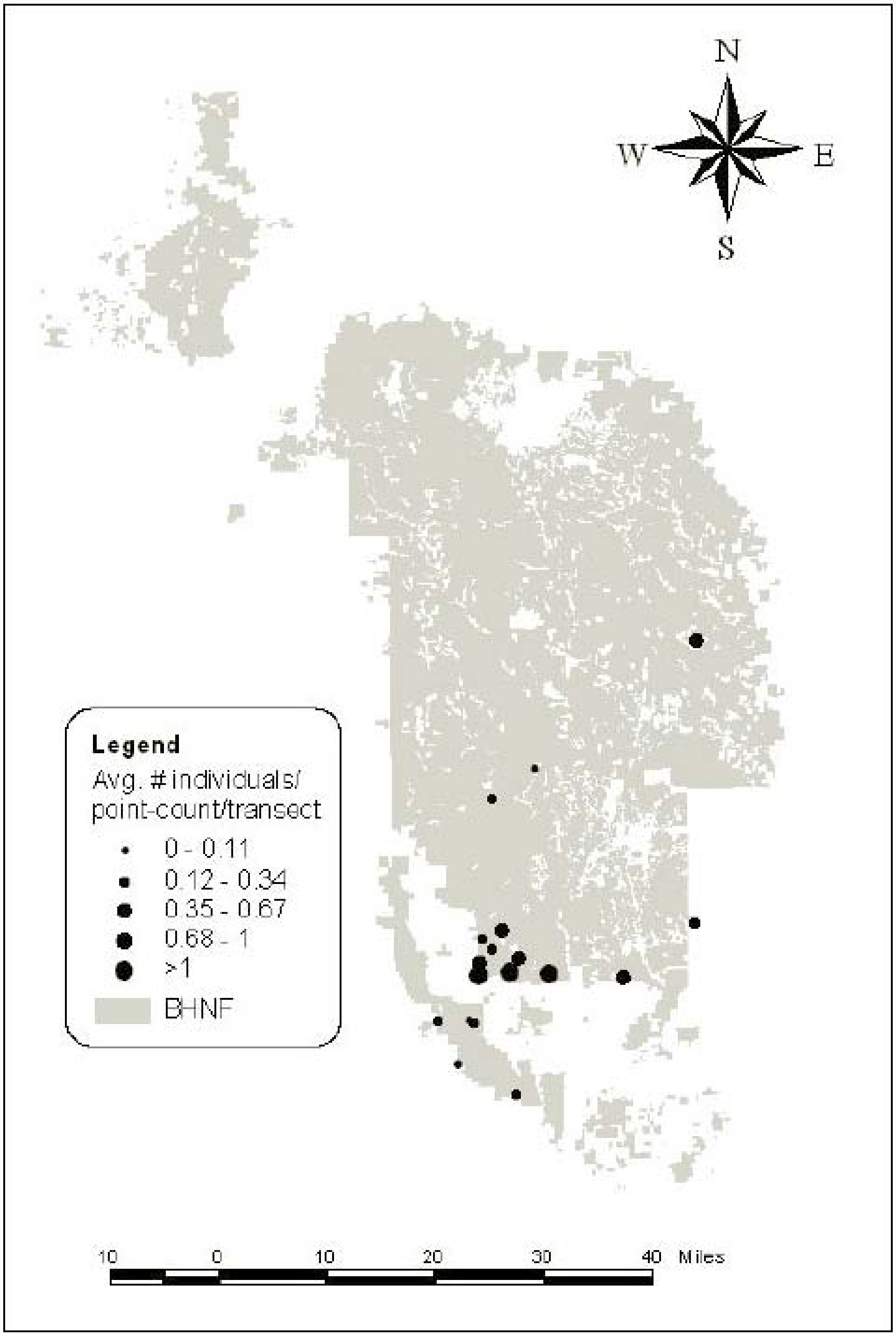
Affected Environment

Distribution and Natural history

The grasshopper sparrow breeds from southern Canada south through the majority of the United States including northwest portions of Washington, Oregon and California (Sibley 2000). It does not breed in the arid southwest. This species winters in southern United States and Mexico (Sibley 2000). In Wyoming, it breeds mainly in the eastern portion of the state, and occurs almost statewide except in the south central portion (Luce et al. 1999). In South Dakota, there are breeding records throughout the state, including the Black Hills (Peterson 1995). It is considered an uncommon to common summer resident (South Dakota Ornithologist's Union 1991).

It occurs widely in native mixed-grass prairies in the southern Black Hills, and locally further north in the central Black Hills (Panjabi 2005). Panjabi (2005) found them in the highest density in mixed-grass prairie habitat. They may also occur in other types of grasslands (Panjabi 2003).

Figure 3-18. General Abundance And Distribution Of Grasshopper Sparrow Observations Along Point Transects On The Black Hills National Forest In 2004.



Source: Panjabi (2005)

Species-Habitat Relationships

The grasshopper sparrow is found in a variety of open grassland types, but appears to be area sensitive, preferring grasslands greater than 20 acres in size (Slater 2004). They may select larger patches to avoid predation associated with edge habitats (Slater 2004). In South Dakota they are primarily found in mixed-grass prairies (Slater 2004). Within these grassland patches, they prefer grasslands of intermediate height and avoid habitats where vegetation is less than 4 inches (Slater 2004). They require some areas of bare ground for foraging and some taller vegetation (tall grasses, forbs, or scattered shrubs) for singing perches (Slater 2004). Grasshopper sparrows can be locally abundant in some prairies, especially where there is a greater proportion of tall grass (Panjabi 2005).

Habitat Condition And Trend

The most recent estimate of area covered by grasslands on the Forest is 110,000 acres. High-frequency fires help to maintain an open forest character that contains gaps to support understory herbaceous and shrub communities. Fire can keep the boundaries of conifer and hardwood communities in check by preventing the expansion of trees into grasslands, prairies, and shrubland. Fire suppression in the Forest has resulted in changes in the distribution and structure of herbaceous and shrub communities. At the periphery of the Black Hills, the forest/prairie interface has shifted from being historically higher in elevation to lower in elevation. Some native shrubs and trees have had the chance to become dominant over areas of grasses and forbs. The interior prairies (e.g., Reynolds Prairie) have declined in size due to encroachment of ponderosa pine.

For more information on the grassland ecosystem, see Section 3-2.2 Grassland/Shrubland Ecosystems.

Population Status And Trend

Breeding Bird Survey data show an average range-wide decline for grasshopper sparrows of 3.7 percent per year between 1966 and 2000. In Wyoming and South Dakota, the declines are 5.3 percent per year and 3.3 percent per year for the same 34-year period, respectively (Sauer et al. 2001). Population declines have been attributed to the loss of habitat by urbanization, conversion of native grasslands to croplands, and intensive livestock grazing (Slater 2004).

Grasshopper sparrows have been monitored on the Black Hills since 2002 in cooperation with the RMBO (Panjabi 2003, 2005). It occurs widely in native mixed-grass prairies in the southern Black Hills, and locally further north in the central Black Hills (Panjabi 2005). Panjabi (2005) found them in the highest density in mixed-grass prairie habitat. Grasshopper sparrow relative density (Panjabi 2003, 2005) is shown in the table below.

Table 3-26. Relative Density (Birds/Km^2) Of Grasshopper Sparrows, 2002 and 2004

	2002	2004
Mixed-grass Prairie	14.7	38.4

Source: Panjabi (2003, 2005).

Using Panjabi (3003, 2005) relative densities and acres of existing grasslands, current population estimates range from approximately 6,500 to 17,000 birds associated with grassland habitat.

<u>Direct And Indirect Effects</u>

Ecosystem Approaches by Alternative

Alternatives 3, 4, and 6 contain a habitat objective for grasshopper sparrows. In Alternatives 3, 4, and 6, Objective 200-11a strives to maintain or enhance habitat for grasshopper sparrows across the Forest, as outlined in specific direction pertaining to grasslands. Alternatives 1 and 2 do not contain a specific habitat objective for grasshopper sparrows. Habitat objectives in Alternatives 1 and 2 are outlined in specific direction pertaining to grasslands. Specific direction pertaining to grassland is discussed below for each alternative.

In Alternatives 1, 2, and 4, Objective 205 targets restoration of grassland communities (meadow and prairie) by 10 percent over 1995 conditions. Under Alternatives 3 and 6, Objective 205 targets approximately 12,000 acres of prairie grasslands (a 13-percent increase) for restoration, primarily where pines are encroaching on existing grasslands.

All alternatives provide consistent guidance in considering the effects of prescribed burning activities on grassland communities. Guideline 2107 encourages treatment of pines that have encroached on grassland habitat to maintain the composition of grass species under Alternatives 1, 2, and 4. Under Alternatives 3 and 6, this guideline encourages treatment of conifers (not just pine) that have encroached on grasslands. Alternatives 3 and 6 would strengthen these measures by additionally specifying that no more than 60 percent of any contiguous grassland be burned at any time, and that burning activities take place in early spring or fall (Standard 3100-10). This would ensure food sources were still available and activities were conducted outside the nesting window. This is consistent with the recommendations in the Wyoming Partners in Flight Bird Conservation Plan (Nicholoff 2003).

Effects Of Species-viability Management On Grasshopper Sparrow

The grasshopper sparrow was not chosen as an MIS because of concerns regarding its viability but because of its link to particular features of grasslands on the Forest. However, Forest management direction focused on species viability has the potential to influence habitat for grasshopper sparrows.

Under Alternatives 1, 2, and 4, Objective 205 provides for the restoration of grassland and prairie communities across the Forest by 10 percent over 1995 conditions. However, this level of restoration would ensure only that existing grassland and prairie communities would not be overtaken by ponderosa pine encroachment. Restoration Objective 205 would result in a slight increase in grassland habitat in Alternatives 3 and 6.

High intensity livestock grazing can be detrimental to this species, but disturbance from low-to-moderate grazing and light burns can be used as habitat management tools (Nicholoff 2003). New Standard 3100-14 under Alternatives 3 and 6 could help restrict ponderosa pine in a given area but generally would not affect the total acreage of grassland nor its distribution. It would provide some area in each grassland patch unburned, thus reducing impacts on nesting habitat.

No changes in livestock-grazing levels are proposed in any of the alternatives. Therefore, grasshopper sparrow habitat and populations are not expected to change due to livestock grazing.

Grassland habitatwill continue to be distributed as patches at low abundance, and there may be gaps where grassland habitat is absent or only present in low abundance, especially in the northern and central Black Hills. However, grassland habitat in the southern Black Hills will typically be large enough and close enough to permit dispersal and interaction among subpopulations. If management activities move conditions toward Objective 205, grasshopper sparrow habitat is likely to be less fragmented in the future for all alternatives.

If management activities move conditions toward Objective 205, grasshopper sparrow habitat is likely to remain stable or increase in the future for all alternatives. Grasshopper sparrow populations may respond to increases in grassland habitat. Alternatives 3 and 6 take a more aggressive approach to enhancing grassland habitat and would have the most benefit over the long term. Future distribution will likely be similar to current conditions, with expansion around existing grasslands. Large distribution increases are not expected in the northern and central Black Hills due to the limited availability of suitable sites. Distribution of grasshopper sparrows will likely follow the same pattern. If standards and guidelines are followed, existing grasslands will likely be adequately conserved until grassland restoration objectives are achieved.

Effects Of Research Natural Area Management On Grasshopper Sparrow

Under Alternative 4, Lemming Draw, which represents the montane grassland type, is a candidate RNA. Standard 2.2-1001 requires that candidate RNAs be managed to maintain and enhance the character and ecological values for which the areas have been identified until formal establishment.

If Lemming Draw were designated as RNA, standards and guidelines for RNAs (MA 2.2) would prohibit timber harvest, mineral entry, and mechanized or motorized travel and could potentially restrict public access and livestock grazing. Guideline 2.2-1002 allows uses that maintain or improve the ecological characteristics for which the RNA was designated, subject to monitoring. If monitoring determines an adverse effect on the ecological values for which the RNA was designated, then the use would be limited or prohibited. These restrictions could help conserve these small areas of grassland but would not appreciably affect the extent or distribution of grassland/shrubland associations Forest-wide. All the candidates have small amounts of grasslands and their designation could help conserve these small areas of grassland but again would not appreciably affect the extent or distribution of grassland associations Forest-wide.

Refer to the Research Natural Areas section for candidate RNA locations and additional information on the size and composition of each.

Effects Of Fire-hazard And Insect-risk Management On Grasshopper Sparrow

Grasslands and shrublands are not the primary focus of the alternatives with a fire-hazard and insect-risk management emphasis. The primary focus for the alternatives is to reduce fire-hazard rating, with Alternative 6 proposing the largest reduction. Grassland and shrubland restoration would generally occur where ponderosa pine has encroached into these cover types and will in principle reduce crown-fire hazard and insect risk. No significant effects are expected from fire-hazard and insect-risk management.

Summary

All alternatives will likely maintain or enhance grasshopper sparrow habitat (Objective 200-11a) through implementation of the strategies mentioned above. Grassland habitat will continue to be distributed as patches at low abundance, and there may be gaps where grassland habitat is absent or only present in low abundance, especially in the northern and central Black Hills. However, grassland habitat in the southern Black Hills will typically be large enough and close enough to permit dispersal and interaction among subpopulations. If management activities move conditions toward Objective 205, grasshopper sparrow habitat is likely to be less fragmented in the future for all alternatives.

Under all alternatives, there will be adequate habitat for maintaining populations of grasshopper sparrows. The affects analysis is based on the following assumptions:

1. The conservation objectives and protective standards and guideline direction for the various alternatives will be applied or implemented as written.
2. Activities will move conditions towards the Grassland restoration objective (205) in each alternative.

Cumulative Effects

Past activities are accounted for in the existing condition displayed under direct and indirect effects. Future Forest Service activities are included in the direct and indirect effects discussion. Other Federal and non-Federal activities are discussed here.

Management of national and state parks adjacent to the Forest would have an unknown effect on grasshopper sparrow populations. It is assumed that federal and state lands offer suitable habitats for grasshopper sparrows. Bison graze in both parks. Bison and other ungulate grazing may provide additional impacts to grasshopper sparrow habitat.

Privately owned land within and adjacent to the Forest boundary may also provide suitable breeding and migration stopover habitat for the grasshopper sparrow. Resource management and conservation by private citizens and companies depends on a number of factors (e.g., desired goals, market prices, development potential, etc.), making it difficult to predict future trends in private forest structure and diversity. As a general rule, potential grasshopper sparrow habitat on private lands would occur across the Black Hills; however, the extent and persistence of such habitats is uncertain. Continued urban development in the Black Hills will likely continue to affect habitat, including grasslands, thereby increasing the importance of habitat on NFS lands over the next 50 years. However, given the conservation measures designed into the alternatives for grassland areas on NFS lands, and the efforts at national parks and monuments, this species is likely to persist in the Black Hills Ecoregion over the next 50 years.

Grasshopper sparrow habitat is likely to remain stable or increase on NFS lands in the future for all alternatives. Cumulative effects are expected to be lowest in Alternatives 3 and 6. Alternatives 3 and 6 take a more aggressive approach to enhancing grassland habitat than the other three alternatives, and would have the most benefit over the long-term. Future distribution will likely be similar to current conditions, with expansion around existing grasslands. Alternative 3 and 6 also include Standard 3100-10, which limits the amount of continuous grasslands that can be burned (prescribed fire) at one time. This provides some areas with higher cover for nesting grasshopper sparrows

Monitoring Approach

Monitoring will be designed to examine Forest-wide trends. Based on the language in 36 CFR 219.14f, project-level monitoring is not required.

According to Panjabi (2001), this species would be effectively monitored with the existing RMBO protocol. For flexibility, the suggested frequency of reporting is 1 to 5 years. Monitoring habitat attributes such as grass height and composition may provide additional information on habitat availability and prairie grassland management. Habitat will be monitored in general; however, when available, populations may be used as a strong indicator of management response. Monitoring of populations will be discretionary as provided by 36 CFR 219.14f. Any revision to the monitoring protocol will describe the relationship between habitat monitoring and populations.

3-3.3.7.5. Ruffed Grouse *(Bonasa umbellus)*

Selection Rationale

The selection of MIS including the ruffed grouse is detailed in SAIC (2005). Historic fire suppression has resulted in reduced vigor of existing aspen stands and inhibited regeneration (Parrish et al. 1996). Also, expanding ponderosa pine stands have reduced the amount of aspen as an understory component in mixed forests on the Forest. Reduced aspen vigor and availability as an associate in mixed stands or as an understory component in coniferous stands is not readily monitored with remote-sensing/GIS techniques. Ruffed grouse may require a variety of aspen structural stages to thrive including late successional aspen for drumming logs and most other stages for buds and catkins (SAIC 2005). Therefore ruffed grouse are a suitable indicator of aspen quantity and vigor in pure and mixed stands on the Black Hills NF. South Dakota Department of Game, Fish and Parks has conducted historical drumming counts for ruffed grouse which may provide some baseline data. The ruffed grouse is selected as an indicator of aspen quantity and vigor in pure and mixed stands. The ruffed grouse was selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the forest to support species that rely on a variety of conditions in aspen to meet their needs.

Affected Environment

Distribution And Natural History

Ruffed grouse occurs throughout much of North America including Alaska and most of Canada. It occurs across the central and northern United States but is absent from the more southern states including Arizona, New Mexico, Texas, Oklahoma, Louisiana, Mississippi, and Florida. Ruffed grouse is a year-round resident in the Black Hills and occurs widely but in low abundance (Panjabi 2003). Ruffed grouse is classified by state wildlife agencies (South Dakota and Wyoming) as an upland game bird. There is an annual fall hunting season for these birds. Distribution on the Black hills roughly correlates to the distribution of Aspen. Aspen is more abundant in the northern and central Black hills and Bear Lodge Mountains. Aspen becomes sparse in the southern Black Hills.

Species-Habitat Relationships

In South Dakota, ruffed grouse is typically found in young-to-medium age aspen stands, other hardwood stands, and open pine forests (SDOU 1991 p. 95). Ruffed grouse typically inhabits dense forest (NatureServe 2004). It nests in forests or woodlands with some deciduous trees and is closely associated with hardwoods; particularly aspen (McCaffery et al. 1997) On the Forest, this species is associated with aspen in a variety of structural stages. The species feeds on aspen buds and catkins in the winter and spring, respectively (USDA Forest Service 1996a).

Habitat Condition And Trend

Historic fire suppression has resulted in reduced vigor of existing aspen stands and inhibited aspen regeneration (Parrish et al. 1996). Fire suppression has resulted in loss of some optimum habitat (SDOU 1991). Aspen abundance and distribution may limit this species' abundance and distribution. Ruffed grouse is listed as apparently secure (S4) in South Dakota and as secure (S5) in Wyoming (NatureServe 2004).

Aspen currently occupies about 47,000 acres on the Forest. Aspen is more abundant on the northern portions of the Black Hills and becomes sparse at the southern end of the Black Hills. For more discussion on aspen, see the Hardwood Ecosystem section of this chapter.

Population Status And Trend

Ruffed grouse have been tracked on the Black Hills since 2001 in cooperation with the RMBO (Panjabi 2001, 2003, 2004, 2005). Three years of data suggest the ruffed grouse occurs widely throughout the northern Black Hills (Panjabi 2001, 2003, 2004). The number of ruffed grouse observations (Panjabi 2001, 2003, 2004, 2005) is shown in **Table 3-27**.

Table 3-27. Number of Ruffed Grouse Observation, 2001-2004

	2001	2002	2003[1]	2004
All habitats Forest-wide	44	62	15	6

Source: Panjabi (2001, 2003, 2004, 2005).
[1]Aspen was not monitored in 2003.

SDGFP collected ruffed grouse census data in 2003 and 2004. The 2004 data have not been compiled, but 2003 data are summarized from Wrede (2004). Survey data estimate a mean of 0.07 grouse per listening stop for all stops made on the routes and 0.11 grouse per listening stop on routes where grouse were detected. A total of 67.7 miles were traveled during the survey. A total of 11 male ruffed grouse were detected and recorded during the survey. Results show an index of 0.16 grouse per lineal mile for all routes and 0.28 grouse per lineal mile for routes where grouse were detected.

Direct And Indirect Effects

Ecosystem Approaches By Alternative

Alternatives 3, 4, and 6 contain a habitat objective for ruffed grouse habitat. In Alternatives 3, 4, and 6, Objective 200-11a strives to maintain or enhance habitat for ruffed grouse across the Forest, as outlined in specific direction pertaining to aspen and other hardwood management. Alternatives 1 and 2 do not contain a specific habitat objective for ruffed grouse. Habitat objectives in Alternatives 1 and 2 are outlined in specific direction pertaining to aspen and other hardwood habitat. Specific direction pertaining to aspen and other hardwoods is discussed below for each alternative.

The distribution and abundance of ruffed grouse in the Black Hills is largely dependant on the abundance and distribution of hardwoods, especially aspen. Objective 201 is the primary conservation measure for hardwoods, including aspen. Acreages targeted for conservation and restoration vary among alternatives. Alternatives 1, and 2 call for conserving existing hardwood communities and restoring historic hardwood communities by 10 percent over 1995 conditions on sites capable of supporting them. Alternative 4 calls for conserving existing hardwood communities and restoring historic hardwood communities by 20 percent over 1995 conditions on sites capable of supporting them. Alternatives 3 and 6 call for increasing the aspen acreage by 46,000 acres (approximately doubling the current aspen acreage) and increasing bur oak acres to 4,000 acres (an approximate 33-percent increase) during the life of the planning period. In terms of specific restoration treatments for aspen (Objective 201), Alternatives 3 and 6 far exceed the other alternatives.

Several standards and guidelines give direction for managing hardwood stands. Guideline 2202 calls for a mix of structural stage in landscapes with multiple aspen clones under all alternatives. Under Guideline 2203, successful aspen regeneration is defined for Alternatives 1, 2, and 4 as several thousand 6-foot tall stems per acre with at least one unbrowsed terminal leader within 3 to 5 years. For Alternatives 3 and 6, this guideline is elevated to a standard and more clearly defines parameters for aspen regeneration. Guideline 2206 does not allow the development of new recreation sites in aspen/birch stands. Improvements to existing sites would consider the aspen stands' health and aesthetics. This guideline exists under Alternatives 1, 2, and 4 and is strengthened to a standard under Alternatives 3 and 6. Guideline 2207 calls for locating livestock/wildlife-watering sites or drinking structures outside of hardwood communities. Because livestock and wildlife tend to concentrate at watering sites, this guidance is designed to minimize damage to hardwoods. Guideline 2205 treats hardwood stands to meet the hardwood restoration objective (201), but allows leaving 10 conifers per acre under Alternatives 1, 2, and 4. Under Alternatives 3 and 6, this guideline is changed to a standard, and all conifers would be removed. Guideline 2505c limits browsing of young aspen under Alternatives 1. This guideline is a standard under Alternatives 2, 3, 4 and 6 to provide for emphasis species conservation.

Effects Of Species-viability Management On Ruffed Grouse

The ruffed grouse was not chosen as an MIS because of concerns regarding its viability but because of its link to particular features of the forest. However, Forest management direction focused on species viability has the potential to influence habitat for ruffed grouse.

The expected aspen-habitat acres for each alternative if Objective 201 is achieved, are shown in **Table 3-28**.

Table 3-28. Expected Forest-wide Changes in Ruffed Grouse Habitat

	Existing Condition	Alternatives				
		1	2	3	4	6
Aspen Habitat (acres)[1]	47,000	55,900	55,900	93,000	61,000	96,000

Source: Existing acres: Forest vegetation database. Alternatives assume achievement of objective 201. 1995 acres were taken from the 1996 Forest Plan Revision EIS.

[1]Assumes accomplishment of Objective 201 in all alternatives.

If management activities move conditions toward Objective 201, grouse habitat is likely to increase in the future for all alternatives. Ruffed grouse populations may respond to increases in aspen habitat. Alternatives 3 and 6 take a more aggressive approach to enhancing aspen and would have the most benefit over the long term. However, areas treated will likely take many years to grow into various age classes and density, so grouse population increases will be slow and only realized in future decades. If the above standards and guidelines are followed, existing aspen stands will likely be adequately conserved until restored areas grow into new habitat.

The location, size, age, and proximity of aspen to other elements effect habitat effectiveness for ruffed grouse. Distribution of aspen is dependent on suitable site conditions. Future distribution will likely be similar to current conditions, with expansion around existing clones. Large distribution increases are not expected in the southern Black Hills due to the limited availability of suitable sites. Distribution of ruffed grouse will likely follow the same pattern. For more information on the effects to aspen, see Section 3-2.1.3 Hardwood Ecosystems of this chapter.

Aspen habitat is distributed as patches at low abundance, and there are gaps where aspen habitat is absent or only present in low abundance, especially in the southern Black Hills. However, aspen habitat on the northern and central Black Hills will typically be large enough and close enough to permit dispersal and interaction among subpopulations. If management activities move conditions toward Objective 201, grouse habitat is likely to be less fragmented in the future for all alternatives.

Effects Of Research Natural Area Management On Ruffed Grouse

Hardwoods are represented in each candidate RNA, with the exception of Fanny/Boles. Aspen, bur oak, and other hardwoods are found through out these different candidate RNAs and in varying amounts. Hardwoods would be represented in 8 of the candidate RNAs under Alternative 4. Under Alternative 6, three candidate RNAs would have representation of hardwood species. Four RNAs would be established under Alternative 3 with three containing hardwoods.

Although there are a number of restrictions on the use of RNAs (e.g., timber harvest, mineral entry, motorized travel), there would be no expected gains in hardwoods in these areas. For more information on RNA descriptions and size, see the Research Natural Area section in this chapter.

Effects Of Fire-hazard and Insect-risk Management On Ruffed Grouse

Although the greatest change in hardwood distribution and abundance on the Forest would be derived from species-viability management, hardwoods could benefit from fire-hazard management on the Forest. Hardwoods are less flammable than conifers, and fire-hazard treatments would generally remove conifers in favor of hardwoods. Guideline 2201 would disperse restoration treatments across the Forest under Alternatives 1, 2, and 4. For alternatives 3 and 6 Objective 201 would treat in areas where conifers have encroached on hardwoods and will also disperse restoration treatments across the Forest.

Hardwoods could benefit from management for insect risk. Insects are most abundant in dense conifer stands. Therefore, opening up the forest canopy to minimize risk of insects may benefit hardwoods in some areas.

The potential benefit to hardwoods, especially aspen, from fire-hazard and insect management would also benefit ruffed grouse.

Summary

All alternatives will likely maintain or enhance ruffed grouse habitat (Objective 200-11a) through implementation of the strategies mentioned above. Aspen habitat will be distributed as patches at low abundance, and there may be gaps where aspen habitat is absent or only present in low abundance, especially in the southern Black Hills. However, aspen habitat on the northern and central Black Hills will typically be large enough and close enough to permit dispersal and interaction among subpopulations.

Based on expected habitat changes, all alternatives may provide for an increase in aspen habitat. Alternatives 3 and 6 show the most potential for increasing aspen acres. However, areas treated will likely take many years to grow into various age classes, so grouse population increases will be slow and only realized in future decades. If the above standards and guidelines are followed, existing aspen stands will likely be adequately conserved until restored areas grow into new habitat. Future distribution will likely be similar to current conditions, with expansion around existing clones. Large distribution increases are not expected in the southern Black Hills due to the limited availability of suitable sites. Distribution and abundance of ruffed grouse will likely follow a similar pattern.

Under all alternatives, adequate habitat for maintaining viable ruffed-grouse populations exists.

The affects analysis is based on the following assumptions:

1. The conservation objectives and protective standards and guideline direction listed above for the various alternatives will be applied or implemented as written.

2. Activities will move conditions towards aspen and hardwood objectives for each alternative.

Cumulative Effects

Past activities are accounted for in the existing condition displayed under direct and indirect effects. Future Forest Service activities are included in the direct and indirect effects discussion. Other Federal and non-Federal activities are discussed here.

Management activities in the national and state parks adjacent to the Forest may have some impacts on ruffed grouse. Foreseeable activities are unknown at this time. However, these parks emphasize recreational opportunities and will likely manage aspen as a desired species where possible. National parks and monuments tend to manage for natural conditions, using fire and other processes, which would likely provide conditions under which hardwoods and ruffed grouse evolve. Management in national and state parks will likely contribute to the conservation of this species over the next 50 years.

Privately owned land within the Forest boundary also provides potential nesting, brood, and drumming habitat. Resource management by private citizens and companies depends on a number of factors (e.g., desired goals, market prices, development potential) making it difficult to predict future trends. Landowners may treat aspen, which could reduce habitat for ruffed grouse, though aspen is often seen as a desirable species. It is assumed that urban development will continue on private lands, which will likely increase the importance of habitat on NFS land over the next 50 years. These activities may reduce suitable habitat for ruffed grouse, which could offset some of the long-term benefits to hardwood restoration efforts on the Forest. Overall, if hardwood restoration treatments are successful on the Forest, populations should remain stable or increase in the long term.

Based on expected habitat changes, all alternatives may provide for an increase in aspen habitat on the Forest. This may help offset some cumulative impacts if activities off-Forest reduce aspen habitat. Alternatives 3 and 6 show the most potential for increasing aspen acres because of more aggressive hardwood restoration objectives, followed by Alternative 4, followed by Alternatives 1 and 2. If standards and guidelines are followed, existing aspen stands will likely be adequately conserved until restored areas grow into new habitat for all alternatives.

Monitoring Approach

Monitoring will be designed to examine Forest-wide trends. Based on the language in 36 CFR 219.14f, project-level monitoring is not required.

SDGFP monitored ruffed grouse in the approximately 10 years preceding 1983 on the Forest (Wrede 2002). The SDGFP monitoring protocol used drumming surveys conducted (between April 15 and May 15) along 10-mile transects and stationary location transects in the Black Hills. Count data are used as a population index (SDGFP no date). In spring 2002, SDGFP relocated several survey transect routes from earlier monitoring efforts and conducted some drumming surveys. Given the availability of some trend data and tentative reestablishment of grouse monitoring by SDGFP, cooperative monitoring of ruffed grouse by SDGFP and the Forest may be effective. For flexibility, the suggested frequency of monitoring is 1 to 5 years.

The existing protocol with the RMBO (Panjabi 2001, 2003, 2004, 2005) may also aid in tracking ruffed grouse.

Habitat will be monitored in general, however, when available, populations may be used as a strong indicator of management response. Monitoring of populations will be discretionary as provided by 36 CFR 219.14f. Any revision to the monitoring protocol will describe the relationship between habitat monitoring and populations. The cyclical nature of ruffed grouse populations must be considered when interpreting monitoring data. Harvest statistics from Wyoming suggest ruffed grouse populations generally cycle on about a 10-year interval.

3-3.3.7.6. Song Sparrow *(Melospiza melodia)*

Selection Rationale

The selection of the song sparrow as a MIS is detailed in SAIC (2005). This species is dependent on riparian areas across much of its range and Panjabi (2001) found them closely associated with riparian and wetland habitat on the Forest. They are uncommon winter residents in the Black Hills, many likely spending the winter on adjacent prairie habitat (SDOU 1991). Panjabi (2003) mentions them as excellent indicators of riparian habitat. Baseline data exist for song sparrows from recent monitoring efforts with the Rocky Mountain Bird Observatory (Panjabi 2001, 2003, 2004, 2005). It should be effectively monitored through continuing this effort (Panjabi 2005). This species would likely be a good supplemental indicator of riparian habitat condition in addition to beaver. The song sparrow is selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the forest to support characteristic riparian species that rely on a variety of riparian conditions to meet their needs.

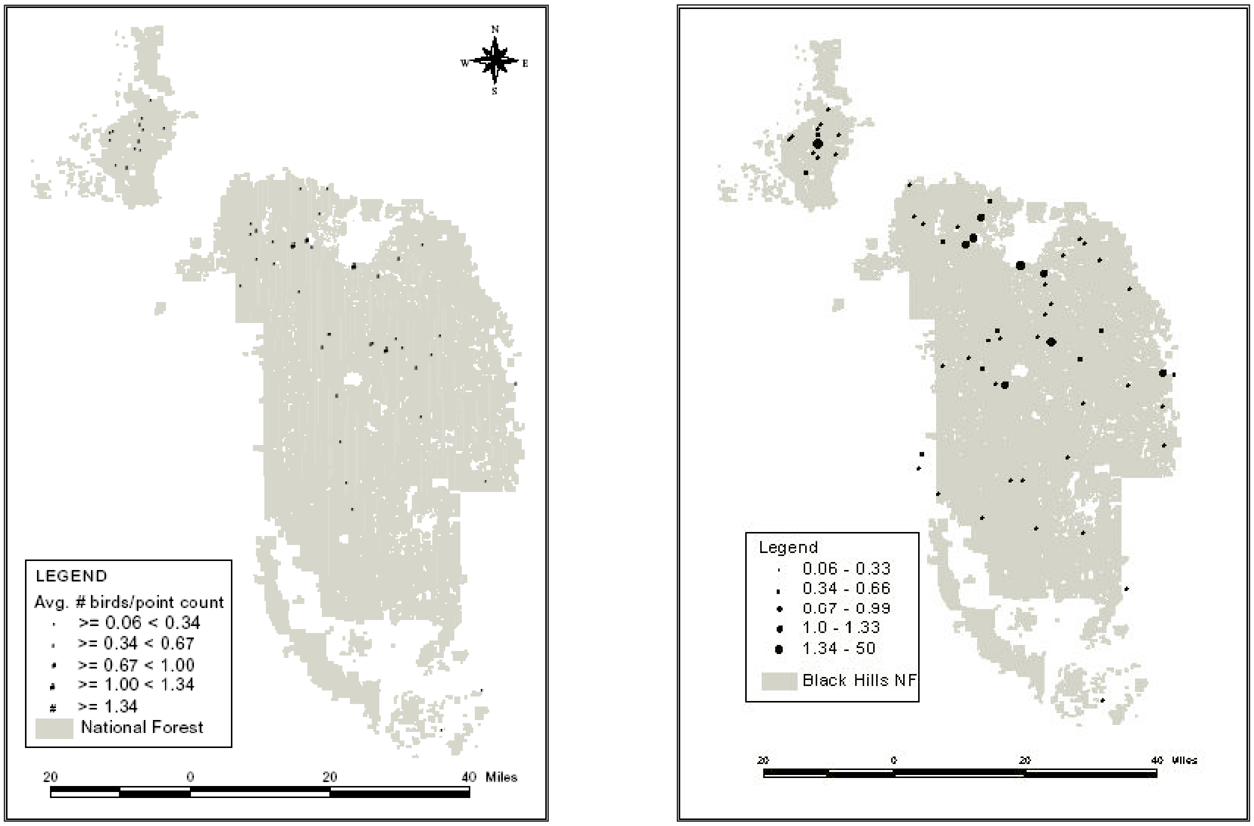
Affected Environment

Distribution And Natural history

Song sparrows breed throughout the United States, from Newfoundland to the Aleutian Islands of Alaska and south to central Mexico (Arcese et al. 2002). It is found throughout much of the Black Hills, but is more common in the north part of the Black hills. It occurs mainly in streamside thickets, especially willows, and is dependant upon these habitats (Panjabi 2001). Panjabi (2001, 2003) found them in the highest density in riparian habitat. He also found them in white spruce adjacent to riparian stringers.

Figure 3-19. General Abundance And Distribution Of Song Sparrow Observations (Average # Of Bird/ point-count) Along Point Transects On The Black Hills National Forest In 2001 And 2002.

2001 2002



Source: Panjabi (2001, 2003)

Species-Habitat Relationships

The song sparrow breeds in a wide range of forest, shrub and riparian habitats, but in dry areas are normally limited to those close to fresh water (Arcese et al. 2002). Year-round residents are often found near breeding areas during winter (Arcese et al. 2002). Panjabi (2001, 2003) found song sparrows in the highest densities in riparian habitat.

Habitat Condition And Trend

Riparian areas account for approximately 1 percent of public and private land in the Black Hills and are typically located adjacent to streams and around natural springs, seeps, fens, and reservoirs (USDA Forest Service 1996a p. III-294). Due to the presence of water these areas frequently receive a disproportionate amount of use from wildlife, livestock, and humans (USDA Forest Service 1996a p. III-294).

Historically, low elevation riparian-plant communities were probably composed of deciduous hardwoods such as green ash, boxelder, and American elm; at higher elevations they probably consisted of white spruce (Parrish et al. 1996). Riparian habitat historically also included an extensive shrub component including willows, birches, and red-osier dogwood (Froiland 1990).

The composition, structure, and pattern of riparian areas in the Black Hills have changed over the last 120 years due to a number of influences. Due to their location adjacent to streams and rivers, many of the riparian areas and wetlands found in the Black Hills are adapted to flooding disturbance. Other types of natural disturbances include fire and beaver. Fire stimulates regeneration in some species (e.g., aspen) and opens habitat for other earlier seral types (e.g., paper birch) (Marriott and Faber-Langendoen 2000b). A reduction of fire frequency may have an impact on riparian areas (USDA Forest Service 1996a p. 3-295).

Historically, beavers may have been the most important biological influence on Black Hills riparian ecosystems, particularly in low gradient drainages that supported an abundance of deciduous woody species (Parrish et al. 1996). The creation of dams impounded water that increased the width of riparian zones, trapped sediment, and stored water that could extend water flows later into the summer months (Parrish et al. 1996). Beavers were heavily trapped in the Black Hills, and by 1888 beaver populations were low and restricted to remote portions of the Black Hills (Parrish et al. 1996). The drastic reduction in beaver activity has caused a lowering of alluvial water tables and subsequently a loss of woody plants dependent on higher water tables or flooded conditions (Parrish et al. 1996).

Human-related influences on riparian habitats include the following: mining within streams and floodplains; browsing by domestic livestock; road construction for timber harvest activities; a drop in the water table due to the trapping and removal of beaver from the ecosystem; a reduction of fire frequency as a result of fire suppression; vegetation disturbance from recreation activities; insect infestation of willow species and the clearing or spraying of willows for agricultural purposes (USDA Forest Service 1996a p. III-294); dumping of mining, mill and domestic effluent into streams, water diversions for milling and domestic uses; and draining wet meadows (Parrish et al. 1996). As a result, natural riparian habitat on the Forest is much less abundant today (USDA Forest Service 1996a p. III-294). In many drainages there has been a shift to drier species such as Kentucky bluegrass (USDA Forest Service 1996a p. III-295).

The latest estimate of riparian habitat on the Forest is about 64,000 acres. This includes riparian areas with an overstory of hardwoods or conifers. Of this acreage, about 12,000 acres have a shrub (willow) component.

Population Status And Trend

Breeding Bird Survey data show that song sparrow populations are stable to slightly increasing in the Black Hills (Sauer at al. 2003).

Song sparrows have been monitored on the Black Hills since 2001 in cooperation with the RMBO (Panjabi 2001, 2003, 2004, 2005). Four years of data suggest that song sparrows occur throughout much of the Black Hills although it appears more abundant and widespread in the north (Panjabi 2001, 2003). This species was found primarily in riparian habitats (Panjabi 2001, 2003). Relative densities for song sparrows are shown below.

Table 3-29. Relative Density (Birds/Km^2) Of Song Sparrows, 2001-2003

	2001	2002	2003
Riparian	32.5	-	-
Wet Meadows	7.8	-	-
Montane Riparian	-	8.39	55.66
Foothills Riparian	-	42.47	-

Source: Panjabi (2001, 2003, 2004).

In 2002, the wet meadows habitat was eliminated from the program after ground-truthing in 2001 showed that most sites in this category were dry meadows rather than wet meadows and that monitoring this habitat did not contribute additional species to the monitoring effort (Panjabi 2003). In 2002, additional effort was allocated towards riparian habitat. Thus, the riparian habitat from 2001 was split into two categories: montane riparian habitat and foothills riparian habitat. Foothills riparian habitat was not monitored in 2003.

Population estimates range from approximately 8,000 to 14,000 birds associated with riparian habitat.

Direct And Indirect Effects

Ecosystem Approaches By Alternative

Alternatives 3, 4, and 6 contain a habitat objective for song sparrows. In Alternatives 3, 4, and 6, Objective 200-11a strives to maintain or enhance habitat for song sparrows across the Forest, as outlined in specific direction pertaining to riparian areas. Alternatives 1 and 2 do not contain a specific habitat objective for song sparrows. Habitat objectives in Alternatives 1 and 2 are outlined in specific direction pertaining to riparian areas. Specific direction pertaining to riparian areas is discussed below for each alternative.

Direct impacts to riparian and wetland ecosystems are typically obvious and occur from direct disturbances such as the clearing of vegetation, over-utilization by livestock or wildlife, roads, or trails (e.g., stream crossings), placement of fill material (e.g., development in a floodplain), and wildfire. Indirect impacts are typically less obvious and can be more difficult to identify or quantify. Examples of indirect impacts to riparian and wetland ecosystems include changes in water quantity or flow regimes, such as the loss of beaver from the system or water diversions; changes in water quality, such as an increase or decrease in sediment loading; and the spreading of noxious weeds.

Forest-wide standards and guidelines protect riparian areas, water influence zones, and wetlands. Under all alternatives, long-term riparian ecosystem health and ecological function are provided for by not allowing actions that would be detrimental to riparian- ecosystem condition (Standards 1301, 1302). Riparian and wetland areas that contain emphasis species are given additional protection from direct and indirect disturbances under all alternatives (Guidelines 3106a,b, c or 3107a,b, c). In Alternatives 3 and 6, Guideline 3106 becomes a standard. Standard 1306 prohibits log landings, decking areas, and mechanical-slash piling within riparian areas unless the integrity of riparian areas can be protected.

Improper livestock grazing can have numerous adverse effects on riparian and wetland ecosystems such as water-quality degradation and over utilization of riparian vegetation (USDA Forest Service 1996a). The level of livestock use will remain constant across the range of alternatives (Objective 301a; 128,000 Animal Unit Months). Under Alternatives 3 and 6, the Forest-wide guideline (2505) on residual levels (the remaining height of key plant species after livestock grazing) is changed to a standard and modified so that residual levels in riparian and wetland areas would have to be prescribed in allotment management plans (AMPs) or AOI letters. Objective 200-03, under Alternatives 3 and 4 protects aquatic and shoreline vegetation around 50 ponds or water catchments over the life of the Plan. In Alternative 6, this objective protects aquatic, shoreline and upland vegetation around ponds or water catchments containing leopard frogs. Standard 1304 opportunistically relocates or implements mitigation measures for water tanks or water catchments located in the water influence zone. Measures to maintain proper use or residual levels of vegetative cover promote bank stability adjacent to aquatic habitats and maintain the filtering function of riparian areas adjacent to water (Guidelines 2505 and 2506). Guideline 2505c limits the utilization of willows and other deciduous vegetation to 40 percent. This guideline becomes a standard in Alternatives 3 and 6 and is treated as a standard in Alternatives 2 and 4. Guideline 2505d removes livestock from the grazing unit or allotment when further utilization exceeds proper use or residual levels. Impacts from livestock grazing in fenced riparian pastures are mitigated through Guidelines 2507 and 2508.

All alternatives contain direction to avoid the effects of roads and vehicle traffic on riparian and wetland habitat. Objective 105 strives to prohibit motorized vehicles in wetlands, wet meadows, and riparian areas. Standard 1113 minimizes sediment discharge into streams, lakes, and wetlands during road construction and other site disturbances. Guideline 4102 protects streams, lakes, and adjacent riparian areas from wildfire-suppression efforts, including the use of earth-moving equipment in stream channels and the use of fire-retardant chemicals would be avoided in riparian areas, wetlands, and open water. Guideline 9107 prohibits land vehicles from entering perennial steams where resource damage would occur. Guideline 9108 restricts vehicle traffic to roads and trails in riparian areas. Both of these guidelines become standards in Alternatives 3 and 6.

Standard 1505 and Guidelines 1506, 1507, and 1508 minimize disturbance to riparian areas by mineral activities and by requiring monitoring of mitigation measures to ensure effectiveness. The discharge of new pollutant sources is mitigated by Standards 1211, 1212, and 1213. Standard 1305 locates camping sites for contractual purposes (e.g., mining, logging, etc.) such that channel and riparian areas are not impacted.

All alternatives contain measures to minimize direct and indirect impacts to riparian and wetland habitats; however, Alternatives 3 and 6 contain additional provisions that provide additional conservation measures for these areas. Alternatives 2 and 4 continue to treat a number of environmentally protective guidelines as standards.

Effects Of Species-viability Management On Song Sparrow

The song sparrow was not chosen as an MIS because of concerns regarding its viability but because of its link to particular features of the forest (riparian areas). However, Forest management direction focused on species viability has the potential to influence habitat for song sparrows.

Acres of riparian areas and miles of streams are not expected to change under all alternatives. The effects on song sparrows will likely be reflected in the quality of riparian habitat rather than the quantity of riparian habitat.

The song sparrow would benefit by management actions that conserve and restore riparian and wet meadow resources in the Black Hills. For specific details, please refer to Section 3-2.3 Riparian and Wetland Ecosystems. In all alternatives, many standards and guidelines are designed to maintain and improve the health of riparian ecosystems, including benefits to water quality, bank stabilization, and riparian vegetation. Several guidelines for Alternatives 1, 2, and 4 are standards in Alternatives 3 and 6 (e.g., Standards 2505, 2505C, 2507, 9107, and 9108).

Increased suitable habitat that leads to an increase in beaver numbers and distribution would benefit aquatic ecosystems and may increase the mileage and/or the duration of flow in the stream network. These assumed benefits would be greatest in Alternatives 3 and 6 because they restore the most aspen (Objective 201).

The amount of riparian area is not expected to change substantially in the future. Objectives, standards, and guidelines are designed to maintain or enhance riparian condition. Song sparrow populations are expected to remain stable or increase in these riparian areas. This conclusion assumes that management will move towards objectives and follow applicable standards and guidelines.

Effects Of Research Natural Area Management On Song Sparrow

The overall effect of RNA management on riparian and wetland ecosystems is expected to be beneficial because of the limitation on land management activities. Currently, management of the Upper Pine Creek RNA under Alternatives 1 and 2 mimics management of the surrounding Black Elk Wilderness. The North Fork Castle Creek candidate RNA already receives some increased protection due to its current status as a Botanical Area (Management Area 3.1) in Alternatives 1 and 2. New standards and guidelines are included in Alternatives 3, 4, and 6 to limit land management activities necessary to preserve the natural ecosystem condition, its processes and the values for which the RNA was established.

Candidate RNAs would be subject to MA Standard 2.2-1001 that requires maintaining and/or enhancing the character and ecological values for which the candidate RNAs have been identified and to Standard 2.2-2501 that prohibits the increase in domestic livestock animal-unit-months (AUMs) prior to designation. Standards (2.2-1501, 2.2-2401, 2.2-4101, 2.2-4102, 2.2-4103, 2.2-5201, 2.2-5401, 2.2-8301, 2.2-9101, and 2.2-9102) would prevent mineral entry, timber harvest, mechanized or motorized use, special forest products collections, and may require restricted public access. Restricting public access may include obliterating closed or existing roads or in extreme cases closing an RNA or a portion of it to any public use. See Appendix D Standards 2.2-5201, 2.2-9101, and 2.2-9102. The standards would also require the use of minimum impact suppression techniques (MIST) in suppressing wildfire. This would avoid and minimize the amount of ground disturbance and other potential impacts from fire-suppression activities. RNA guidelines (2.2-1002, 2.2-4201, 2.2-5101, 2.2-5202, and 2.2-5601) would allow uses that maintain or improve the ecological values for which the RNA was designated. Should monitoring reveal that a use causes adverse effects on the ecological values for which the RNA was designated, that use would be limited or prohibited.

In Alternatives 3 and 6, Objective 10-03 strives for a moderate-to-low fire-hazard rating between RNAs and ARC and the WUI, excluding the Upper Pine Creek RNA, to reduce the potential for stand-replacing fire affecting RNAs or for areas adjacent to RNAs being in a high fire-hazard rating should a fire ignite in an RNA. Wetlands and riparian habitat are generally natural fuel breaks given wetter site conditions, with the exception of some communities, such as white spruce, during drought conditions. The Canyon City, Geis Spring, Iron Mountain North and North Fork Castle Creek candidate RNAs target riparian plant communities. Candidate RNAs that target other non-riparian plant communities may also influence riparian habitat. The amount of wetland habitat is disclosed in Section 3-2.3 Riparian and Wetland Ecosystems.

Alternative 4 would affect the most wetland and riparian habitat acres and Alternatives 1 and 2 the least. Wetlands and riparian habitat affected by RNA management may be on the RNA boundary or completely within the RNA. The benefits to wetland and riparian habitat that occurs on an RNA boundary, particularly along streams, are contingent on the site-specific management actions, for example the location of boundary fencing if needed to exclude livestock grazing or off-road recreational uses. The Sand Creek and Canyon City candidate RNAs have 0.4 and 1.4 acres of wetlands located on the proposed RNA boundary, respectively. The Canyon City, Cranberry Springs and Iron Mountain North candidate RNAs have riparian habitat along approximately 5.4, 8.2, and 0.7 miles of stream that form their boundaries.

Refer to Section 3-6.2 Research Natural Areas for candidate RNA locations and additional information on the size and composition of each.

Effects Of Fire-hazard and Insect-risk Management On Song Sparrow

Higher fire hazard implies a greater probability of stand-replacing fire, which would in turn imply a greater risk to riparian vegetation. The general location of wetlands and riparian areas in valley bottoms or depressions and wetter site conditions make them less prone to stand-replacing fire, except under extreme conditions. Because riparian vegetation is generally more resistant to wildfire than other vegetation, it is likely that fires in riparian areas would be derived from fires in adjacent pine forest. All alternatives would achieve some measure of fire-hazard reduction by altering structural stages and restoring other less flammable vegetation types. Alternative 6 provides the greatest reduction of high or very high fire hazard followed by Alternative 3, Alternative 1, and Alternative 2. Alternative 4 provides the least improvement in reduced fire-hazard rating. See Section3-7 Natural Disturbance Processes for a detailed discussion of fire- and insect-hazard reduction.

Goals 10 and 11 were added in Alternatives 3, 4, and 6 to emphasize fire-hazard and insect-risk reduction. Objective 10-01 manages for a low-to-moderate fire-hazard rating on 50 percent of the WUI in Alternative 3 and 4, except in certain management areas. Alternative 3, Objective 10-01 adds a 50-percent moderate-to-low fire hazard throughout the forest as needed to conserve emphasis species, except certain management areas. Alternative 6 objective 10-01 manages for a 50- to 75-percent low-to-moderate fire hazard in the WUI (including ARCs) and manages the remainder of the Forest for 50-percent low-to moderate fire hazard, except in certain management areas.

Fire-hazard management generally involves fuel-load reductions through silvicultural treatments and prescribed burns. These treatments require ground disturbance, which has the potential to indirectly affect riparian and wetland ecosystems primarily through changes in sediment loads to creeks and the introduction or spread of noxious weeds. The larger the amount of ground disturbance and/or the closer proximity to wetland and riparian areas, the greater the potential for disturbed areas to be connected to the streams and riparian areas, and the greater potential to have an indirect impact to riparian and wetland habitats. Alternatives 1, 3 and 6 are expected to treat the most annual acreage for commercial timber harvest, followed by Alternative 4 and Alternative 2.

Treatment acres of small diameter fuels vary between alternatives. Alternative 6 has the highest estimated non-commercial thinning acres, followed by Alternative 3, Alternative 4, Alternative 1 and Alternative 2. Non-commercial treatments are expected to have minimal adverse effect to wetland and aquatic resources, based on the assumption that no roads will be constructed for these treatments, that most of these treatments are done by human labor using hand tools or limited mechanized rubber-tired equipment and that some of these small diameter treatment acres will overlap commercial treatment acres.

Much of the WUI encompass riparian areas. This puts fire-hazard reduction treatments in closer proximity to riparian habitats. Treatments on NFS land in the WUI will generally occur within upslope ponderosa pine stands that are adjacent to but not within riparian areas, thereby avoiding the direct disturbance of riparian habitat.

Direct impacts to riparian and wetland ecosystems from fire-hazard management actions are mitigated under all alternatives. The following standards and guidelines are common to all alternatives and mitigate sediment impacts from roads and other management activities associated with fire-hazard and insect-risk management. Standard 1105 limits roads and other disturbed sites to the minimum feasible amount. Standard 1106 stabilizes and maintains roads and other disturbed sites during and after construction to control erosion. Standard 1109 requires the reclamation of roads and other disturbed sites when use ends to prevent resource damage. Standards 1113, 1114, and Guideline 1115 avoid and reduce sediment input due to roads, disturbed sites, and vegetation management associated with surface-water runoff.

Wildland-fire prevention, suppression, and rehabilitation activities may result in ground-disturbing activities within or affecting wetlands or riparian habitat. Fire-suppression activities may result in the need for heavy equipment, such as dozers or engines, to cross streams. Guideline 4102a protects streams, stream banks, shorelines, lakes, and associated vegetation from degradation by wildfire-suppression efforts by avoiding the use of earth-moving equipment in stream channels except at designated points and with proper mitigation. Guideline 4111 locates slash piles that are scheduled for burning out of meadows that contribute to Waters of the United States. These two guidelines are common to all alternatives. Alternative 2 treats these guidelines as standards.

The accidental escape of a prescribed burn could affect riparian and wetland areas in the vicinity. Potential adverse direct impacts from an escaped prescribed burn would likely be less than those of a wildfire because prescribed burning generally occurs in the winter or early spring when snow cover or ground moisture may protect riparian areas from high-severity burns.

The riparian effects of fire-hazard reduction management are a tradeoff with stand-replacing fire. Management that may contribute acceptable impacts to riparian systems are used to reduce the extent and intensity of stand-replacing wildfire that can create very large sediment loads and eliminate riparian vegetation that can take decades to recover.

Summary

All alternatives will likely maintain or enhance song sparrow habitat (Objective 200-11a) through implementation of the strategies mentioned above. Riparian habitat will be distributed as patches at low abundance, and there may be gaps where riparian habitat is absent or only present in low abundance. However, the disjunct areas of primary habitat will typically be large enough and close enough to permit dispersal and interaction among subpopulations across the Forest.

Riparian habitats will be maintained and restored through implementation of objectives, standards, and guidelines. Alternative 3 has the highest targets for riparian restoration. The integrity of existing riparian areas will be maintained through standard 1303 and guidelines from activities such as timber management, mining, roads, livestock grazing, and traffic. Guidelines 2505 and 2507 (Alternatives 1, 2, and 4) manage grazing in riparian areas to a residual objective. Under Alternatives 3 and 6, these are elevated to standards to meet the objective of enhancing riparian habitats.

Under all alternatives, there will be adequate habitat for maintaining populations of song sparrows.

The affects analysis is based on the following assumptions:

1. The conservation objectives and protective standards and guideline direction for the various alternatives will be applied or implemented as written.

2. Activities will move conditions towards riparian restoration objectives in each alternative. The time required to reach these objectives is dependent on funding and other factors. As a result, it may take two or more decades to achieve these objectives.

Cumulative Effects

Past activities are accounted for in the existing condition displayed under direct and indirect effects. Future Forest Service activities are included in the direct and indirect effects discussion. Other Federal and non-Federal activities are discussed here.

Cumulative effects to song sparrows will likely mirror cumulative effects to riparian and wetland areas. Cumulative effects on riparian areas and wetlands are discussed in Section 3.2-3 Riparian and Wetland Ecosystems. Management of national and state parks adjacent to the Forest would have an unknown effect on song sparrow populations. It is assumed that federal and state lands offer suitable habitats for song sparrows and that this habitat will be maintained over the next 50 years.

Privately owned land within and adjacent to the Forest boundary may also provide suitable breeding and migration stopover habitat for the song sparrow. Resource management and conservation by private citizens and companies depends on a number of factors (e.g., desired goals, market prices, development potential, etc.), making it difficult to predict future trends in private forest structure and diversity. As a general rule, potential song sparrow habitat on private lands would occur across the Black Hills; however, the extent and persistence of such habitats is uncertain. Wetland and riparian habitat on private lands may not be afforded the same level of conservation management on private lands. It is assumed that urban development will continue on private lands, which will likely increase the importance of habitat on NFS land over the next 50 years.

Alternatives 3 and 6 have the least potential for cumulative effects because these alternatives elevate riparian guidelines (e.g., 2505 and 2507) to standards. Alternative 3 also has the highest targets for riparian restoration. The integrity of existing riparian areas will be maintained through standard 1303 and guidelines from activities such as timber management, mining, roads, livestock grazing, and traffic. Guidelines 2505 and 2507 (Alternatives 1, 2, and 4) manage grazing in riparian areas to a residual objective.

Monitoring Approach

Monitoring will be designed to examine Forest-wide trends. Based on the language in 36 CFR 219.14f, project-level monitoring is not required.

According to Panjabi (2001) this species would be effectively monitored with the existing RMBO protocol. For flexibility, the suggested frequency of reporting is 1 to 5 years. Monitoring of habitat elements may provide additional information on riparian area management.

Habitat will be monitored in general, however, when available, populations may be used as a strong indicator of management response. Monitoring of populations will be discretionary as provided by 36 CFR 219.14f. Any revision to the monitoring protocol will describe the relationship between habitat monitoring and populations.

3-3.3.8. Management Indicator Species – Mammals

3-3.3.8.1. Beaver (*Castor canadensis*)

Selection Rationale

The selection of MIS including beaver is detailed in SAIC (2005). Likely limits to persistence of beaver on the Forest include degradation and/or loss of riparian shrubs and forests from historic management activities as well as the loss of hardwood components on adjacent uplands. Historically, beavers on the Forest influenced riparian vegetation and changed stream flows, often converting intermittent drainages to perennial streams (Parrish et al. 1996). This species is selected due to its relationship to riparian/aquatic habitat condition, status as a keystone species, available monitoring protocols, and dependence on riparian forest and shrub habitat. Also, some baseline information is available in historic documents. Beaver is selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on a variety of riparian and hardwood forest conditions to meet their needs.

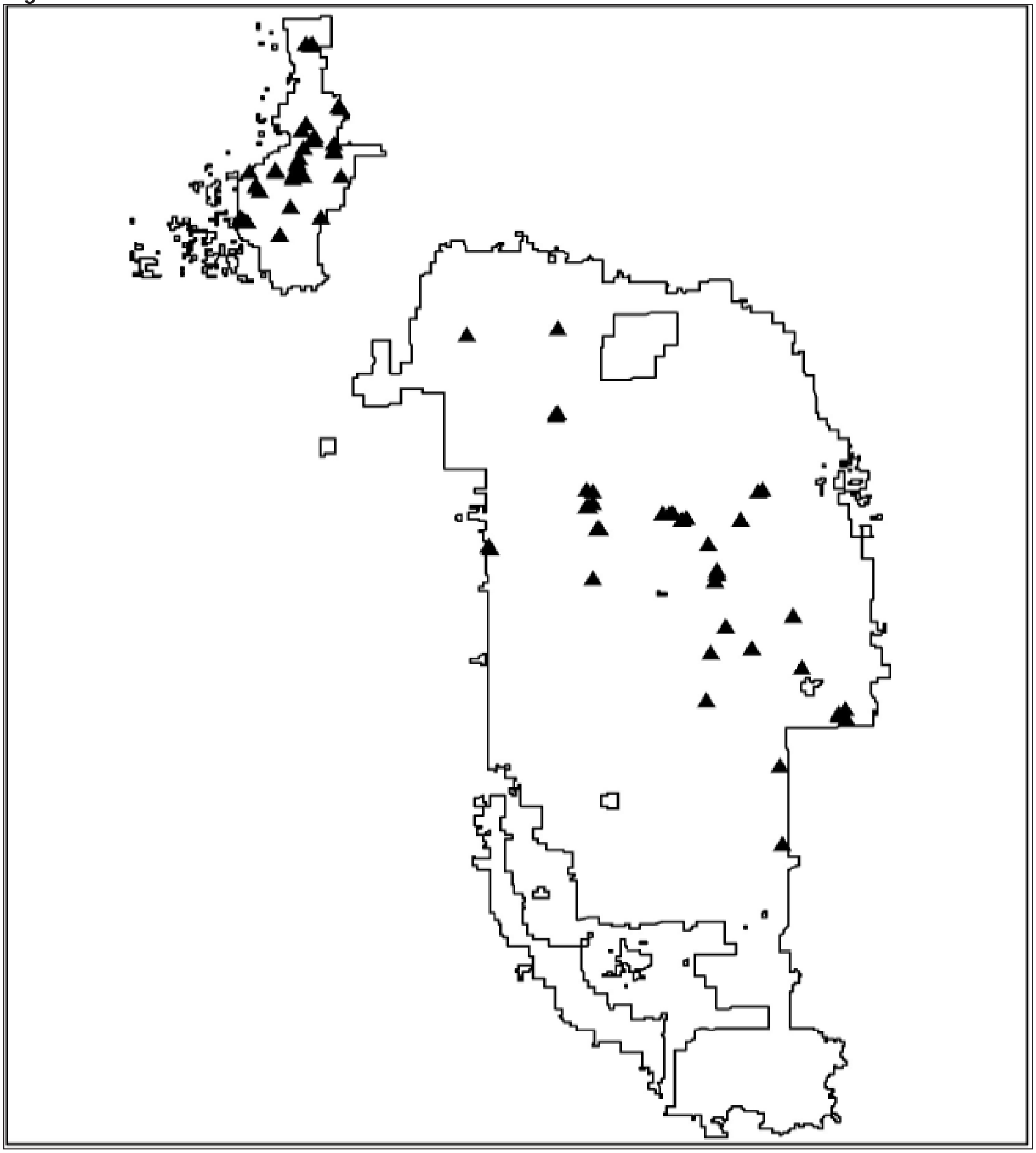
Affected Environment

Distribution And Natural History

Beavers are found in suitable habitat throughout much of North America, ranging as far south as northern Mexico; they are widely distributed throughout South Dakota. The beaver is North America's largest rodent, with adults weighing 30 to 60 pounds (Higgins et al. 2000 p.119). Beavers are semi-aquatic and widely distributed in large rivers and lakes with constant water levels, marshes, small lakes, and streams with weak flows adequate for damming (Higgins et al. 2000 p.120).

Beavers are adversely affected by predation, loss of food base due to wildfire or habitat overuse, and drought. Direct impacts to beavers by humans typically are caused by trapping and hunting. Indirect impacts to beavers are any impacts that affect their specific habitat requirements for perennial water and deciduous riparian woody vegetation. Examples of indirect impacts to beaver habitat include increased or decreased flows; loss of willow, aspen, or cottonwood species; and changes in water quality, such as increases or decreases in sediment loading.

Figure 3-20. General Distribution Of Beaver On The Black Hills National Forest



Source: NRIS Fauna Database

Species-Habitat Relationships

General habitat requirements of beavers include suitable riparian habitat dominated by stands of willow, aspen, or cottonwood (Streubel 1989). Beavers are not found in areas without permanent water and suitable woody vegetation; they build dams by cutting down trees and shrubs and packing mud between the branches. They also build lodges with feeding and sleeping chambers that are accessed through underwater entrances. The beaver is nocturnal and active year-round. It is vegetarian, preferring aspen, willow, cottonwood, and alder (Higgins et al. 2000 p.120).

At one time, beavers were likely the most important biological influence on riparian systems of the Forest. Through dam construction, they can enhance and maintain aquatic and riparian communities by elevating water tables; reducing stream velocity and subsequent sedimentation and bank erosion; improving water quality; improving stream flow stability; and enhancing fish and wildlife habitat (Olson and Hubert 1994). Riparian and aquatic dynamics created or enhanced by beavers are considered beneficial to many plant emphasis species.

Habitat Condition And Trend

Historically, beavers on the Forest influenced riparian vegetation and changed stream flows, often converting intermittent drainages to perennial streams (Parrish et al. 1996). Beavers were heavily trapped in the Black Hills, and by the late 1800s, beaver populations were low and restricted to remote portions of the Black Hills (Parrish et al. 1996). The drastic reduction in beaver activity has caused a lowering of alluvial water tables and a subsequent loss of the woody plants dependent on higher water tables or flooded conditions (Parrish et al. 1996). Beaver dams also extended water flows through the summer and created habitat for a wide range of plants and animals (Parrish et al. 1996). About 107,600 acres of riparian habitat are within the Forest administrative boundary and about 70 percent of these riparian acres are on NFS lands.

Historic fire suppression has resulted in reduced vigor of existing hardwood stands and inhibited regeneration (Parrish et al. 1996). The acreage of upland deciduous forest may have been greater prior to 1874 than it is today, though no data are available. Hardwoods currently occupy about 63,000 acres on the Forest (see Table B-4 in Appendix B). Hardwoods are more abundant on the northern portions of the Black Hills and become sparse at the southern end of the Black Hills. For more discussion on hardwoods, see Section 3-2.1.3 Hardwood Ecosystems of this chapter.

Population Status And Trend

In Wyoming and South Dakota, beaver are ranked apparently secure (S4), and secure (S5), respectively (NatureServe 2004). Likely limits to persistence include degradation and/or loss of riparian shrubs and forests due to historical management activities, as well as the loss of hardwood components on adjacent uplands.

Early explorers noted the abundance of beavers in the Black Hills (Parrish et al. 1996). Beavers were heavily trapped in the Black Hills, and by the late 1800s beaver populations were low and restricted to remote portions of the Black Hills (Parrish et al. 1996). During the 1930s, efforts were made to increase beaver populations in the Black Hills; harvest restrictions were imposed, and populations were supplemented with animals from the eastern part of South Dakota (Parrish et al. 1996). Populations have varied over the past 60 years but have not reached historical numbers due to habitat reduction (Parrish at al. 1996).

Beavers are sometimes transplanted onto the Forest in cooperation with State Game and Fish agencies. Recent transplants have occurred on the Bearlodge Ranger District. This activity is likely to continue to occur as beavers and habitat are available. Recent surveys estimate about 80 beaver colonies on the Forest (USDA Forest Service 2005b).