SELECTION OF MANAGEMENT INDICATOR SPECIES
BLACK HILLS NATIONAL FOREST PHASE II PLAN AMENDMENT

Prepared for:

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Black Hills National Forest

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May 4, 2005

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1. INTRODUCTION

The Forest Service Manual defines Management Indicator Species (MIS) as "…plant and animal species, communities, or special habitats selected for emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent" (United States Department of Agriculture [USDA]-Forest Service 1991). The National Forest Management Act (NFMA) requires that MIS be selected as part of the forest plan to estimate the effects of planning alternatives on fish and wildlife populations (Hayward et al. 2001).

Therefore, as part of the Black Hills National Forest (BHNF) 1997 Revised Land and Resource Management Plan (Plan) Phase II Amendment, this document identifies MIS and includes rationale for selection and suggestions for monitoring approaches. The process used for MIS selection follows the method described in Hayward et al. (2001) (as presented in the Regional Desk Guide, Appendix G: Revision Analysis Requirements for Planning Documents) and includes principles guiding selection process and a seven-step process to select MIS. The MIS concept and scientific criticism of MIS are discussed in Hayward et al. (2001).

The first step in the MIS revision process (prior to implementing Hayward et al. [2001]) is to compile lists of the four emphasis species categories on the BHNF. The categories include species listed or proposed as threatened or endangered (TEP) in accordance with the Endangered Species Act (ESA), MIS from the 1997 Revised Plan and the Phase I Amendment, Region 2 Sensitive Species (SS), and Species of Local Concern (SOLC). Once compiled, all emphasis species are then reviewed for potential MIS designation.

Lists of TEP species were provided by the Wyoming and South Dakota State Offices of the U.S. Department of Interior Fish and Wildlife Service (USDI-Fish and Wildlife Service 2004a, 2004b, 2004c). The MIS list was obtained from the Revised Plan (USDA-Forest Service 1997) as modified by the Phase I Amendment (USDA-Forest Service 2001a). Sensitive species known to occur on the Forest or that may be potentially affected by Forest management activities were selected from the Rocky Mountain Region sensitive species list (USDA-Forest Service 2003). The BHNF SOLC list was developed by the BHNF and Science Applications International Corporation (SAIC) and is documented in Allen et al. (2005).

2. GUIDING PRINCIPLES

Hayward et al. (2001) outline five principles to guide selection of MIS. Each principle is discussed below in terms of its relevance to the selection of MIS for the BHNF.

Principle 1 - Choose MIS to Reflect Major Management Issues and Challenges.

The Forest Service Strategic Plan (USDA-Forest Service 2000) includes the goal: "(P)romote ecosystem health and conservation using a collaborative approach to sustain the Nation's forests, grasslands, and watersheds." Objectives related to this goal include:

a) Improve and protect watershed conditions to provide the water quality and quantity and the soil productivity necessary to support ecological functions and intended beneficial water uses,

b) Provide ecological conditions to sustain viable populations of native and desired nonnative species and to achieve objectives for MIS/(*Emphasis)* species,

c) Increase the amount of forests and grasslands restored to or maintained in condition that reduces risk and damage from fires, insects and diseases, and invasive species (USDA-Forest Service 2000).

Specific management issues relative to attaining these goals and objectives on the BHNF include:

(1) The implications of management on plant and animal species conservation, particularly:

- Species listed or proposed as federally threatened or endangered,
- Region 2 sensitive species,
- Species of Local Concern, and
- MIS.

(2) The implications of management on major vegetation communities and water resources including:

- The distribution and abundance of early, mid-, and late-successional stages of ponderosa pine,
- The abundance and distribution of white spruce successional stages,
- The abundance and distribution of hardwood successional stages
- Riparian community distribution and condition,
- Grassland community (montane and mixed grass prairie) distribution and condition,
- Aquatic ecosystem condition,
- Cave ecosystem condition, and
- Shrubland community condition.

(3) The implications of management on important components of major vegetation communities including:

- The abundance and distribution of a shrub/forb understory, and
- Snag abundance, size and distribution.

(4) The implications of land management from introduced species particularly:

- Invasive weed species, which impact native and/or rare plant communities, and
- Non-native aquatic species, which can impact native fish and amphibian species.

(5) The implications of land management on natural disturbance factors including:

- Wildfire (controlling high severity fire, while maintaining some beneficial occurrence of fire on the landscape), and
- The likelihood of insect and disease outbreaks.

(6) The implications of management to provide recreational hunting/fishing opportunities and the associated social/economic benefits:

- Maintain habitat for game and fish populations to meet state objectives.

Principle 2 - MIS Function to Facilitate Evaluation.

According to Hayward et al. (2001), MIS selection "… must be anchored by the principle that each MIS will significantly improve the agency's ability to evaluate the consequences of land management activities." MIS species that best facilitate evaluation are those that represent a forest-wide condition but have applicability on a project level and whose habitat parameters are able to be described and tracked using geographic information system (GIS) and/or remote sensing technology (Bighorn National Forest [BNF] 2002). Major land management activities on the BHNF that will dominate the next planning period include livestock grazing, mineral development, timber harvest, prescribed fire, travel management, and recreation (USDA-Forest Service 2001i).

Specific activities related to livestock grazing on the BHNF include various grazing systems, riparian pasture, water developments, salting areas, exclosures, and fence construction. Impacts may also result from cattle trailing and round-up locations. Timber harvest activities are likely to include commercial harvest, thinning, regeneration plantings, aspen regeneration, hardwood restoration, seed cuts, overstory removals, firewood cutting, and construction related to skid trails, logging decks, cat trails, and cable decks. Noxious weed control and prescribed burning associated with silvicultural treatments and habitat manipulation will also be management activities on the BHNF. Travel management activities include road, bridge, and culvert construction and maintenance, and decommissioning of some roads. Recreation activities include dispersed and developed including campground camping, campground maintenance and construction, hiking, hunting and fishing, trail maintenance (including snow trail grooming) and construction, trailhead construction, and motorized and non-motorized off-road recreation. Mining activities will include mineral exploration, pit mining, and associated cyanide treatment.

Principle 3 - Consider MIS Chosen on Neighboring Planning Units.

Some vertebrate populations are best monitored on a large spatial scale. Therefore, effective monitoring may be best accomplished by developing partnerships with adjacent Forests within the region (Hayward et al. 2001). However, the Black Hills comprise a distinct ecoregion from the Southern Rocky Mountains and Great Plains which contain all other lands administered by Region 2 (Bailey 1995). Furthermore, due to spatial isolation from other forests in Region 2 and the unique floral and faunal assemblages of the BHNF, Principle 3 may not be applicable.

Principle 4 - Consider Whether Employing MIS is the Best Approach to Evaluate the Management Problem.

Many of the species included within the four categories of emphasis species are not appropriate MIS because MIS monitoring is required. Many of the emphasis species populations, based on elements of their ecology, are not easily monitored. Also, many of the species have such limited occurrence on the BHNF that monitoring would not effectively evaluate forest-wide management issues. Others are seasonal residents, whose populations are subject to decline based on conditions in their off-site range. Conservation concerns for most emphasis species are best addressed with management approaches other than MIS designation.

Principle 5 - Choose an Adequate but Limited Number of Species.

The 1997 Plan and Phase I Amendment identified 24 wildlife species as MIS and 10 habitat components as ecological indicators. Ecological elements of species that limit MIS selection are discussed in Principle 4. However, it is desirable to have adequate ecological indicators to monitor habitat integrity. Selection is a function of accurately assessing a species' utility as a MIS and understanding major management issues. Budget constraints, staff limitations and other factors also limit the number of species that can be effectively monitored on a continual basis.

3. MIS SELECTION STEPS

Hayward et al. (2001) outline the following seven steps for selecting MIS:

Step 1 - Assemble Information About the Planning Area and Species-Habitat Relationships.

Information reviewed for the MIS evaluation process includes reports describing the historic range of variability (HRV) in the Black Hills, the 1997 Plan, the 2001 BHNF Phase 1 Environmental Assessment (EA), and the LRMP Phase II Amendment Content Analysis Report (2002). HRV publications reviewed include, Parrish et al. (1996), Brown (2001; 2003), Wienk (2001), Shinneman and Baker (1997), Uresk and Severson (1998), and Sieg and Severson (1996). Specific elements of the 2001 Phase I Amendment EA that were reviewed include, Appendix C (The Appeals Decision Summary) and Appendix G (BA/BE). The compilation of emphasis species (TEP, SS, SOLC, and existing MIS) also helped to identify dominant species and biotic communities and management for MIS analysis. Where possible, population trends of emphasis species were related to changes in habitat structure, management activities, or

ecological processes. Other species and biological communities, which are appropriate for consideration as MIS, but are not within an emphasis species category, are evaluated in this process. These species typically have well-understood, narrow habitat associations as described in Hayward et al. (2001). All bird species detected by Panjabi (2001) during breeding bird surveys were examined for consideration in this process. Several bird species, which had distinct habitat associations, suitable abundance for monitoring, and ecological requirements, which may reflect qualitative elements of habitat, were considered for MIS selection.

Step 2 - Establish MIS Monitoring Priorities

Monitoring priorities were established in accordance with Principle 1 (Choose MIS to reflect major management issues and challenges) and Principle 2 (MIS function to facilitate evaluation). Integrating information on management issues, management activities, current ecological conditions, and management direction facilitated development of MIS priorities. The following four elements were identified as MIS monitoring priorities:

1. Forest condition and habitat diversity (particularly ponderosa pine and white spruce, aspen, bur oak, and birch/hazelnut types),
2. Riparian/aquatic habitat condition,
3. Grassland habitat condition (montane grasslands and prairie), and
4. Dry plains shrublands condition.

Step 3 - Identify Potential MIS Based on Categories Identified in the Regulations and the Forest Service Manual.

The 1982 NFMA identifies five appropriate MIS categories:

- Federally and state listed endangered and threatened plant and animal species that occur on the forest,
- Species that have special habitat needs and may be impacted by planning activities,
- Species commonly hunted, fished, or trapped,
- Non-game species of special interest, and
- Species whose population changes may be indicative of the effects of management activities on other species within a selected biological community.

Tables 3-1, 3-2, 3-3, and 3-4 summarize relevant characteristics of species selected from the above-described categories. Table 3-1 includes federal TEP and candidate species considered as potential MIS. Table 3-2 summarizes species listed by Region 2, USDA-Forest Service as Sensitive. Table 3-3 identifies species determined to be of Local Concern to the BHNF (Allen et al. 2005), and Table 3-4 summarizes MIS designated by the BHNF in the 1997 Forest Plan and Phase 1 Amendment. Table 3-5 considers other species, which are appropriate for consideration as MIS, but which are not within an emphasis species category. Collectively these groups represent most species relevant for consideration as MIS according to the Step 3 criteria (a

separate table including species commonly hunted, fished, or trapped is not provided because these species are included in existing categories). A total of 125 species or biological elements are considered for potential MIS selection in this report.

Table 3-1. Species Listed, Proposed, or Candidates for Listing as Threatened or Endangered in Accordance with the Endangered Species Act and Considered for MIS Selection on the BHNF (USDI-Fish and Wildlife Service 2004a, 2004b, 2004c)

Species	Habitat Description / Distribution
Bald Eagle (*Haliaeetus leucocephalus*) Status - Threatened	Adequate habitat to support winter population on BHNF, but not sufficient to support critical habitat designation (USDA-Forest Service 1996). No known nesting activity or roost sites on the BHNF. Winter resident only. Feeds opportunistically on carrion - road-killed deer may be important (USDA-Forest Service 2001a).
Black-Footed Ferret (*Mustela nigripes*) Status - Endangered	The last sighting in the Black Hills area was in Wind Cave National Park in 1956. Ferret trenching also was found there in 1969 (USDA-Forest Service 1996). Not known to occur on the BHNF. Historically tied to prairie dog colonies for food and shelter. BHNF has only 200 acres of black-tailed prairie dog colonies (USDA-Forest Service 2001a).
Narrowleaf Grapefern (*Botrychium lineare*) Status - Candidate Threatened	This species was first confirmed on the Forest in 2003 in Crook County, Wyoming (Reyher 2004). The species had colonized an old native surface roadbed that continues to receive low levels of disturbance, the microhabitat is open with no tree canopy though there is deciduous cover below and coniferous cover above, and the relatively coarse-textured soils at the site have formed from parent materials that include limestone. Elsewhere, this species has been found associated with a wide variety of ecological conditions and range of elevations (0 to 10,000 feet) across its distribution.

Table 3-2. Region 2 Sensitive Species Considered for MIS Selection on the BHNF (USDA-Forest Service 2003)

Species	Habitat Description / Distribution
Plants	
Small-Flower Columbine *(Aquilegia brevistyla)*	Range is from eastern Alaska to Ontario south to British Columbia and Southern Manitoba (Fertig 2001). This species occurs at mid to high elevations in moist coniferous or mixed deciduous forests and mainly in drainages within limestone areas (Larson and Johnson 1999). More than 30 occurrences of this species have been documented on the Forest and it occurs on all four Ranger Districts.
Prairie Moonwort *(Botrychium campestre)*	This primitive fern is a grassland species that ranges from Central Canada to the upper mid-Western U.S. In the Black Hills there is one recorded historical occurrence in Crook County, Wyoming. The taxonomy of this historic collection is now being questioned. The record location was from the Bearlodge Mountains at 5,000 feet above mean sea level (AMSL) in an area that is currently dominated by ponderosa pine forest, along with some deciduous tree components. Distribution and ecology on the BHNF are poorly understood (USDA-Forest Service 2001a) and it is questioned as to whether the species even occurs on the Black Hills.
Narrowleaf Grapefern (*Botrychium lineare*)	**See Table 3-1**
Leathery GrapeFern *(Botrychium multifidum)*	This fern occurs across much of northern North America and inhabits moist or wet, open or shaded area at lower elevations (0-3000 meters) across its range (USDA-Forest Service 2001g). Occurrences in the Black Hills have been from streamside or drainage bottom meadows or clearings in spruce/aspen riparian zones (USDA-Forest Service 2001g) and are located in the Black Elk Wilderness and the Norbeck Wildlife Preserve. Ecology in South Dakota is poorly understood (USDA-Forest Service 2002c). Potential risks to the currently known occurrences may include risks associated with recreational activities, trail construction, wildlife use or noxious weeds.
Fox-Tail Sedge *(Carex alopecoidea)*	Species' range is Northern U.S. and Southern Canada. On BHNF, known range is limited primarily to the northwestern Black Hills and Bearlodge Mountains. It may require a disturbance regime for establishment. It occurs in wet meadows and willow/sedge riparian communities between 3,800 and 6,000 feet AMSL, and associated habitat conditions at a number of the sites include old beaver dams. Noxious weeds and other non-native invasive plants, livestock grazing and mining may represent risks to this species on BHNF (USDA-Forest Service 2001a).
Bristle-Stalk Sedge (*Carex leptalea*)	*C. leptalea* is a rare to locally common plant on the BHNF. It is documented in Lawrence, Custer, Pennington and Meade Counties in the South Dakota Black Hills, and from Crook County in the Wyoming portion of the Black Hills. It generally occurs on moist sites associated with white spruce and birch. This species may be vulnerable to forest management practices, particularly timber harvest and livestock grazing.

Table 3-2. Region 2 Sensitive Species Considered for MIS Selection on the BHNF (USDA-Forest Service 2003)

Species	Habitat Description / Distribution
Yellow Lady's Slipper *(Cypripedium parviflorum)*	This species occupies a wide range of habitats including bogs, fens, marshes, and wooded swamps to mesic grasslands and well-drained woodland sites and open deciduous forests (USDA-Forest Service 2001f). Generally found on shallow calcareous derived soils, with adequate soil moisture and have a litter or duff organic layer that may be covered with moss (Mergen 2003). The species is widely but discontinuously distributed throughout northern and eastern North America. There is a minimum of 50 reported occurrences located on the BHNF. Habitat loss, plant collection, timber harvest, and grazing present potential risks to this species (Mergen 2003).
Stream Orchid *(Epipactis gigantea)*	This species is associated with open early successional flood benches with moderate year-round climate provided by warm spring flows. This species occurs at Cascade Spring and on lands of other ownership immediately adjacent to the BHNF. Closely associated with southern maidenhair fern. Recreational activities, invasive non-native plant species and potential alterations to hydrology may present potential risks to this species (USDA-Forest Service 2001a).
Trailing Clubmoss *(Lycopodium complanatum)*	This species is boreal in distribution. Black Hills population is disjunct and represents a boreal remnant. A limited number of occurrences are located in the northern Black Hills. Relatively protected from human/management disturbance due to its occurrence on steep slopes. Catastrophic wildfire and impacts from adjacent mining activities have the potential to impact this species on the BHNF (USDA-Forest Service 2001a).
Large Round-Leaf Orchid *(Platanthera orbiculata)*	This species is found in a variety of forested habitat across North America. Its distribution in the Black Hills is disjunct and is restricted to hardwood communities between 4,300 and 6,000 feet AMSL on north-facing slopes or draw bottoms. It is associated with birch/hazelnut forest, with a spruce component in the northern Black Hills and Bearlodge Mountains. Primary risks to this species are conditions associated with long-term drought or changes in climate associated with warming and drying trends. Other potential risks include invasion by non-native plants, from activities associated with recreation and catastrophic fire events. Because of associated habitat conditions, limited potential risks of currently known occurrences are associated with livestock grazing or timber management activities.
Hoary Willow *(Salix candida)*	This species is an obligate wetland shrub that occurs in bogs and fens in the Northern U.S. and Canada. The Black Hills population is disjunct and occurs within the McIntosh Fen Botanical Area. Other areas of potential habitat have been surveyed. McIntosh Fen is protected from off-road vehicles and livestock use; however, continued expansion of upland forest, absence of beaver habitat and populations, and water table declines are natural risks to the hoary willow (Glisson 2003a).

Table 3-2. Region 2 Sensitive Species Considered for MIS Selection on the BHNF (USDA-Forest Service 2003)

Species	Habitat Description / Distribution
Autumn Willow *(Salix serissima)*	Most of the range of this species is within the northern boreal forest. The Black Hills represents a disjunct relic population. *S. serissima* is documented at McIntosh Fen Botanical Area and on the Northern Hills District within a fenced exclosure. An additional occurrence is documented on private land near Nahant, South Dakota. Noxious weed invasion, lower water tables (compared to historic conditions) and changes to hydrologic function in the watershed above the occurrence are potential and ongoing risks to this species' persistence on the BHNF (USDA-Forest Service 2001a).
Bloodroot *(Sanguinaria canadensis)*	Common inhabitant of the eastern deciduous forest floor in rich soils. Black Hills population is disjunct and habitat requirements in the Hills are not well known. On the Black Hills, bloodroot occurs in mixed forest associated with bur oak, hazelnut, and birch, typically in eastern deciduous, boreal, and mesic soil conditions, with some portions of the occurrences extending into riparian associated habitat conditions created by beaver (USDA-Forest Service 2001a). Twenty-two occurrences are documented in the north and northeastern portion of the Hills between elevations of 3,900 and 5,000 feet AMSL. *S. canadensis* may have been impacted by past and current fire suppression activities, which have resulted in conifer encroachment into the hardwood forest component on the BHNF. Other potential risks to the species may be associated with non-native invasive plant competition and road construction (USDA-Forest Service 2001a).
Highbush Cranberry *(Viburnum opulus var. americanum)*	This species grows in wet woods, along streams and on moist, wooded hillsides. It is associated with moist but well-drained sites (USDA-NRCS 2002). Widespread across north-central North America (USDA-NRCS 2002) and is widely dispersed across the northern Black Hills and Bearlodge Mountains, located in Crook, Lawrence, Meade and Pennington Counties. Recent evaluations for the species completed by the Rocky Mountain Region indicated that livestock trampling, road construction, altered hydrology and impacts to riparian systems may present risks to the species (USDA-Forest Service 2001h) however, recent baseline data gathered at a number of the sites, along with information from other sites document limited risk potential associated with livestock use.
Great-Spurred Violet *(Viola selkirkii)*	This species has a circumboreal range; the South Dakota population is disjunct. *V. selkirkii* is found on moist mossy benches and rocky slopes with granitic parent material. It grows in cool mesic ravines on elevations ranging from 5,400 to 7,000 feet AMSL. These ravines are typically cold air drainages associated with cliffs with numerous rotting logs. Most occurrences are in protected areas, where the most likely risk is from dispersed recreation, wildlife use or destruction from catastrophic wildfire (USDA-Forest Service 2001a).

Table 3-2. Region 2 Sensitive Species Considered for MIS Selection on the BHNF (USDA-Forest Service 2003)

Species	Habitat Description / Distribution
Invertebrates	
Cooper's Rocky Mountain Snail (*Oreohelix strigosa cooperi*)	Thrives with less cover and litter than other snails, and tends to avoid moist areas. It may be found on downed logs, tree trunks or limestone talus. Forages on decayed deciduous leaves and other herbaceous detritus. In the Black Hills most sites are on relatively undisturbed north or east-facing slopes within a ponderosa pine canopy with a deciduous midstory and a diverse understory. May be endemic to the Black Hills and may be negatively impacted by logging, grazing, and road construction (USDA-Forest Service 2001a).
Regal Fritillary (*Speyeria idalia*)	Once found from the Northeast U.S. and Canadian Maritimes west to the northern prairie states and adjacent Canadian provinces. In South Dakota this species occurs on remnant native tallgrass prairie in bluestem prairie and wheatgrass-bluestem-needlegrass associations on the periphery of the BHNF. Forages on nectar (Royer and Marrone 1992a). Few records of occurrence in the Black Hills exist (USDA-Forest Service 2001a).
Fishes	
Mountain Sucker (*Catostomus platyrhynchus*)	Lives in variety of habitats such as large rivers, creeks, montane lakes and streams feeding on algae and aquatic macroinvertebrates. Spawns in late spring to early summer (Baxter and Stone 1995). Currently ranked by South Dakota Natural Heritage Program as S3 because it is an isolated, possibly declining population (Erickson 2002). Formerly abundant in the Black Hills, the species still is common to locally abundant. On BHNF, the mountain sucker lives only in perennial streams with suitable cover and rubble substrate (Erickson 2002).
Lake Chub (*Couesius plumbeus*)	Species range is throughout Eastern and Central Canada and the northern U.S. Occupies varied habitats but most common in streams, gravel-bottomed pools and along rocky lake margins. Historically more widely distributed in streams of the Black Hills, now only occurs in Deerfield Reservoir, which is man-made. The population trend is downward. (USDA Forest Service 2002a).
Finescale Dace (*Phoxinus neogaeus chrosomus*)	Species ranges from Northwest Canada to New England and in relict populations in Wyoming and South Dakota. The South Dakota populations occur off of the BHNF. Habitat is cool weedy streams, ponds, and lakes where it forages on algae, mollusks, and aquatic macroinvertebrates (Baxter and Stone 1995). Beaver ponds may be favored habitat (USDA-Forest Service 2002a). This species is critically imperiled in South Dakota and Wyoming and is documented in only a few locations in the Black Hills. Stocked in Sand Creek in 1982 but population failed (USDA-Forest Service 2002a).

Table 3-2. Region 2 Sensitive Species Considered for MIS Selection on the BHNF (USDA-Forest Service 2003)

Species	Habitat Description / Distribution
Sturgeon chub *(Macrhybopsis gelida)*	This species prefers large, turbid rivers with a diversity of depths and velocities forming braided channels, sand bars, sand flats, and gravel bars (USDI-Fish and Wildlife Service 2001). Historically known in 14 states of the Missouri and Mississippi rivers and their larger tributaries (USDA-Forest Service 2001c). In South Dakota, sturgeon chub have been found in the Missouri, White, Cheyenne, Grand and Little Missouri Rivers (Ashton and Dowd 1991). No known occurrences on the BHNF (USDA-Forest Service 2001c), but has been collected in Pennington County in South Dakota (Ashton and Dowd 1991).
Plains Minnow *(Hybognathus placitus)*	Prefers slower water and sidepools of turbid streams, feeding on algae and other bottom vegetation (Baxter and Stone 1995). Range is primarily west of the Mississippi River from North Dakota and Montana, south to central Texas (Baxter and Stone 1995). No known occurrences on the BHNF (USDA-Forest Service 2001d).
Reptiles and Amphibians	
Black Hills Redbelly Snake (*Storeria occipitomaculata pahasapae*)	Endemic subspecies to the Black Hills. This snake uses a variety of habitat types on BHNF, usually moist cover types with ample down woody debris (USDA-Forest Service 1996). Usually found under surface material such as logs or rocks. Diet is slugs, snails, earthworms and beetle grubs (USDA-Forest Service 1981). No population trend data is available, but habitat trend is stable. This subspecies is included as Region 2 SS primarily because it is a Black Hills endemic (USDA-Forest Service 2002a).
Northern Leopard Frog (*Rana pipiens*)	Occurs in a wide variety of habitats including, but not limited to, creeks, lakes, ephemeral wetlands and ponds with few or no fish for breeding, and mesic uplands during the summer (Fischer et al. 1999). Overwinters in wetlands and becomes active as water temperatures rise in the spring. Individuals are often found far from water in summer and may travel long distances overland from spring to fall. The leopard frog is not listed as a species of special concern by the South Dakota Department of Game, Fish, and Parks (SDGFP) or the Natural Heritage Program (Fischer 1999). This species is relatively common on the BHNF, is known in all Black Hills counties, and the local population seems stable (Peterson 1974). On BHNF species is likely dependent on mesic habitats such as aspen, white spruce, and riparian areas (USDA-Forest Service1996). It may have been associated with beaver ponds on the BHNF (USDA-Forest Service 1996).
Birds	
Northern Goshawk (*Accipiter gentilis*)	Forest habitat generalist. Requires abundant prey base, possibly related to understory shrub development in forested habitat. Confirmed breeding records in Custer, Meade, Lawrence and Pennington Counties within the Black Hills. Most important prey items in BHNF are flickers, jays, tree squirrels and rabbits but prey diversity and abundance is critical. Breeds in dense mature ponderosa pine in BHNF. There are 144 historic nests recorded in the BHNF database but the status and condition of these nests is unknown (Burns pers. comm. 2002). The goshawk is a winter resident in ponderosa pine throughout most of the Black Hills.

Table 3-2. Region 2 Sensitive Species Considered for MIS Selection on the BHNF (USDA-Forest Service 2003)

Species	Habitat Description / Distribution
Grasshopper Sparrow (*Ammodramus savannarum*)	Ground-nester that breeds in open grassland habitat with less than 35% shrubs. Feeds on insects, particularly grasshoppers (USDA-Forest Service 1981). Confirmed breeding records and numerous probable and possible breeding records on BHNF (Luce et al. 1999, SDOU 1991). Selects larger patches of open grassland types (Slater 2004). Within grasslands of suitable size, prefer grassland habitat of intermediate height and avoid grasslands where vegetation less than 10 cm in height (Slater 2004). Require some taller vegetation such as tall grasses, forbs, or shrubs, to use as singing perches (Slater 2004). Suspected downward population trend (Sauer et al. 2001).
Burrowing Owl (*Athene cunicularia*)	Uses vacant rodent burrows, mainly associated with prairie dog habitat. Diet includes grasshoppers, beetles, moths, some birds and mice. Winters in southwestern U.S. and Northern Mexico (USDA-Forest Service 1981). Burrowing owls are known from several locations in the Black Hills. Population status is unclear, although BHNF only has approximately 200 acres of prairie dog habitat (USDA-Forest Service 2001a).
Ferruginous Hawk (*Buteo regalis*)	Prefers live deciduous trees in low-elevation riparian zones, in the plains or foothills. Diet is mostly lagomorphs and rodents (USDA-Forest Service 1981). They are winter resident in the central U.S. Other than as migrants, ferruginous hawks are not known to occur on the BHNF (Peterson 1995, SDOU 1991).
Mountain Plover (*Charadrius montanus*)	Inhabits grasslands, short-grass prairie, alkali flats, agricultural lands, and shrub-steppe. Mountain plovers have been observed in the general vicinity of the Wyoming Black Hills (Luce et al. 1999). The mountain plover is not listed as a breeding bird in South Dakota (Peterson 1995), and the Black Hills are not within known winter range (USGS 2000).
Northern Harrier (*Circus cyaneus*)	Found throughout North America in marshes, wet meadows, grasslands, and shrub-steppe. Nests on the ground within moist vegetation. Prey includes mice, voles, frogs, and invertebrates (USDA Forest Service 1981). No confirmed occurrence on the BHNF (Peterson 1995).
Yellow-Billed Cuckoo (*Coccyzus americanus*)	Breeds in open woodlands and riparian woodlands throughout much of the U.S., but not common in the west (USDA-Forest Service 2002a and 1981). Diet includes fruits, berries, and insects, particularly caterpillars (USDA-Forest Service 1981). Breeding occurrence documented in Crook County Wyoming and observed in Weston County, Wyoming in lower elevations of the Black Hills (Luce et al. 1999). Not known to occur in the South Dakota Black Hills (SDOU 1991).
Peregrine Falcon (*Falco peregrinus*)	Delisted by the USDI-Fish and Wildlife Service in August 1999 and considered recovered in many areas (USDA-Forest Service 2002a). Nests near rocky cliffs and often hunts near water. Formerly considered a rare summer resident in the Black Hills. In 1979 two peregrines were cross-fostered and fledged from a prairie falcon nest. Considered extirpated from the Black Hills and South Dakota (SDOU 1991).

Table 3-2. Region 2 Sensitive Species Considered for MIS Selection on the BHNF (USDA-Forest Service 2003)

Species	Habitat Description / Distribution
Loggerhead Shrike (*Lanius ludovicianus*)	Prefers open habitat including shrub-steppe, deserts and grasslands with access to elevated perches and impaling stations. Feeds mostly on large insects such as grasshoppers and beetles but some small birds and rodents are also taken. Loggerhead shrike winter in the southern U.S. and Mexico (USDA-Forest Service 1981). This species has declined in North America in recent decades, but South Dakota populations have increased, although trend data for the Black Hills is not available (USDA-Forest Service 2002a). Habitat is limited to meadows and areas where pine encroaches on the prairie in the southern and western Black Hills (USDA-Forest Service 1996).
Lewis' Woodpecker (*Melanerpes lewis*)	Cottonwood riparian and open ponderosa pine forests are the major breeding habitat of this species. Brushy understory is considered a special habitat requirement of this species (USDA-Forest Service 1981). It is a primary and secondary cavity nester. Diet includes flies, beetle larvae, caterpillars, and ants (USDA-Forest Service 1981). This species is known to breed in all Black Hills counties (Luce et al. 1999, Peterson 1995) and is rare but locally common near large burns (Peterson 1995). Lewis' woodpecker may colonize large burned areas within a year of the burn. Preferred habitat is a mosaic of sound green trees, unsound large diameter trees, with 40-70% canopy closure (USDA-Forest Service 2001a). The regional population trend data is down, but there is no specific data for the Black Hills (Sauer et al. 2001). The recent Jasper fire may have implications for Lewis' woodpecker populations.
Flammulated Owl (*Otus flammeolus*)	Nests in woodpecker holes made in mature aspen or ponderosa pine habitat. This owl is almost entirely insectivorous (USDA-Forest Service 1981). This species is not listed as a Black Hills resident by Luce et al. (1999), SDOU (1991) or Peterson (1995). However, flammulated owls were sighted near the Hanna/Spearfish Canyon area in the spring of 2002 (Panjabi 2003). A second likely occurrence was recorded in 1992 at a bat-monitoring site near Woodcock Spring in the southern Black Hills (Phillips 2002).
Black-Backed Woodpecker (*Picoides arcticus*)	Uncommon year-round resident of various coniferous forest types - ponderosa pine in the Black Hills (USDA-Forest Service 1981). Prefers dense coniferous forests, burns, or beetle-killed forests with greater than 15-inch diameter at breast height (dbh) snags needed for nesting cavities (DeGraaf et al. 1991). Species is rare and local on the BHNF with no available trend data (Sauer et al. 2001). However, habitat is similar to three-toed woodpecker habitat that may be declining (Allen et al. 2005). Species utilizes sapling and pole-sized stands and some mature two-storied pine stands. Average nest snag is approximately 15 inches DBH.
Three-Toed Woodpecker (*Picoides tridactylus*)	Similar habitat to black-backed woodpecker. Prefers burns, spruce, and denser coniferous forests and needs greater than 16 inches DBH snags for nesting. This species is resident but rare in the Black Hills, usually at higher elevations (Luce et al. 1999, Peterson 1995, SDOU 1991). No available population trend data, but preferred habitat may be in decline (Allen et al. 2005).

Table 3-2. Region 2 Sensitive Species Considered for MIS Selection on the BHNF (USDA-Forest Service 2003)

Species	Habitat Description / Distribution
Mammals	
Black-Tailed Prairie Dog (*Cynomys ludovicianus*)	Formerly occurred on grasslands throughout the great plains forming large colonies. In the State of Wyoming currently occurs in scattered populations in the eastern portion of the state (Clark and Stromberg 1987). The BHNF in South Dakota currently has approximately 200 acres of prairie dog habitat in 4-5 colonies. The largest colony is approximately 80 acres (USDA-Forest Service 2001a).
Fringed Myotis (*Myotis thysanodes*)	Utilizes caves, mines, snags, rock outcrops, and human structures as roost sites. Requires some open water for drinking. The fringed myotis feeds on insects and is dependent on riparian habitat for foraging. After breeding in the fall, fertilization is delayed until April and young are born in the summer. Females segregate into maternity colonies. The fringed myotis is migratory in parts of its range, but this is poorly understood. This species is known to hibernate in caves of the Black Hills (Clark and Stromberg 1987). Maternity roosts require warm microsites within a mine or cave and hibernation sites require cold, well-ventilated microsites. Open water habitats on BHNF are likely provided by stock tanks and other water catchments (USDA-Forest Service 2001a).
Townsend's Big-Eared Bat (*Corynorhinus townsendii*)	Similar habitat as the fringed myotis but more closely associated with caves and mines for day roosts and hibernation sites. It is not known to be a long-distance migrant and hibernating sites are documented in the Black Hills. Townsend's big-eared bat is a moth specialist. Disturbance to Townsend's big-eared bat hibernation sites can be devastating to individuals or populations. It is common in shrub-steppe, juniper woodlands and dry coniferous forest (Clark and Stromberg 1987).
Spotted Bat (*Euderma maculatum*)	Spotted bats occur in a patchy distribution from British Columbia to Mexico (Watkins 1997). No spotted bats have been recorded in the Black Hills (Tigner and Aney 1994). The closest confirmed sightings have been from Big Horn County in Wyoming (Oakleaf et al. 1992). Habitat is primarily dry, rough, desert terrain with suitable cliff habitats (Garber 1991, Colorado Division of Wildlife 1984, Watkins 1977).
American Marten (*Martes americana*)	Preferred habitat is moist coniferous forest with infrequent fire intervals and to a lesser degree, drier coniferous forest with frequent fire return intervals (Buskirk 2002). Uses confer forests with near-ground structure. The marten is present in the BHNF usually in habitat dominated by white spruce. Reintroduction efforts in 1980s resulted in two populations - one in Spearfish Canyon and the second in the Black Elk Wilderness (USDA-Forest Service 2001a). Researchers have documented efforts by martens to move between the two areas (USDA-Forest Service 2001a).
Northern River Otter (*Lontra canadensis*)	Occurs throughout much of Canada and U.S. in lakes, streams and rivers with adequate food supply. Majority of their diet is fish (Clark and Stromberg 1987). Not likely to occur in the Black Hills (Turner 1974).

Table 3-2. Region 2 Sensitive Species Considered for MIS Selection on the BHNF (USDA-Forest Service 2003)

Species	Habitat Description / Distribution
Swift Fox *(Vulpes velox)*	This small canid was historically found across the Great Plains from the Prairie Provinces of Central Canada south through Texas (Egoscue 1979). Considered a threatened species in South Dakota, the swift fox has recently been seen in the southwestern quarter of the state (Ashton and Dowd 1991). An associate of short and mixed grass prairie, swift fox numbers declined dramatically due to shooting, poisoning, loss of habitat due to settlement, and the eradication efforts directed toward larger canines and prairie dog colonies (Uresk and Sharps 1986, Jones et al. 1983, and Egoscue 1979). No known populations on the BHNF with the only suitable habitat surrounding active prairie dog colonies (comprising 200 acres) in the southern portions of the BHNF (USDA-Forest Service 1996, Appendix H).

Table 3-3. Species of Local Concern Considered for MIS Selection on the BHNF (Allen et al. 2005)

Species	Habitat Description / Distribution
Plants	
Southern Maidenhair Fern *(Adiantum capillus-veneris)*	The Black Hills population is disjunct. Species occupies habitat adjacent to flow of warm calcareous waters. This prevents freezing in winter months, likely enhancing the species' persistence on the BHNF. In the Black Hills, this fern is found along Cascade Creek and due to its strict habitat requirements, it is unlikely to occur or disperse into other habitats on the BHNF (USDA-Forest Service 2001a). Impacts associated with various levels of recreational activities, invasion by non-native invasive species or potential changes in hydrology are potential risks to long-term persistence of this species (USDA-Forest Service 2001a).
Showy Sedge (*Carex bella*)	*C. bella* exists in three occurrences in the Black Elk Wilderness and in several occurrences in the adjacent Custer State Park (Glisson 2003b). Occupied sites are typically cool, moist, shaded white spruce habitat, although exact habitat requirements are unknown in the Black Hills. The occurrences are at high elevations in the Black Hills, which are considered low elevations for *C. bella* in other parts of its range in the Rocky Mountains. This indicates the species may be approaching the limit of habitat availability in the Black Hills under present climatic conditions (Glisson 2003b). Potential risks to this species on the BHNF may include disturbance from dispersed recreation and loss due to catastrophic wildfire (Glisson 2003b).
Beaked Spikerush (*Eleocharis rostellata*)	This species is a wetland obligate with a broad ecological amplitude. The single known occurrence of *E. rostellata* on the BHNF is along Cascade Creek in Fall River County. It occurs on BHNF lands, the Whitney preserve (owned by The Nature Conservancy), and other private lands [Glisson 2003c]. Year-round flows of warm spring water in Cascade Creek may be an important component of this species' survival in the Black Hills area. However, surveys for *E. rostellata* have been limited on the BHNF, so the extent of its distribution is not known (Glisson 2003c). Changes in hydrology, trampling by humans or animals, and invasion by exotic plants are potential risks to this species' persistence on the BHNF (Glisson 2003c).
Northern Gentian (*Gentiana affinis var. affinis*	*G. affinis* is an uncommon low to mid-elevation perennial in the Black Hills. It occurs in dry-wet meadows, fens, and stream riparian areas. There are 5 known populations in Pennington County South Dakota within the Black Hills. It is vulnerable to activities, that cause loss or degradation of riparian areas and it may decline with heavy grazing pressure due to trampling (Larson and Johnson 1999).
Broad-Lipped Twayblade (*Listera convallarioides*)	This orchid occurs in association with white spruce and ponderosa pine at two sites within Lawrence County, South Dakota on the BHNF. The sites are a moist, forested side-hill near a stream and a riparian area, respectively. Risks to this species on the BHNF may include trampling from animals and recreationists, overcollection, and loss or degradation of riparian habitat.

Table 3-3. Species of Local Concern Considered for MIS Selection on the BHNF (Allen et al. 2005)

Species	Habitat Description / Distribution
Mountain Sorrel (*Oxyria digyna*)	This species is known from four occurrences in the Harney Peak area, three on National Forest System land, and one in Custer State Park. Associated habitat conditions across the species range include moist ground and alpine or subalpine areas (Hitchcock and Cronquist 1973). Also across the species range it is documented in tundra rills and depressions, rock crevices and forest edges (Guennel 1995).
Arrowleaf Sweet Coltsfoot (*Petasites sagittatus*)	A boreal forest rhizomatous forb disjunct in the Black Hills from northeast North Dakota and from the Laramie Range in southeast Wyoming. Inhabits saturated, organic soils of spruce swamps and wet meadows in a small region of the central Black Hills. Species' habitat and range are quite restricted within the Black Hills. Sweet coltsfoot may currently occupy all available habitat within the National Forest. At least one occurrence on private land has been lost. Potential risks to the species long-term persistence could include climate change, streamflow alterations, or alterations to groundwater discharge within its habitat.
Northern Holly-Fern (*Polystichum lonchitis*)	A circumboreal and subalpine forest fern disjunct in the Black Hills from western Wyoming. A limited number of occurrences are located in the northern Black Hills primarily on moist talus or rich, north facing, lower slopes in forested ravines. Suitable habitat is apparently very limited, possibly due to microclimate factors.
Stiff Clubmoss *(Lycopodium annotinum)*	This species is found in boreal forests and occurrences in the Black Hills are disjunct (Hornbeck et al. 2003). In the Black Hills this stiff clubmoss is found in white spruce forests with blueberry and hazelnut. Across the range of the species, risks include collection for "Christmas greens" and habitat loss due to recreation, logging, and road construction (Fertig 1994). Two occurrences are recorded within BHNF: an occurrence in Crook County, Wyoming is located within the Upper Sand Creek Botanical Area, and a second, occurrence is located near Strawberry Creek in Lawrence County, South Dakota (Hornbeck et al. 2003).
Limber Pine (*Pinus flexilis*)	*P. flexilis* is in the white-pine group and has 5-needle fascicles. Its flexible branches and bole allow it to thrive in exposed locations. The BHNF has one 20-acre stand of *P. flexilis* in Cathedral Spires south of Harney Peak (Larson and Johnson 1999). This population is reproducing and appears stable. However, as a white pine it is susceptible to blister rust (Larson and Johnson 1999).
Shining Willow *(Salix lucida)*	This species is known from a single occurrence in the Black Hills National Forest and until recently was thought to be extirpated. Two records for this species in the Black Hills exist: an historical record from 1913 in the vicinity of Deadwood, and a record from 1993 of a senescent specimen found along a small tributary to Iron Creek in the Central Black Hills (Larson and Johnson 1999). Across the species range, this species is commonly found in swamps and wet meadows (Great Plains Flora Association 1986).

Table 3-3. Species of Local Concern Considered for MIS Selection on the BHNF (Allen et al. 2005)

Species	Habitat Description / Distribution
Invertebrates	
Atlantis Fritillary *(Speyeria atlantis pahasapa*)	Endemic to the Black Hills it is known from three counties, Pennington, Custer and Lawrence. Habitat is higher elevation moist boreal forests and riparian areas with adjacent meadows (NatureServe 2001). This species is found in the Canadian Maritime Provinces and northeast United States south to West Virginia and west through the Great Lakes region and southern Canada. It also occurs south in Rocky Mountains to the Colorado Front Range.
Tawny Crescent (*Phycoides batesii*)	Habitat is typically moist aspen stands and riparian forest near the transition between deciduous and coniferous forests (Royer and Marrone 1992b). Adults feed on the nectar of aster and dogbane. This species' habitat has declined in the BHNF due to pine encroachment into wet meadows and decreases in water flows, and the resulting degradation of riparian areas (USDA-Forest Service 2001a).
Callused Vertigo *(Vertigo arthuri)*	Most widely distributed Black Hills vertigo species with a limited distribution in the U.S. and Canada. In the Black Hills, found in wet, relatively undisturbed forest on limestone or schist substrate. Most common at sites with a varied understory, diverse flora, and deep litter, on shaded north-facing slopes. This species is cryptic and feeds on the surface of half decayed leaves. It is vulnerable to management activities such as grazing, logging, major forest fires, and pesticide and herbicide spraying, which may lead to the extirpation of local populations (Frest and Johannes 2002).
Mystery Vertigo *(Vertigo paradoxa)*	Only found in the Northern Black Hills where it is restricted to rich lowland wooded sites often with *Picea glauca* communities, on limestone or schist-derived soils. Important habitat components include closed canopy forest, deep litter, and rich floral understory. This species feeds on partially decayed leaves and the organic coating on rock surfaces. It is vulnerable to management activities such as grazing, logging, catastrophic fires, and pesticide and herbicide spraying, which may lead to the extirpation of local populations (Frest and Johannes 2002).
Frigid Ambersnail *(Catinella gelida)*	Found in the Black Hills at low to medium elevations, in somewhat dry forests on limestone talus, near the slope base. The most frequent vegetation at known colonies was open *Pinus ponderosa* forest with a mixture of deciduous trees and shrubs. Since this species has sparse populations it may be more vulnerable to management activities, such as logging and grazing, than other land snails. Some of the colonies on the Black Hills are located near highways and roads (Frest and Johannes 2002).

Table 3-3. Species of Local Concern Considered for MIS Selection on the BHNF (Allen et al. 2005)

Species	Habitat Description / Distribution
Striate Disc (*Discus shimekii*)	Found in moist habitat such as riparian areas, north-facing slopes on calcareous soils, mesic forest floors. This species cannot regulate body fluids and is susceptible to desiccation if habitat dries out. Populations may be negatively impacted by logging, grazing, and road construction (USDA-Forest Service 2001a).
Fishes - None	
Reptiles and Amphibians - None	
Birds	
Sharp-Shinned Hawk *(Accipiter striatus)*	Found in forests, woodlots and brushy draws (USDA-Forest Service 1981). Black Hills habitat is riparian forests and conifers (SDOU 1991). Listed as an uncommon permanent resident in the Black Hills (SDOU 1991, Peterson 1995). Diet is almost exclusively small passerine birds. Nest sites are typically in dense conifer stands often adjacent to deciduous trees (Stephens and Anderson 2002).
Cooper's Hawk (*Accipiter cooperii*)	A forest habitat generalist that forages near the ground taking avian and mammalian prey. Their diet may overlap significantly with *A. gentilis* (Stephens and Anderson 2002). Preferred nest sites are located in tall, large-diameter trees in dense stands, often with a significant sapling component. Dense forest may also be important for foraging (Stephens and Anderson 2002). On the BHNF this species was only found in uncut stands (Stephens and Anderson 2002).
Broad-Winged Hawk (*Buteo platypterus*)	Common Buteo of the Wyoming and South Dakota Black Hills where it nests in pine stands with a deciduous component, often in large diameter ponderosa pine. This species is also known to inhabit agricultural and suburban areas (Luce et al. 1999). Its prey base is varied and includes small mammals, birds, reptiles and insects (Stephens and Anderson 2003, Luce et al. 1999). The entire broad-winged hawk population of the Black Hills migrates south to Central and South America (Ehrlich et al.1988). Depending on scale and timing, timber harvest may improve or degrade broad-winged hawk habitat (Stephens and Johnson 2003).
Northern Saw-Whet Owl (*Aegolius acadicus*)	*A. acadicus* is a forest habitat generalist found at lower to middle elevations in forested habitat, particularly in riparian areas. Nest sites are 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). This species often forages along forest edges preying upon small mammals. *Peromyscus maniculatus* is an important prey species throughout much of its range, however they are opportunistic hunters. In the Black Hills seasonal migration is likely between high- and low-elevation habitat (Johnson and Anderson 2003).
Pygmy Nuthatch (*Sitta pygmaea*)	Found primarily in mature ponderosa pine forests throughout the Western U.S. although may be an irregular migrant in other coniferous types (USDA-Forest Service 1981). Favors open park-like forests of ponderosa

Table 3-3. Species of Local Concern Considered for MIS Selection on the BHNF (Allen et al. 2005)

Species	Habitat Description / Distribution
	and Jeffrey pines in the Sierra Nevada (Kingery and Ghalambor 2001). Prefers old-growth, mature, undisturbed forests (Kingery and Ghalambor 2001). Unlogged forests host larger populations than logged forests (Kingery and Ghalambor 2001). Diet is mainly insects, although some pine seeds are eaten. This species is an uncommon resident of the Black Hills. No local trend data is available although BHNF habitat trend is stable (Allen et al. 2005). Pygmy nuthatches may require snags greater than 19 inches DBH (Kingery and Ghalambor 2001).
American Dipper *(Cinclus mexicanus)*	Dipper habitat is fast-flowing streams with rock, sand, and rubble substrates (Kingery 1998). This substrate type is associated with the dipper's main food source, aquatic invertebrates (Anderson 2002). In the Black Hills they are found primarily in Spearfish Creek and Rapid Creek watersheds (SDOU 1991, Peterson 1995). Dippers occurred historically in several other streams in the Black Hills (Anderson 2002). Spearfish creek is thought to be the only stream supporting a self-sustaining population (Anderson 2002).
Black and White Warbler (*Mniotilta varia*)	*M. varia* nests in deciduous woodlands on or near the ground and feeds primarily on insects (Ehrlich et al. 1988, Luce et al. 1999). This species has been observed in Wyoming counties of the Black Hills but breeding has not been confirmed (Luce et al. 1999). Both Peterson (1995) and SDOU (1991) reflect confirmed breeding records in the South Dakota Black Hills. Panjabi (2001) did not detect *M. varia* during breeding surveys of the BHNF.
Mammals	
Northern Myotis (*Myotis septentrionalis*)	*M. septentrionalis* is a year-round resident of the Black Hills. It hibernates in caves and mines and roosts in caves, mines, and snags. Often associated with dense ponderosa pine and mixed coniferous/deciduous forest (Luce et al. 1999). Forages over forests on hillsides and ridgetops where it feeds on flying insects (Luce et al. 1999).
Small-Footed Myotis (*Myotis ciliolabrum*)	*M. ciliolabrum* is a year-round resident of the Black Hills. Hibernacula are known in the Black Hills including Davenport, Jewel, French Creek, and Igloo Caves. Mine hibernacula are also documented (Turner 1974). Summer roost sites are typically buildings, caves, and mines (Luce et al. 1999). This species usually forages near water including creeks, ponds, and reservoirs where it feeds on flying insects, particularly beetles (Turner 1974).
Long-Eared Myotis *(Myotis evotis)*	Occurs across much of montane western North America (Schmidt 2003). The only records of L.E. Myotis in the Black Hills come from unpublished reports (Schmidt 2003). The species is associated with coniferous montane habitats (Barbour and Davis 1969).

Table 3-3. Species of Local Concern Considered for MIS Selection on the BHNF (Allen et al. 2005)

Species	Habitat Description / Distribution
Long-Legged Myotis (*Myotis volans*)	This bat occupies montane areas throughout western North America and is widely distributed in the Black Hills between 4,500 and 6,000 feet AMSL (Turner 1974). This species is a year-round resident in the Black Hills. Hibernating individuals are known to use caves in the Black Hills including Bush's and Jewel Cave (Luce et al. 1999, Turner 1974). Caves and snags are used in summer as roost sites. *M. volans* forages over meadows, ponds, streams and open mesic habitats of the Black Hills where it feeds on flying insects, particularly moths (Luce et al. 1999, Turner 1974).
Northern Flying Squirrel *(Glaucomys sabrinus)*	The northern flying squirrel ranges throughout the mountainous western U.S. and boreal forests of North America (USDA-Forest Service 1996). In the Black Hills the highest densities are found in white spruce forests in moist canyons of the Northern Black Hills (Turner 1974, Over and Churchill 1974). They use hollow trees and cavities for nest sites (USDA-Forest Service 1996). Uneven aged management of spruce may benefit this species (USDA-Forest Service 1996).
Meadow Jumping Mouse (*Zapus hudsonius campestris*)	*Z. hudsonius* is associated with riparian areas along small streams in meadows or beneath forests usually with an understory of deciduous shrubs, grasses, forbs, and fallen logs (Luce et al. 1999, Turner 1974). This species is a profound hibernator, retreating to burrows in dry ground from October to May. Burrows are also used for nests (Clark and Stromberg 1987). Diet includes grass seeds, fungi, and insects (Luce et al. 1999). *Z. hudsonius* habitat may be impacted by management practices which reduce understory shrubs, grasses and forbs in low to mid-elevation riparian areas (Clark and Stromberg 1987, Luce et al. 1999). Maintenance of dense understory vegetation is an important management consideration for this species (Clark and Stromberg 1987).
Mountain Goat *(Oreamnos americanus)*	Introduced into the Black Hills in 1924. Primary range and habitat of the mountain goat in the Black Hills covers about 2,000 acres and is centered around Harney Peak and the Needles area (Richardson 1971). Population estimated in 1971 by Richardson at 300 to 400 animals, static and occupying all suitable habitat. Current population is estimated at 150 to 175 animals and a future objective of 200 to 225 (USDA-Forest Service 1996, Appendix H). Mountain goat habitat is typically high, rocky mountains (Clark and Stromberg 1987). Range of the mountain goat extends from northern Rocky Mountains in the U.S. to Southeast Alaska (Clark and Stromberg 1987). In goat habitat, a wide range of forage is utilized; often consuming the most available rather the most palatable (Richardson 1971).
Mountain Sheep *(Ovis canadensis canadensis)*	*Ovis canadensis auduboni* were native to the Black Hills but extinct by 1916 (Buechner 1960). In 1991 and 1992 thirty-one Rocky mountain bighorn sheep (*O. c. canadensis*) were transplanted into Spring Creek Canyon in the Black Hills (Benzon and Halseth 1999). Current population is estimated at 75 to 100 animals (USDA-Forest Service 1996, Appendix H). Their range extends in the mountain west from Canada to Northern Mexico. They inhabit alpine meadows, foothills, and cliffs (Clark and Stromberg 1987).

Table 3-4. Species Designated as MIS or ecological indicators in the 1997 Forest Plan (USDA-Forest Service 1996) or the Phase I Amendment (USDA-Forest Service 2001a)

Species	Habitat Description / Distribution
Plants/Ecological Components	
Ponderosa Pine, Closed Canopy Late Succession (*Pinus ponderosa*)	Closed canopy and late successional forest stands are classed in structural stages 4C and 5. Structural stage 4C consists of mature stands (> 9 inches DBH) with 71% to 100% canopy closure. Structural stage 5 refers to late successional forests (USDA-Forest Service 1996). There are currently 114,798 acres of ponderosa pine in strucural stage 4C and 22,409 acres in structural stage 5 (RIS database 1995).
Ponderosa Pine Grass/Forb Stage	Forest stands that are in the process of regeneration, temporarily covered with grass or forbs, and will eventually be forested (USDA-Forest Service 1996). This cover type occupies 23,502 acres in the BHNF (RIS Data Base 1995).
White Spruce (*Picea glauca*)	Second most common conifer on the BHNF, whose community type comprises 21,737 acres or 2 percent of the forested land-base (RIS Database 1995). The BHNF white spruce population is disjunct from its core range and is at the southern extent of its distribution (Nienstaedt and Zasada 1990). This climax tree of the northern boreal forest is found at high elevations and in cooler drainage bottoms across the BHNF (Nienstaedt and Zasada 1990).
Quaking Aspen (*Populus tremuloides*)	A broad-leaved deciduous hardwood of temperate North America comprising 48,224 acres or 4 percent of the forested lands on the BHNF (RIS Database 1995). On the BHNF, aspen favor sites characterized by cold winters, long growing seasons, and moist soil types (Jones 1985). Changing precipitation patterns, fire suppression, and generally dry site conditions are thought to be responsible for aspen decline in the interior West, as well as on BHNF lands (USDA-Forest Service 1996).
Bur Oak (*Quercus macrocarpa*)	On the BHNF, bur oak reaches its western distribution limit and is found as a small tree in densely spaced stands, in lowland riparian communities with other deciduous trees, or in shrub form under ponderosa pine overstories (Hoffman and Alexander 1987). In stands by itself it comprises only 9,243 acres of forested lands (USDA-Forest Service 1996). Fire suppression may have helped skew the age distribution in the Black Hills towards older age classes, resulting in conversion of seral bur oak woodlands by more shade tolerant species (Sieg 1991).
Mountain Mahogany (*Cercocarpus montanus*)	The mountain mahogany type is the most extensive of the dry plains shrub-lands in the Black Hills but it is also restricted in distribution. It is best developed on the low-elevation limestone deposits east of New Castle, Wyoming (Marriott et al.1999). Not a true mahogany species, its evergreen leaves are an important source of deer browse year-round (Whitney 1985).

Table 3-4. Species Designated as MIS or ecological indicators in the 1997 Forest Plan (USDA-Forest Service 1996) or the Phase I Amendment (USDA-Forest Service 2001a)

Species	Habitat Description / Distribution
Riparian Areas and Seral Stage and Trend	Riparian vegetation occurs on approximately 1% of the Black Hills (an estimated 50% on private land) (USDA-Forest Service 1997). Four types of riparian communities are identified: plains riparian and shrubland, high elevation riparian forests and shrubland, dry riparian forest and woodland, and riparian wet meadows. Plains riparian and shrubland are made up of narrowleaf cottonwood/red osier dogwood community, and western snowberry shrublands. The high elevation riparian forest and shrubland type comprises bebb willow scrub, sandbar willow mixed with bebb willow, water birch shrublands restricted to higher elevations of the Central Hills, and white spruce alluvial Black Hills forests found in mesic drainages. The dry riparian types occupy lower slopes and bottoms of drainages with or without streams. Paper birch and beaked hazel occupy higher elevations in this type; bur oak/iron wood in transitional zones followed by aspen/ chokecherry and ponderosa pine/chokecherry. Aspen/chokecherry may be seral to ponderosa pine/chokecherry. Riparian wet meadows at higher elevations comprise high elevation forest and shrublands, Canada bluejoint meadow, Nebraska sedge wet meadow, prairie cordgrass-sedge wet prairie, and black hills streamside vegetation. At lower elevations, Nebraska sedge wet meadow, prairie cordgrass-sedge wet prairie, creeping spikerush wet meadow, northern great plains cattail community and western great plains streamside vegetation occur. McIntosh Fen northwest of Deerfield Lake supports the following vegetative communities: Nebraska sedge wet meadow, Baltic rush wet meadow, sage willow fen. Two rare willows (*Salix candida and S. serissima*), found nowhere else in the Black Hills are found at the McIntosh Fen (Marriott et al. 1999).
Water Quality	Water quality in the South Dakota Black Hills has been classified as “good to satisfactory” by the state’s Department of Environment and Natural Resources 305(b) Water Quality Assessment conducted in 1994 (Allen et al. 2005). There are localized water quality issues associated with violations of water quality standards due to pH, temperature, total suspended solids, conductivity and pathogens from acid drainage from mine tailings, loss of riparian shrubs, livestock use and road construction (Allen et al. 2005). Implementation of current Best Management Practices for forestry, mining, and livestock grazing activities should help to improve overall water quality (Allen et al. 2005).
Instream Fisheries Habitat	There are currently about 800 miles of cold-water fisheries streams with 2,000 surface acres of reservoirs located within the BHNF (USDA-Forest Service 1996). The loss of approximately 100 miles of stockable streams has been attributed to reduced water yields, road and rail construction, flood control, unregulated timber harvest prior to 1900, overgrazing, and wells in and around the Forest (USDA-Forest Service 1996).

Table 3-4. Species Designated as MIS or ecological indicators in the 1997 Forest Plan (USDA-Forest Service 1996) or the Phase I Amendment (USDA-Forest Service 2001a)

Species	Habitat Description / Distribution
Snags	Snags are described as dead or partially dead trees large enough to support cavity nesting wildlife (Thomas et al. 1979). Cavity nesting wildlife, most notably some bird species, are dependant on snags for nesting and foraging (USDA-Forest Service 1996). Formally, snags were removed during timber harvests because of their threat as a fire and safety hazard and because of detrimental effects to timber production (USDA-Forest Service 1996). Populations of cavity nesting wildlife are dependant upon an adequate number of snags in the forest (USDA-Forest Service 1996).
Dead and Down Woody Material	Down woody material includes all woody debris found on the forest floor. A wide variety of plant and animal species benefit from the habitats provided by down woody material (USDA-Forest Service 1996). Down woody material acts as a moisture and nutrient reservoir, and provide foraging, denning and hiding sites (USDA-Forest Service 1996). Snag retention is an important aspect of insuring adequate down woody material.
Invertebrates	
Striate Disc (*Discus shimekii)*	**See Table 3-3**
Cooper's Rocky Mountain Snail (*Oreohelix strigosa cooperi)*	**See Table 3-2**
Regal Fritillary (*Speyeria idalia*)	**See Table 3-2**
Fishes	
Finescale Dace *(Phoxinus neogaeus)*	**See Table 3-2**
Lake Chub *(Couesius plumbeus)*	**See Table 3-2**
Mountain Sucker *(Catostomus platyrhynchus)*	**See Table 3-2**

Table 3-4. Species Designated as MIS or ecological indicators in the 1997 Forest Plan (USDA-Forest Service 1996) or the Phase I Amendment (USDA-Forest Service 2001a)

Species	Habitat Description / Distribution
Brook Trout (*Salvelinus fontinalis*)	Brook trout are native to east coast streams from Central Canada to Georgia and westward to the Great Lakes region. They thrive in montane streams and lakes. Spawning occurs in the fall usually in small streams but also beaver ponds. Diet is mostly invertebrates, although larger brook trout may feed on fish (Baxter and Stone 1995). It reproduces naturally in most streams, occurring in higher elevation reaches than brown trout (USDA-Forest Service 2001i). Brook trout may be sensitive to increases in water temperature, changes in pH, low dissolved oxygen, and sedimentation resulting from management activities (USDA-Forest Service 2001i). In the Black Hills, brook trout are also negatively affected by competition with brown trout and lack of forage.
Brown Trout (*Salmo trutta*)	Native to Europe and Asia, this species has been introduced widely in North America. Occurs in lakes and streams, and may thrive in lower elevation runs if overhead cover is adequate. Browns spawn in fall and their diet is variable with larger individuals feeding mostly on smaller fish (Baxter and Stone 1995). This fish is a game species on the BHNF and they often reproduce naturally (USDA-Forest Service 2001i). Brown trout are sensitive to loss of riparian vegetation and the subsequent effects on water temperature and increases in turbidity (USDA-Forest Service 2001i).
Reptiles and Amphibians - None	
Birds	
Bald Eagle (*Haliaeetus leucocephalus)*	**See Table 3-1**
Osprey (*Pandion haliaetus*)	Locally found from Alaska to the Southwestern United States and east to the Atlantic coast (DeGraaf et al. 1991). In South Dakota the osprey is considered an uncommon migrant and a casual summer visitor at scattered locations (SDOU 1991) at reservoirs in the Black Hills. The only active nest is found in Pennington County (Peterson 1995). Associated with aquatic environments due to its reliance on fish, the osprey's recent range expansion into South Dakota has been attributed to reservoir construction of the last century combined with the introduction of game fish state-wide (USDA-Forest Service 1996, Appendix H).
Northern Goshawk (*Accipiter gentilis*)	**See Table 3-2**

Table 3-4. Species Designated as MIS or ecological indicators in the 1997 Forest Plan (USDA-Forest Service 1996) or the Phase I Amendment (USDA-Forest Service 2001a)

Species	Habitat Description / Distribution
Merriam's Turkey (*Meleagris gallopavo merriami*)	This species is not native to the Black Hills and was introduced in the late 1940s and early 1950s. Turkeys in the Black Hills are altitudinal migrants, moving to lower elevations in the winter to escape snow cover (USDA-Forest Service 1996). Turkeys use a variety of habitats over the course of the year and benefit from maximum structural diversity within and between stands. Key turkey habitat characteristics include rocks, outcrops, or shrubs to provide horizontal cover for nesting; trees of a least 9-inch DBH with large horizontal branches for roosting; and dense conifer stands in winter for thermal cover and pine seed forage (Rumble and Anderson 1993). In the summer this species is found throughout the BHNF. It is estimate that the South Dakota BHNF contains 10,000 to 15,000 birds (USDA-Forest Service 1996).
Brown Creeper (*Certhia americana)*	This species is associated with large diameter spruce, Douglas-fir, and pine snags where it nests behind loose bark. May be an old growth obligate due to dependence on large diameter snags for nesting (USDA-Forest Service 1981). Generally it is an interior forest species and therefore, sensitive to forest fragmentation (USDA-Forest Service 2002a). This species is a widely distributed year-round resident of the Black Hills and the regional population is expanding (SDOU 1991; Sauer et al. 2001).
Pygmy Nuthatch (*Sitta pygmaea*)	**See Table 3-3**
Black-Backed Woodpecker (*Picoides arcticus)*	**See Table 3-2**
Three-Toed Woodpecker (*Picoides tridactylus*)	**See Table 3-2**
Mammals	
Fringed Myotis *(Myotis thysanodes)*	**See Table 3-2**
Townsend's Big-Eared Bat (*Corynorhinus townsendii*)	**See Table 3-2**
Mountain Lion (*Felis concolor*)	Wide range throughout the hemisphere, preferred habitat in mountain west is rocky, rugged terrain with deer (Clark and Stromberg 1987). Historically occurred in all Black Hills counties and may be expanding on the BHNF and adjacent lands. Habitat use is tied closely to deer (USDA-Forest Service 1996).
American Marten (*Martes americana*)	**See Table 3-2**

Table 3-4. Species Designated as MIS or ecological indicators in the 1997 Forest Plan (USDA-Forest Service 1996) or the Phase I Amendment (USDA-Forest Service 2001a)

Species	Habitat Description / Distribution
White-tailed Deer (*Odocoileus virginianus*)	White-tailed deer occur through most of the U.S. and Southern Canada and occur in a wide range of habitats (Whitaker 1980). In the Black Hills they are associated closely with forested and riparian habitats (USDA-Forest Service 1996, Appendix H). White-tails are mostly migratory in the Black Hills using the lower elevations as winter range (USDA-Forest Service 1996, Appendix H). The estimated current population of deer in the Black Hills of South Dakota is 40,000 (Wrede pers. comm. 2002), 75% of which are white-tails (USDA-Forest Service 1996, Appendix H). No estimate is given for the Wyoming portion of the Black Hills.
Mule Deer (*Odocoileus hemionus*)	Mule deer range throughout most of Western U.S. and Canada, south to Mexico in a variety of habitats (Whitaker 1980). Of the estimated 40,000 deer (Wrede pers. comm. 2002) in the South Dakota Black Hills, 25% are mule deer (USDA-Forest Service 1996, Appendix H). Mule deer are more common in the rugged open terrain of the Southern Black Hills (USDA-Forest Service 1996, Appendix H).
Rocky Mountain Elk (*Cervus elaphus*)	Elk populations occur in most western states and into Southern Canada in a variety of habitats, though primarily montane (Whitaker 1980). There are approximately 4,000 elk in the South Dakota Black Hills (Wrede pers. comm. 2002). Elk use dense timber with complex understory for hiding cover and more open habitat for foraging. They are usually non migratory except in severe winters (SDGFP 1988).
Mountain Goat *(Oreamnos americanus)*	**See Table 3-3**

Table 3-5. Other Species and Biological Communities/Elements with Well-Understood, Narrow Habitat Associations as Described in Hayward et al. (2001) Considered for MIS Selection on the BHNF

Species Biological Communities/Elements	**Habitat Description / Distribution**
Benthic Macroinvertebrates	Benthic macroinvertebrates are large invertebrates generally found on or in the substrate of stream courses and lake bottoms (USDA-Forest Service 1997). Several individual species, especially some caddisfly and stonefly species, as well as various macroinvertebrate assemblages, can be useful in indicating current water quality since they utilize aquatic habitats during a portion of their life cycle (USDA-Forest Service 1997).
Rainbow Trout (*Oncorhynchus mykiss*)	Native to west coast streams of North America from Alaska to Mexico, although sea-run rainbows (steelheads) may migrate far inland to spawn. Rainbows thrive in lakes, rivers, and small streams and generally move into smaller tributary streams to spawn from February to May. Their diet includes invertebrates and smaller fish, or fish eggs (Baxter and Stone 1995). Essential habitat components for rainbows include a silt-free rocky substrate for spawning, overhanging vegetation on banks, deep pools, submerged vegetation, and escape and resting cover (USDA-Forest Service 2001i). This game species has been introduced in the Black Hills where it is generally maintained by stocking. However, self-sustaining populations are present in Sand, Spearfish, Rapid, Stockade and Beaver Creeks. Reservoir populations are apparently maintained by stocking (USDA-Forest Service 2001i).
Ruffed Grouse (*Bonasa umbellus*)	Common in deciduous forests throughout northern portion of North America. On the BHNF this species is associated with aspen in a variety of structural stages. The species feeds on aspen buds and catkins in the winter and spring, respectively (USDA-Forest Service 1996). Found mostly in the Central and Northern Black Hills, where the population has remained stable at approximately 1,700 birds for the past ten years (SDGFP no date).
Red-Naped Sapsucker (*Sphyrapicus nuchalis*)	Associated with aspen stands or aspen component of mixed stands, particularly when these types occur in riparian areas. Dependent on aspen for nesting and summer foraging, but uses a variety of forest habitats in winter (USDA-Forest Service 1996).
Hairy Woodpecker (*Picoides villosus*)	Common woodpecker in forests throughout Central Canada and the U.S. They are also common permanent residents throughout forested habitats in the Black Hills. Although associated with conifers, they may prefer aspen for nesting due to the softer wood. Considered a forest habitat generalist and edge species in the Black Hills (USDA-Forest Service 1996).
Northern Flicker (*Colaptes auratus*)	Widespread and common in open forest and other open habitats in the West. In the Black Hills this species is common (Peterson 1995) in open canopy pine and aspen forest (USDA Forest Service 1996). Largest primary cavity nester in the Black Hills. Much of their diet is ants. Optimal habitat in the Black Hills may be open, mature ponderosa pine, aspen, and spruce (USDA-Forest Service 1996).
Red-Breasted Nuthatch (*Sitta canadensis*)	Common in the Canadian boreal forest and the Rocky Mountains. May use existing cavities for nesting or excavate its own, which requires soft wood. Prefers coniferous forest for nesting and may move to lower coniferous

Table 3-5. Other Species and Biological Communities/Elements with Well-Understood, Narrow Habitat Associations as Described in Hayward et al. (2001) Considered for MIS Selection on the BHNF

Species Biological Communities/Elements	**Habitat Description / Distribution**
	forest during winter. In the Black Hills, these birds may be restricted to dense canopy and old growth conifer stands (USDA-Forest Service 1996).
Ovenbird (*Seiurus aurocapillus*)	Ground-nesting bird of dry deciduous forests. In the Black Hills this warbler uses dense mature aspen and conifer stands with a significant aspen component for nesting. A closed canopy with well-developed deciduous understory may be preferred. In the BHNF, ovenbirds use smaller patches than the large un-fragmented habitat this species is associated with in the Eastern U.S. (USDA-Forest Service 1996).
Common Yellowthroat (*Geothlypis trichas*)	*G. trichas* is a true riparian obligate species in the Southern Rocky Mountains (i.e., >90% of nests, or >90% of abundance occurs in riparian vegetation) (BLM no date). They typically nest on or near the ground in dense understory. This species is an insect foliage gleaner but it may also hawk insects from an exposed perch. Layered shrub vegetation may be essential to this species for foraging (Yanishevsky and Rupp 1998). This species is sensitive to degradation of riparian vegetation, and responds negatively to heavy grazing (Kantrud 1981). May occur in a wide range of habitats with thick vegetation, including dry upland pine forests with undergrowth (Guzy and Ritchison 1999). *G. trichas* is a summer resident in the Black Hills. Panjabi (2001) found them associated with riparian and wet meadow habitats on breeding surveys conducted on the BHNF.
Swainson's Thrush *(Catharus ustulatus)*	Habitat for the Swainson's thrush includes conifers, aspens and forest undergrowth along streams (USDA-Forest Service 1981) as well as coniferous forest edges (Ehrlich et al. 1988). Widespread throughout boreal forests of Alaska, Canada, and Northwestern U.S. (Peterson 1990). Winters in South America (Ehrlich et al. 1988). Common in the Black Hills within suitable habitat (Luce et al. 1999, Peterson 1995).
MacGillivray's Warbler (*Oporornis tolmiei*)	*O. tolmiei* prefers foothills and montane riparian areas. It nests in dense shrub near the ground to several meters high. It forages for insects in dense vegetation on or near the ground. It is likely sensitive to even short-term degradation of riparian habitat (Yanishevsky and Rupp 1998). Panjabi (2001) describes this species as the most densely populated species in riparian areas on the BHNF, but they were also commonly found in aspen.
Warbling Vireo (*Vireo gilvus*)	*V. gilvus* is most commonly associated with aspen forests in mountain habitat. Nests are suspended from horizontal branches from a variety of heights (Yanishevsky and Rupp 1998). *V. gilvus* gleans insects from the outer foliage of the canopy, but will also eat seeds and berries. They are neutral as to preference for shrubs in the understory (Yanishevsky and Rupp 1998). They are also tolerant to openings and ecological change (USDA Forest Service 1981). Panjabi (2001) found *V. gilvus* in multiple structural stages of pine, almost as often within aspen. They were also detected in white spruce, riparian and wet meadow habitats (Panjabi 2001).
Red-Eyed Vireo (*Vireo olivaceus*)	*V. olivaceus* is associated with semi-open deciduous forests and riparian areas. The use of ponderosa pine is usually limited to open stands with deciduous associates (Yanishevsky and Rupp 1998). In the BHNF, Panjabi

Table 3-5. Other Species and Biological Communities/Elements with Well-Understood, Narrow Habitat Associations as Described in Hayward et al. (2001) Considered for MIS Selection on the BHNF

Species Biological Communities/Elements	**Habitat Description / Distribution**
	(2001) found *V. olivaceus* in ponderosa pine and riparian areas, most often with a bur oak component. Suspended nests are built from 10-40 feet above ground. Insects, primarily Lepidoptera larvae and beetles, are gleaned from foliage. *V. olivaceus* is one of the most heavily parasitized species by cowbirds. This species may respond negatively to timber harvest (Yanishevsky and Rupp 1998).
Song Sparrow (*Melospiza melodia*)	*M. melodia* is closely associated with riparian areas and Panjabi (2001) found all song sparrows detected during breeding surveys associated with riparian areas or wet meadows. BLM (no date) considers *M. melodia* as a good indicator of riparian habitat condition. However BLM (no date) does describe song sparrows as riparian obligates in the Southern Rocky Mountains or Great Plains. Surveyors in Colorado found evidence of breeding *M. melodia* in riparian, woodland, shrubland, and grass habitats (Kingery 1998). They feed on insects and seeds gleaned from the ground. It is a common summer resident and uncommon in the winter on the BHNF (SDOU 1991, USDA-Forest Service 1981).
Fox Sparrow (*Paserella iliaca*)	Found from Alaska to Newfoundland south through the mountains of Southern California, the inter-mountain West to Colorado and across Central Canada to Southern Quebec, wintering south to the Southern U.S. (Sibley 2000). Considered an accidental summer resident in Western South Dakota (SDOU 1991) and as a transient in the Black Hills with uncertain status (Peterson 1995). An inhabitant of dense brush thickets, brushy margins of thick forests and riparian thickets of willow or alders, this species feeds primarily on seeds, as well as on insects (Johnsgard 1986, Sibley 2000) and has nonspecific nesting requirements, preferring a coniferous forest with dense shrubby under-stories (USDA-Forest Service 1996, Appendix H).
Red-Winged Blackbird (*Agelaius phoeniceus*)	This species is most commonly associated with emergent wetlands, but they will nest in a variety of habitats including riparian areas and grasslands (Kingery 1998). However, wetland nest sites may be 10 times more successful than upland nest sites. They construct nests in sturdy herbaceous vegetation, and feed primarily on emergent aquatic insect larvae. Panjabi (2001) found this species locally abundant, primarily in wetland habitats on the BHNF.
Golden-Crowned Kinglet (*Regulus satrapa*)	Distributed across the boreal forest zone of North America from Alaska through Southern Canada south through the mountainous regions of the continent and into Central America (DeGraaf et al. 1991). Typically found during the breeding season in spruce-fir forests, as well as other coniferous habitats and even into riparian woodlands (Johnsgard 1986). This species is considered an uncommon permanent resident at higher elevations within the Black Hills (SDOU 1991) and is generally confined to the spruce cover type in the BHNF (USDA-Forest Service 1996, Figure H-28).
Ruby-Crowned Kinglet (*Regulus calendula*)	*R. calendula* is closely associated with spruce/fir forests throughout the Rocky Mountains (Yanishevsky and Rupp 1998). Panjabi (2001) found this bird very closely associated with white spruce on the BHNF. It nests very high in coniferous trees so little is known about reproduction. They glean

Table 3-5. Other Species and Biological Communities/Elements with Well-Understood, Narrow Habitat Associations as Described in Hayward et al. (2001) Considered for MIS Selection on the BHNF

Species Biological Communities/Elements	**Habitat Description / Distribution**
	insects and spiders from tree and shrub foliage.
Virginia's Warbler (*Vermivora virginiae*)	*V. virginiae* is a common summer resident of lower montane shrublands throughout Region 2. It will also breed within shrubby understories of ponderosa pine forests (USDA-Forest Service 1981). Steep slopes may be preferred as nest sites and nests are built on the ground. It forages on the ground beneath a shrub canopy gleaning insects from underbrush and litter. This species is migratory.
Pinyon Jay (*Gymnorhinus cyanocephalus*)	This species requires conifers (particularly pinon and ponderosa pine) for nest cover, roosting, and foraging. Shrubland and grassland habitats are also used for foraging (Yanishevsky and Rupp 1998). This species is highly gregarious and forms large flocks. Foraging occurs on the ground for cone seed, although they also glean from pine bark and foliage. Due to the ephemeral nature of their primary food source, flocks will often travel great distances to forage (Yanishevsky and Rupp 1998).
Beaver (*Castor canadensis*)	At one time beaver were likely the most important biological influence on riparian systems of the BHNF. Beaver dams extended water flows through the summer and created habitat for a wide range of plants and animals (Parrish et al. 1996), many of which are now emphasis species. Beavers, through dam construction, can enhance and maintain aquatic and riparian communities by elevating water tables, reducing stream velocity and subsequent sedimentation and bank erosion, improving water quality and stream flow stabilization, and enhancing fish and wildlife habitat (Olson and Hubert 1994). Riparian and aquatic dynamics created or enhanced by beaver are considered beneficial to many plant emphasis species.
Dwarf Shrew (*Sorex nanus*)	Occurring in sub-alpine and alpine habitat throughout much of the U.S. Intermountain West (Jones Jr. et al.1983), although in South Dakota three specimens were collected from prairie habitats east of the Black Hills (Turner 1974). No confirmed presence on the BHNF (USDA-Forest Service 1996, Appendix H), but interior low elevation montane grasslands are assumed to be potentially suitable due to this species' presence in similar habitats elsewhere in the state and Wyoming (Oakleaf et al. 1992).
Birch/Hazelnut Association (*Betula papyrifera/Corylus cornuta*)	This plant association is rare in the Black Hills (Marriott et al. 1999). It occurs as an association within the dry riparian forest and shrubland community often found in moist open forest and along meadow borders (Larson and Johnson 1999). Marriott et al. (1999) identified eight element occurrences in the Black Hills Community Inventory. Despite limited occurrence on the BHNF, birch/hazelnut is a common associate of many other rare plants listed as emphasis species in this report.
Dry Plains Shrubland Community	Low elevation shrublands in the Black Hills include big sagebrush/western wheatgrass shrubland, mountain mahogany/side-oats gramma shrubland, creeping juniper/little bluestem dwarf shrubland, and three-leafed sumac/bluebunch wheatgrass shrubland (Marriott et al. 1999). The big sagebrush association occurs mostly on private lands but the other types represent important habitat diversity on the BHNF and important winter

Table 3-5. Other Species and Biological Communities/Elements with Well-Understood, Narrow Habitat Associations as Described in Hayward et al. (2001) Considered for MIS Selection on the BHNF

Species Biological Communities/Elements	**Habitat Description / Distribution**
	range for wild cervids (Sieg and Severson 1996).
Black Hills Montane Grasslands Community	Endemic to the Black Hills, this association may be a seral stage between wetland to climax forest. On lower elevations these grasslands are dominated by timothy. Prairie drop-seed and needlegrass dominate higher well-drained slopes. Much of the montane grassland complex is dominated by non-native species (Marriott et al. 1999). This is historically an important element of habitat diversity on the forest, which may be shrinking and degrading due to pine encroachment, road construction, livestock grazing, exotic invasive plants, and weed invasion.
Mixed-grass Prairie Community	Two prairie associations occur on the BHNF: Dry Mixed-grass Prairie and Mesic Mixed-grass Prairie. This is historically an important element of habitat diversity on the BHNF, which may be shrinking and degrading due to pine encroachment, livestock grazing, and weed invasion.

Step 4 - Sort The Potential MIS Identified In Step 3, Grouped By Each Important Monitoring Priority Identified In Step 2.

Table 3-6 sorts species considered for MIS selection by the four MIS monitoring priorities established in Step 2. These priorities are:

1. Forest condition and habitat diversity
2. Riparian/aquatic habitat condition
3. Grasslands habitat condition
4. Dry plains shrublands condition

Prior to sorting, species whose persistent presence on the forest is not documented or remains unconfirmed were removed from the MIS selection process. Species removed included: black-footed ferret, gray wolf, northern river otter, lynx, swift fox, spotted bat, sturgeon chub, plains minnow, mountain plover, ferruginous hawk, northern harrier, peregrine falcon, fox sparrow, purple martin, leathery grape-fern, and shining willow.

The remaining species were evaluated for consideration as MIS with the *Principles* and *Steps* described earlier. Additional screening criteria identified by Hayward et al. (2001) in Step 4 include the following:

1. Scientific literature should support the habitat relationships and limiting factors assumed for each species.

2. Preference is given to species whose habitat and/or population trends can be monitored effectively and efficiently.

3. Selection should favor persistent year-round residents.

4. Selection should favor indigenous species.

5. "MIS should reflect habitat change at appropriate spatial and temporal scales."

Table 3-6. Selection/Elimination Rationale of Potential MIS for BHNF Monitoring Priorities

MIS/Element	Selection/Elimination Rationale[1]
Monitoring Priority No. 1 - Forest Condition and Habitat Diversity	
Bald Eagle	Not selected. Winter resident only. Inadequate information on habitat associations for monitoring.
Sharp-Shinned Hawk	Not selected. Forest habitat generalist. Inadequate habitat associations, therefore, monitoring data would not provide significant feedback on management activities.
Cooper's Hawk	Not selected. Forest habitat generalist. Inadequate habitat associations, therefore, monitoring data would not provide significant feedback on management activities.
Northern Goshawk	Not selected. Thrives on vertical structural diversity. Abundance and variety of prey required to breed is a limiting factor to nest success. May be good indicator of forest biodiversity. However, due to low density and wide-ranging habits it would be difficult to monitor population trends. Also, if population trends were detected they would be unlikely to provide feedback on which habitat components are affecting declines or increases.
Broad-Winged Hawk	Not selected. Forest habitat generalist. Inadequate habitat associations, therefore, monitoring data would not provide significant feedback on management activities. Migratory species.
Merlin	Not selected. Nests in a variety of forest associations. Inadequate information on habitat associations for monitoring. Migratory species. Ecological limiting factors not clearly understood.
Northern Saw-Whet Owl	Not selected. Forest habitat generalist. Inadequate habitat associations, therefore, monitoring data would not provide significant feedback on management activities.
Flammulated Owl	Not selected. Only one documented and one likely sighting recorded on BHNF.
Merriam's Turkey	Not selected. Inadequate information on habitat associations for monitoring. Ecological limiting factors not clearly understood, therefore, better addressed in a management approach other than MIS designation. Non-native species.

Table 3-6. Selection/Elimination Rationale of Potential MIS for BHNF Monitoring Priorities

MIS/Element	Selection/Elimination Rationale[1]
Ruffed Grouse	**Selected. Year-round resident in Black Hills. Dependence on aspen forest is consistent with monitoring priorities. Ruffed grouse may require a variety of aspen structural stages to thrive including late successional aspen for drumming logs and most other stages for buds and catkins. Therefore, ruffed grouse habitat and/or population trends will likely serve as an indicator of the abundance, distribution and condition of aspen habitat on the BHNF. Existence of some SDGFP population data provides baseline information.**
Brown Creeper	**Selected. The abundance and distribution of this species is tied to large trees and late successional coniferous forest on the BHNF (Panjabi 2001). May be coniferous old growth obligate and sensitive to habitat fragmentation. Brown creeper habitat and/or population trends will likely serve as an indicator of the abundance, distribution and condition of large trees and late successional coniferous forest habitat. This species can be effectively monitored with existing monitoring methods (Panjabi 2001).**
Lewis' Woodpecker	Not selected. Prefers open canopy forest with well-developed understory. May colonize burned areas. This species may serve as an indicator for open, older burned habitat with larger snags. However, current efforts have been unable to adequately monitor the species (Panjabi 2001, 2003, 2004, 2005). Not selected due to the difficulty and expense of monitoring.
Black-Backed Woodpecker	**Selected. Panjabi (2001) found this species occurring most frequently in recently burned habitat, and at lower densities in other forest types including late-successional pine forest. Species is a year-round resident. Monitoring could enhance the ability to evaluate impacts from management on availability of snags in both complex mature coniferous forest and recently burned forest. More numerous and detectable than the three-toed woodpecker (Panjabi 2001).**
Three-Toed Woodpecker	Not selected. Closely tied to spruce habitat (Panjabi 2004). Recent monitoring efforts (Panjabi 2001, 2003, 2004, 2005) have not shown a close tie to recently burned habitat. Therefore, this species was not selected as an indicator of burned habitat. Also, this species is less common than the black-backed woodpecker (Panjabi 2001). This species should be adequately monitored in white spruce habitat (Panjabi 2004). However, it was not selected as an indicator of spruce habitat because it has a much smaller sample size than golden-crowned kinglet.
Northern Flicker	Not selected. Inadequate information on habitat associations (Panjabi 2001) to provide significant feedback from monitoring.
Red-Naped Sapsucker	Not selected. Closely associated with aspen stands. Preferred nesting habitat is mature and late-successional aspen. However, migrates out of the Black Hills in winter, which complicates tying population trends to BHNF habitat condition. Also, red-naped sapsucker relative abundance would not indicate the availability and vigor of young aspen stands.
Hairy Woodpecker	Not selected. Appears to be a generalist, therefore, monitoring data would not provide significant feedback on management activities.

Table 3-6. Selection/Elimination Rationale of Potential MIS for BHNF Monitoring Priorities

MIS/Element	Selection/Elimination Rationale[1]
Red-Breasted Nuthatch	Not selected. Often associated with mature conifer habitat. However, Panjabi (2001) found red-breasted nuthatches distributed in a wide variety of habitats on the BHNF. Ambiguous habitat associations may limit the utility of population trend data on understanding effects of management activities.
Pygmy Nuthatch	Not selected. This species would be difficult to monitor due to its scarcity and localized distribution (Panjabi 2001). Habitat relationships unclear: may prefer open forests; but also undisturbed, late-successional forests (which tend to grow dense in the Black Hills in the absence of disturbance). This may compound ability to draw inferences about the effects of management on habitat and/or populations.
Black and White Warbler	Not selected. Inadequate information on presence in the BHNF habitat associations, therefore, monitoring data would not provide significant feedback on management activities. Migratory species.
Golden-Crowned Kinglet	**Selected. Permanent resident of the BHNF. This species is very closely associated with white spruce forests. This species is readily monitored with existing survey protocol (Panjabi 2001). Golden-crowned kinglet habitat and/or population trends will likely serve as an indicator of the abundance, distribution and condition of spruce habitat.**
Ovenbird	Not selected. Panjabi (2001) found ovenbirds in a very wide range of forested habitat. Inadequate information on habitat associations for monitoring. Migratory species. Ecological limiting factors not clearly understood.
Long-Eared Myotis	Not selected. Forages over dry forested habitat, but limiting factor is likely cave habitat, which is not a monitoring priority.
Long-Legged Myotis	Not selected. Forages over dry forested habitat, but limiting factor is likely cave habitat, which is not a monitoring priority.
Townsend's Big-Eared Bat	Not selected. Forages over dry forested habitat, but limiting factor is likely cave habitat, which is not a monitoring priority.
American Marten	Not selected. Presence may be limited to two reintroduced populations. Closely tied to spruce habitat, but also likely uses pine and other forest types in close proximity to spruce. Difficult and expensive to monitor population trends at Forest-wide scale in a manner that would allow inferences to management. Golden-crowned kinglet and American three-toed woodpecker are more easily and efficiently monitored as an indicator of abundance, distribution and condition of spruce habitat..
Northern Flying Squirrel	Not selected. Difficult to assess population trends at Forest-wide scale. Also, its habitat associations may not be narrow enough to provide relevant feedback from monitoring. Monitoring mature coniferous forest components would likely be more effective.
Mountain Goat	Not selected. Limited habitat distribution. Habitat association does not encompass monitoring priorities. Also, not an indigenous species.

Table 3-6. Selection/Elimination Rationale of Potential MIS for BHNF Monitoring Priorities

MIS/Element	Selection/Elimination Rationale[1]
Mountain Sheep	Not selected. Limited distribution. Habitat association does not encompass monitoring priorities. Would not significantly aid evaluation of management activities on habitat elements. Also, subspecies is not indigenous.
Mountain Lion	Not selected. Limiting factor may be deer presence rather than habitat. Also, difficult to detect and monitor and would not significantly aid evaluation of management activities on habitat elements.
White-Tailed Deer	**Selected. Numerous sources associate deer decline with decline of shrubs and other forage on winter range and in forest understory. Also uses aspen, open areas, and forested areas for forage and cover. Easily monitored in coordination with State game and fish agencies. White-tailed deer habitat trends and/or population parameters will likely serve as an indicator of the abundance, distribution and condition of understory shrubs and general habitat diversity.**
Mule Deer	Not selected. Much of the current research on deer habitat utilization in the Black Hills focuses on white-tailed deer. Mule deer are not as well distributed across the Forest, making it less likely to address Forest-wide management issues. Monitoring this species would not significantly aid evaluation of management activities on habitat elements.
Rocky Mountain Elk	Not selected. Uses a variety of habitat types and would not significantly aid evaluation of management activities on habitat elements. Effects of road density on elk is a management concern, but is best addressed in a management approach other than MIS designation.
Black Hills Redbelly Snake	Not selected. Inadequate information on habitat associations for monitoring. Ecological limiting factors not clearly understood, therefore, better addressed in a management approach other than MIS designation.
Cooper's Rocky Mountain Snail	Not selected. Inadequate information on habitat associations for monitoring. Ecological limiting factors not clearly understood, therefore, better addressed in a management approach other than MIS designation.
Callused (Dakota) Vertigo	Not selected. Inadequate information on habitat associations for monitoring. Ecological limiting factors not clearly understood, therefore, better addressed in a management approach other than MIS designation.
Mystery Vertigo	Not selected. Although associated with moist spruce types, monitoring this species would not significantly aid evaluation of management activities on this habitat element. Species management best addressed by approach other than MIS designation.
Frigid Ambersnail	Not selected. Inadequate information on habitat associations for monitoring. Ecological limiting factors not clearly understood, therefore, better addressed in a management approach other than MIS designation.

Table 3-6. Selection/Elimination Rationale of Potential MIS for BHNF Monitoring Priorities

MIS/Element	Selection/Elimination Rationale[1]
Limber Pine	Not selected. Only one known occurrence on the BHNF, therefore, monitoring this species would not significantly aid evaluation of management activities on landscape-level habitat elements. Species management best addressed by approach other than MIS designation.
Trailing Clubmoss	Not selected. Only two known occurrences on the BHNF, therefore, monitoring this species would not significantly aid evaluation of management activities on habitat elements. Species management best addressed by management approach other than MIS designation.
Showy Sedge	Not selected. Only three known occurrences on the BHNF located within the granitic core, therefore, monitoring this species would not significantly aid evaluation of management activities on landscape-level habitat elements. Species management is best addressed by approach other than MIS designation.
Large Round-Leaf Orchid	Not selected. Inadequate information on habitat associations for monitoring, therefore, monitoring this species would not significantly aid evaluation of management activities on habitat elements. Ecological limiting factors not clearly understood, therefore, better addressed in a management approach other than MIS designation.
Stiff Clubmoss	Not selected. Only two known populations on the BHNF, therefore, monitoring this species would not significantly aid evaluation of management activities on landscape-level habitat elements. Species management is best addressed by approach other than MIS designation.
Bloodroot	Not selected due to this species' narrow associated habitat conditions and limited range on BHNF. Species management best addressed by approach other than MIS designation.
Bristle-Stalk Sedge	Not selected due to this species' narrow associated habitat conditions. Species management best addressed by approach other than MIS designation.
Highbush Cranberry	Not selected due to this species' narrow associated habitat conditions.. Species management best addressed by approach other than MIS designation.
Small-Flower Columbine	Not selected due to this species' narrow associated habitat conditions. Species management best addressed by approach other than MIS designation.
Yellow Lady's Slipper	Not selected due to lack of reliable information on associated habitat conditions or requirements for this species. Species management is best addressed by approach other than MIS designation.
Ponderosa Pine - All Structural Stages	Not selected. Complex biological communities are not appropriate as MIS.

Table 3-6. Selection/Elimination Rationale of Potential MIS for BHNF Monitoring Priorities

MIS/Element	Selection/Elimination Rationale[1]
White Spruce - All Structural Stages	Not selected. Complex biological communities are not appropriate as MIS.
Quaking Aspen	Not selected. Complex biological communities are not appropriate as MIS.
Bur Oak	Not selected. Complex biological communities are not appropriate as MIS.
Birch/Hazelnut Association	Not selected. Despite the importance of this plant association to BHNF biodiversity, its restricted occurrence in small patches (Marriott et al. 1999) limits its utility as an MIS. Conservation of this association is best addressed by a management approach other than MIS designation.
Mountain Mahogany	Not selected. This plant community is only one of four Dry Plains Shrublands associations found on the BHNF. Monitoring should focus on all four associations that comprise Dry Plains Shrublands (see Dray Plains Shrublands in Table 3-6).
Snags	Not selected. This forest community element is an important component of biodiversity on the BHNF. However, monitoring the quantity of snags on the landscape does not address the often-complex relationship between attributes of snag habitat and snag-dependent species. Monitoring selected snag-dependent species is a better approach to address the effects of management.
Dead and Down Woody Material	Not selected. This biological element is not identified as a monitoring priority and is more effectively and efficiently maintained with a management approach other than MIS designation.
Monitoring Priority No. 2 - Riparian/Aquatic Habitat Condition	
Osprey	Not selected. This species range is limited to scattered locations at reservoirs in the Black Hills. Species is migratory. Species conservation is best addressed by management approach other than MIS designation.
Yellow-Billed Cuckoo	Not selected. Uncommon in Wyoming and absent in South Dakota Black Hills. Species is migratory and breeding may be irruptive, both of which could confound efforts at population monitoring.
Swainson's Thrush	Not selected. Panjabi (2001) found this species most closely associated with spruce on the BHNF, but a variety of other forested habitats were used. Species is also migratory. These factors may reduce this species utility as an MIS.
American Dipper	Not selected. This species' range is limited on BHNF. Species conservation is best addressed by management approach other than MIS designation.

Table 3-6. Selection/Elimination Rationale of Potential MIS for BHNF Monitoring Priorities

MIS/Element	Selection/Elimination Rationale[1]
Common Yellowthroat	Not Selected. This species depends on riparian vegetation for both nesting and foraging (Yanishevsky and Rupp 1998). It is considered an indicator of riparian ecosystem condition by BLM (no date). It may be particularly relevant as an indicator where management attempts to restore degraded riparian habitat. This species was not selected because it may occur in a wide range of habitats with thick vegetation, including dry upland pine forests with undergrowth (Guzy and Ritchison 1999. Also, It migrates out of the Black Hills in winter, which can confound efforts at tying monitoring to effects of management; however, threats on its winter range are considered moderate compared to threats on its breeding grounds, which are extensive (Yanishevsky and Rupp 1998).
Virginia's Warbler	Not selected. This species is closely associated with lower montane shrublands, where it nests and forages. However, this species is migratory and threats to populations on winter grounds are considered extensive. This may confound population monitoring efforts on breeding grounds (Yanishevsky and Rupp 1998).
MacGillivray's Warbler	Not selected. This species is considered a riparian dependent species (compared to common yellowthroat, which is an obligate). It is sensitive to disturbances in riparian areas, but threats on the winter range are considered extensive compared to threats on its breeding range, which are moderate. Common yellowthroat is likely a more effective MIS.
Song Sparrow	**Selected. This species is dependent on riparian areas across much of its range and Panjabi (2001) found them closely associated with riparian and wetland habitat on the BHNF. They are uncommon winter residents in the Black Hills, many likely spending the winter on adjacent prairie habitat (SDOU 1991). BLM (no date) considers *M. melodia* as a good indicator of riparian habitat condition. This species would likely be a good supplemental indicator of riparian habitat condition in addition to Beaver. Song sparrow habitat and/or population trends will serve as an indicator of the condition riparian habitat.**
Warbling Vireo	Not selected. Although closely associated with aspen on the BHNF it is also common in a variety of pine structural stages. It is tolerant of ecological change and neutral as to understory condition. This species is also migratory. *V. gilvus* would likely only provide feedback on aspen quantity, which is best evaluated by monitoring aspen habitat directly.
Red-Eyed Vireo	Not selected. Although Panjabi (2001) found this species primarily in pine and riparian areas on the BHNF, he suggests that an association with bur oak may be required. The relationship between this species and various habitat components are not clear enough to warrant MIS selection.
Red-Winged Blackbird	Not selected. This species is locally abundant at suitable wetland locations around the BHNF. Monitoring would not provide adequate feedback on a habitat scale required for MIS selection.

Table 3-6. Selection/Elimination Rationale of Potential MIS for BHNF Monitoring Priorities

MIS/Element	Selection/Elimination Rationale[1]
Ruby-Crowned Kinglet	Not selected. Closely associated with spruce throughout most of its range in the Rocky Mountains, and possibly the BHNF (USDA-Forest Service 1981, Panjabi 2001). However, the species is migratory and winter range conditions are believed to control the size of breeding populations (Yanishevsky and Rupp 1998).
Pinyon Jay	Not selected. Panjabi (2001) detected almost all pinyon jays observed during breeding surveys of the BHNF within shrublands. However, it is likely that these birds were foraging in shrublands - not nesting. They are likely dependent on ponderosa pine for nesting. Their ecological limitations on the BHNF are unclear and they are therefore not suitable as an MIS.
Fringed Myotis	Not selected. Forages over riparian areas, but limiting factor is likely cave habitat, which is not a monitoring priority.
Northern Myotis	Not selected. Forages over riparian habitat, but limiting factor is likely cave habitat, which is not a monitoring priority.
Small-Footed Myotis	Not selected. Forages over riparian habitat, but limiting factor is likely cave habitat, which is not a monitoring priority.
Meadow Jumping Mouse	Not selected. Presence of this species may reflect riparian understory in good condition. However, periodic crashes typical of many small mammal populations may confound the ability to tie management activities to population variation of this species (although not specifically documented for *Z. hudsonius*) (Shenk 2002).
Beaver	**Selected. This species is selected due to its relationship to riparian/aquatic habitat condition, status as a keystone species, available monitoring protocols, and dependence on riparian forest and shrub habitat. Also, some baseline information is available in HRV documents.**
Northern Leopard Frog	Not selected. This species uses a variety of moist habitats through the summer, but is dependent on wetlands to breed and overwinter. Availability of wetland riparian habitat is likely a limiting factor. However, attributes of riparian habitat are better monitored directly.
Tiger Salamander	Not selected. This species uses a variety of moist habitats through the summer, but is dependent on wetlands to breed and overwinter. Availability of wetland riparian habitat is likely a limiting factor. However, attributes of riparian habitat are better monitored directly.
Brook Trout	Not selected. Brook trout populations may be a sensitive indicator of the effects of management activities on aquatic biological communities or water quality (USDA-Forest Service 2001i). However, population fluctuations from competition with brown trout and other non-management activities may confound attempts to tie population monitoring to aquatic habitat condition (USDA-Forest Service 2001i). This species is not indigenous. Non-native species may be selected if there is a concern about conservation/population levels (Hayward et al. 2001). Conservation issues for brook trout were not identified (Allen et al. 2005).

Table 3-6. Selection/Elimination Rationale of Potential MIS for BHNF Monitoring Priorities

MIS/Element	Selection/Elimination Rationale[1]
Brown Trout	Not selected. Brown trout populations are less likely to be an indicator of habitat changes than other trout because of their higher tolerance of degraded water quality conditions. This species is not indigenous. Non-native species may be selected if there is a concern about conservation/population levels (Hayward et al. 2001). Conservation issues for brown trout were not identified (Allen et al. 2005).
Rainbow Trout	Not selected. Rainbow populations are sensitive to the effects of management activities on aquatic biological communities or on water. Populations are strongly influenced by supplemental stocking that is regulated by the states. This species is not indigenous. Non-native species may be selected if there is a concern about conservation/population levels (Hayward et al. 2001). Conservation issues for rainbow trout were not identified (Allen et al. 2005).
Mountain Sucker	**Selected. This native species is fairly well distributed on the BHNF and easily monitored. Forest Plan direction to protect/improve stream health should be reflected in stable or increasing population trends for this species. Interactions with non-native fish may indicate a need for modified management emphasis to balance native species conservation with non-native recreational fisheries.**
Lake Chub	Not selected. This species does not represent forest-wide management issues due to its restricted distribution to one created impoundment (Deerfield Reservoir). Species conservation is best addressed by management approach other than MIS designation.
Finescale Dace	Not selected. This species does not represent forest-wide management issues due to its limited range in the Black Hills; no documented occurrences on the South Dakota portion of the Black Hills National Forest (Isaak et.al. 2003).
Striate Disc	Not selected. This species uses a variety of moist habitats through the summer, but is dependent on wetlands to breed and overwinter. Availability of wetland riparian habitat may be a limiting factor. However, attributes of riparian habitat are better monitored directly.
Tawny Crescent	Not selected. Closely associated with riparian habitats. Difficult to detect and monitor such that the ability to evaluate impacts to riparian areas from management activities would not be significantly enhanced.
Southern Maidenhair Fern	Not selected. This species has limited associated habitat conditions and a range limited to one location on BHNF. Species persistence is best addressed by management approach other than MIS designation.
Fox-Tail Sedge	Not selected. This species has a range limited to an area in the northwestern Black Hills and Bearlodge Mountains. Species persistence is best facilitated by management approach other than MIS designation.
Mountain Sorrel	Not selected due to this species' narrow associated habitat conditions and limited range on BHNF. Species management best addressed by approach other than MIS designation.

Table 3-6. Selection/Elimination Rationale of Potential MIS for BHNF Monitoring Priorities

MIS/Element	Selection/Elimination Rationale[1]
Arrowleaf Sweet Coltsfoot	Not selected due to this species' narrow associated habitat conditions and limited range on BHNF. Species management best addressed by approach other than MIS designation.
Northern Holly-Fern	Not selected due to this species' narrow associated habitat conditions and limited range on BHNF. Species management best addressed by approach other than MIS designation.
Broad-Lipped Twayblade	Not selected due to this species' narrow associated habitat conditions and limited range on BHNF. Species management best addressed by approach other than MIS designation.
Northern Gentian	Not selected due to this species' narrow associated habitat conditions and limited range on BHNF. Species management best addressed by approach other than MIS designation.
Beaked Spikerush	Not selected. This species has limited associated habitat conditions and a range limited to one location on BHNF. Species management best facilitated by approach other than MIS designation.
Stream Orchid	Not selected. This species has limited associated habitat conditions and a range limited to one location on BHNF. Species management best addressed by approach other than MIS designation.
Autumn Willow	Not selected. This species has limited associated habitat conditions and a range limited to two locations on BHNF. Species management best facilitated by management approach other than MIS designation.
Great-Spurred Violet	Not selected. A mesic species, but within a narrow niche in the high elevation granitic core area of the Black Hills. Therefore, monitoring this species would not significantly enhance the ability to evaluate Forest-wide impacts from management activities.
Hoary Willow	Not selected. This species has narrow associated habitat conditions and a range limited to one location on BHNF. Species management best addressed by approach other than MIS designation.
Riparian Communities	Not selected. Complex biological communities are not appropriate as MIS.
Water Quality	Not selected. This is not identified as a monitoring priority in Step 2. This issue is best addressed with a management approach other than MIS designation.
Benthic Macroinvertebrates	Not selected. Inadequate information on habitat associations for monitoring. Ecological limiting factors not clearly understood.
Instream Fisheries Habitat	Not selected. Monitoring attributes of fisheries habitat does not lend itself to the definition of Management Indicators in the context of a "species" and the need to identify a population trend.

Table 3-6. Selection/Elimination Rationale of Potential MIS for BHNF Monitoring Priorities

MIS/Element	Selection/Elimination Rationale[1]
Monitoring Priority No. 3 - Grasslands Habitat Condition	
Upland Sandpiper	Not selected. Requires taller vegetation (grass) height for nesting, which could be a limiting factor due to livestock grazing. However, not detected by Panjabi (2001) and species is migratory. Limited occurrence in Black Hills (SDOU 1991) and migratory habits could confound efforts at population monitoring.
Burrowing Owl	Not selected. Generally associated with prairie dog towns, which are limited to approximately 200 acres on the BHNF. Monitoring this species would not significantly aid evaluation of management activities on habitat elements. Species is also migratory.
Grasshopper Sparrow	**Selected. Species occurs locally in the Black Hills. Because this species selects larger patches of open grassland types, prefers grassland habitat of intermediate height, avoids grasslands where vegetation less than 10 cm in height, and requires some taller vegetation (Slater 2004), grasshopper sparrow habitat and/or population trends will serve as an indicator of the abundance, distribution and condition of prairie grassland habitat.**
Loggerhead Shrike	Not selected. Grassland edge species with poorly defined habitat limitations. Species is also migratory, which may confound population monitoring efforts.
Dwarf Shrew	Not selected. Not well documented on the BHNF, but suitable habitat may exist in lower montane grasslands. Management best addressed through approach other than MIS designation.
Black-Tailed Prairie Dog	Not selected. This species only occurs on approximately 200 acres of habitat in BHNF and, therefore, would not significantly aid evaluation of management activities on habitat elements. Conservation concerns best addressed with management approach other than MIS designation.
Pale Milk Snake	Not selected. Details of habitat use in Black Hills poorly understood. Inadequate information on habitat associations for monitoring. Ecological limiting factors not clearly understood.
Atlantis Fritillary	Not selected. Difficult to detect and monitor such that the ability to evaluate impacts to riparian areas from management activities would not be significantly enhanced.
Regal Fritillary	Not selected. Few records of occurrence in the Black Hills. Preferred habitat is tallgrass prairie on the periphery of BHNF, therefore, would not significantly aid evaluation of management activities on habitat elements.
Prairie Moonwort	Not selected. One recorded historical occurrence in the Black Hills and identity of that collection is being questioned. The species is not currently known to occur on the Black Hills.
Narrowleaf grapefern	Not selected. One new occurrence documented in June 2003. Distribution is currently limited to the one location and ecology on the Black Hills is poorly understood.

Table 3-6. Selection/Elimination Rationale of Potential MIS for BHNF Monitoring Priorities

MIS/Element	Selection/Elimination Rationale[1]
Grasslands (Montane Grasslands and Mixed-grass Prairie)	Not selected. Complex biological communities are not appropriate as MIS.
Monitoring Priority No. 4 - Dry Plains Shrublands Condition	
Dry Plains Shrublands	Not selected. Complex biological communities are not appropriate as MIS.

[1] Species selected as potential MIS are in bold.

Step 5 - Review Preliminary List of MIS

Step 5 requires that selected species and habitat components be reviewed to determine how well they fulfill Principle 3 (Consider MIS chosen on neighboring planning units), Principle 4 (Consider whether employing MIS is the best approach to evaluate the management problem), and Principle 5 (Choose an adequate but limited number of species). Principle 3 is not applicable to Step 5 for reasons discussed earlier. Therefore, the following review of selected elements focuses on Principles 4 and 5. Based on this review, the following MIS elements were identified:

a) Ruffed grouse
b) White-tailed deer
c) Black-backed woodpecker
d) Brown Creeper
e) Beaver
f) Golden-crowned kinglet
g) Song sparrow
h) Grasshopper sparrow
i) Mountain sucker

The majority of species/biological communities/elements reviewed are not appropriate MIS. Non-selection for MIS does not dismiss management concerns for species considered; it merely rates them as unlikely to provide effective and efficient feedback to forest managers. Many of the species were considered as possible MIS due to their rarity in the Black Hills. However, rare species are typically poor MIS due to the limited presence and subsequent inability to provide feedback on the required scale. Other species are inappropriate MIS because of obscure habitat associations or limited information on their ecological limitations. This limits a manager's ability to understand potential responses of these species to management activities. Some species are migratory and therefore, mortality on their off-site ranges may confound monitoring efforts on the BHNF.

The nine species in the list were selected because they may reasonably and effectively provide quantitative feedback on habitat condition and/or trend.

Step 6 - Prepare MIS Report Documenting Selection

Rationale for the selection of the above MIS and an outline of proposed monitoring approaches and activities are described below. Combined with the above-described selection process, this document fulfills the requirement of Step 6.

Ruffed Grouse

Selection - Historic fire suppression has resulted in reduced vigor of existing aspen stands and inhibited regeneration (Parrish et al. 1996). Also, expanding ponderosa pine stands have reduced the amount of aspen as an understory component in mixed forests on the BHNF. Reduced aspen vigor and availability of aspen as an associate in mixed stands, or as an understory component in coniferous stands, is not readily monitored with remote-sensing/GIS techniques. Ruffed grouse are dependent on the availability of aspen buds for winter survival (USDA-Forest Service 1981). Ruffed grouse may require a variety of aspen structural stages to thrive including late successional aspen for drumming logs and most other stages for buds and catkins. Therefore ruffed grouse are a suitable indicator of aspen quantity and vigor in pure and mixed stands on the BHNF. Selection of ruffed grouse as an MIS addresses monitoring priority (1) (forest condition and habitat diversity identified in Step 2 of this report). Ruffed grouse habitat and/or population trends will serve as an indicator of the abundance, distribution and condition of aspen habitat on the BHNF.

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

White-tailed Deer

Selection - Long-term fire suppression in the Black Hills has altered deer habitat. Conversion of deciduous forest such as aspen and bur oak to ponderosa pine types has reduced diversity of forage available to deer (Uresk and Severson 1998). An increase in density and canopy cover of ponderosa pine stands has resulted in large areas of pine forest with depauperate understories, thus reducing available forage for deer (Parrish et al. 1996). Invasion of ponderosa pine into meadow habitats has reduced forb, shrub, and grass availability to foraging deer. Selection of white-tailed deer as an MIS addresses monitoring priority (1) identified in Step 2 of this report (Forest condition and habitat diversity). White-tailed deer habitat trends and/or population parameters will serve as an indicator of the abundance, distribution and condition of understory shrubs and general forest habitat diversity.

Monitoring – Wyoming Department of Game and Fish (WGF) and SDGFP have some long-term population trend data for white-tailed deer on the BHNF. The BHNF should collaborate with continued efforts by state agencies to continue monitoring white-tailed deer on the BHNF.

Black-backed Woodpecker

Selection - In the Black Hills, potential limits to persistence of black-backed woodpeckers include: fire suppression, salvage logging, and loss of late-successional pine forest (Anderson 2003). Panjabi (2001) found this species occurring most frequently in recently burned habitat, and at lower densities in other forest types including late-successional pine forest. Selection of black-backed woodpecker as an MIS addresses monitoring priority (1) identified in Step 2 of this report (Forest condition and habitat diversity), particularly the availability of late successional pine stands, snags, and burned forest. Black-backed woodpeckers will serve as an indicator of the abundance, distribution and condition of snag habitat and burned habitat.

Monitoring - The Rocky Mountain Bird Observatory (RMBO) established a bird monitoring protocol to sample bird populations in the Black Hills (Panjabi 2001). Surveyors conduct point transects to sample bird populations in 10 habitats. BHNF staff identified potential stands using vegetation data layers from GIS databases. RMBO used the computer program DISTANCE (Thomas et al. 1998-99 as reported in Panjabi 2001) to estimate density of species per habitat. RMBO conducted DISTANCE analyses on each species in each habitat for which there was a minimum of 23 observations (Panjabi 2001). Results of first year monitoring and estimates of the potential for effectively monitoring individual species is presented in Panjabi (2001, 2003, 2004, 2005).

Brown Creeper

Selection - Preferred habitat of the brown creeper within the BHNF is late-successional ponderosa pine and white spruce (USDA Forest Service 1996). The abundance and distribution of this species is tied to large trees and late successional coniferous forest on the BHNF (Panjabi 2001). As such management actions may affect habitat condition, quantity and distribution (USDA-Forest Service 1996; USDA-Forest Service 2002a). Brown creeper habitat and/or population trends will serve as an indicator of the abundance, distribution and condition of large trees and late successional coniferous forest habitat. Selection of the brown creeper as an MIS addresses monitoring priority (1) identified in Step 2 of this report (Forest condition and habitat diversity), particularly availability of late successional pine stands and spruce stands.

Monitoring - According to Panjabi (2001) this species should be effectively monitored with the existing RMBO protocol.

Beaver

Selection - Likely limits to persistence of beaver on the BHNF include degradation and/or loss of riparian shrubs and forests from historic management activities, as well as the loss of hardwood components on adjacent uplands. Historically, beavers on the BHNF influenced riparian vegetation and changed stream flows, often converting intermittent drainages to perennial streams (Parrish et al. 1996). This species is selected due to its relationship to riparian/aquatic habitat condition, status as a keystone species, available monitoring protocols, and dependence on riparian forest and shrub habitat. Also, some baseline information is available in historic documents. Selection of beaver as an MIS addresses monitoring priority (2) identified in Step 2 of this report (riparian/aquatic habitat condition).

Monitoring - Beaver evaluation efforts should focus on monitoring the quantity of active beaver-influenced habitat on the BHNF. Determining beaver influence per reach is facilitated by using existing remote sensing and GIS technology currently available on the BHNF. Remote-sensing/GIS tracking of beaver-influenced streams (reported on a 5-year basis) should be augmented to include annual surveys to determine the number of active beaver colonies in selected stream reaches.

Golden-crowned Kinglet

Selection – This species is closely associated with white spruce, particularly mature forest. It may be intolerant to changes on nesting grounds (USDA-Forest Service 1981) and therefore a good indicator. This species is readily monitored with existing survey protocol (Panjabi 2001). Golden-crowned kinglet habitat and/or population trends will serve as an indicator of the abundance, distribution and condition of spruce habitat. Selection of golden-crowned kinglet as an MIS addresses monitoring priority (1) identified in Step 2 of this report (Forest condition and habitat diversity, particularly spruce habitat).

Monitoring - According to Panjabi (2001) this species should be effectively monitored with the existing RMBO protocol.

Song Sparrow

Selection – Song sparrows are closely associated with riparian areas and Panjabi (2001) found song sparrows detected during breeding surveys associated with riparian areas or wet meadows. BLM (no date) considers song sparrows a good indicator of riparian habitat condition. BLM (no date) does describe song sparrows as riparian obligates in the Southern Rocky Mountains or Great Plains. This species would likely be a good supplemental indicator of riparian habitat condition in addition to Beaver. Song sparrow habitat and/or population trends will serve as an indicator of riparian habitat condition.

Monitoring - According to Panjabi (2001) this species should be effectively monitored with the existing RMBO protocol.

Grasshopper Sparrow

Selection – Selects larger patches of open grassland types (Slater 2004). Within grasslands of suitable size, prefer grassland habitat of intermediate height and avoid grasslands where vegetation less than 10 cm in height (Slater 2004). Require some taller vegetation such as tall grasses, forbs, or shrubs, to use as singing perches (Slater 2004). Because of its association with intermediate and taller vegetation, grasshopper sparrow habitat and/or population trends will serve as an indicator of the abundance, distribution and condition of prairie grassland habitat.

Monitoring - According to Panjabi (2005) this species should be effectively monitored with the existing RMBO protocol.

Mountain Sucker

Selection – Management activities have the potential to affect the amount, quality or connectivity of instream fisheries habitat. Selection of mountain sucker as an MIS addresses monitoring priority (2) identified in Step 2 of this report (riparian/aquatic habitat condition). Mountain sucker are a native species that is fairly well distributed on the BHNF and easily monitored. The Forest recently completed a stream inventory and is establishing reference reaches to aid in tracking changes in aquatic habitat. Baseline data exists from past and ongoing state survey efforts to aid in monitoring changes in fish numbers or distribution. Forest Plan direction to maintain or improve aquatic and riparian condition should be reflected in stable or improving mountain sucker populations and should aid in balancing habitat management between native fish species conservation and desirable non-native recreational fisheries.

Monitoring - The Forest will monitor instream fisheries habitat or mountain sucker populations in cooperation with State resource agencies, to the maximum extent practicable. One or more parameters of stream health may be measured. Commonly used measures include streambank stability, width-to-depth ratios or streambed substrate/embeddedness. Habitat monitoring will include stream reference reaches and repeat sampling at sites used in the Common Water Unit - Integrated Resource Inventory. Fish monitoring may occur at established sites to determine population trends within the 5th-level watershed, e.g., Rapid Creek, French Creek, Spring Creek, etc. Fish monitoring will use established state protocols to ensure that the data collected is compatible with current state fisheries methodologies and/or databases. Monitoring frequency will be on a 3-5 year cycle. All fish survey sites would be sampled, typically using a backpack electroshocker, in the same year during baseflow periods in late summer or early fall to minimize environmental variance.

Step 7 - Conduct a Review of the MIS Selection Process and Report

Prior to submission of this report a draft version was reviewed by appropriate USDA-Forest Service staff with the BHNF, Regional Office, and Rocky Mountain Research Station as recommended by Hayward et al. (2001). Reviewers provided written comments, which were incorporated or considered during the preparation of this final MIS report. Comments received through the Draft EIS comment period were also considered in the preparation of this final MIS Report.

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