3-3.3.3. Species Of Local Concern – Invertebrates

3-3.3.3.1. Atlantis Fritillary *(Speyeria atlantis pahasapa)*

Affected Environment

The Atlantis fritillary is an endemic butterfly of the Black Hills (NatureServe 2004). In general, it occurs in riparian areas adjacent to openings and moist meadows and in boreal forests (NatureServe 2004). In the Black Hills, this subspecies is restricted to Custer, Lawrence, and Pennington counties (Marrone 2002). It prefers wet meadows and moist canyons such as those near Dalton Lake and Lakota Lake (Marrone 2002). It is assumed that habitat requirements and preferences are similar to other species of this genus. Although adults are regarded as general nectarvores, feeding on a variety of flowers, larvae of this genus feed exclusively on violets (*Viola* spp.) (NatureServe 2004)

Due to the restricted nature of the Atlantic fritillary's distribution in the Black Hills, development or management activities within suitable habitats pose a risk to long-term persistence. Much of the fritillary's habitat is privately owned. There are currently no reliable estimates of the Black Hills population (NatureServe 2004).

Direct And Indirect Effects

Management activities may indirectly affect this species by modifying the quality or extent of riparian habitat. Indirect effects to the Atlantis fritillary are mitigated through a wide variety of standards and guidelines, watershed conservation practices, and State BMPs that protect riparian areas. These effects are analyzed in detail in the *Riparian and Wetlands Ecosystems* and the *Aquatic Ecosystems* effects analysis in the Draft EIS and are summarized below.

Numerous objectives, standards, and guidelines under all alternatives strive to maintain or enhance the quality or quantity of existing riparian communities, wetlands, and wet-meadows areas. Objectives 107, 108, and 215 are all designed to restore and enhance historic wet areas (including wetlands, wet-meadows, and riparian communities). Objective 213 (all alternatives) is designed to conserve or enhance riparian area biodiversity, structure, and size, potentially improving Atlantis fritillary habitat. Standards 1301, 1302, 1304, and 1306 and Guideline 1303 would help protect riparian areas and maintain their health and diversity from a host of various management and recreational activities. Guideline 5301 discourages dispersed camping within 100 feet of lakes and streams, with exceptions.

Noxious-weed treatments could positively impact the Atlantis fritillary by aiding in native plant restoration. Treatments could potentially harm the species if nectar or larval host plants were treated. Noxious-weed treatments would be similar under all alternatives. Guidelines 4302, 4304, and 4305 are designed to encourage minimal treatments with the least toxic method when treating noxious weeds; these would benefit the fritillary by decreasing the occurrence of weeds and minimizing unintended negative effects to non-target plants. These guidelines help ensure that food sources are still available for adults and minimize the extent to which larvae, larval hosts, and larval forage might be affected.

Livestock grazing could affect the Atlantis fritillary by altering plant species composition and by trampling. Utilization could be beneficial by opening grass cover and allowing the establishment and growth of violets and nectar-producing forbs. Heavy utilization could be detrimental by causing noxious-weed establishment and spread or through consumption or trampling of important forbs. Grazing guidance would be similar under all alternatives. AMPs and the associated AOIs determine the distribution and season of use related to livestock grazing. Livestock grazing on the Forest generally occurs June through October, though earlier or later entry or removal may occur on a limited basis. Year-round grazing is avoided. Most grazing allotments are subdivided into pastures. Livestock use may be rotated through these pastures on a seasonal basis or on an annual basis so that livestock is not grazing portions of the allotments continuously, thereby avoiding some of the effects associated with grazing.

To mitigate the impacts from livestock grazing, Standard 1304 opportunistically relocates or implements mitigation measures for water tanks or water catchments located in the water influence zone. Guidelines 2505, 2505c, and 2507 (Alternatives 1, 2, and 4) would manage grazing in riparian areas and riparian shrublands to meet residual-cover objectives, which would protect and enhance Atlantis fritillary habitat. Under Alternatives 3 and 6, these guidelines are changed to standards.

Numerous objectives, standards, and guidelines under all alternatives propose to enhance existing riparian communities, wetlands, and wet meadow habitats. In Alternative 3, Objective 214 doubles the acreage targeted for riparian restoration (1,000 acres) compared to Alternatives 1, 2, 4, and 6. Objective 215 (Alternatives 1, 2, 4, and 6) strives to implement riparian rehabilitation projects for at least three stream reaches. Under Alternatives 3 and 6, restoration goals would be increased to rehabilitate at least five stream reaches.

Numerous Forest-wide goals, objectives, standards, and guidelines promote and enhance the riparian and meadow habitats that may be beneficial to the Atlantis fritillary. If these objectives are met, Atlantis fritillary habitat, including violets, will likely be similar to or more abundant than what is currently available. Alternatives 3 and 6 benefit riparian habitats more than the other three alternatives, with double the restored acres (Alternative 3), in addition to converting some riparian guidelines to standards. Alternatives 3 and 6 also restore an additional two stream sections above the three stream segments targeted under the other four alternatives. As a result, future populations will likely be similar or more abundant than the current level.

Due to the above conservation measure, the Atlantis fritillary is likely to persist on the Forest over the next 50 years. The above evaluation is based on the assumption that conservation objectives and protective standard and guideline direction listed above for the various alternatives will be applied or implemented as written.

Cumulative Effects

Cumulative effects result from the incremental impact (direct and indirect effects) associated with the alternatives when added to past, present and reasonably foreseeable actions. Past activities on NFS lands in the Black Hills are accounted for in the existing condition displayed under direct and indirect effects. Other Federal and non-Federal activities are discussed here.

Limitations on management actions and the achievement of riparian habitat objectives will have a positive additive impact on maintaining habitat for this species. Private in-holdings occur frequently within riparian areas. These private lands provide suitable habitat, but conditions may have been altered by private land management activities, such as livestock grazing or draining to convert to drier site conditions for subsequent haying. Efforts to conserve and enhance riparian habitat for this species on the Forest may be constrained by habitat conditions on adjacent non-NFS lands.

Indirect effects, and therefore cumulative effects, are expected to be lowest in Alternative 3 due to the increased riparian restoration objective and because some guidelines on riparian grazing are changed to standards. Alternative 3 is followed by Alternatives 6, 4, 2, and 1, respectively.

3-3.3.3.2. Callused Vertigo *(Vertigo arthuri)*

Affected Environment

The narrowly restricted geographical range of the callused vertigo includes South Dakota (51 sites), Wyoming (12 sites in the Bear Lodge Mountains), North Dakota, Minnesota, and Alberta (Frest and Johannes 2002). The USFWS considered the callused vertigo a Category 2 candidate species as recently as 1994, although that designation was discontinued when the USFWS revised the candidate classification system in 1996. The callused vertigo is currently ranked imperiled globally and in South Dakota; it has not been ranked in Wyoming (NatureServe 2004).

In 2002, the Forest received the final report for a contract to inventory and/or monitor 357 sites for land snails (Frest and Johannes 2002). Many of the sites had been surveyed in the early to mid 1990s, and some were revisited in 1999 to help assess population changes. More than 100 new sites were inventoried for the first time in 1999, 27 at which the callused vertigo was located. Callused vertigos were found sparingly at a total of 63 of the 357 sites inventoried/monitored.

Callused vertigo has been found at 12 different habitats in Minnesota, with the highest densities occurring in Balsam-white spruce forests and aspen forests (Anderson 2004a). They have also been found in bur oak riparian areas and mountain mahogany shrublands. The diversity of habitat types may indicate that additional locations could be found in the Black Hills.

The following discussion is based on information from the Black Hills (Frest and Johannes 2002). The sites at which callused vertigo was found were wet, relatively undisturbed forest, most often white spruce or ponderosa pine with a varied understory. The species was most common at sites with relatively diverse floras and deep litter, generally on shaded north-facing slopes, and often at the slope base or extending slightly onto the adjacent floodplain. The most common substrate was limestone, but callused vertigo also occurred occasionally on schist-derived soils. Down woody material that helps maintain moist soil conditions and lessens sun exposure is an important habitat element. Foraging substrate appears to consist of decayed deciduous leaves and herbaceous plants. The species was mostly found at sites with high mollusk, including mystery vertigo, striate disc, and Cooper’s Mountainsnail.

Land snails, in general, are susceptible to habitat changes that increase sun exposure, disturb ground cover, reduce micro site humidity, or compact the soil. Additional risks include direct loss of habitat, barriers to dispersal (e.g., roads), predation, trampling by grazing ungulates, intense wildfire, herbicide or pesticide application, and toxic leachates from mining activities. According to Frest and Johannes (2002), the callused vertigo may be negatively affected by road construction, livestock grazing, timber harvest, herbicides and pesticides, and high-intensity forest fires. Timber harvest and grazing may affect snails if it affects the amount of litter, soil moisture or temperature on snail colonies (Anderson 2004a). Although fire is a natural disturbance, it can potentially eliminate snail habitat (Anderson 2004a). The intensity of fire this species is able to survive is unknown (Anderson 2004a). Forest management, including fire suppression, in the last century has led to fuel buildup, which may promote high intensity fires. Road construction and maintenance can also affect snails by eliminating habitat or killing snails. Roadside brushing or weed spraying can also damage snails and/or their habitat (Anderson 2004a). Due to the sessile nature of land snails, they have limited ability to disperse and colonize adjacent habitats.

Direct And Indirect Effects

Based on site characteristics where Frest and Johannes (2002) found the callused vertigo on the Forest, the species is associated with the closed-canopied white-spruce and ponderosa pine ecosystems (structural stages 3C, 4C, and 5). Associated understory vegetation species identified by Frest and Johannes (2002) are representative of the high-elevation riparian-forest ecological group (Marriott and Faber-Langendoen 2000a), indicating callused vertigo is also associated with the riparian and hardwood ecosystems. Regardless of the association with these ecosystems, however, essential habitat features include limestone or schist substrate, shaded forest floor, deep organic surface litter, downed logs, and mesic site conditions. These components are requirements for suitable callused vertigo habitats. Due to limited dispersal capability of all land snails, changes in potentially suitable habitat do not necessarily imply increases in numbers of colonies or extent of distribution of snail populations across the Forest.

The effects to the spruce ecosystem are discussed in Section 3-2.1.2 White Spruce Ecosystem earlier in this chapter and are summarized here. Spruce habitat has likely increased since historic times (Parrish et al. 1996) and has continued to increase some since 1995. 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.

Vegetation management activities can influence the ponderosa pine ecosystem. The effects to the ponderosa pine ecosystem are discussed in Section 3-2.1.1 Ponderosa Pine Ecosystem earlier in this chapter and are summarized here. Alternatives 3, 4, and 6 are expected to maintain or increase Ponderosa pine in structural stages 3C, 4C, and 5 if structural stage objectives are met. The most increase is expected in Alternative 3. Alternatives 4 and 6 will be similar to current conditions. Alternatives 1 and 2 do not contain structural stage objectives, and Alternative 4 does not contain a structural stage objective for 3C. Though there will likely be some of these structural stages available in the future, the amount is uncertain.

The callused vertigo is also associated with the hardwood ecosystem. The effects on the hardwood ecosystem are discussed in Section 3-2.1.3 Hardwood Ecosystems earlier in this chapter and are summarized here. All alternatives are expected to increase hardwoods if objectives are met and standards and guidelines are followed. Alternatives 1 and 2 propose to increase the acreage of existing hardwood communities by 10 percent (Objective 201). Alternative 4 proposes to increase the hardwood acreage by 20 percent (Objective 201). Alternatives 3 and 6 more aggressively approach losses to encroachment by proposing to restore 46,000 acres of aspen (almost doubling the current acreage) (Objective 201). Guidelines 2201, 2202, 2203, 2205, 2206, and 2207 conserve and promote hardwood habitats. Alternatives 3, 4, and 6 strengthen Guidelines 2205, 2206, and 2207 to standards, providing the most comprehensive direction for hardwood restoration across the Forest. Alternatives 3 and 6 modify Guideline 2203 to provide a clearer definition of a regenerated aspen stand and change it to a standard. Alternatives 3 and 6 also modify Guideline 2205 to remove all conifers when treating for hardwood restoration Additional habitat, namely aspen/birch and other hardwood communities, is projected to increase under all alternatives. See Section 3-2.1.3 Hardwood Ecosystems for more discussion of this community.

The callused vertigo has also been found to be associated with the riparian ecosystem. The effects on riparian ecosystems are discussed in Section 3-2.3 Riparian and Wetland Ecosystems earlier in this chapter and are summarized here. Riparian wetland condition is expected to be maintained or enhanced in all alternatives. All alternatives are designed to maintain or restore historic wet areas, wet meadows, and beaver (Objective 215). Standards 1306 and 1505 and Guidelines 1303 and 9108 (all alternatives) will likely maintain the integrity of existing riparian areas with respect to activities such as timber management, mining, roads, livestock grazing, and traffic. Guidelines 2505 and 2507 manage grazing in riparian areas to a residual cover objective.

The extent to which the above white-spruce, ponderosa pine, hardwood, and riparian ecosystem objectives, standards, and guidelines would benefit or modify callused vertigo habitat, however, is limited to the proportion of activities that target high elevation sites on north-facing slopes with limestone or schist substrates. Implementation of these ecosystem activities, regardless of alternative, would not significantly increase or decrease suitable callused vertigo habitat. Due to the currently restricted distribution of the species on the Forest and limited dispersal capability, maintenance and restoration of spruce, hardwood, and riparian ecosystems or activities in the ponderosa pine ecosystem are not expected to substantially increase species distribution on the Forest.

Since downed woody material is an important habitat feature for callused vertigo, measures to conserve downed logs and woody debris could potentially benefit suitable habitats to the extent that other habitat components (e.g., shaded forest floor, limestone substrate) are present. Across all alternatives, Objective 212, Guidelines 2307 and 1102a, and Standards 2308a and 3117 specify guidance designed to provide downed logs and woody debris left after harvest operations. Under Alternatives 3 and 6, Standard 2308a would increase the target for downed logs in spruce communities.

Soil compaction from mechanical operations is minimized by Guideline 1104 (all alternatives).

Herbicide and pesticide applications can contaminate areas with toxic chemicals. Guideline 4304, which governs treatment of individual plants or groups of plants instead of broadcast treatments, is strengthened to become a standard in Alternatives 3, 4, and 6. Snails are not specifically mentioned here, so it is possible that noxious-weed treatments could affect snails more in Alternatives 3 and 4, than in Alternatives 1 and 2. Alternative 6 specifically addresses herbicide use (Standard 3103) at snail colonies and is expected to have the least impact to snails from herbicides.

Road maintenance will likely affect snail colonies in all alternatives. Road right-of ways are often brushed, including along State highways. This activity will likely continue for public safety reasons. The effects from these activities are not expected to change from current levels for all alternatives.

High intensity wildfire is likely to negatively affect snails, as was found in the Jasper Fire area (USDA Forest Service 2004a). Alternatives 3 and 6, which are designed to reduce stand density, may provide lower fire intensity to which the callused vertigo and other land snails are better adapted. The direction (Standard 3103) in Alternative 6 is the most explicit of all the alternatives and will have best likelihood of reducing effects of prescribed fire on snail colonies.

To add emphasis for snail conservation, each alternative contains snail-specific direction. Specific direction is provided in Standard 3103 in all alternatives. Alternative 1 conserves habitat at callused vertigo colonies initially identified by Frest and Johannes in the early to mid 1990s. This will likely provide adequate protection, assuming that conservation is interpreted as maintaining moist site conditions and protecting the sites if needed. Alternatives 2 and 4 include colonies subsequently found by Frest and Johannes in 1999 and require that these colonies be protected from adverse effects of livestock use and other management activities, although the definition of “protect” is subject to interpretation. Alternatives 2 and 4 provide the strictest protection, assuming that protect means no management activities on the colony. However, Alternatives 2 and 4 do not include newly located colonies, as is the case with Alternatives 3 and 6. Alternative 3 allows only those management activities at all known colonies that maintain mesic site conditions and surface organic material or enhance snail habitat.

Alternative 6 offers the most direction on managing snail colonies (Standard 3103). The direction in Alternative 6 is based on Anderson (2005) and Burke et al. (1999). Alternative 6 manages sensitive snail colonies to:

a. Retain overstory sufficient to maintain moisture regimes, ground-level temperatures and humidity;
b. Retain ground litter, especially deciduous litter;
c. Avoid burning, heavy grazing, OHVs, heavy equipment and other activities that may compact soils or alter vegetation composition and ground cover;
d. If prescribed burning is unavoidable, burn when snails are hibernating, usually below 50 degrees Fahrenheit, and use fast moving fires to minimize effects to snails;
e. Control invasive weeds, but use herbicides when snails are not on the surface and treat individual plants rather than broadcast application.

Vegetation management activities, including timber harvest, grazing and fuel treatments, can increase sun exposure, disturb ground cover, reduce micro site humidity, and increase soil compaction from mechanical operations. Alternatives 1, 2, 3, and 4 will likely provide for the continued persistence of this species, assuming that "conserve" and "protect" is interpreted as including many of the items mentions in Alternative 6 (Standard 3103). The interpretations of "conserve" and "protect" are not always clear. Therefore, these alternatives carry some uncertainty with the likelihood of persistence. Alternative 6 (Standard 3103) specifically outlines the conservation measures for snail colonies and offers the best likelihood that snail colonies will persist over time. Alternative 6 also takes an aggressive approach to fuels management. If the above standard is followed on snail colonies, effects to known snail colonies are expected to be minimal. The additional fuel treatments may lead to a more open forest condition in some areas. This could lead to an increase in understory shrubs, which may benefit the snail.

Due to the above conservation measure, the callused vertigo is likely to persist on the Forest over the next 50 years. The above 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. In Standard 3103, "protect" means no management activities on the colony, and "conserve" means that moist site conditions and litter will be maintained on the colony.

Cumulative Effects

Cumulative effects result from the incremental impact (direct and indirect effects) associated with the alternatives when added to past, present and reasonably foreseeable actions. Past activities on NFS lands in the Black Hills are accounted for in the existing condition displayed under direct and indirect effects. 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 land snail populations. It is assumed that federal and state lands may offer suitable habitat for land snail colonies; however, information on location, abundance, and distribution is unavailable. National parks and monuments typically use natural processes and prescribed fire to manage vegetation, similar to disturbances with which this species evolved. National parks and monuments are likely to contribute to the conservation of this species and compliment conservation on the Forest.

Privately owned lands within the Forest boundary may also provide suitable habitat, but 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 in private forest structure and diversity. Potential suitable snail habitat is expected to occur on private lands across the Black Hills; however, the extent and persistence of such habitat is uncertain. Continued urban development in the Black Hills will likely continue to affect habitat, including riparian areas, thereby increasing the importance of habitat on NFS land. Given the conservation measures designed into the alternatives for spruce, ponderosa pine, hardwood, and riparian ecosystems and measures emphasizing land-snail conservation on NFS land, this species is likely to persist in the Black Hills over the next 50 years.

Cumulative effects are expected to be the lowest for Alternative6, due to the specific direction in Standard 3103, followed by Alternatives 2, 3, 4 and 1 respectively.

3-3.3.3.3. Frigid Ambersnail *(Catinella gelida)*

Affected Environment

The frigid ambersnail is currently found only in Iowa (14 sites), South Dakota (12 sites), and Wisconsin (Frest and Johannes 2002). The USFSW considered the frigid ambersnail a Category 2 candidate species as recently as 1994 although that designation was discontinued when the USFWS revised the candidate classification system in 1996. The frigid ambersnail is currently ranked as critically imperiled globally and in South Dakota and Iowa; it is ranked imperiled/critically imperiled in Wisconsin (NatureServe 2004). The state of Iowa considers the frigid ambersnail an endangered species.

Nekola (2003) considered this species a “duff-specialist”. Duff specialists were strongly affected by human activities, suggesting that protecting soil and surface characteristics are important in their conservation.

In 2002, the Forest received the final report for a contract to inventory and/or monitor 357 sites for land snails (Frest and Johannes 2002). Many of the sites had been surveyed in the early to mid 1990s, and some were revisited in 1999 to help assess population changes. More than 100 new sites were inventoried for the first time in 1999. Frigid ambersnails were found at only 12 of the 357 sites inventoried/monitored, an increase from eight sites over the previous surveys. No live adult specimens were found at any of the sites in 1999.

The following discussion is based on information from the Black Hills (Frest and Johannes 2002). The frigid ambersnail was rare at all locations, and very few live adults were observed during the early 1990s surveys. Locations are widely distributed geographically across the Forest at varying elevations (3,800 to 6,800 feet). The species was usually found on limestone but also on schist soils, and colonies were often found in somewhat dry wooded limestone talus, generally near the slope base. They were most often found in rather open ponderosa pine forest, often with a secondary deciduous tree and shrub component, although white spruce was a minor component at a few sites. The frigid ambersnail was found to co-occur with Cooper’s Mountainsnail and rarely with the callused vertigo and striate disc. According to Frest and Johannes (2002), the family of land mollusks that includes the frigid ambersnail is associated not only with rather moist forest sites but also with quite dry and open settings in much of the western United States.

Land snails, in general, are susceptible to habitat changes that increase sun exposure, disturb ground cover, reduce micro site humidity, or compact the soil. Additional risks include direct loss of habitat, barriers to dispersal (e.g., roads), predation, trampling by grazing ungulates, intense wildfire, herbicide or pesticide application, and toxic leachates from mining activities. According to Frest and Johannes (2002), road construction, livestock grazing, timber harvest, herbicides and pesticides, and high-intensity forest fires may negatively affect land snails. Due to the land snail’s sessile nature, it has limited ability to disperse and colonize adjacent habitats. Additionally, the frigid ambersnail was found in unusually sparse populations at all sites and thus may be more vulnerable to standard threats.

Direct And Indirect Effects

Based on site characteristics where the frigid ambersnail was found on the Forest by Frest and Johannes (2002), it appears that this species is primarily associated with ponderosa pine forests with partially open canopies (e.g., structural stages 3A, 3B, 4A, and 4B) and a secondary deciduous component. Associated understory vegetation species identified by Frest and Johannes (2002) are representative of the mesic coniferous-forest ecological group (Marriott and Faber-Langendoen 2000a), which includes a substantial hardwood component. Regardless of the association with the ponderosa pine or hardwood ecosystems, however, essential habitat features include limestone or schist substrate with talus, somewhat shaded forest floor, organic surface litter, downed logs, and somewhat mesic site conditions. These components are requirements for suitable frigid ambersnail habitats. Due to limited dispersal capability of all land snails, changes in potentially suitable habitat do not necessarily imply changes in numbers of colonies or extent of distribution of snail populations across the Forest.

Vegetation management activities can influence the ponderosa pine ecosystem. The effects to the ponderosa pine ecosystem are discussed in Section 3-2.1.1 Ponderosa Pine Ecosystem earlier in this chapter and are summarized here. Ponderosa pine in structural stages 3A, 3B, 4A, and 4B is projected to increase from current conditions under alternatives 3 and 6, if structural stage objectives are met. Alternative 6 provides the greatest increase in potential habitat for this species. Alternatives 1, 2, and 4 do not contain objectives for these structural stages. Though there will likely be some of these structural stages available in the future, the amount is uncertain.

The frigid ambersnail is also associated with the hardwood ecosystem. The effects on the hardwood ecosystem are discussed in Section 3-2.1.3 Hardwood Ecosystems earlier in this chapter and are summarized here. All alternatives are expected to increase hardwoods if objectives are met and standard and guidelines are followed. Alternatives 1, 2, and 4 propose to increase the acreage of existing hardwood communities by 10 percent (Objective 201). Alternatives 3 and 6 more aggressively approach losses to encroachment by proposing to restore 46,000 acres of aspen (almost doubling the current acreage) (Objective 201). Guidelines 2201, 2202, 2203, 2205, 2206, and 2207 conserve and promote hardwood habitats. Alternatives 3, 4, and 6 strengthen Guidelines 2205, 2206, and 2207 to standards, providing the most comprehensive direction for hardwood restoration across the Forest. Alternatives 3 and 6 modify Guideline 2203 to provide a clearer definition of a regenerated aspen stand and change it to a standard. Alternatives 3 and 6 also modify Guideline 2205 to remove all conifers when treating for hardwood restoration. Additional habitat, namely aspen/birch and other hardwood communities, is projected to increase under all alternatives.

Implementation of vegetation management activities, regardless of alternative, would not significantly increase or decrease suitable frigid ambersnail habitat. Due to the currently restricted distribution of the species on the Forest and limited dispersal capability, changes in the ponderosa pine or hardwood ecosystems are not expected to substantially increase species distribution on the Forest. If hardwood-restoration treatments remove conifers at a snail site, it could adversely affect the site through loss of shade and physical disturbance. These effects are mitigated through implementation of snail-specific direction (Standard 3101, discussed below).

Since downed woody material is an important habitat feature for frigid ambersnail, measures to conserve downed logs and woody debris could potentially benefit suitable habitats to the extent that other habitat components (e.g., shaded forest floor and limestone substrate) are present. Across all alternatives, Objective 212, Guidelines 2307 and 1102a, and Standards 2308a and 3117 specify guidance designed to provide downed logs and woody debris left after harvest operations.

Soil compaction from mechanical operations is minimized by Guideline 1104 (all alternatives).

Herbicide and pesticide applications can contaminate areas with toxic chemicals. Guideline 4304, which governs treatment of individual plants or groups of plants instead of broadcast treatments, is strengthened to become a standard in Alternatives 3, 4, and 6. Snails are not specifically mentioned here, so it is possible that noxious-weed treatments could affect snails more in Alternatives 3 and 4, than in Alternatives 1 and 2. Alternative 6 specifically addresses herbicide use (Standard 3103) at snail colonies and is expected to have the least impact to snails from herbicides.

Road maintenance will likely affect snail colonies in all alternatives. Road right-of ways are often brushed, including along State highways. This activity will likely continue for public safety reasons. The effects from these activities are not expected to change from current levels for all alternatives.

High intensity wildfire is likely to negatively affect snails, as was found in the Jasper Fire area (USDA Forest Service 2004a). Alternatives 3 and 6, which are designed to reduce stand density, may provide lower intensity fires to which the frigid ambersnail and other land snails are better adapted. The direction (Standard 3103) in Alternative 6 is the most explicit of all the alternatives and will have best likelihood of reducing effects of prescribed fire on snail colonies.

To add emphasis for snail conservation, each alternative contains snail-specific direction. Specific direction is provided in Standard 3103 in all alternatives. Alternative 1 conserves habitat at frigid ambersnail colonies initially identified by Frest and Johannes in the early to mid 1990s. This will likely provide adequate protection, assuming that conservation is interpreted as maintaining moist site conditions and protecting the sites if needed. Alternatives 2 and 4 include colonies subsequently found by Frest and Johannes in 1999 and require that these colonies be protected from adverse effects of livestock use and other management activities, although the definition of “protect” is subject to interpretation. Alternatives 2 and 4 provide the strictest protection, assuming that protect means no management activities on the colony. However, Alternatives 2 and 4 do not include newly located colonies, as is the case with Alternatives 3 and 6. Alternative 3 allows only those management activities at all known colonies that maintain mesic site conditions and surface organic material or enhance snail habitat.

Alternative 6 offers the most direction on managing snail colonies (Standard 3103). The direction in Alternative 6 is based on Anderson (2005) and Burke et al. (1999). Alternative 6 manages sensitive snail colonies to:

a. Retain overstory sufficient to maintain moisture regimes, ground-level temperatures, and humidity;

b. Retain ground litter, especially deciduous litter;

c. Avoid burning, heavy grazing, OHVs, heavy equipment, and other activities that may compact soils or alter vegetation composition and ground cover;

d. If prescribed burning is unavoidable, burn when snails are hibernating, usually below 50 degrees Fahrenheit, and use fast moving fires to minimize effects to snails;

e. Control invasive weeds, but use herbicides when snails are not on the surface and treat individual plants rather than broadcast application.

Vegetation management activities, including timber harvest, grazing and fuel treatments, can increase sun exposure, disturb ground cover, reduce micro site humidity, and increase soil compaction from mechanical operations. Alternatives 1, 2, 3, and 4 will likely provide for the continued persistence of this species, assuming that “conserve” and “protect” is interpreted as including many of the items mentions in Alternative 6 (Standard 3103). The interpretations of “conserve” and “protect” are not always clear. Therefore, these alternatives carry some uncertainty with the likelihood of persistence. Alternative 6 (Standard 3103) specifically outlines the conservation measures for snail colonies and offers the best likelihood that snail colonies will persist over time. Alternative 6 also takes an aggressive approach to fuels management. If the above standard is followed on snail colonies, effects to known snail colonies are expected to be minimal. The additional fuel treatments may lead to a more open forest condition in some areas. This could lead to an increase in understory shrubs, which may benefit the snail.

Due to the above conservation measure, the frigid ambersnail is likely to persist on the Forest over the next 50 years. The above 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. In Standard 3103, “protect” means no management activities on the colony, and “conserve” means that moist site conditions and litter will be maintained on the colony.

Cumulative Effects

Cumulative effects result from the incremental impact (direct and indirect effects) associated with the alternatives when added to past, present and reasonably foreseeable actions. Past activities on NFS lands in the Black Hills are accounted for in the existing condition displayed under direct and indirect effects. 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 land snail populations. It is assumed that federal and state lands may offer suitable habitat for land snail colonies; however, information on location, abundance, and distribution is unavailable. National parks and monuments typically use natural processes and prescribed fire to manage vegetation, similar to disturbances with which this species evolved. National parks and monuments are likely to contribute to the conservation of this species and compliment conservation on the Forest.

Privately owned lands within the Forest boundary may also provide suitable habitat, but 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 in private forest structure and diversity. Potential suitable snail habitat is expected to occur on private lands across the Black Hills; however, the extent and persistence of such habitat is uncertain. Continued urban development in the Black Hills will likely continue to affect habitat, thereby increasing the importance of habitat on NFS land. Given the conservation measures designed into the alternatives for ponderosa pine and hardwood ecosystems and measures emphasizing land snail conservation on NFS land, this species is likely to persist in the Black Hills over the next 50 years.

Cumulative effects are expected to be the lowest for Alternative 6, due to the specific direction in Standard 3103, followed by Alternatives 2, 3, 4, and 1, respectively.

3-3.3.3.4. Mystery Vertigo *(Vertigo paradoxa)*

Affected Environment

The mystery vertigo is rare in the United States and occurs only in South Dakota (21 sites); Wyoming (2 sites in the Bear Lodge Mountains); Michigan (1 site); Maine (2 counties); and a few northern Wisconsin, Michigan, and Minnesota sites (Frest and Johannes 2002). The species appears to be more common in adjoining areas of southern Canada, generally from the Great Lakes eastward. The USFSW considered the mystery vertigo a Category 2 candidate species as recently as 1994 although that designation was discontinued when the USFWS revised the candidate classification system in 1996. The mystery vertigo is currently ranked vulnerable globally and critically imperiled in South Dakota; it has not been ranked in Wyoming (NatureServe 2004).

Few studies have looked at habitat preferences versus habitat used. In general, this species occurs in forest habitats and prefers duff soils with a substantial layer of organic matter (Anderson 2004b). They can be found under fallen logs and leaves, and aspen may also provide suitable habitat (Anderson 2004b).

In 2002, the Forest received the final report for a contract to inventory and/or monitor 357 sites for land snails (Frest and Johannes 2002). Many of the sites had been surveyed in the early to mid 1990s, and some were revisited in 1999 to help assess population changes. More than 100 new sites were inventoried for the first time in 1999, six at which the mystery vertigo was located. Mystery vertigos were found at a total of 23 of the 357 sites inventoried/monitored. They were not generally abundant at any site.

The following discussion is based on information from the Black Hills (Frest and Johannes 2002). Mystery vertigo is generally restricted to rich lowland wooded sites, quite often in the white-spruce community, but occasionally in the ponderosa pine community. The forest canopy is generally closed or nearly so, with well-developed litter and a rich understory. Sites are usually in leaf litter at the base of a wooded, north-facing slope on limestone or schist substrates. Down woody material that helps maintain moist soil conditions and lessens sun exposure is an important habitat element. Mystery vertigo was not common in taluses but could be found crawling on rock surfaces in moist weather and appears to feed on the organic coating of rock surfaces and partially decayed leaves. Associated snail species include callused vertigo, cross vertigo, Cooper's Mountainsnail, and striate disc. All sites with mystery vertigo were in the central or northern Black Hills or the Bear Lodge Mountains.

Land snails, in general, are susceptible to habitat changes that increase sun exposure, disturb ground cover, reduce micro site humidity, or compact the soil. Additional risks include direct loss of habitat, barriers to dispersal (e.g., roads), predation, trampling by grazing ungulates, intense wildfire, herbicide or pesticide application, and toxic leachates from mining activities. According to Frest and Johannes (2002), road construction, livestock grazing, timber harvest, herbicides and pesticides, and high-intensity forest fires may negatively affect the mystery vertigo. The land snail's sessile nature gives it limited ability to disperse and colonize adjacent habitats.

Direct And Indirect Effects

Based on site characteristics where the mystery vertigo was found on the Forest by Frest and Johannes (2002), the species is associated with the closed-canopied white-spruce and ponderosa pine ecosystems (structural stages 3C, 4C, and 5). Associated understory vegetation species identified by Frest and Johannes (2002) are representative of the high elevation riparian-forest ecological group (Marriott and Faber-Langendoen 2000a), indicating mystery vertigo is also associated with the riparian and hardwood ecosystems. Regardless of the association with these ecosystems, however, essential habitat features include limestone or schist substrate, shaded forest floor, well-developed organic surface litter, downed logs, and mesic site conditions. These components are requirements for suitable mystery vertigo habitats. Due to limited dispersal capability of all land snails, changes in potentially suitable habitat do not necessarily imply increases in numbers of colonies or extent of distribution of snail populations across the Forest.

The effects to the spruce ecosystem are discussed in Section 3-2.1.2 White Spruce Ecosystem earlier in this chapter and are summarized here. Spruce habitat has likely increased since historic times (Parrish et al. 1996) and has continued to increase some since 1995. 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.

Vegetation management activities can influence the ponderosa pine ecosystem. The effects to the ponderosa pine ecosystem are discussed in Section 3-2.1.1 Ponderosa Pine Ecosystem earlier in this chapter and are summarized here. Alternatives 3, 4, and 6 are expected to maintain or increase Ponderosa pine in structural stages 3C, 4C, and 5 if structural stage objectives are met. The most increase is expected in Alternative 3. Alternatives 4 and 6 will be similar to current conditions. Alternatives 1 and 2 do not contain structural stage objectives and Alternative 4 does not contain a structural stage objective for 3C. Though there will likely be some of these structural stages available in the future, the amount is uncertain.

The mystery vertigo is also associated with the hardwood ecosystem. The effects on the hardwood ecosystem are discussed in Section 3-2.1.3 Hardwood Ecosystems earlier in this chapter and are summarized here. All alternatives are expected to increase hardwoods if objectives are met. Alternatives 1, and 2 propose to increase the acreage of existing hardwood communities by 10 percent (Objective 201). Alternative 4 proposes to increase hardwood acres by 20 percent (Objective 201). Alternatives 3 and 6 more aggressively approach losses to encroachment by proposing to restore 46,000 acres of aspen (almost doubling the current acreage) (Objective 201). Guidelines 2201, 2202, 2203, 2205, 2206, and 2207 conserve and promote hardwood habitats. Alternatives 3, 4, and 6 strengthen Guidelines 2205, 2206 and 2207 to standards, providing the most comprehensive direction for hardwood restoration across the Forest. Alternatives 3 and 6 modify Guideline 2203 to provide a clearer definition of a regenerated aspen stand and change it to a standard. Alternatives 3 and 6 also modify Guideline 2205 to remove all conifers when treating for hardwood restoration. Additional habitat, namely aspen/birch and other hardwood communities, is projected to increase under all alternatives.

The mystery vertigo has also been found to be associated with the riparian ecosystem. The effects on riparian ecosystems are discussed in Section 3-2.3 Riparian and Wetland Ecosystems earlier in this chapter. Riparian wetland condition is expected to be maintained or enhanced in all alternatives.

The extent to which the above white-spruce, ponderosa pine, hardwood, and riparian ecosystem objectives, standards, and guidelines would benefit or modify mystery vertigo habitat, however, is limited to the proportion of activities that target high elevation sites on north-facing slopes with limestone or schist substrates. Implementation of these ecosystem activities, regardless of alternative, would not significantly increase or decrease suitable mystery vertigo habitat. Due to the currently restricted distribution of the species on the Forest and limited dispersal capability, maintenance and restoration of spruce, hardwood, and riparian ecosystems, or activities in the ponderosa pine ecosystem, are not expected to substantially increase species distribution on the Forest.

Since downed woody material is an important habitat feature for mystery vertigo, measures to conserve downed logs and woody debris could potentially benefit suitable habitats to the extent that other habitat components (e.g., shaded forest floor, limestone substrate) are present. Across all alternatives, Objective 212, Guidelines 2307 and 1102a, Standards 2308a and 3117 specify guidance designed to provide downed logs and woody debris left after harvest operations. Under Alternatives 3 and 6, Standard 2308a would increase the target for downed logs in spruce communities.

Soil compaction from mechanical operations is minimized by Guideline 1104 (all alternatives).

Herbicide and pesticide applications can contaminate areas with toxic chemicals. Guideline 4304, which governs treatment of individual plants or groups of plants instead of broadcast treatments, is strengthened to become a standard in Alternatives 3, 4, and 6. Snails are not specifically mentioned here, so it is possible that noxious-weed treatments could affect snails more in Alternatives 3 and 4, than in Alternatives 1 and 2. Alternative 6 specifically addresses herbicide use (Standard 3103) at snail colonies and is expected to have the least impact to snails from herbicides.

Road maintenance will likely affect snail colonies in all alternatives. Road right-of ways are often brushed, including along State highways. This activity will likely continue for public safety reasons. The effects from these activities are not expected to change from current levels for all alternatives.

High intensity wildfire is likely to negatively affect snails, as was found in the Jasper Fire area (USDA Forest Service 2004a). Alternatives 3 and 6, which are designed to reduce stand density, may provide lower intensity fires to which the mystery vertigo and other land snails are better adapted. The direction (Standard 3103) in Alternative 6 is the most explicit of all the alternatives and will have best likelihood of reducing effects of prescribed fire on snail colonies.

To add emphasis for snail conservation, each alternative contains snail-specific direction. Specific direction is provided in Standard 3103 in all alternatives. Alternative 1 conserves habitat at mystery vertigo colonies initially identified by Frest and Johannes in the early to mid 1990s. This will likely provide adequate protection, assuming that conservation is interpreted as maintaining moist site conditions and protecting the sites if needed. Alternatives 2 and 4 include colonies subsequently found by Frest and Johannes in 1999 and require that these colonies be protected from adverse effects of livestock use and other management activities, although the definition of ‘protect’ is subject to interpretation. Alternatives 2 and 4 provide the strictest protection, assuming that ‘protect’ means no management activities on the colony. However, Alternatives 2 and 4 do not include newly located colonies, as is the case with Alternatives 3 and 6. Alternative 3 allows only those management activities at all known colonies that maintain mesic site conditions and surface organic material, or enhances snail habitat.

Alternative 6 offers the most direction on managing snail colonies (Standard 3103). The direction in Alternative 6 is based on Anderson (2005) and Burke et al. (1999). Alternative 6 manages sensitive snail colonies to:

a. Retain overstory sufficient to maintain moisture regimes, ground-level temperatures, and humidity;
b. Retain ground litter, especially deciduous litter;
c. Avoid burning, heavy grazing, OHVs, heavy equipment, and other activities that may compact soils or alter vegetation composition and ground cover;
d. If prescribed burning is unavoidable, burn when snails are hibernating, usually below 50 degrees Fahrenheit, and use fast moving fires to minimize effects to snails;

e. Control invasive weeds, but use herbicides when snails are not on the surface and treat individual plants rather than broadcast application.

Vegetation management activities, including timber harvest, grazing and fuel treatments, can increase sun exposure, disturb ground cover, reduce micro site humidity, and increase soil compaction from mechanical operations. Alternatives 1, 2, 3, and 4 will likely provide for the continued persistence of this species, assuming that "conserve" and "protect" is interpreted as including many of the items mentions in Alternative 6 (Standard 3103). The interpretations of "conserve" and "protect" are not always clear. Therefore, these alternatives carry some uncertainty with the likelihood of persistence. Alternative 6 (Standard 3103) specifically outlines the conservation measures for snail colonies and offers the best likelihood that snail colonies will persist over time. Alternative 6 also takes an aggressive approach to fuels management. If the above standard is followed on snail colonies, effects to known snail colonies are expected to be minimal. The additional fuel treatments may lead to a more open forest condition in some areas. This could lead to an increase in understory shrubs, which may benefit the snail.

Due to the above conservation measure, the mystery vertigo is likely to persist on the Forest over the next 50 years. The above 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. In Standard 3103, "protect" means no management activities on the colony, and "conserve" means that moist site conditions and litter will be maintained on the colony.

Cumulative Effects

Cumulative effects result from the incremental impact (direct and indirect effects) associated with the alternatives when added to past, present and reasonably foreseeable actions. Past activities on NFS lands in the Black Hills are accounted for in the existing condition displayed under direct and indirect effects. 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 land snail populations. It is assumed that federal and state lands may offer suitable habitat for land snail colonies; however, information on location, abundance and distribution is unavailable. National parks and monuments typically use natural processes and prescribed fire to manage vegetation, similar to disturbances with which this species evolved. National parks and monuments are likely to contribute to the conservation of this species and compliments conservation on the Forest.

Privately owned lands within the Forest boundary may also provide suitable habitat, but 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 in private forest structure and diversity. Potential suitable snail habitat is expected to occur on private lands across the Black Hills; however, the extent and persistence of such habitat is uncertain. Continued urban development in the Black Hills will likely continue to affect habitat, including riparian areas, thereby increasing the importance of habitat on NFS land. Given the conservation measures designed into the alternatives for spruce, ponderosa pine, hardwood, and riparian ecosystems, and measures emphasizing land snail conservation on NFS land, this species is likely to persist in the Black Hills over the next 50 years.

Cumulative effects are expected to be the lowest for Alternative 6, due to the specific direction in Standard 3103, followed by Alternatives 2, 3, 4 and 1 respectively.

3-3.3.3.5. Striate Disc *(Discus shimekii)*

Affected Environment

The 1996 Final EIS BA/BE (USDA Forest Service 1996a, Appendix H) gives a thorough overview of striate disc (*Discus shimekii*) distribution and natural history, and is incorporated by reference.

The range of the striate disc includes Wyoming (2 sites), Montana (1), Colorado (perhaps 26 sites), South Dakota, Oregon (1), California (2), Utah (5), Arizona (3), and New Mexico (7) (Frest and Johannes 2002). Hendricks (2003) also lists 5 records in Montana. Live sites have also been reported from several Canadian provinces. The striate disc was previously designated a sensitive species in Region 2, but was not included when the sensitive species list was updated in 2003. The USFSW considered the striate disc as a Category 2 candidate species as recently as 1994, although that designation was discontinued when the USFWS revised the candidate classification system in 1996. The striate disc is currently ranked globally as G5 (secure), and S2 (imperiled) in South Dakota (NatureServe 2004).

In 2002, the Forest received the final report for a contract to inventory and/or monitor 357 sites for land snails (Frest and Johannes 2002). Many of the sites had been surveyed in the early to mid 1990s, and some were revisited in 1999 to help assess population changes. More than 100 new sites were inventoried for the first time in 1999. Striate discs were found live at only 18 of the 357 sites inventoried/monitored. When comparing original survey data with that replicated in 1999, one site appears to have lost the striate disc, and one site gained the species. In addition, the striate disc was present at seven of the 100 sites surveyed for the first time in 1999.

The following discussion is based on information from the Black Hills (Frest and Johannes 2002). Striate disc was most often found in litter in rich mesic forest, generally on shaded, north-facing slope bases, often bordering or ranging slightly onto stream floodplains. They were locally abundant in comparatively small colonies spatially, most frequently in white-spruce communities but also aspen and riparian habitats, at the base of slopes where deciduous trees and shrubs were often common. Most sites had soils derived from weathered limestone, although four sites were on schist substrate. Foraging substrate consists of decayed deciduous leaves and herbaceous plants. Down woody material that helps maintain moist soil conditions and lessens sun exposure is an important habitat element. The striate disc was found to co-occur with Cooper's Mountainsnail, but more commonly with the mystery vertigo, callused vertigo, and cross vertigo.

According to Frest and Johannes (2002), striate disc were found only in relatively undisturbed forested sites, with minor sun exposure and minor grazing and logging pressure, and most sites were protected by topography, down logs, or other physical features. Sites where the striate disc occurs appear restricted to the higher elevations of the limestone plateau of the west-central and north-central portions of the Black Hills.

Land snails, in general, are susceptible to habitat changes that increase sun exposure, disturb ground cover, reduce micro site humidity, or compact the soil. Additional risks include direct loss of habitat, barriers to dispersal (e.g., roads), predation, trampling by grazing ungulates, intense wildfire, application of herbicides or pesticides, and toxic leachates from mining activities. According to Frest and Johannes (2002), the striate disc may be negatively affected by road construction, livestock grazing, timber harvest, herbicides and pesticides, and high-intensity forest fires. Due to the sessile nature of land snails, they have limited ability to disperse and colonize adjacent habitats.

Direct And Indirect Effects

Based on site characteristics where the striate disc was found on the Forest by Frest and Johannes (2002), the species is associated with the white-spruce, hardwood, and riparian ecosystems. Regardless of the association with these ecosystems, however, essential habitat features include limestone or schist substrate, shaded forest floor, organic surface litter, downed logs, and mesic site conditions. These components are requirements for suitable striate disc habitats. Due to limited dispersal capability of all land snails, changes in potentially suitable habitat do not necessarily imply increases in numbers of colonies or extent of distribution of snail populations across the Forest.

The effects to the spruce ecosystem are discussed in Section 3-2.1.2 White Spruce Ecosystem earlier in this chapter and are summarized here. Spruce habitat has likely increased since historic times (Parrish et al. 1996) and has continued to increase some since 1995. 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.

The striate disc is also associated with the hardwood ecosystem. The effects on the hardwood ecosystem are discussed in Section 3-2.1.3 Hardwood Ecosystems earlier in this chapter and are summarized here. All alternatives are expected to increase hardwoods if objectives are met and standards and guidelines are followed. Alternatives 1 and 2, propose to increase the acreage of existing hardwood communities by 10 percent (Objective 201). Alternative 4 proposes to increase hardwoods by 20 percent (Objective 201). Alternatives 3 and 6 more aggressively approach losses to encroachment by proposing to restore 46,000 acres of aspen (almost doubling the current acreage) (Objective 201). Guidelines 2201, 2202, 2203, 2205, 2206, and 2207 conserve and promote hardwood habitats. Alternatives 3, 4, and 6 strengthen Guidelines 2205, 2206, and 2207 to standards, providing the most comprehensive direction for hardwood restoration across the Forest. Alternatives 3 and 6 modify Guideline 2203 to provide a clearer definition of a regenerated aspen stand and change it to a standard. Alternatives 3 and 6 also modify Guideline 2205 to remove all conifers when treating for hardwood restoration. Additional habitat, namely aspen/birch and other hardwood communities, is projected to increase under all alternatives.

The striate disc has also been found to be associated with the riparian ecosystem. The effects on riparian ecosystems are discussed in Section 3-2.3 Riparian and Wetland Ecosystems earlier in this chapter. Riparian wetland condition is expected to be maintained or enhanced in all alternatives.

The extent to which the above white-spruce, hardwood, and riparian ecosystem objectives, standards, and guidelines would benefit striate disc habitat, however, is limited to the proportion of maintenance and restoration efforts that target high elevation sites with limestone substrates. Implementation of these ecosystem maintenance and restoration efforts regardless of alternative would not significantly increase suitable striate disc habitat. Due to the currently restricted distribution of the species on the Forest and limited dispersal capability, maintenance and restoration of spruce, hardwood, and riparian ecosystems is not expected to substantially increase species distribution on the Forest.

Since downed woody material is an important habitat feature for striate disc, measures to conserve downed logs and woody debris could potentially benefit suitable habitats to the extent that other habitat components (e.g., shaded forest floor, limestone substrate) are present. Across all alternatives, Objective 212, Guidelines 2307 and 1102a, and Standards 2308a and 3117 specify guidance designed to provide downed logs and woody debris left after harvest operations. Under Alternatives 3 and 6, Standard 2308a would increase the target for downed logs in spruce communities.

Soil compaction from mechanical operations is minimized by Guideline 1104 (all alternatives).

Herbicide and pesticide applications can contaminate areas with toxic chemicals. Guideline 4304, which governs treatment of individual plants or groups of plants instead of broadcast treatments, is strengthened to become a standard in Alternatives 3, 4, and 6. Snails are not specifically mentioned here, so it is possible that noxious-weed treatments could affect snails more in Alternatives 3 and 4, than in Alternatives 1 and 2. Alternative 6 specifically addresses herbicide use (Standard 3103) at snail colonies and is expected to have the least impact to snails from herbicides.

Road maintenance will likely affect snail colonies in all alternatives. Road right-of ways are often brushed, including along State highways. This activity will likely continue for public safety reasons. The effects from these activities are not expected to change from current levels for all alternatives.

High intensity wildfire is likely to negatively affect snails, as was found in the Jasper Fire area (USDA Forest Service 2004a). Alternatives 3 and 6, which are designed to reduce stand density, may provide lower intensity fires to which the striate disc and other land snails are better adapted. The direction (Standard 3103) in Alternative 6 is the most explicit of all the alternatives and will have best likelihood of reducing effects of prescribed fire on snail colonies.

To add additional emphasis for snail conservation, each alternative contains snail-specific direction. Specific direction is provided in Standard 3103 in all alternatives. Alternative 1 conserves habitat at striate disc colonies initially identified by Frest and Johannes in the early to mid 1990s. This will likely provide adequate protection assuming that conservation is interpreted as maintaining moist site conditions and protecting the sites if needed. Alternatives 2 and 4 include colonies subsequently found by Frest and Johannes in 1999 and require that these colonies be protected from adverse effects of livestock use and other management activities, although the definition of “protect” is subject to interpretation. Alternatives 2 and 4 provide the strictest protection, assuming that protect means no management activities on the colony. However, Alternatives 2 and 4 do not include newly located colonies, as is the case with Alternatives 3 and 6. Alternative 3 allows only those management activities at all known colonies that maintain mesic site conditions and surface organic material or enhance snail habitat.

Alternative 6 offers the most direction on managing snail colonies (Standard 3103). The direction in Alternative 6 is based on Anderson (2005) and Burke et al. (1999). Alternative 6 manages sensitive snail colonies to:

a. Retain overstory sufficient to maintain moisture regimes, ground-level temperatures, and humidity;

b. Retain ground litter, especially deciduous litter;

c. Avoid burning, heavy grazing, OHVs, heavy equipment, and other activities that may compact soils or alter vegetation composition and ground cover;

d. If prescribed burning is unavoidable, burn when snails are hibernating, usually below 50 degrees Fahrenheit, and use fast moving fires to minimize effects to snails;

e. Control invasive weeds, but use herbicides when snails are not on the surface and treat individual plants rather than broadcast application.

Vegetation management activities, including timber harvest, grazing and fuel treatments, can increase sun exposure, disturb ground cover, reduce micro site humidity, and increase soil compaction from mechanical operations. Alternatives 1, 2, 3, and 4 will likely provide for the continued persistence of this species, assuming that “conserve” and “protect” is interpreted as including many of the items mentions in Alternative 6 (Standard 3103). The interpretations of “conserve” and “protect” are not always clear. Therefore, these alternatives carry some uncertainty with the likelihood of persistence. Alternative 6 (Standard 3103) specifically outlines the conservation measures for snail colonies and offers the best likelihood that snail colonies will persist over time. Alternative 6 also takes an aggressive approach to fuels management. If the above standard is followed on snail colonies, effects to known snail colonies are expected to be minimal. The additional fuel treatments may lead to a more open forest condition in some areas. This could lead to an increase in understory shrubs, which may benefit the snail.

Due to the above conservation measure, the striate disc is likely to persist on the Forest over the next 50 years. The above 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. In Standard 3103, “protect” means no management activities on the colony, and “conserve” means that moist site conditions and litter will be maintained on the colony.

Cumulative Effects

Cumulative effects result from the incremental impact (direct and indirect effects) associated with the alternatives when added to past, present and reasonably foreseeable actions. Past activities on NFS lands in the Black Hills are accounted for in the existing condition displayed under direct and indirect effects. 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 land snail populations. It is assumed that federal and state lands may offer suitable habitat for land snail colonies; however, information on location, abundance, and distribution is unavailable. National parks and monuments typically use natural processes and prescribed fire to manage vegetation similar to disturbances with which this species evolved. National parks and monuments are likely to contribute to the conservation of this species and compliment conservation on the Forest.

Privately owned lands within the Forest boundary may also provide suitable habitat, but 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 in private forest structure and diversity. Potential suitable snail habitat is expected to occur on private lands across the Black Hills; however, the extent and persistence of such habitat is uncertain. Continued urban development in the Black Hills will likely continue to affect habitat, including riparian areas, thereby increasing the importance of habitat on NFS land. Given the conservation measures designed into the alternatives for spruce, hardwood, and riparian ecosystems and measures emphasizing land snail conservation on NFS land, this species is likely to persist in the Black Hills over the next 50 years.

Cumulative effects are expected to be the lowest for Alternative 6, due to the specific direction in Standard 3103, followed by Alternatives 2, 3, 4, and 1 respectively.

3-3.3.3.6. Tawny Crescent (*Phycoides batesii*)

Affected Environment

The tawny crescent is found in open meadows, stream bottoms, roads, trails, and riparian woodlands (Stefanich 2001). It is also found in mesic forest corridors across an ecotone between mixed-grass meadows or prairie grasslands to adjacent woodlands (Royer and Marrone 1992a). Elsewhere in the Dakotas, adults are known to forage for nectar from a variety of floral species, including dogbane leafy spurge and various composite flowers (Stefanich 2001). Males of this species are often observed taking moisture at springs and stream banks (Marrone 2002). Tawny crescent larvae appear dependent on asters as a food source although the specific host species and their relationship remain unclear (Stefanich 2001).

In South Dakota, the tawny crescent is restricted in its distribution to the Black Hills. The populations inhabiting the Black Hills of South Dakota and Wyoming are considered genetically isolated and disjunct from crescents elsewhere (Royer and Marrone 1992a). Tawny crescents were observed at two of 20 monitoring sites on the Mystic Ranger District in 2002 (USDA Forest Service 2004a). However, there continue to be no reliable estimates of local abundance or population estimates for the Black Hills (Stefanich 2001). Additionally, distinguishing this species from the northern pearl crescent and the field crescent is extremely difficult, and the potential for hybridization between these species has not been resolved (Stefanich 2001).

Stefanich (2001) hypothesized that the only limiting factor in the Black Hills is the destruction of this butterfly's habitat or isolation of colonies to the extent that populations are unable to disperse.

Direct And Indirect Effects

The tawny crescent's distribution in the Black Hills is predictably tied to macro and/or micro sites characterized by mesic conditions (Stefanich 2001). Moist meadow or grassland habitats along forest or woodland edges are characteristic of this species (Royer and Marrone 1992a; Stefanich 2001). As such, management direction affecting riparian ecosystems and hardwood communities, as well as grassland and meadow areas, has the potential to impact this species. See the relevant ecosystems section for a more detailed effects analysis specific to this species' habitat.

Objective 213 (all alternatives) is designed to conserve or enhance riparian area biodiversity, structure, and size. Objective 215 (Alternatives 1, 2, and 4) implements riparian rehabilitation projects for at least three stream reaches. Under Alternatives 3 and 6, restoration goals are increased to rehabilitate at least five stream reaches. The management emphasis to increase beaver populations in the Black Hills (Objective 215c, all alternatives) is an important component of restorative goals as the beaver's dam complexes likely create diverse riparian habitats that benefit a variety of species.

Objective 214 (Alternatives 1, 2, 4, and 6) restores 500 acres of riparian-shrub habitats. Alternative 3 doubles this restoration goal to 1,000 acres of riparian-shrub habitat. Guidelines 2505 and 2507 (Alternative 1) manage grazing in riparian areas to meet residual cover objectives. Under Alternatives 2, 3, 4, and 6 these guidelines are strengthened to standards. Guidelines 3210, 3211, and 3212 (all alternatives) emphasize maintaining and enhancing riparian shrub and tree species, providing riparian diversity through vegetation treatments, and managing for high quality riparian communities. The increase in riparian-shrub habitat would increase the available habitat for the tawny crescent.

All alternatives are designed to maintain or restore historic wet areas and wet meadows. Numerous objectives, standards, and guidelines under all alternatives strive to enhance existing riparian communities, wetlands, and wet-meadows areas. Objectives 107, 108, 215a, 215b, 215c, and 215d (all alternatives) are all designed to restore and enhance historic wet areas including wetlands, wet meadows, and riparian communities. Objective 105, Standards 1306 and 1505, and Guidelines 1303 and 9108 (all alternatives) help protect these areas and maintain their health and diversity from a host of various management and recreational activities. Standard 1116 (all alternatives) conserve moist soil conditions. Guideline 3104 (Alternative 1) conserves moist soil habitat around springs or seeps when developed as water facilities. This guideline becomes a standard in Alternatives 2, 3, 4, and 6. Standards 1306 and 1505 and Guidelines 1303 and 9108 (all alternatives) will likely maintain the integrity of existing riparian areas from activities such as timber management, mining, roads, livestock grazing, and traffic.

All alternatives attempt to maintain or enhance tawny crescent habitat by restoring meadows. Alternatives 3 and 6 take a more aggressive approach to providing meadow habitat for tawny crescents. Several standards and guidelines also promote diverse, high quality grassland and shrubland communities. Under Alternatives 1, 2, and 4, Objective 205 restores grassland and meadow communities to 10 percent over 1995 conditions. Alternatives 3 and 6 increase restoration acreages to 2,400 of meadow, which is approximately triple the current conditions.

Additional tawny crescent habitat, namely aspen/birch and oak and other hardwood communities, increases under all alternatives (Objective 201). The effects on the hardwood ecosystem are discussed in Section 3-2.1.3 Hardwood Ecosystems earlier in this chapter and are summarized here. All alternatives are expected to increase hardwoods if objectives are met and standards and guidelines are followed. Alternatives 1 and 2 propose to increase the acreage of existing hardwood communities by 10 percent (Objective 201). Alternative 4 proposes to increase hardwood by 20 percent (Objective 201). Alternatives 3 and 6 more aggressively approach losses to encroachment by proposing to restore 46,000 acres of aspen (almost doubling the current acreage) (Objective 201). Guidelines 2201, 2202, 2203, 2205, 2206, and 2207 conserve and promote hardwood habitats.

All alternatives provide consistent guidance in considering the effects of prescribed burning activities and insecticide use on grassland communities with regard to butterfly habitat requirements and uses. Although specifically designed for fritillary species, this guidance would undoubtedly help other butterflies as well. Alternatives 3 and 6 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 for adults and minimize the extent to which larval hosts and larval forage might be affected.

Under all alternatives, riparian and meadow habitats for the tawny crescent will be conserved and/or enhanced. There will also likely be an increase in extent of these habitats dependent upon the emphasis of the alternative. Alternatives 3 and 6 would be more beneficial in enhancing tawny crescent habitat than the other alternatives. Conserving or providing more suitable habitat is beneficial to the species, and populations are expected to remain stable or increase relative to the current level.

Due to the above conservation measure, the tawny crescent is likely to persist on the Forest over the next 50 years. The above evaluation is based on the assumption that conservation objectives and protective standards and guideline direction listed above for the various alternatives will be applied or implemented as written.

Cumulative Effects

Cumulative effects result from the incremental impact (direct and indirect effects) associated with the alternatives when added to past, present and reasonably foreseeable actions. Past activities on NFS lands in the Black Hills are accounted for in the existing condition displayed under direct and indirect effects. 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 tawny crescent populations. It is assumed that federal and state lands offer suitable habitat for crescents; however, information on location, abundance, and distribution are unavailable.

Additionally, privately owned lands within the Forest boundary likely provide suitable habitat, but 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 in vegetative structure and diversity on private lands. Potential tawny crescent habitat is assumed to occur on private lands across the Black Hills; however, the extent of the habitat and how long it would persist is uncertain.

Under all alternatives, riparian and meadow habitats for the tawny crescent will be conserved and/or enhanced. Alternatives 3 would be more beneficial in enhancing tawny crescent habitat, followed by Alternative 6, because of efforts to restore riparian, hardwood, and meadow habitat. Alternatives 1, 2, and 4 restore these habitats to a lesser extent.

3-3.3.4. Species Of Local Concern – Birds

3-3.3.4.1. American Dipper *(Cinclus mexicanus)*

Affected Environment

Anderson (2002) assesses the conservation status of the American dipper on the Black Hills. This species occurs from Alaska south along the Pacific Coast to Panama and inland mountain ranges of the west, including scattered populations in southeast Oregon, Nevada, Utah, and Arizona, western and southern New Mexico, and in the Black Hills of South Dakota (Kingery 1996). The Black Hills population is at the eastern edge of its global distribution (Panjabi 2001). The dipper is not considered migratory, but movements within or between drainages are common to find near open, moving water during the freeze-up months of winter (Anderson 2002). There are no stream migration corridors to dipper populations to the west of the Black Hills (Backlund 2001).

In the Black Hills, the species occurs in Spearfish Creek and several of its tributaries. It has also been found at Rapid Creek and some of the streams between Rapid Creek and Spearfish Creek. However, Spearfish Creek is considered to be the only creek left in the Black Hills capable of supporting a self-sustaining population of dippers (Backlund 2001). Annual monitoring along Spearfish Creek began in 1993. Surveys conducted in 2003 indicate that there are less than 100 dippers in the Black Hills (Backlund 2003). Spearfish Creek occurs in MA 4.2A - Spearfish Canyon, which is primarily managed for scenic values.

The dipper inhabits clear, fast-flowing streams. It feeds primarily on aquatic insects and insect larvae that it catches by diving underwater. Dippers nest within 25 feet of a stream (Anderson 2002) on rocky streamside ledges and cliffs, boulders, behind waterfalls, and under bridges.

During winter, dippers move to areas of open water (Anderson 2002) and may move to lower elevations. The availability of food in open water is likely important during winter.

The primary risk factor appears to be the degradation of water quality due to sedimentation and other pollutants that affect prey availability (Anderson 2002, Biodiversity Conservation Alliance et al. 2003). Flow reductions, especially in the winter; likely pose a risk as well. Limiting factors are thought to be adequate summer foraging habitat, suitable winter habitat, stream connectivity, and availability of nest sites.

Direct And Indirect Effects

Management activities are not expected to have direct effects to this species given the lack of in-water activities that occur near dipper nests or that affect adult birds. Many different types of management actions can indirectly affect dippers. For example, livestock grazing, timber harvest, and mining activities that result in an increase in siltation to a stream and consequently reduce aquatic insect productivity would likely decrease dipper abundance. Wildfire can immediately affect aquatic insect populations by altering water chemistry and increasing water temperatures (due to canopy removal). Wildfire can also affect streams over the mid- to long-term by increasing siltation that can degrade habitat (e.g., fill in spaces between cobbles) for aquatic insects and affect water quality parameters such as temperature and dissolved oxygen. The analysis of effects to this species' habitat is further discussed in Section 3-2.3 *Riparian and Wetlands Ecosystem* and Section 3-2.4 *Aquatic Ecosystem*.

MA direction in Spearfish Canyon prohibits livestock grazing, off-road motorized vehicle use, except for administrative purposes, and allows for minimal timber harvesting while limiting mineral development to valid and existing rights only. All alternatives, standards, and guidelines for MA 4.2A provide for

American dippers and their habitat found along Spearfish Creek. The Spearfish Canyon Scenic Byway (Highway 14a) is a 20-mile drive along Spearfish Creek. This road receives very high recreational use throughout the year but especially during the summer and fall. This road has an all-weather surface avoiding road-related sediment input into Spearfish Creek. Landownership adjustments undertaken related to Guidelines 8101and 8102 have benefited the American dipper in Spearfish Canyon. Since 2002, 635 acres have been conveyed from private ownership into NFS lands reducing the likelihood of development along Spearfish Creek.

Management actions in other portions of the Forest, however, may affect potentially suitable habitat for the dipper. The greater the amount of ground disturbance, the greater the potential for impacts to aquatic habitat and the dipper if these activities occur in watersheds containing the dipper and if these disturbances are connected by surface runoff to the stream network. Alternatives 1, 3, and 6 are expected to treat the highest annual level of acreage for commercial timber harvest followed by Alternative 4 and 2 respectively. Treatment acres of small diameter fuels also vary between alternatives. 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.

Implementation of standards and guidelines, watershed conservation practices, and State BMPs mitigate these impacts at the project level. These features mitigate impacts to nesting sites, foraging habitat and winter habitat by conserving soil, aquatic, and riparian systems. The WCP Handbook contains proven watershed conservation practices to protect soil, aquatic, and riparian systems. They are incorporated verbatim into the Forest Plan as standards. The State BMPs carry the same weight as guidelines. Proper implementation of the WCP Handbook practices meets or exceeds State BMPs.

The Forest completed an assessment of standards, guidelines, and BMPs to mitigate impacts of forest-management activities (USDA Forest Service 2003e). The evaluation compared the effectiveness of BMPs to specific elements/functions, (i.e., buffer zones, erosion and sediment, flow regime, ground cover, and water quality) relevant to the Black Hills and provided key literature citations to support the effectiveness determination. In summary, the implementation of BMPs and standards and guidelines on the Forest will be as effective or more effective at preventing erosion, sediment delivery, and flow regime changes as those studied in the literature because of the less erodible soil types, the seasonal rainfall pattern, and the gentler topography existing here.

Stream connectivity is an important aspect of stream networks because it allows for the transport of sediment through the system and the passage of fish and other aquatic organisms to maintain their distribution. Existing barriers, such as dams, culverts, in-stream habitat structures that may impede the passage of aquatic organisms will persist on NFS and non-NFS lands. Natural factors, such as drought, will continue to fragment habitat on a variable basis and the underlying geology disrupts stream connectivity at the “loss zone” within or surrounding the Forest. None of the alternatives would further fragment stream habitat above existing conditions because Standard 1203 requires that all stream crossings and in-stream structures be designed and constructed to provide for the passage of flow and sediment and to allow free movement of resident aquatic life. All alternatives have the potential to improve stream connectivity by removing existing in-stream barriers as part of general road system improvements or as connected actions to vegetation management treatments. The level of road construction, reconstruction, and road and two-track obliteration (Objective 309) is the same for all alternatives. Management emphasis to create conditions favorable for beaver may result in additional beaver dams.

Backlund (2001) indicates that a major fire in the upper Spearfish Creek watershed could be devastating to dippers due to the temporary increase in sediment. This is likely true for other watersheds where dippers occur. Activities in these areas that reduce the risk of stand-replacing fires will likely reduce the risks to dippers and increase the likelihood they will persist over time. The effects to fire-hazard ratings are discussed in Section 3-7.1 Fire. Alternative 6 yields the highest percentage of the Forest in a low-medium fire-hazard rating. This reduces the probability of large catastrophic wildfires and the potential for large post-fire sediment loads into aquatic ecosystems. 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. 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 makes for easier control or containment should a fire occur. The benefits to the dipper would be contingent on fire-hazard reduction occurring in watersheds currently or historically occupied by the species. Adherence to Forest-wide standards and guidelines (1201, 1209, 1212, and 1306) for fire-hazard reduction activities would minimize sedimentation and other impacts to streams and dipper habitat while reducing long-term risks from wildfires.

If a fire occurs, Objectives 11-01 and 11-02 would target achievement of non-emergency watershed condition as soon as possible after a fire event and achieve a fuel-loading mosaic within 3 to 5 years and to reassess the mosaic as conditions change over time. A variety of techniques are available to achieve these objectives and mitigate impact from fires if they occur.

Alternatives 3, 4, and 6 propose candidate RNAs for designation (see Section 3-6.2 Research Natural Areas for more detail on RNAs). The Canyon City candidate RNA occurs along Rapid Creek, which historically contained dippers. Alternatives 3, 4, and 6 include the Canyon City candidate RNA for potential RNA designation. Designation of a site as an RNA restricts land use practices of the land in that area. Therefore, Alternatives 3, 4, and 6 would potentially conserve some of the American dipper habitat along Rapid Creek.

When compared to the other alternatives, Alternative 3 would restore 500 additional acres of riparian habitat on the Forest. In addition, Alternatives 3 and 6 would rehabilitate two additional stream reaches (Objective 215) over the other alternatives and therefore would potentially be more beneficial to the dipper relative to other alternatives.

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. 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.

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.

This species is likely to persist over the next 50 years under all alternatives because aquatic habitat conditions are maintained or enhanced through specific MA protection in Spearfish Canyon and the implementation of standards and guidelines, watershed conservation practices, and State BMPs. Alternative 3 would likely have the highest probability for maintaining or increasing current populations because of the increased amount of stream rehabilitation; moderate levels of timber-harvest and fire-hazard management actions; and candidate RNA designation along Rapid Creek. Alternative 6 followed by Alternative 3, also has the most potential for reducing the risk of stand-replacing fires in the headwaters of streams containing dippers, thus reducing the risk to dippers from the resulting sedimentation.

The above evaluation 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. Watershed conservation practices and State BMPs will be followed in all alternatives.

Cumulative Effects

Cumulative effects result from the incremental impact (direct and indirect effects) associated with the alternatives when added to past, present and reasonably foreseeable actions. Past activities on NFS lands in the Black Hills are accounted for in the existing condition displayed under direct and indirect effects. Other Federal and non-Federal activities are discussed here.

American dippers can be impacted by natural and anthropogenic factors. Flooding and winter starvation are among the top natural causes of dipper mortality (Anderson 2002). Dipper populations on the Forest have declined since they were first reported. Dams and water diversions have altered pre-European settlement conditions on many of the perennial streams in the Black Hills. Dams such as Pactola trap sediment and moderate spikes in flow to meet human water demands. These changes would seem to favor dippers on Rapid Creek, but that is not reflected in the current population. Water release rates may affect winter habitat availability. Urban development continues to increase in the Black Hills. Much of this private development occurs along riparian and stream courses. Increased sedimentation from cattle grazing and road building and pollution from mines also creates problems along French Creek and Rapid Creek as well as several other creeks that offer potential dipper habitat (Backlund 2001). Recreational activity continues to increase on the Forest. Spearfish Canyon is a popular destination. Anderson (2002) reports dippers are not unduly disturbed by human activity, though there were factors that complicated the results in the study reported.

Management actions under the Phase II Amendment alternatives are not expected to contribute to a substantial cumulative adverse impact to dippers or their habitat. In fact, Alternatives 3 and 6 may have a slight beneficial effect on this species over the next 50 years due to riparian-habitat restoration if it occurs in watersheds suitable to the dipper. Efforts to reduce the potential for catastrophic wildfire in the headwaters of Spearfish Canyon are likely to have a positive effect. These effects would contribute to maintaining the habitat and population of dippers along with other habitat-enhancement projects such as nest box placement by South Dakota Game, Fish and Parks (SDGFP) and private landowners and reduced water diversions from Spearfish Creek related to gold mining, In March 2003, Biodiversity Conservation Alliance et al. (2003) petitioned the USFWS to list the American dipper under the Endangered Species Act. The USFWS determined the dipper was not in imminent danger of extinction, but a petition finding is still pending. In response to the petition, the Forest began assessing effects to this species in project-level decisions. Determinations to date have confirmed that Forest Plan direction adequately protects the dipper and its habitat.

Alternative 3 would likely have the highest probability for maintaining or increasing current populations because of the increased amount of stream rehabilitation; moderate levels of timber-harvest and fire-hazard management actions; and candidate RNA designation along Rapid Creek. Alternative 6 followed by Alternative 3, also has the most potential for reducing the risk of stand-replacing fires in the headwaters of streams containing dippers, thus reducing the risk to dippers from the resulting sedimentation. Alternatives 1and 2 allow for reducing the risk of stand-replacing fires, including in the headwaters of streams containing dippers, but this is not emphasized in these alternatives through stated objectives. Alternative 4 has the least potential for reducing the risk of stand-replacing fires in watersheds with dippers.

3-3.3.4.2. Black-And-White Warbler *(Mniotilta varia)*

Affected Environment

The black-and-white warbler breeds in mature deciduous forests of the eastern United States and throughout Canada. Overall its populations are stable throughout North America (Sauer et al. 2003). Habitat fragmentation is probably the main threat to this species. The Black Hills is at the edge of the black-and-white warbler's distribution in the United States.

It is a rare breeder in the Black Hills, with breeding records confirmed in South Dakota but not in Wyoming (SDOU 1991, Luce et al. 1999). Panjabi (2001, 2003, 2004) detected only a few individuals during surveys in 2001, 2002, and 2003 though not all habitat types were sampled in 2003. There are no population trends available from breeding bird survey routes in the Black Hills or in South Dakota or Wyoming (Sauer et al. 2003). During the breeding season, black-and-white warblers are found in mature and second growth deciduous and mixed deciduous-coniferous forests (Kricher 1995).

A forest-interior specialist, this species tends to prefer moist, swampy forests. Mature aspen stands are also used. Quality habitat has a high canopy closure and a dense understory of shrubs and small trees. Nests are placed on or near the ground and are well concealed at the base of a stump, log, or rock (Kricher 1995 p. 10). The species is found in a variety of habitats during migration, including forests and woodlands, but especially riparian areas (Kricher 1995 p. 5). The black-and-white warbler is probably more commonly encountered during migration in the Black Hills (SDOU 1991). This species is unique among warblers in its foraging strategy. It creeps along tree trunks and branches, feeding largely on caterpillars.

Direct And Indirect Effects

The black-and-white warbler uses mature aspen stands and forested riparian areas in the Black Hills. Riparian types of bur oak may also be used. Therefore, management actions that benefit hardwoods and riparian areas would likely benefit black-and-white warblers.

Hardwoods are not typically found in large stands on the Forest. Therefore, management activities in adjacent pine stands could reduce the suitability of hardwood stands for black-and-white warbler use. For example, harvest in adjacent pine could reduce the effective area of an aspen stand and increase edge effects and habitat fragmentation..

Effects to aspen and other hardwoods are discussed in Section 3-2.1.3 Hardwood Ecosystems. Hardwood systems are expected to increase in all alternatives. Alternatives 3 and 6 take a more aggressive approach to enhancing hardwoods 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. If the standards and guidelines are followed, existing aspen stands will likely be adequately conserved until restored areas grow into new habitat.

Riparian-restoration objectives may improve habitat for the black-and-white warbler. Effects to riparian systems are discussed in Section 3-2.3 Riparian and Wetland Ecosystems. Riparian and wetland habitat is expected to be maintained or enhanced in all alternatives. Efforts to restore beaver would have an additive benefit to riparian and wetland ecosystems. Alternative 3 proposes the most riparian-shrub restoration. Alternatives 3 and 6 propose the most stream reaches for riparian rehabilitation. Accomplishment of these objectives would improve the amount and quality of riparian and wetland habitat on the Forest.

Implementation of Forest-wide goals, objectives, standards, and guidelines will conserve and restore hardwood and riparian habitats in the Black Hills, providing potential habitat for the black-and-white warbler. This species is likely to persist on the Forest over the next 50 years because habitats will continue to be available at or above the current level. The above evaluation is based on the assumption that conservation objectives and protective standards and guideline direction for the various alternatives will be applied or implemented as written.

Cumulative Effects

Cumulative effects result from the incremental impact (direct and indirect effects) associated with the alternatives when added to past, present and reasonably foreseeable actions. Past activities on NFS lands in the Black Hills are accounted for in the existing condition displayed under direct and indirect effects. 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 black-and-white warbler populations. It is assumed that federal and state lands offer suitable habitats for black-and-white warblers.

Privately owned lands within and adjacent to the Forest boundary may also provide suitable breeding and migration stopover habitat for the black-and-white warbler. Resource management and conservation by companies and private citizens 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 black-and-white warbler habitat on private lands would occur across the Black Hills; however, the extent and persistence of such habitats is uncertain.

Implementation of Forest-wide goals, objectives, standards, and guidelines will conserve and restore hardwood and riparian habitats in the Black Hills, providing potential habitat for the black-and-white warbler. Alternative 3 proposes the most riparian-shrub restoration. Alternatives 3 and 6 propose the most stream reaches for riparian rehabilitation. Accomplishment of these objectives would improve the amount and quality of riparian and wetland habitat on the Forest and possibly offset some effects off the Forest. Alternatives 1, 2, and 4 propose the least amount of stream and riparian shrub restoration.

3-3.3.4.3. Broad-winged Hawk *(Buteo platypterus)*

Affected Environment

The broad-winged hawk breeds from Nova Scotia to central Alberta, south to Texas, and east to the Atlantic coast (Johnsgard 1990). These hawks are complete migrants, best known for their migratory congregations of thousands of individuals as they head south into Central and South America (Johnsgard 1990, Stephens and Anderson 2003).

The broad-winged hawk is one of eastern North America's most common woodland hawks. It is generally associated with dry to wet deciduous, mixed, or occasionally coniferous forests (Johnsgard 1990). Meadows, woodland openings, wet areas, and edges are important habitats and hunting grounds (Keran 1978,; Rosenfeld 1984). The broad-winged hawk is an opportunistic hunter, feeding on a wide variety of prey, including amphibians, reptiles, insects, birds, and small mammals (Johnsgard 1990, Stephens and Anderson 2003). Broad-winged hawks forage in mature to old-growth forests, along forest streams, roads, and openings (Stephens and Anderson 2003).

In the Black Hills, the broad-winged hawk nests primarily in ponderosa pine in mixed pine and deciduous habitats, occasionally with a white-spruce component (Powder River Eagle Studies 2000). Although considered rare in both Wyoming (Luce et al. 1999) and South Dakota (Peterson 1995), the species was the second most frequently encountered raptor during surveys in 1996 and 1997 (Powder River Eagle Studies 2000). Of 27 broad-winged hawk nests found on the Forest, 25 were in ponderosa pine while one was in an aspen and one was in a paper birch. Nest trees had an average dbh of about 16 inches; canopy closure in nest stands averaged 66 percent with a range of from 45 to 96 percent (Stephens and Anderson 2003). These nest-stand characteristics equate to structural stages 4B, 4C, and 5. Nest sites typically were in areas with slopes less than 10 percent. No association between nest sites and forest openings or wetlands was detected on the Forest (Stephens and Anderson 2003).

Habitat alteration or loss is the single most imminent threat because it decreases the availability of nest sites (Stephens and Anderson 2003).

Direct And Indirect Effects

As described by Stephens and Anderson (2003), broad-winged hawks nesting on the Forest do not appear to prefer sites near forest openings. There is also no clear association between this species and wetlands or deciduous trees such as aspen. Thus, the available information suggests that any impact of management on the status of the species would relate primarily to changes in the relative representation of ponderosa pine structural stages.

The effects to ponderosa pine are discussed in Section 3-2.1.1 Ponderosa Pine Ecosystem and are summarized here related to Broad-winged hawks. In ponderosa pine, structural stages 4B, 4C, and 5 correspond most closely to the nesting habitat preferences of the broad-winged hawk. The amount is expected to be similar to existing conditions for Alternative 3 and decrease in Alternative 6. Alternatives 1 and 2 do not have an objective for structural stages 4B and 4C and Alternative 4 does not have an objective for structural stage 4B. The amount of these structural stages that would be available on the landscape in the future is less certain. Certainly, there would be some of each of structural stage present, but how much is unclear.

Numerous objectives, standards, and guidelines maintain foraging habitat and prey availability. Objectives 201 through 205 promote vegetative diversity. Objectives 206 through 209 and Standards and Guidelines 2101 through 2109 promote structural diversity. Objective 212, Guideline 2307, and Standard 2308 target adequate dead woody material that provides habitat for prey species. Objectives 213 through 215 and Guidelines 3210 through 3212 maintain and restore riparian communities. Objective 218 conserves and enhances habitat for resident and migratory non-game wildlife. Standards and Guidelines 2101 through 2109 limit actions in order to achieve structural diversity. See Section 3-2.1 Forested Ecosystems, Section 3-2.2 Grassland/Shrubland Ecosystems and Section 3-2.3 Riparian and Wetlands Ecosystems discussions for additional effects to foraging habitat.

Standards and guidelines protect raptor nests from disturbance during the nesting season. In Alternatives 3 and 4, Standard 3100-01 prohibits selected activities within 0.5 mile of a broad-winged hawk nest from April 15 to August 15. Protective dates and distances in Standards 3100-01 (Alternatives 3 and 4) are based on USDI Fish and Wildlife Service (1999) Guidelines and Wyoming dates for raptor protection. In Alternatives 1, 2, and 6, Guideline 3204 encourages general protection at active raptor nests. Guideline 3204 would become a standard in Alternatives 2 and 6 and directs projects to consider recommendations from other federal and state agencies when designing management near known raptor nests. Currently, the best information on raptor protective dates comes from USDI Fish and Wildlife Service (1999) Guidelines and Wyoming dates for raptor protection. Therefore, the effects in Alternatives 2 and 6 are likely to be similar to Alternatives 3 and 4.

All alternatives contain conservation measures to reduce the risk to raptors from overhead power lines and poles. Guideline 8303 advises that new or reconstructed electrical utility lines (less than 33 kilovolt) be buried when feasible. This guideline is treated as a standard in Alternative 2. Alternatives 1 and 4, Guideline 8308 is designed to encourage the replacement or reconfiguration during normal replacement schedules of existing unsafe power line poles in high probability raptor habitat. This guideline is treated as a standard in Alternative 2. This becomes a standard in Alternatives 3 and 6 and is modified to require the replacement or reconfiguration with raptor-safe designs as soon as possible in areas with identified raptor electrocution problems. Standard 8309, common to all alternatives, require raptor protections for new electric lines and pole construction. The best guidance on raptor-safe practices is contained in the Avian Power Line Interaction Committee’s (1996) *Suggested Practices for Raptor Protection on Power Lines*. No instances have been recorded of broad-winged hawks being electrocuted due to overhead transmission lines on the Forest.

This species is likely to persist on the Forest over the next 50 years because all alternatives provide suitable nesting habitat. Alternatives 3 and 6 would have the least risk to persistence because these alternatives contain structural stage objectives that provide desired amounts of nesting habitat on the Forest. Nest-site protection measures would follow the latest suggested practices under all alternatives. The adaptability of this species to forage in a variety of habitat types for a variety of prey species further insures its persistence.

The above evaluation 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. The best available information on raptor protective dates will be applied when implementing Standard/Guideline 3204. Currently, the best information on raptor protective dates comes from USDI Fish and Wildlife Service (1999) Guidelines and Wyoming dates for raptor protection.
3. When modifying power lines for raptor-safe features (Guideline 8308, Standard 8309), the best available practices will be used. Currently, the most widely accepted practices are contained in the Avian Power Line Interaction Committee’s (1996) *Suggested Practices for Raptor Protection on Power Lines*.

Cumulative Effects

Cumulative effects result from the incremental impact (direct and indirect effects) associated with the alternatives when added to past, present and reasonably foreseeable actions. Past activities on NFS lands in the Black Hills are accounted for in the existing condition displayed under direct and indirect effects. Other Federal and non-Federal activities are discussed here.

Suitable nesting and foraging habitat occurs on non-NFS lands within and adjacent to the Forest. Management in the national and state parks adjacent to the Forest would likely have little negative effect on this species. Because mature conifer stands are common at Mount Rushmore National Memorial and in Custer State Park, potential nest sites would be abundant and would probably supplement the amount of nesting habitat on the Forest. Human activity may limit nesting at Mount Rushmore National Memorial.

Privately owned forest within the Forest boundary also may provide nesting habitat. Resource management 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. Potential nesting habitat is expected to occur on private lands across the Forest. However, the amount and persistence of that nesting habitat remain uncertain.

Alternatives 2, 3, 4, and 6 have the least potential for cumulative effects. In Alternatives 3 and 4, Standard 3100-01 prohibits selected activities within 0.5 mile of a broad-winged hawk nest from April 15 to August 15. Protective dates and distances in Standards 3100-01 (Alternatives 3 and 4) are based on USDI Fish and Wildlife Service (1999) Guidelines and Wyoming dates for raptor protection. In Alternatives 2 and 6, Standard 3204 requires general protection at active raptor nests. Standard 3204 directs projects to consider recommendations from other federal and state agencies when designing management near known raptor nests. Currently, the best information on raptor protective dates comes from USDI Fish and Wildlife Service (1999) Guidelines and Wyoming dates for raptor protection. Therefore, cumulative effects in alternatives 2 and 6 are likely to be similar to Alternatives 3 and 4. Alternative 1 has the most potential cumulative effects because it does not include Standard 3100-01 and because, as a guideline, 3204 may not be followed as closely as in Alternative 2 and 6.

3-3.3.4.4. Cooper's Hawk *(Accipiter cooperii)*

Affected Environment

The Cooper's hawk (*Accipiter striatus*) breeds throughout the conterminous United States, southern Canada, and northern Mexico. The species is considered a partial migrant, with populations in the northern portions of its breeding range considered more migratory than those to the south (Palmer 1988). Some birds may remain on their breeding ranges throughout the winter. In South Dakota, the Cooper's hawk is considered "uncommon," with the only recorded occurrences in the western part of the state (Peterson 1995). In Wyoming, it is regarded as a "common summer resident" (Luce et al. 1999).

The Cooper's hawk has been observed in a variety of habitats in the Black Hills, including ponderosa pine, white-spruce, riparian, shrublands, and burned area (Panjabi 2001, Panjabi 2003, Panjabi 2004, Peterson 1995). The species appears to be widespread but uncommon on the Forest. Bird monitoring over the past 3 years has yielded an average of five sightings per year (Panjabi 2004).

The Cooper's hawk is considered a habitat generalist but typically requires wooded areas for nesting (Stephens and Anderson 2002). The bird is known to nest in riparian, conifer, and aspen forests (Stephens and Anderson 2002, Ehrlich et al. 1988). The most common forest type in the Black Hills, ponderosa pine, is used for nesting in other areas of the species range (Stephens and Anderson 2002).

Stephens and Anderson (2002) analyzed the likely habitat preferences of the Cooper's hawk on the Forest based on information from nearby regions. Range-wide, most pairs nest in patches of mature forest with moderate-to-high (60 to 90 percent) canopy closure near openings (Stephens and Anderson 2002). Nest tree diameters are usually larger than what is randomly available. Data from other portions of the Cooper's hawk range suggest it would nest in smaller trees than those used by goshawks and larger trees than used by sharp-shinned hawks.

Although little is known about the foraging habitat of the Cooper's hawk preferences, it appears that the species uses habitats non-selectively provided forested areas are not too dense for flight (Reynolds 1989). The Cooper's hawk forages opportunistically across a diversity of habitats and preys on a variety of mid-sized birds and mammals (Stephens and Anderson 2002).

In general, the Cooper's hawk is more tolerant of human presence and habitat fragmentation than other North American accipiters (Rosenfeld and Bielefeldt 1993). Overall, however, habitat loss or alteration resulting in a loss of suitable nesting habitat, as well as a decrease in prey abundance and availability, are thought to be the most significant threats to accipiter species' persistence (Reynolds 1983). This assertion is, however, somewhat confounded for Cooper's hawks as they have been recorded nesting in highly fragmented, urban environments (Bielefeldt and Rosenfeld 2000).

Direct And Indirect Effects

The most important habitat type for Cooper's hawks on the Forest is probably ponderosa pine forest based on availability and known use. Specifically, the parameters examined here are the projected acreage of mature ponderosa pine stands with intermediate-to-high canopy closure (for nesting) and the projected amount of edge (for foraging).

In ponderosa pine, structural stages 4B (mature stands with 40- to 70-percent canopy closure) and 4C (mature stands with greater than 70-percent canopy closure) correspond most closely to the nesting habitat preferences of the Cooper's hawk. The projected acreage of these structural stages under each alternative is expected to decline in Alternative 3 and 6. Alternative 3 projects the least decline. Still, these structural stages would exist on over 30 percent of the forested acres. These projections are based on the assumption that structural stage objectives will be achieved in these alternatives. Alternatives 1 and 2 do not have an objective for structural stages 4B and 4C, and Alternative 4 does not have an objective for structural stage 4B. The amount of these structural stages that would be available on the landscape in the future is less certain. Certainly, there would be some of each of these structural stages present, but how much is unclear. For more information on structural stages, see Section 3-2.1.1 Ponderosa Pine Ecosystems.

The Cooper's hawk often nests near and hunts along forest edges and clearings. The importance of forest openings suggest that Alternatives 3 and 6, which would maintain open forest conditions (Structural stages 3A and 4A), may benefit Cooper's hawk foraging habitat more than other alternatives.

Meadow restoration activities could also improve habitat for the Cooper's hawk. Objective 205 addresses meadow restoration in all alternatives. Alternatives 3 and 6 would provide the highest amounts of meadow restoration compared to Alternatives 1, 2, and 4 although in any alternative the amount of habitat improved would be relatively minor (e.g., only 2,400 acres in Alternatives 3 and 6).

Riparian-woodland communities also provide potentially important habitat for the Cooper's hawk. Objective 215 would target restoration in three stream reaches in Alternatives 1, 2, and 4 and five reaches in Alternatives 3 and 6. While there are no assurances these efforts would occur in locations with potential to benefit the Cooper's hawk, the potential is there. Restoration of riparian-shrub habitat (Objective 214 and Alternatives 1, 3, and 6) may also provide additional foraging habitat; in Alternatives 1, 2, 4, and 6, 500 acres would be restored, and in Alternative 3, 1,000 acres would be affected. As with meadow enhancements, the amount of habitat improved would be relatively small regardless of which alternative would be implemented.

If Cooper's hawk nests were found on the Forest, Standard 3100-01 and/or Guideline 3204 would be enacted depending on alternative. Standard 3100-01 (Alternatives 3 and 4) would prohibit many activities from occurring within 0.5 mile of any active Cooper's hawk nest from April 1 through August 15. Protective dates and distances in Standards 3100-01 (Alternatives 3 and 4) are based on USDI Fish and Wildlife Service (1999) Guidelines and Wyoming dates for raptor protection. In Alternatives 1, 2 and 6, Guideline 3204 encourages general protection at active raptor nests. Guideline 3204 would become a standard in Alternatives 2 and 6 and directs projects to consider recommendations from other federal and state agencies when designing management near known raptor nests. Currently, the best information on raptor protective dates comes from USDI Fish and Wildlife Service (1999) Guidelines and Wyoming dates for raptor protection. Therefore, the effects in alternatives 2 and 6 are likely to be similar to Alternatives 3 and 4.

Raptor electrocution is addressed as a guideline in Alternatives 1, 2, and 4 (Guideline 8308) but is strengthened and made a standard in Alternatives 3 and 6 (Standard 8308). Under Guideline 8308, power lines with unsafe configurations should be replaced with raptor-safe designs only in certain areas that are thought to be "high probability raptor habitat," and only during normal replacement schedules. In Standard 8308 (Alternatives 3 and 6), the wording is changed to indicate that any power lines with unsafe design for raptors should be replaced during normal schedules, but if any raptors are electrocuted before scheduled replacement, lines must be replaced as soon as possible. Standard 8309 specifies that any new power lines must be constructed to raptor-safe specifications; the standard would be kept in place under all alternatives. The best guidance on raptor-safe practices is contained in the Avian Power Line Interaction Committee's (1996) *Suggested Practices for Raptor Protection on Power Lines*.

In summary, nesting habitat is probably the most important factor for long-term persistence of the Cooper's hawk. Potential nesting habitat may decrease in all alternatives, with the least decrease predicted in Alternative 3. Still, nesting habitat will likely be available on the Forest, with Alternatives 3 and 6 providing the best likelihood through the structural stage objectives. Nest-site protection measures would follow the latest suggested practices under all alternatives. The apparent adaptability of the species to a diversity of wooded habitats, together with the fact that the Cooper's hawk is a relatively common bird of prey through much of its range, suggests that the species likely would persist on the Forest over the next 50 years under all alternatives.

The above evaluation 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. The best available information on raptor protective dates will be applied when implementing Standard/Guideline 3204. Currently, the best information on raptor protective dates comes from USDI Fish and Wildlife Service (1999) Guidelines and Wyoming dates for raptor protection.

3. When modifying power lines for raptor-safe features (Guideline 8308, Standard 8309), the best available practices will be used. Currently, the most widely accepted practices are contained in the Avian Power Line Interaction Committee's (1996) *Suggested Practices for Raptor Protection on Power Lines*.

Cumulative Effects

Cumulative effects result from the incremental impact (direct and indirect effects) associated with the alternatives when added to past, present and reasonably foreseeable actions. Past activities on NFS lands in the Black Hills are accounted for in the existing condition displayed under direct and indirect effects. Other Federal and non-Federal activities are discussed here.

Management in the national and state parks adjacent to the Forest would have little effect on Cooper's hawks. Because conifers across all age categories are common in Mount Rushmore National Memorial and Custer State Park, potential nest sites would be abundant and would probably supplement the amount of nesting habitat on the Forest. Human activity may limit nesting at Mount Rushmore National Memorial although Cooper's hawks have been known to nest in proximity to human activities (Mannan 2001)

Privately owned forestlands within the Forest boundary also provide nesting habitat. Resource management by companies and private citizens depends on a number of factors (e.g., desired goals, market prices, development potential, etc.) making it difficult to predict future trends. As a general rule, potential nesting habitat on private lands would persist over the next 50 years across the Black Hills. However, the amount and persistence of nesting habitat remain uncertain.

Cumulative effects to nest sites are expected to be similar under all alternatives because nest-site protection measures would follow the latest suggested practices under all alternatives. Potential nesting habitat may decrease in all alternatives, with the least decrease predicted in Alternative 3. Still, nesting habitat will likely be available on the Forest, with Alternatives 3 and 6 providing the best likelihood through the structural stage objectives. Alternatives 1 and 2 do not have an objective for structural stages 4B and 4C and Alternative 4 does not have an objective for structural stage 4B. The amount of these structural stages that would be available on the landscape in the future is less certain. Certainly, there would be some of each of these structural stages present, but how much is unclear.

3-3.3.4.5. Northern Saw-Whet Owl *(Aegolius acadicus)*

Affected Environment

Saw-whet owls occur from the southern boundary of Alaska, across most of Canada and into the northern tier of states from Maine to Minnesota (Johnson and Anderson 2003). The Rocky Mountains, the Cascade Range, Coastal Range, and the Sierra Nevada Mountains all support year-round populations. In the Black Hills, seasonal migration is likely among high- and low-elevation habitat (Johnson and Anderson 2003).

The northern saw-whet owl is a forest habitat generalist found at lower to middle elevations in forested habitat, particularly in riparian areas. The highest densities of this species tend to be found in coniferous forests (Cannings 1993). This species nests in snags in cavities excavated by flickers (*Collaptes auratus*) and other large woodpeckers. Nests tend to be in mature forest, while dense sapling-pole-sized stands are preferred for roosting (Johnson and Anderson 2003). Saw-whet owls also utilize dense riparian woodlands for roosting. Fauna West Wildlife Consultants (2003) noted that this species appears to be associated with a variety of habitats but was unable to draw conclusions about habitat use.

This species often forages along forest edges, preying on small mammals. Deer mice are an important prey species throughout much of its range; however, northern saw-whet owls are opportunistic hunters taking a variety of small mammals and birds (Cannings 1993).

Cannings (1993) estimates overall population numbers of northern saw-whet owls at 100,000 to 300,000 individuals. In South Dakota, the northern saw-whet owl is considered an uncommon resident (SDOU 1991). No local density estimates are available for the Black Hills (Johnson and Anderson 2003). The saw-whet owl was determined to be widely distributed and common in the Black Hills (Fauna West Wildlife Consultants 2003).

The northern saw-whet owl is tracked by the South Dakota Natural Heritage Program as a rare species and is ranked three on a rarity scale of one to five, with one being critically imperiled and five being secure (SDNHP 2002). Wyoming Natural Diversity Database does not track this species. Limits to persistence are most likely tied to the area of mature forests and the availability of nesting cavities within suitable breeding habitats (Johnson and Anderson 2003).

Direct And Indirect Effects

Structural stages 4C and 5 most closely resemble the preferred breeding and nesting habitat for the saw-whet owl. These structural stages contain mature and old growth forest cover respectively with at least 70-percent canopy cover in the 4C stage.

The management approach, here-after referred to as the ‘ecosystem approach’ (see Appendix E-Glossary) in Alternatives 1 and 2 relies on a system of reserves (late successional areas, late successional stands, and non-development MAs) to provide nesting habitat across the Forest (structural stages 4C and 5). Objective 207 is designed to manage at least 5 percent of the forest for late succession. These late successional areas include MA 3.7; smaller scale stands identified in the Resource Information System (RIS) and other MAs that provide late successional conditions such as Wilderness; this is common to all alternatives. Wilderness (1.1A) and late successional (3.7) MAs make up about 3 percent of the Forest.

The ecosystem approach in Alternative 3 is based on a combination of 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 nesting 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 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 late succession.

The ecosystem approach in Alternative 6 is based on a combination of reserve areas and structural stage objectives. Alternative 6 also contains habitat objectives that provide nesting 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 nesting habitat (structural stages 4C and 5).

The effects to ponderosa pine are discussed in Section 3-2.1.1 Ponderosa Pine Ecosystem and are summarized here related to saw-whet owls. In ponderosa pine, structural stages 4C, and 5 correspond most closely to the nesting habitat preferences of the species. The amount is expected to be increase from existing conditions for Alternatives 3 and 4, and decrease in Alternative 6. Alternatives 1 and 2 do not have an objective for structural stages 4C. The amount of this structural stage that would be available on the landscape in the future is less certain. Certainly, there would be some of each of structural stage present in Alternative 1 and 2, but how much is unclear.

Snags are an integral part of nesting habitat. 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. Alternatives 2, 3, 4, and 6 are consistent with current snag inventories and recent snag studies (see Section 3-2.1 Forested Ecosystem). They will likely provide sufficient snags well distributed across the landscape. Alternative 1 manages for snag densities below these recent estimates and snag studies presenting a higher risk of not providing adequate snags. In Alternative 1, the low standard for snag density and the 15-feet minimum height standard and the lack of direction for snags larger than 10-inch diameter poses a higher risk for those species requiring a larger diameter or taller snags at higher densities. Still, this alone is not likely to cause the species to not persist on the Forest. Snags do not occur evenly across the landscape. There will likely be some areas with higher snag densities that will allow the species to persist. They would likely persist at much lower densities. Certainly, managing for these conditions presents an increased risk to snag-dependant species, and a higher level of uncertainty as to whether the species will persist on the Forest. All alternatives retain soft snags unless they are a safety hazard. Alternatives 3 and 6 retain all snags over 20 inches dbh unless they are a safety hazard.

Large trees are also important for this species because they provide future large snags. 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. Alternative 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 to manage 10 percent of the structural stage 4 ponderosa pine acreage in the management area with a tree size of very large (16 inches diameter or greater). Alternatives 2, 3, 4, and 6 will likely provide sufficient large trees well distributed across the Forest.

To help reduce disturbances to nesting and wintering raptors, Standard 3100-01 that prohibits specific activities within the minimum distances of active raptor nests and winter roost areas would be implemented under Alternatives 3 and 4. Protective dates and distances in Standards 3100-01 (Alternatives 3 and 4) are based on USDI Fish and Wildlife Service (1999) Guidelines and Wyoming dates for raptor protection. In Alternatives 1, 2, and 6, Guideline 3204 encourages general protection at active raptor nests. Guideline 3204 would become a standard in Alternatives 2 and 6 and directs projects to consider recommendations from other federal and state agencies when designing management near known raptor nests. Currently, the best information on raptor protective dates comes from USDI Fish and Wildlife Service (1999) Guidelines and Wyoming dates for raptor protection. Therefore, the effects in Alternatives 2 and 6 are likely to be similar to Alternatives 3 and 4.

Guidelines 1102a and 1102b mitigate timber-harvest effects by providing for increased slash quantities as potential prey habitats and refuges under all alternatives. Standard 3117 provides additional mitigation by requiring 1 pile of woody material per 2 acres in vegetation treatment units. In Alternatives 2 and 4, this would only in areas adjacent to spruce sites.

Due to Forest-wide objectives, standards, and guidelines designed to conserve and enhance suitable habitat, the saw-whet owl is likely to persist on the Forest over the next 50 years. Nesting habitat would increase from current conditions under Alternatives 3 and 4, and decrease in Alternative 6. However, Alternatives 3 and 6 offer more rigorous direction to manage for large trees across the landscape. Alternatives 2, 3, 4, and 6 provide direction to manage known nests (Standards 3100-01 and 3204). 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, lacks clear direction on managing known nests, and lacks direction for providing large trees, thus presenting a higher risk to this species.

The above evaluation 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. The best available information on raptor protective dates will be applied when implementing Standard/Guideline 3204. Currently, the best information on raptor protective dates comes from USDI Fish and Wildlife Service (1999) Guidelines and Wyoming dates for raptor protection.

Cumulative Effects

Cumulative effects result from the incremental impact (direct and indirect effects) associated with the alternatives when added to past, present and reasonably foreseeable actions. Past activities on NFS lands in the Black Hills are accounted for in the existing condition displayed under direct and indirect effects. Other Federal and non-Federal activities are discussed here.

Saw-whet owls could potentially use preferred nesting and foraging habitat in Custer State Park. Foreseeable actions 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 this species 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 hazard, which could reduce habitat if late successional pine and spruce stands are treated. It is assumed that urban development will continue on private lands, which will likely increase the importance of habitat located on NFS land over the next 50 years. These activities may reduce suitable habitat, which could lead to some reduction in saw-whet owl 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 treatment in saw-whet owl habitat and how effects would be expected to change.

Cumulative effects to nesting habitat are expected to be lowest for Alternatives 3 and 4 because nesting habitat on the Forest would increase from current conditions under Alternatives 3 and 4. Nesting habitat is expected to decrease in Alternative 6. However, Alternatives 3 and 6 offer more rigorous direction to manage for large trees across the landscape. Alternatives 2, 3, 4, and 6 provide direction to manage known nests (Standards 3100-01 and 3204). Alternatives 2, 3, 4, and 6 are consistent with current snag inventories and recent snag studies (see the Forested Ecosystem section). Alternative 1 manages for snag densities below these recent estimates, lacks clear direction on managing known nests, and lacks direction for providing large trees, thus presenting a higher risk to this species.

3-3.3.4.6. Pygmy Nuthatch *(Sitta pygmaea)*

Affected Environment

A thorough overview of the pygmy nuthatch's natural history and distribution is provided in the Revised Forest Plan Biological Evaluation (BE) (USDA Forest Service 1996a Appendix H p. 41-42) and the Phase I Amendment Environmental Assessment (EA) (USDA Forest Service 2001c Appendix G p. 21-22).

The pygmy nuthatch subspecies of the Black Hills (*Sitta pygmaea melanotis*) is found from southern interior British Columbia and south throughout the forests of the Rocky Mountain West into Mexico and western Texas (De Graaf et al. 1991). It is considered an uncommon resident in both Wyoming (Luce et al. 1999) and South Dakota (Peterson 1995). There are no reliable estimates of pygmy nuthatch abundance for the Black Hills (Ghalambor 2003).

The pygmy nuthatch (*Sitta pygmaea*) is a primary cavity nester that also uses secondary cavities (Ghalambor 2003 p. 13; Kingery and Ghalambor 2001 p. 17) found in mature yellow-pine communities throughout the West (Ghalambor 2003). It feeds on trunks, branches, outermost twigs and cones, primarily gleaning insects during the breeding season and conifer seeds during the non-breeding season (Ghalambor 2003).

Pygmy nuthatches prefer old or mature undisturbed forests, but are also known to use open, park-like stands of ponderosa pine (Kingery and Ghalambor 2001). This presents a challenge in the Black Hills where ponderosa pines typically grow very densely in the absence of disturbance (see Section 3-7.41 Fire and Section 3-2.1 Forested Ecosystems). Roosting habitat for the pygmy nuthatch varies seasonally. Foraging habitat is primarily in pine stands with high canopy closure (Ghalambor 2003 p. 32). Pygmy nuthatches likely need heterogeneous forests with a mixture of well-spaced old trees and trees of intermediate age (Kingery and Ghalambor 2001).

The preference for undisturbed forests may relate to the availability of large snags. The nuthatch is a weak cavity excavator, requiring soft, large snags for nesting and communal winter roost sites (USDA Forest Service 1996a Appendix H p. 40). Dead or decaying coniferous trees and snags provide substrate for nest cavities. Nesting habitat generally includes trees that average 15 to 27 inches in diameter (Ghalambor 2003 p. 13; Kingery and Ghalambor 2001 p. 12). Suggested practices include managing for at least three to five snags (19 inches in diameter) per acre (Kingery and Ghalambor 2001).

On the Black Hills, as elsewhere, identified limiting factors are thought to be the availability of snags for nesting sites and winter roosting habitat and the availability of productive foraging habitat (Ghalambor 2003). Estimates of local abundance are unavailable due to the scarcity of this species and its unpredictable distribution (Panjabi 2003).

Direct And Indirect Effects

Structural stages 4C and 5 most closely resemble one component of preferred habitat (old or mature undisturbed forest). Structural stage 4A most closely resembles open, park-like, mature forest conditions.

The ecosystem approach in Alternatives 1 and 2 relies on a system of reserves (late successional areas, late successional stands, and non-development MAs) to provide habitat across the Forest (structural stages 4C and 5). Objective 207 is designed to manage at least 5 percent of the forest for late succession. 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; MA 3.7 is common to all alternatives. Wilderness (1.1A) and late successional (3.7) MAs make up about 3 percent of the Forest. Alternatives 1 and 2 do not include direction for managing for open, mature forest conditions.

The ecosystem approach in Alternative 3 is based on a combination of reserve areas and structural stage objectives to provide old or mature, undisturbed forest conditions. 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 these conditions 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 old or mature habitat (structural stages 4C and 5). The structural stage objectives also manage for 20 to 30 percent (depending on the management area) of the ponderosa pine acres in open, park-like, mature forest (structural stage 4A). 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 old or mature, undisturbed forest conditions. Alternative 4 does not include direction for managing for open, mature forest conditions.

The ecosystem approach in Alternative 6 is based on a combination of reserve areas and structural stage objectives to provide old or mature, undisturbed forest conditions. Alternative 6 also contains habitat objectives that provide these conditions 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 old or mature habitat (structural stages 4C and 5). The structural stage objectives also manage for 25 percent (depending on the management area) of the ponderosa pine acres in open, park-like, mature forest (structural stage 4A).The effects to ponderosa pine are discussed in Section 3-2.1.1 Ponderosa Pine Ecosystem and are summarized here related to pygmy nuthatches. The amount of old or mature, undisturbed forest (structural stages 4C and 5) is expected to be increase from existing conditions for Alternatives 3 and 4, and decrease in Alternative 6. Still, Alternative 6 is expected to maintain about 120,000 acres of this type of habitat on the Forest. Alternatives 1 and 2 do not have an objective for structural stages 4C. The amount of this structural stage that would be available on the landscape in the future is less certain. Certainly, there would be some of each of structural stage present in Alternative 1 and 2, but how much is unclear.

Open, park-like forest conditions (Structural Stage 4A) are expected to decline by about 15 percent in Alternatives 3 and 6. Still, there would remain about 250,000 acres of this habitat type on the Forest. Alternatives 1, 2, and 4 do not include objectives for managing this structural stage, so the amount of this structural stage that would be available on the landscape in the future is less certain. Certainly, there would be some of each of structural stage present in Alternative 1, 2, and 4, but how much is unclear. The above discussion assumes that structural stage and late successional objectives are met for each alternative. Structural stage 5 may also occur in open, park-like conditions and is discussed in the previous paragraph.

Structural stage objectives in alternatives 3 and 6 are designed to manage for the various structural stages across the landscape in a diversity of sizes and shapes. These alternatives are most likely to result in heterogeneous forests with a mixture of well-spaced old trees and trees of intermediate age (Kingery and Ghalambor 2001). In doing so, these alternatives are less likely to result in adverse effects from fragmentation. Structural stages will likely be distributed such that interactions among the nuthatch population will continue to occur.

Snags that are greater than 15 inches in diameter are an integral part of pygmy nuthatch nesting and roosting habitat. 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, 25 percent of which must be greater than 20 inches in diameter (Standard 2301). 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. All alternatives retain soft snags unless they are a safety hazard. Alternatives 3 and 6 retain all snags over 20 inches dbh unless they are a safety hazard.

Alternatives 2, 3, 4, and 6 are consistent with current snag inventories and recent snag studies (see Section 3-2.1.1 Ponderosa Pine Ecosystems). They will likely provide sufficient snags well distributed across the landscape. Alternative 1 manages for snag densities below these recent estimates and snag studies providing more risk to nuthatch persistence. In Alternative 1, the low standard for snag density and the 15-feet minimum height standard and the lack of direction for snags larger than 10 inches in diameter poses a higher risk for those species requiring a larger diameter or taller snags at higher densities. Still, this alone is not likely to cause the species to not persist on the Forest. Snags do not occur evenly across the landscape. There will likely be some areas with higher snag densities that will allow the species to persist. They would likely persist at much lower densities. Certainly, managing for these conditions presents an increased risk to snag-dependant species, and a higher level of uncertainty as to whether the species will persist on the Forest. Alternatives 2 and 4 provide the most rigorous direction for snag management by requiring 25 percent of the snags to be over 20 inches in diameter. However, in practical application 25 percent of the trees that die and become snags may not be over 20 inches in diameter. If this were the case, all snags over 20 inches would be retained. Alternatives 3 and 6 would likely result in similar conditions because all snags over 20 inches in diameter would be retained unless they are a safety hazard.

None of the alternatives manage for Forest-wide snag densities of three to five snags per acre over 19 inches in diameter (Kingery and Ghalambor 2001). Tree mortality (snag recruitment) is dependant on many factors including weather, disease, and competition, and does not occur evenly across the landscape. Natural mortality may result in some areas on the Forest with snag densities similar to those suggested by Kingery and Ghalambor (2001). If this occurs, standards and guidelines in Alternatives 2, 3, 4, and 6 will ensure that snags 20 inches and greater are properly managed and retained.

Large trees are also important for this species because they provide foraging habitat, and because they are source for future large snags used for roosting and nesting. 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 designed to provide large trees that may become large snags. Alternative 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 15-19 inched diameter class, and 10 percent of the structural stage 4 and 5 basal area in the greater than 19- inch diameter class. This will 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 to manage 10 percent of the structural stage 4 ponderosa pine acreage in the management area with a tree size of very large (16 inches in diameter or greater). This will provide roughly 100,000 acres with abundant large trees, which also serve as a future source of abundant large snags. Alternatives 2, 3, 4, and 6 will likely provide sufficient large trees well distributed across the Forest.

Due to Forest-wide objectives, standards, and guidelines designed to conserve and enhance suitable habitat, the pygmy nuthatch is likely to persist on the Forest over the next 50 years. Sufficient old or mature undisturbed forest will occur on the Forest. 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 lacks direction for providing large trees. Because of this, Alternative 1 presents a higher risk to pygmy nuthatches. Alternative 3 presents the least risk to pygmy nuthatches because it is expected to increase the amount of old or mature, undisturbed areas, is more likely to result in heterogeneous forests with a mixture of well spaced old trees and trees of intermediate age, and includes a strategy for managing for large trees and snags. Alternatives 4 and 6 present an intermediate risk to pygmy nuthatches. Alternative 6 presents somewhat more risk to pygmy nuthatches because it is expected to decrease the amount of old or mature undisturbed forest. Though it also includes structural stage objectives, which are more likely to result in heterogeneous forests with a mixture of well-spaced old trees and trees of intermediate age, and includes a strategy for maintaining large trees and snags. Alternative 4 is expected to increase the amount of old or mature undisturbed forest and includes a strategy for maintaining large trees and snags, but the amount and distribution of other structural stages across the Forest is less certain.

The above evaluation 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. Management will move conditions towards the 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

Cumulative effects result from the incremental impact (direct and indirect effects) associated with the alternatives when added to past, present and reasonably foreseeable actions. Past activities on NFS lands in the Black Hills are accounted for in the existing condition displayed under direct and indirect effects. Other Federal and non-Federal activities are discussed here.

Pygmy nuthatches could potentially use preferred nesting and foraging habitat in Custer State Park. Foreseeable actions 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 this species 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 if late successionall pine and spruce stands are treated. It is assumed that urban development will continue on private lands, which will likely increase the importance of habitat located on NFS land over the next 50 years. These activities may reduce suitable habitat, which could lead to some reduction in pygmy-nuthatch 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 pygmy-nuthatch habitat and how effects would be expected to change.

Alternative 3 presents the least potential for cumulative effects to pygmy nuthatches because it is expected to increase the amount of old or mature, undisturbed areas, is more likely to result in heterogeneous forests with a mixture of well-spaced old trees and trees of intermediate age, and includes a strategy for managing for large trees and snags. Alternatives 4 and 6 present more potential cumulative effects to pygmy nuthatches. Alternative 6 presents somewhat more risk of cumulative effects to pygmy nuthatches because it is expected to decrease the amount of old or mature undisturbed forest. Though it also includes structural stage objectives, which are more likely to result in heterogeneous forests with a mixture of well-spaced old trees and trees of intermediate age, and includes a strategy for maintaining large trees and snags. Alternative 4 is expected to increase the amount of old or mature undisturbed forest and includes a strategy for maintaining large trees and snags, but the amount and distribution of other structural stages across the Forest is less certain. 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 lacks direction for providing large trees. Because of this, Alternative 1 presents the highest risk of cummultive effects risk to pygmy nuthatches.

3-3.3.4.7. Sharp-Shinned Hawk *(Accipiter striatus)*

Affected Environment

The sharp-shinned hawk breeds from Alaska to Newfoundland, south throughout much of North America, Mexico, and into Central and South America wherever suitable habitat occurs (Stephens and Anderson 2002). The species is considered partial to long-distance migration, with northern-most individuals wholly abandoning their breeding ranges and wintering in the southern United States. Other birds may remain on their breeding ranges throughout the winter.

The sharp-shinned hawk is the smallest of the North American accipiters. It has short, powerful rounded wings and a long tail, enabling it to effectively chase prey through dense cover (Stephens and Anderson 2002). Sharp-shinned hawks primarily forage in the forest canopy (Reynolds 1989) where they nonselectively take a variety of avian prey species (Joy et al. 1994). Although over 90 percent of their diet may consist of avian species, they may also selectively hunt for small mammals such as voles (Joy et al. 1994). Due to the large degree of sexual dimorphism in these hawks, some (Platt 1976, Palmer 1988) have suggested that prey partitioning may occur, allowing for an increase in efficiency when provisioning young.

Sharp-shinned hawks nest almost exclusively in conifers, with the exception of some densely leafed deciduous trees that also provide for nest concealment (Platt 1976, Reynolds et al. 1982, Clarke 1984, Joy 1990). On the Forest, the only documented nests both occurred in white spruce (Stephens and Anderson

2002). This is a very small sample size from which to draw any major conclusions, but it does indicate that white spruce is used for nesting. Sharp-shinned hawks have also recently been detected in ponderosa pine, riparian, aspen, and burned habitats on the Forest, but these were not observations of nest sites (Panjabi 2001, Panjabi 2003, Panjabi 2004).

In eastern Oregon, sharp-shinned hawks nest most commonly in white spruce even though the forests there are ponderosa pine dominated (Stephens and Anderson 2002). In Colorado, nest stands have been described as small (2 to 28 acres), early seral stage, insular, conifer or mixed aspen-conifer stands, surrounded by aspen forests, mixed forests, or conifer forests (Joy 1990). However, another study found sharp-shinned hawk density to be positively correlated with stand area and negatively correlated with the percentage of clear cuts (Bosakowski and Smith 2002). According to Bildstein and Meyer (2000), sharp-shinned hawks breed mainly in large stands.

The association between nesting habitat and young seral stage has been noted by several authors (Bildstein and Meyer 2000, Bosakowski and Smith 2002, Stephens and Anderson 2002). On the Forest, one of the two documented sharp-shinned hawk nests was located in a 42-acre stand of white-spruce sapling/pole-sized trees. Canopy closure ranged from 30 to 70 percent, but previous studies have tended to find high canopy closure (68 percent and higher) characterizing nesting habitat (Bildstein and Meyer 2000; Bosakowski and Smith 2002).

Young stands with mid-to-high canopy cover levels for nesting correspond most closely with structural stages 3B (sapling-pole stands with 40- to 70-percent canopy closure) and 3C (sapling-pole stands with greater than 70-percent canopy closure). In white spruce, there are currently about 800 acres in these conditions. In ponderosa pine, there are approximately 113,000 acres.

The variety of habitats adjacent to nest stands is thought important in providing diverse prey habitats. Mature aspen stands near the nest may be particularly important to the species (Stephens and Anderson 2002), and one sharp-shinned hawk detected during recent surveys was in an aspen stand (Panjabi 2003). There are currently about 12,000 acres of mature aspen on the Forest.

Habitat loss or alteration resulting in a loss of suitable nesting habitat as well as a decrease in prey abundance and availability are thought to be the most significant threats to accipiter species' persistence (Reynolds 1983, Stephens and Anderson 2002). Habitat loss may also occur as forests mature beyond early seral stages. Due to its ability to set back the successional process, Clarke (1984) postulated that wildfire might be an important factor influencing species distribution and abundance.

In South Dakota, the sharp-shinned hawk is considered "uncommon," with the only recorded occurrences in the western part of the state (Peterson 1995). In Wyoming, the bird is regarded as a "common summer resident," with some known to remain throughout the winter (Luce et al. 1999). In the Black Hills, they have been observed at all elevations (Peterson 1995), but estimates of local abundance are not available due to their low numbers (Panjabi 2003). The species has been observed an average of three times per year since bird monitoring began in 2001 (Panjabi 2004).

Direct And Indirect Effects

The sharp-shinned hawk is very secretive and has been documented nesting only in white spruce within the Black Hills. In all likelihood, the species also breeds (or has the potential to occur) in ponderosa pine, the most widespread cover type. Sharp-shinned hawks occur in most forest types across their range (Bildstein and Meyer 2000) including ponderosa pine (USDA Forest Service 2003b).