United States
Department of
Agriculture

Forest
Service

Black Hills
National
Forest

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BLACK HILLS NATIONAL FOREST

A Downy Woodpecker located in the Black Hills NF.

FY2006 MONITORING AND EVALUATION REPORT

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Black Hills Forest Plan
Monitoring and Evaluation Report
Fiscal Year 2006

(October 2005 through September 2006)

This is the annual monitoring and evaluation report for the Black Hills Land and Resource Management Plan (Forest Plan). A revision of the Forest Plan was completed in June 1997. The first major amendment (Phase I) to this Forest Plan was completed in May 2001, and the second major amendment (Phase II) was completed in October 2005.

Phase II includes strategies to address risks from fire and insects, reviewing protections for a variety of plant and animal species, and evaluating and designating research natural areas as appropriate. Visit the Black Hills National Forest website at www.fs.fed.us/r2/blackhills to view the Phase II decision.

This report is a transition to the monitoring provisions of the Phase II Amendment.

The basis for the annual monitoring report is in Chapter Four of the Forest Plan. This report does not discuss the entire inventory and monitoring that occurs in the Black Hills but only monitoring information related to the Forest Plan. More detailed studies may occur in association with individual projects that implement the Forest Plan. When relevant to Forest-wide trends, information from these site-specific projects is incorporated into Forest-wide monitoring.

The Black Hills Monitoring and Evaluation Report focuses on monitoring effectiveness in meeting or moving toward established objectives set forth in the Forest Plan. Implementation monitoring or monitoring to insure standards and guidelines are implemented as directed in the Plan is a minor part of this monitoring report.

The Forest has developed a "Monitoring Implementation Guide" to describe methods to implement the monitoring and evaluation requirements of the Forest Plan; see http://www.fs.fed.us/r2/blackhills/projects/planning/MonGuide.pdf Also, see the Sensitive Plant Species and Plant Species of Local Concern Monitoring Implementation Guide (Addendum to the October 2005 Guide): http://www.fs.fed.us/r2/blackhills/projects/planning/plant_monitoring_guide_2006.pdf

Several environmental factors are monitored each year; however not every item is scheduled for evaluation and reporting on an annual basis. Chapter Four of the Forest Plan indicates how often each item is reported.

Supporting documentation for this report is located in the Supervisor's Office, Black Hills National Forest, 1019 North Fifth St., Custer, SD 57730.

/s/ Craig Bobzien _____ 5/24/07

CRAIG BOBZIEN
Forest Supervisor

Date

Monitoring Item 1: Air Quality

Objective 101: Maintain air quality standards in accordance with state implementation plans.

Monitoring:

The Forest experienced no violations of the Clean Air Act on the Black Hills National Forest for the period year 2006 nor were there any air quality complaints from individuals or other entities attributed to National Forest project activities (South Dakota - Administrative Rules - Article 34:10; Wyoming – Air Quality Standards and Regulations - Chapter 10).

The following mitigation actions are implemented on the Black Hills National Forest during prescribed burning activities to minimize air quality degradation:

Receptors such as subdivisions, roads, towns, and other air-quality sensitive areas are identified during the prescribed burning planning process.

Burning prescriptions are identified in the "prescribed burn plan" to ensure that the air quality standards are maintained in receptor areas.

Prior to implementation of an approved prescribed burn project, weather conditions (predicted and current), including smoke dispersal predictions, are assessed to insure smoke management criteria can be met.

Air quality is monitored on site and at receptor areas during burn implementation to insure that air quality remains within identified parameters.

The Black Hills region has no non-attainment areas identified at this time (EPA 2003). Rapid City, South Dakota remains the key area of concern in that it is close to being designated as a non-attainment area for PM-10, which is a pollutant often produced by smoke and dust. The concern for air quality in the Rapid City area has resulted in the Forest working jointly with the Rapid City Air Quality Office on guidelines for all National Forest burning activities. A 1995 guideline places restrictive measures for all forms of open burning planned on National Forest land in the Rapid City air shed. The Forest continues to work with the Pennington County Air Quality Office in mitigating all potential air-quality-impacting activities.

Evaluation:

The Black Hills National Forest management activities, primarily prescribed burning, have met state clean air standards over the last year.

Monitoring Item 2: Soil Productivity

Authority: Level Two [36 CFR 219.23(e)]

This monitoring item had previously been reported on in the 2002 Monitoring and Five Year Evaluation Report (USDA Forest Service 2004). The Forest Inventory and Monitoring Coordinator identified that this item be reported on for 2006, which is a year earlier than specified (see Chapter 4 of the Black Hills National Forest Land and Resource Management Plan, as amended). In reviewing the previous monitoring report with past available data records, the Forest discovered that some information had not been presented correctly (e.g. sites presented as timber monitoring sites which had been range monitoring sites) and the monitoring information for 1998 had not been included. This report addresses those previous reporting issues and

supercedes the soils information and statements included in the 2002 Monitoring and Five Year Evaluation Report. Therefore, any Forest watershed or soil reports prepared following issuance of this monitoring report that addresses soil bulk density (soil compaction) sampling/monitoring is to reference this report as having the most complete soil bulk density sampling and evaluation information through 2006 for the Black Hills National Forest.

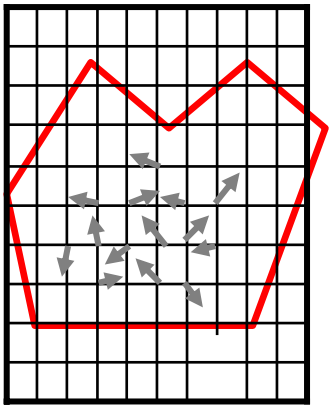
Background and General Design Description:

The Region 2 Supplement to the Forest Service Soil Management Handbook (FSH 2509.18-92-1) (USDA Forest Service 1992) identifies "Guidelines for Sampling Some Physical Conditions of Surface Soils" (USDA Forest Service 1983) as a reference for soil bulk density sampling techniques. The Region 2 Soils Program provided training on the use of those techniques in 1997. Building on that training and the sampling design techniques provided in the above mentioned document, soil bulk density data has been collected within the Black Hills at varying frequencies since 1998. This data has been used to periodically reassess the adequacy of the monitoring design through consultation with the Rocky Mountain Research Station. The current design generally implements a grid design (see diagram below) for the collection of soil samples (the samples generally collected from an approximate depth of 2-8 cm) along random transects for a selected activity unit. The samples are then processed to calculate bulk densities. The average soil bulk density of the generally disturbed activity areas is compared to the pre-disturbance conditions or adjacent sites that are not being disturbed by the specific activity or use.

Selected activity units sampled to date have been targeted at two of the primary activities that occur on forest lands: timber harvesting and livestock use. In addition, sites with characteristics indicating a greater likelihood of potentially becoming compacted were generally targeted initially for site selection (i.e. clay or loam soils, higher water holding capacity capability, minimal amounts of rock fragments, higher elevations that contribute to longer snow retention and therefore later seasonal moisture retention conditions, within the higher precipitation zones of the Forest). The timber harvest design includes sampling cutting units prior to and following harvest activities to assess any change in bulk densities. The sample design for livestock use areas has included sampling within exclosures (generally ungrazed areas) and adjacent grazed areas with the same soil series within the same topographic position. In addition to the target sampling described above, the Jasper Fire offered opportunities for sampling burned areas that were to be salvage harvested.

The Forest Plan and the Region 2 Watershed Conservation Handbook contain direction to be used to prevent increased soil bulk density conditions to the levels of what is defined as detrimental soil compaction. If there is a physical condition indication (such as platy soil structure) or if there is a measured level that indicates that there has been an increase of 15% in bulk density associated with Forest management activities at specific locations, active measures are to be taken in accordance with the Black Hills National Forest Land and Resource Management Plan, as amended, along with Forest Service Handbook direction to decrease those levels.

Example of Grid Placement with Random Transects for Collecting Samples



A soil core sample collected from one of the sample site transects.

Preparing soil samples for bulk density calculations.

Timber Harvest Activity Sampling

As documented in the table below, the data collected for timber harvesting activities since this sampling began occurred primarily since 2000, which is documented as having been a period of years with lower than average precipitation for the Black Hills area (see the precipitation graph below developed from information accessed through the High Plains Regional Climate Center at http://hprc.unl.edu; general climatic condition descriptions of abnormally dry to drought conditions for the area can be accessed through http://drought.unl.edu/dm/current.html). Therefore, it can generally be expected that soil conditions were generally dry in association with the below average precipitation patterns during that same period. Therefore, it was expected that there would be little evidence of increases in soil bulk density for the activity areas sampled from 2000-2006. However, a noticeable increase in bulk density was documented at one of the harvest sites sampled during that time period.

Although not at the level of the 15% threshold for soil bulk density increase defined as detrimental compaction in the Region 2 Supplement to the Forest Service Soil Management Handbook (FSH 2509.18-92-1) (USDA Forest Service 1992), an average bulk density increase of greater than 10% was measured in Uncle #16 (central limestone area of the Black Hills) during the general drier climatic period. Along with the percentage of bulk density increase measured, the sampling report documented rutting associated with equipment within the unit. In reviewing the Black Hills National Forest timber sale inspection reports for activities within this cutting unit area, the soil moisture conditions were described as wet from recent rain events and the sale administrator discontinued harvest operations (end of April 2003). Operations were allowed in early May, although it was recognized that the site had moist to wet soil conditions. The general area evidently received additional precipitation because documentation indicated that harvest operations were to be shut down again on June 3, 2003 based on wet soil conditions. Inspection sheets documented that the area received more snow the week prior to June 10, 2003, likely contributing to some level of increased site moisture and timber sale activities were taking place on June 10, 2003.

Documentation is available for one site that had been sampled prior to the years described as having climatic conditions described as abnormally dry to drought conditions. Either harvesting or post sale activities that occurred on a Baldman Timber Sale cutting unit (northwestern Black Hills) occurred during moisture level conditions when rutting (documented on the soil sampling data sheets and soil bulk densities could be increased (mean increase documented to a level of 23% as compared to pre-harvest soil bulk density measurements).

Therefore, although a limited number of sites are available on which to base conclusions, there is evidence to support:

That sampling results are consistent with statements made in the Forest Service Handbook 2509.25 (Rocky Mountain Region), Watershed Conservation Practices Handbook, Chapter 10 – Management Measures and Design Criteria, Amendment 2509.25-2600-2 (effective 4/20/2006) regarding soil compaction. The handbook specifies that soil compaction is caused by the weight of vehicles and animals on the ground and soils compact when soil moisture exceeds the plastic limit. Consistent with the Handbook, there is evidence that soils in the Black Hills can compact when some level of timber harvest (or post sale activity) equipment activity occurs when some degree of moist to wet soil conditions exist.

Also consistent with the same Forest Service Handbook R2 Amendment (2509.25-2600-2), the data generally collected during the below average precipitation years provides evidence that operating timber harvest equipment during dry soil moisture conditions can be expected to prevent or limit increases in soil bulk densities, or limit the likelihood for increases in soil bulk density effects.

While uncertain that soil bulk density levels would decrease or decrease as fast on every soil within the Black Hills, there is evidence that conditions were such that within one geographic area, on at least one soil type, and to the depth sampled, that the mean soil bulk density decreased from levels above the threshold classified

as “detrimental compaction” to levels below the threshold within the time period of one year. It is unknown what factors may have contributed to this level of decrease, but it may have been associated with soil moisture and temperature conditions that favored active freezing and thawing conditions at the site during that specific year, or that the flush of herbaceous growth (and the associated increased root activity) may have contributed to the decline in soil bulk density levels.

Timber Harvest Soil Bulk Density Sampling

Post Harvest Sample Year	Timber Harvest Units Sample Locations	Soil Sampled	Bulk Density Increase from Pre-harvest Sampling to Post-Harvest Sampling
2004	Uncle #16 T1S, R2E, Section 19	Stovho silt loam	11.6%
2003	Dumbuk II T2S, R1E, Sections 12 and 13 (*Jasper Fire Site*)	Stovho loam/sandy loam	No Increase
2003	Gillette West T2S, R2E, Section 8 (*Jasper Fire Site*)	Stovho silt loam	3.9%
2003	Gillette East T2S, R2E, Section 9 (*Jasper Fire Site*)	Trebor silt loam/loam	No Increase
2003	Hell Canyon T2S, R2E, Section 14 (*Jasper Fire Site*)	Stovho silt loam	No Increase
2003	Uncle #1 T1S, R2E, Section 35	Stovho silt loam	No Increase
2003	Uncle #2 T2S, R2E, Sections 1 and 2	Stovho silt loam	No Increase
2003	Mallo T1N, R1E, Section 6	Stovho loam	No Increase
2000	Duck (Unit #1) T1S, R2E, Section 9 Mystic District	Stovho silt loam	No Increase
2000	Dumbuk (Unit #1) Hell Canyon District	Stovho silt loam	No Increase
2000	Baldman (cutting unit upper flat area) T50N, R60W, Section 31 Bearlodge District	Citadel loam	3%
1999 and 2000	Baldman (cutting unit slope area) T50N, R60W, Section 31 Bearlodge District	Citadel loam	First year following harvest (1999) – 23% increase; sampling one year later (2000) – 6% increase compared to pre-harvest.
1999	Hellsgate T3N, R1E, Section 1 Northern Hills District	Stovho	No increase
1998 - *This was the initiation year of this soil bulk density sampling method (pre-harvest sampling occurred).*			

Collecting post-harvest soil core samples at sample site Uncle #16 in 2004.

A 2003 Gillette West sampling transect located within the Jasper Fire burned area.

Livestock Use Activity Area Sampling

As documented in the table below, data has been collected for livestock use activities since this sampling began in 1998. This sampling has occurred during years documented as having higher than average precipitation for the Black Hills area as well as during years of lower than average precipitation (see the precipitation graph below). Although soil moisture conditions fluctuate with precipitation and temperature levels, throughout the year, soil moisture conditions were generally greater in years with higher precipitation (or immediately following higher precipitation years) and lower soil moisture conditions were generally associated with the below average precipitation patterns. Some of the soil data sheets for this sampling period noted dry soil moisture conditions during the below average precipitation years.

The Wolff Range Allotment was sampled in 1998 during a climatic cycle period with above average precipitation (see precipitation chart for Rapid City below). The general bulk density calculated for the area from the data collected in 1998 was 15.5% greater in the grazed area as compared to the ungrazed exclosure. The site was re-sampled in 2006 based on questions regarding changes in soil moisture conditions from year to year. Since below average precipitation had been documented for the general Black Hills area since 2000, some questioned whether that may influence bulk densities of soils as compared to gathering data during the period of higher moisture climatic conditions, or if sampling would reveal that there would be little or no difference since livestock generally use the same areas in succeeding years. Therefore, the Wolff Range allotment was sampled again in 2006 to compare to bulk densities calculated for the site in 1998. The calculated change in bulk density was slightly lower (approx. 1%) in 2006 as compared to the 1998 results. However, no single factor can be associated with this limited approximately 1% change since there were other contributing factors that could have altered soil bulk density comparisons at this site (i.e. cattle had been in the exclosure for at least two weeks of the 2005 season and could have affected the “ungrazed” conditions for 2006, and gopher activity was prevalent both within and outside of the exclosure).

Therefore, although a limited number of sites are available to base conclusions on, there is evidence to support:

That sampling results are consistent with statements made in the Forest Service Handbook 2509.25 (Rocky Mountain Region), Watershed Conservation Practices Handbook, Chapter 10 – Management Measures and Design Criteria, Amendment 2509.25-2600-2 (effective 4/20/2006) regarding soil compaction. The handbook specifies that soil compaction is caused by the weight of vehicles and animals on the ground and soils compact when soil moisture exceeds the plastic limit. Consistent with the Handbook, there is evidence that soils in the Black Hills can compact when some level of livestock use activity occurs when some degree of moist to wet soil conditions exist.

Soil bulk density changes have been documented to meet or exceed the Region 2 soil quality standards on two of the range allotments that have been sampled in the Black Hills. Both areas are at relatively higher elevations in the Black Hills that likely have longer snow retention and soil moisture retention as compared to other lower elevation or lower precipitation zones within the Black Hills. One of the sites was following a cycle of higher precipitation years and again following a cycle of lower than average precipitation years, and both periods of data collection documented changes in soil bulk density levels at threshold levels. These site conditions in association with the various livestock management that have occurred at those sites likely contributed to the soil bulk density level changes that have occurred.

The Forest Plan and the Region 2 Watershed Conservation Handbook, along with the Region 2 Rangeland Analysis and Management Training Guide (USDA Forest Service 1996a) contain direction, design criteria and guidance to be used to prevent increased soil bulk density conditions to the levels of what is defined as detrimental soil compaction. If there is a physical condition indication or if there is a measured level that indicates that there has been an increase of 15% in bulk density associated with Forest management activities at specific locations, active measures are to be taken in accordance with the Black Hills National Forest Land and Resource Management Plan, as amended, along with Forest Service Handbook direction to decrease those levels.

Range Allotment (Livestock Grazing Areas) Soil Bulk Density Sampling

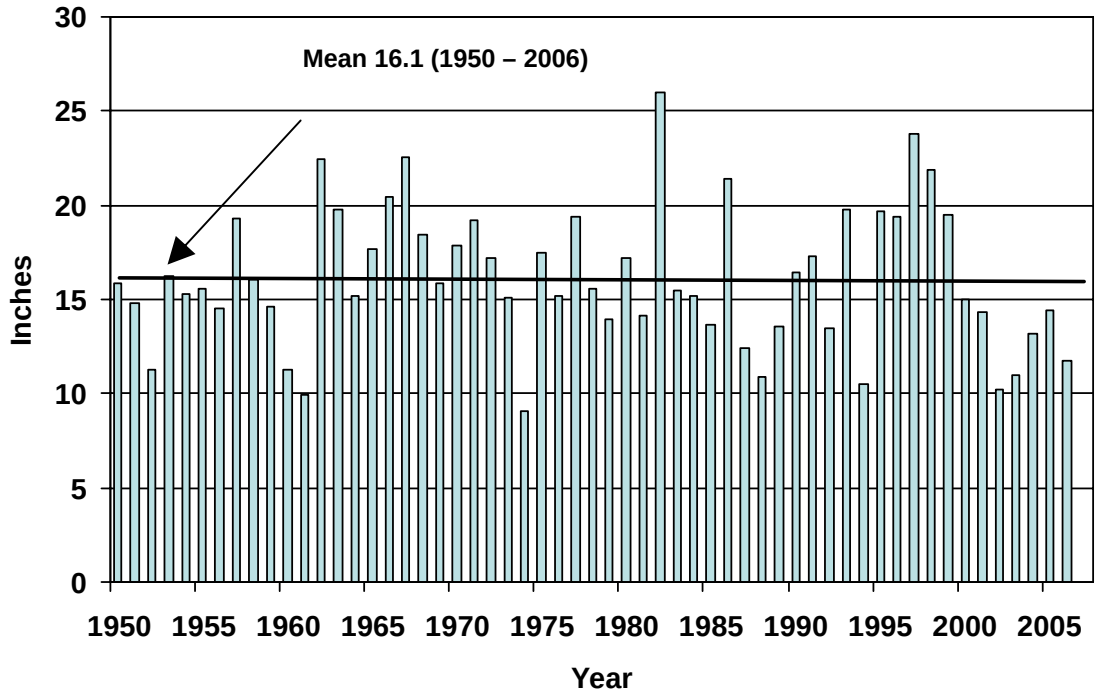
Year Sampled	Sample Site	Soil sampled	Average difference in Soil Bulk Density in Grazed Area Compared to Ungrazed Areas
2006	Wolff Range Allotment* (T3N, R3E, Section 26) Northern Hills District Elevation: ~5900’	Cordeston loam	+14%
2002	Baseline Range Allotment (T1N, R2E, Section 23) Elevation: 6057’	Vanocker loam	+0.9%
2002	Ditch Creek T1S, R2E, Section 36 (comparison to South Fork Castle Creek exclosure:T1N, R2E, Sec 31) Mystic District Elevation: 6497”	Redbird silt loam	+9.6%
2001	Higgins Gulch Allotment (Sheep Flats Range Exclosure) T5N, R1E Section 21 Northern Hills Ranger District Elevation: 5645’	Citadel loam	+10%
2001	Horsethief Allotment (Deerfield North) T1N, R2E, Sec. 23 - Mystic Dist. Elevation: ~6000 to 6100’	Cordeston loam	+2%
2000	Castle Creek Allotment (Manganese Draw Exclosure) T2N, R1E, Section 35	Redbird loam	+5%

Year Sampled	Sample Site	Soil sampled	Average difference in Soil Bulk Density in Grazed Area Compared to Ungrazed Areas
	Hell Canyon District Elevation: 6529’		
2000	Divide Allotment (Lytle Creek Exclosure) Bearlodge District Elevation: 5583’	Cordeston loam	+6%
1999	Spring Creek Allotment (Negro Creek Exclosure) T2S, R3E, Sec. 1 - Mystic District Elevation: 5935’	Cordeston loam	No difference (limited use of livestock at this exclosure location)
1999	Blacktail Allotment (Blacktail Creek Exclosure) T53N, R64W, Sec. 25 Bearlodge District Elevation: 4864’	Marshbrook loam	No difference
1998	Crows Nest/Upper Beaver Range Allotment (T1N, R2E, Sections 31 and 32) Hell Canyon District Elevation: 6565’	Cordeston loam	+18%
1998	Wolff Range Allotment* (T3N, R3E, Section 26) Hell Canyon District Elevation: ~5900’	Cordeston loam	+15%

Soil bulk density sampling within the Wolff Range Allotment in 2006.

Annual precipitation for Rapid City, SD from 1950-2006

Elevation:



~5900'

Monitoring Item 3: Soils Revegetation

Objective 104. Maintain or enhance watershed conditions to foster favorable soil relationships and water quality.

Monitoring:

This monitoring item had been included in the Monitoring Implementation Guide based on policy found in FSH 2509.18 – "Management activities will be conducted in such a way as to not exceed Soil Quality Standards. This emphasis is on protecting the soil resource before excessive damage occurs." The monitoring is targeted at reviewing activity areas to determine if areas are revegetating following disturbance activities or that levels of effective ground cover (a combination of vegetation, litter, moss, surface rock, etc.) were maintained or are being achieved within a 1-2 year time frame following activity completion to keep erosion within tolerable limits, or to continue the maintain soil productivity as one component of long-term site productivity.

The following ground cover data (revegetation) has been collected while collecting data for another monitoring item (during the collection of soil bulk density data). Data was gathered along randomly oriented transects. Through this process generally 10 observations of ground cover were gathered along transects.

Project Activity Area Sampled	Percent Ground Cover	Year
Dumbuk II T2S R1E, Portions of Sec. 12 and 13 Jasper Fire Post Salvage Sample Site (central Black Hills)	91% (Transects: T1-89.5, T2-98.5, T3-94, T4-95, T5-100, T6-49, T7-100, T8-85, T9-98.5, T10-100)	2003
Gillette West T2S, R2E, Portion of Section 8	86%	2003

Project Activity Area Sampled	Percent Ground Cover	Year
Jasper Fire Post Salvage Sample Site (central Black Hills)	(Transects: T1-91, T2-81, T3-87, T4-69, T5-86%, T6-99, T7-84.5, T8-87, T9-90.5,T10-89.5,	
Gillette East T2S, R2E, Portion of Section 9 Jasper Fire Post Salvage Sample Site (central Black Hills)	69% (Transects: T1-99, T2-57, T3-78.5, T4-72.5, T5-61.5, T6-71.5, T7-62.5, T8-60.5, T9-66)	2003
Hell Canyon T2S, R2E, Portion of Section 14 Jasper Fire Post Salvage Sample Site (central Black Hills)	82.8% (Transects: T1-91.5, T2-95.5, T3-63.5, T4-75.5, T5-76, T6-92.5, T7-78.5, T8-93.5, T9-81, T10-80.5)	2003
Uncle 1 T1S, R2E, Portion of Section 35 (central Black Hills)	100% (Transects: All data collection points documented 100% ground cover)	2003
Uncle 2 T2S, R2E, Portions of Sections 1 and 2 (central Black Hills)	100% (Transects: All data collection points documented 100% ground cover)	2003
Mallo T1N, R1E, Portions of Section 6 (central Black Hills)	100% (Transects: All data collection points documented 100% ground cover)	2003
Uncle 16 T1S, R2E, Portions of Section 19 (central Black Hills)	100% (Transects: All data collection points documented 100% ground cover)	2004

In 2006, Soil Health Monitoring Assessments (using the Region 2 Soil Health Monitoring/Assessment Forms, 1/2001) were completed through the method of visual observation walkthroughs conducted within areas where past projects had been completed and future projects were proposed. Effective ground cover information was documented as a component of those assessments.

Project Activity Area Sampled	Percent Ground Cover	Year
Snyder Project Area (northern Bearlodge Mountains)	Effective Ground Cover was either documented as having been met on the forms or were documented from 75% to 95% for areas inspected. Area was determined to have adequate levels of effective ground cover (see requirements in R2 Supplement FSH 2509.18).	2006
Hop Creek Project Area (northern Black Hills)	Effective Ground Cover was either documented as having been met on the forms or were documented from 80 % to 95% for areas inspected. Area was determined to have adequate levels of effective ground cover (see requirements in R2 Supplement FSH 2509.18).	2006
Moskee Project Area (northwestern Black Hills)	Effective Ground Cover was either documented as having been met on the forms or were documented from 85% to greater than 90% for areas inspected. Area was determined to have adequate levels of effective ground cover (see requirements in R2 Supplement FSH 2509.18).	2006
Planting Project Area (northern Bearlodge Mountains)	Effective Ground Cover was either documented as having been met on the forms or were documented from 65% to greater than 90% for areas inspected. Area was determined to have adequate levels of effective ground cover (see requirements in R2 Supplement FSH 2509.18).	2006
Burner Project Area (southern Bearlodge Mountains)	Effective Ground Cover was either documented as having been met on the forms or were documented as greater than 70% for areas inspected. Area was determined to have adequate levels of effective ground cover (see requirements in R2 Supplement FSH 2509.18).	2006
Citadel Project Area	Effective Ground Cover was either documented as having been met on the forms or were documented from 65% to greater than 80% for areas	2006

Project Activity Area Sampled	Percent Ground Cover	Year
(northwestern Black Hills	inspected. Area was determined to have adequate levels of effective ground cover (see requirements in R2 Supplement FSH 2509.18).	

Post Salvage Harvesting Activity Area from within the Jasper Fire Area
Gillette East Revegetation Monitoring Location - Transect #4
July 21, 2003

For previous information presented for this monitoring item refer to the Black Hills National Forest 2002 Monitoring and Five Year Evaluation Report.

Monitoring Item 4: Watershed Health

Objective 102: Use a qualitative survey which emphasizes riparian conditions, such as Proper Functioning Condition methodology, to refine the preliminary watershed health assessments (1997 Forest Plan, Appendix J).

Objective 104. Maintain or enhance watershed conditions to foster favorable soil relationships and water quality.

- **a. Implement projects to improve watershed conditions on an average of at least 300 acres annually over the plan period.**
- **b. Achieve and maintain stable stream beds and banks, diverse riparian vegetation, and effective ground cover that control runoff and erosion.**

Objective 108. Manage for sustained or improved water flows.

Objective 217. Maintain habitat for game and fish populations at the state objectives in effect in 1996.

Objective 219. Maintain or improve instream fisheries habitat. Cooperate with state agencies in aquatic ecosystem improvement to meet mutually agree-upon objectives.

Sub-Item : Watershed Assessment

Authority: Level Two [36 CFR 219.23(e)], Level Three (FSM 2521 and Forest Plan Objective 102).

Monitoring and Reporting Frequency: Forest Plan Revision

A watershed assessment had been prepared for the revision of the 1997 Black Hills National Forest Land and Resources Management Plan (see Appendix J of the EIS that had been prepared for the 1997 Plan). Reanalysis of the watersheds is planned for during the next revision process. The report for this monitoring item is planned for the next revision to the Forest Plan.

Sub-Item: Stream Health

Monitoring:

No new Forest-wide data was collected in FY2006. Stream health assessments were completed on a number of project-level decisions related primarily to timber harvest and livestock grazing projects. Aquatic organism passage was evaluated at road-stream crossings as part of the stream health assessments for three project areas (Citadel, Mitchell and Norbeck) in 2006. This inventory used the “natural stream simulation” approach identified in the national road-stream crossing assessment protocol (USDA Forest Service 2005a). Crossings were also evaluated as to whether they were contributing sediment into the stream. Crossings on private land were not surveyed, but some State or County road-stream crossings were.

Efforts continued in cooperation with the South Dakota School of Mines and Technology to enter the quantitative stream health data collected from 2000-2002 into the Forest Service corporate database (NRIS-Water).

Evaluation:

Data from the Citadel Project Area had not been entered into the Forest road-stream crossing database and was not accessible at the time of this report. Subsequently, the data presented is only for the Mitchell and Norbeck project areas. Aquatic organism passage was based on how well a road-stream crossing simulated natural stream conditions, e.g. the crossing structure was at least as wide as the normal stream channel to avoid a reduction in channel width that may increase water velocity and natural streambed material was present throughout the entire length of the crossing which implies that no abrupt changes in gradient occur, especially at culvert outfalls, that may block fish passage.

Of the 130 crossings evaluated, eighty-one percent were passable for all species and all life stages (juveniles or adults). Approximately sixteen percent were not passable and about five percent were indeterminate and would require more rigorous field measurements. Fish passage problems are typically associated with metal pipe culverts and are least likely to occur with bridges or low-water crossings (fords).

The information from the road-stream crossing inventory is valuable because it identifies opportunities to fix “problem” road-stream crossings using timber sale revenues (Knutson-Vandenberg (KV) funds) or other funding sources, contingent on budgets and other priorities. This information should also have long-term value in identifying opportunities to improve the designated road-trail system that will be produced from the Forest-wide Travel Planning effort currently underway.

In the next year or two, repeat sampling should occur at a representative subset of the stream sites sampled in 2000-2002. This is needed in order to monitor trend in the physical characteristics of the stream network. Stream health monitoring should be as consistent as possible with the national protocols proposed in the Aquatic Ecological Unit Inventory Technical Guide.

Sub-Item: Water Quality

Monitoring:

This monitoring item had recently been reported in the Black Hills National Forest FY2005 Monitoring and Five Year Evaluation Report (USDA Forest Service 2006a). Although the reporting frequency for this monitoring item is specified as every 2-10 years (see Chapter 4 of the Black Hills National Forest Land and Resource Management Plan, as amended)., the Forest Inventory and Monitoring Coordinator identified that this item be reported on for 2006.

The status of surface water quality is summarized in the biennial reports prepared by the states of South Dakota and Wyoming pursuant to sections 303(d) and 305(b) of the Clean Water Act. The Forest Plan Phase II Amendment Final Environmental Impact Statement (FEIS) (USDA Forest Service 2005b) disclosed water quality conditions based on the 2004 biennial reports. The Black Hills National Forest FY 2005 Monitoring and Evaluation Report provided information from the both states' 2006 biennial reports. In reviewing both states water quality websites in March 2007, no new reports have been placed on the websites since the 2006 biennial reports mentioned above, (no change for the Black Hills occurred between Wyoming's draft 2006 report to the final version) therefore, the Forest's FY 2005 information reported is expected to be the most recent information available for this monitoring item.

As was also reported in the 2005 Forest Monitoring Report, water quality continues to be monitored indirectly by the Forest through implementation and effectiveness monitoring of regional Forest Service watershed conservation practices (WCPs) and State Best Management Practices (BMPs). See the monitoring report sub-item nonpoint source water pollution control for a discussion of the Forest WCP and BMP monitoring.

Evaluation:

The Forest continues to work cooperatively with state water resource protection agencies to address water quality and to promote the attainment of state-assigned beneficial uses.

The Black Hills region traditionally has some of the best surface water quality in the state (SD DENR 2006). Primary contributing factors to the maintenance of water quality, in association with the higher elevations and forest cover, are the cooler climate and higher precipitation levels than that associated with the lower elevations of the surrounding plains. Also contributing to the water quality conditions in this region is the nature of local bedrock formations which are generally less erodible (in part due to the amount of ground cover that can occur) than the highly erosive and leachable marine shales and badlands on the surrounding drier plains. However, the Black Hills streams are vulnerable to losses of water flow which can be exacerbated by periodic droughts.

Sub-Item: Nonpoint Source Water Pollution Control

Monitoring:

The Forest implements direction from the Regional Watershed Conservation Practices (Forest Service Handbook 2509.25; WCPs) and State Best Management Practices (BMPs) to control nonpoint source water pollution. This monitoring item was most recently reported on in the Black Hills National Forest FY 2005 Monitoring and Evaluation Report (USDA Forest Service 2006a). In 2006, the implementation and effectiveness monitoring for BMPs and WCPs occurred at 46 timber sale cutting unit areas from September to November. These cutting unit locations are within the boundaries of 20 previously harvested timber sales: Blackhawk, Castle, Lemming, Buffalo, Newton, Reno, A&E Salvage, Big Mac, Comanche, Crawford, Dumbuk, Echo Valley, Garsong, Limestone, Needles 2, Painter, Pleasant, Run, Sanders, and Stateline (USDA Forest Service 2007a, 2007b).

Evaluation:

Similar to results described in the Black Hills National Forest FY 2005 Monitoring and Evaluation Report, the 2006 field season results suggest that the effects of logging activities have generally had limited negative impacts on soil, watersheds and/or streams at the sites that were monitored (USDA Forest Service 2007a, 2007b). The 2006 information collected reveals that BMPs and WCPs are being implemented and are effective in the timber sale and units that were inspected. While BMPs and WCPs are generally being implemented on road systems and are generally effective, there were documented issues with ruts, rills and gullies on roads, more effective road drainage features or hardening (such as gravel application) need to be incorporated on a number of the roads within the areas monitored, also documented

In the past, the Forest has participated within Best Management Practices field audits that have cooperatively been completed by the states of South Dakota and Wyoming in cooperation with the Black Hills Forest Resource Association, Wyoming Timber Industry Association, Wyoming Department of Environmental Quality (WYDEQ) and Wyoming State Forestry Division. These audits have generally been completed on a 3-year cycle. The most recent audits were completed in 2004, and the next audits are anticipated to take place in 2007.

Monitoring Item 6: Riparian – Condition and Trend

Objective 213. Maintain or enhance existing riparian area biodiversity, physical structure, and size.

Monitoring:

No Forest-wide data on riparian resource condition was collected in FY2006. The best available information on existing riparian condition and trend was presented in the Final Environmental Impact Statement (USDA Forest Service 2005b) prepared for the Phase II Forest Plan Amendment. Specific projects that affected riparian habitat are reported in Monitoring Item 7.

Evaluation:

Multiple resource programs influence riparian condition and trend. The implementation of Forest Plan standards and guidelines, Regional Watershed Conservation Practices, and Best Management Practices contribute to maintaining or enhancing riparian habitat Forest-wide. Forest-wide riparian condition and trend should be monitored in unison with future Forest-wide stream health monitoring.

Monitoring Item 7: Riparian Wetlands

Objective 107. Restore degraded wetlands except where exemptions are allowed by a Clean Water Act Section 404 permit.

Objective 214. Restore riparian shrub communities across the forest by 500 acres during the Plan period on sites capable of supporting this community.

Objective 215. Manage for at least 5 stream reaches in a rehabilitated condition during the Plan period. Select reaches where the water table has receded and plant species composition has changed as a result of human activities. Coordinate planning and implementation with state game and fish agencies and downstream private landowners. Use Objective 215a through d in designing the projects.

- **a. raise the water table to saturate historically inundated soils**
- **b. convert drier-site vegetation to native wet-meadow species.**
- **c. Reintroduce beaver into the drainage once suitable habitat is developed**

d. Design management to maintain wet-meadow conditions

Monitoring:

Projects to restore riparian and wetland habitat or rehabilitate stream reaches are generally completed by the following programs; Wildlife, Fish and Rare Plants (NFWF), Vegetation and Watershed Management (NFVW), Range Management/Range Betterment (NFRG/RBRB) or through Knutson-Vandenberg (KV) funds generated from timber sale receipts. The table below shows projects that have contributed to riparian/wetland habitat restoration in FY2006.

Project	District	Funding Source	Target
Mickelson Spring pond fencing	Bearlodge	NFWF	0.5 acres
Upper Redwater spring/stream exclosure	Bearlodge	NFWF	0.5 acres
Cascade Creek riparian vegetation enhancement	Hell Canyon	NFWF/NFVW	0.5 mile/1 acre
Black Fox wetland/stream exclosure	Mystic	NFWF	0.5 mile
Ditch Creek spring/stream exclosure	Mystic	NFWF/NFVW	1 mile/1 acre
Crago Flats (Middle Boxelder Creek) exclosure	Northern Hills	NFWF	0.5 miles
Tilson Spring exclosure	Northern Hills	NFWF/NFVW	0.5 miles

Evaluation:

A broadscale assessment should be completed to determine the potential acres and specific location of sites capable of being restored to a riparian shrub community. This assessment would also be helpful in determining if 500 acres is a realistic target for riparian shrub restoration.

Monitoring Item 8: Vegetative Diversity – Vegetation Species Composition

201: Manage for a minimum of 92,000 acres of aspen (double current aspen acres), and 16,000 acres of bur oak (approximately 33 percent increase) in current bur oak during the life of the Plan. The highest priority for hardwood restoration is where conifers (e.g., spruce and pine) have out-competed aspen adjacent to riparian systems that once supported beaver. Increases in bur oak will be focused in other areas than the Bear Lodge Mountains.

Presently there are 45,560 acres of aspen by cover type, 12,879 acres of bur oak by cover type. See chart below. The increase in aspen or bur oak cover type is achieved generally by removing pine from mixed species stands.

The 1997 Forest Plan display of cover types is included following the year 2005 and year 2006 display.

202: Conserve and manage existing mountain mahogany stands.

Manage a minimum of 10 percent of the site in cover (mature and over mature shrubs).

There are 4,597 acres of mountain mahogany (SMS) by cover type in the vegetation database. The vegetation database does not track the maturity of mountain mahogany.

Manage a minimum of 40 percent of the site in forage (young shrubs) by treating when root reserves are high or immediately prior to the growing season.

There are 186 acres of shrublands. The vegetation database does not track maturity of shrublands by any variable. Further on-the-ground survey is needed to record shrubland maturity.

203: Manage 30 to 50 percent of each bur oak stand for 100-plus year old trees.

The age of bur oak is recorded for bur oak stands within the vegetation database. The age is for the stand as a whole. Within each stand, age distribution is not tracked within the vegetation database. Individual stand data printouts displays within stand variations. The bur oak cover type is 12,879 acres (see cover type chart). There are 7,821 acres of bur oak with stand age determination. Of the 7,821 acres, there are 1,390 acres of bur oak that is 100 years or older.

204: Conserve and manage birch/hazelnut, lodgepole pine, limber pine, and Douglas-fir.

These cover types have the following acres:

Paper birch	3212
Lodgepole pine	87
Limber pine	-0-
Douglas-fir	30

205: Manage for 122,000 acres of prairie grassland and 3,600 acres of meadow during the life of the Plan. Restored acres will not be considered suitable for timber production.

Generally, the cover types displayed below fall into the prairie grassland and meadow categories. However, there is not a definitive link from the database cover type scheme to ecologically classify grassland and meadow categories.

Prairie Grasslands

Needle-and-thread, needlegrass	857
Grasslands	67,353
Sideoats grama	149
Big & Sand bluestems	445
Planted grasslands	210
Little & silver bluestems	7,796
Oatgrass	533
Wheatgrass	6,670
Total =	84,013

Meadow

Blue grama	19,353
Bluegrass	5,496
Total =	24,849

239: Manage for 20,000 acres of spruce across the Forest using active management to achieve multiple-use objectives. Treat spruce within 200 feet of buildings where spruce has encroached into hardwoods and for emphasis species management.

Spruce cover type is 26,483 acres. To increase the acres of spruce cover type is to generally remove pine from a mixed spruce/pine stand.
Areas with trees are at least 10 percent occupied (based on crown cover) by tree species of any size or are sites that are not currently occupied by species but are still Forest sites.

The vegetation species composition is measured by cover type. Cover type is one of the variables in the vegetation database. All the acres of the Forest has been delineated into stands. Each stand has a cover type identified. The following is a summary of the cover types for the Black Hills National Forest:

Forest Cover Type - acres	1997	2005	2006
Grasses	104,174		
Cattails		4	4
Blue grama		19,352	19353
Big and sand bluestems		459	445
Planted grasslands		210	210
Little and Silver bluestems		7,881	7796
Needle-and-thread, needlegrasses		857	858
Oatgrass		516	533
Bluegrass		6,739	5496
Grasslands		67,009	67353
Sideoats grama		149	149
Rush species, wet sedge species		43	962
Wheatgrasses		6,669	6670
		109,888	109829
Non-vegetated sites	8,717		
Urban or buildup land		242	242
Nonvegetated sites		3,183	3049
Strip mines, quarries, gravel pits		192	162
Rockland, talus, scree		686	590
Rights of way		68	68
Urban residential areas		1	1
		4,372	4112
Shrublands	2,897	170	186
Mountain mahogany		4,522	4597
Sagebrush		41	41
Snowberry		141	135
Willows		362	356
		5,236	5315
Aspen	50,848	46,172	45559
Bur oak	9,243	12,477	12879
Douglas fir	24	30	30
Eastern Red Cedar		64	0
Lodgepole pine	129	130	87
Other hardwoods (plus green ash)	638	1,449	970

Forest Cover Type - acres	1997	2005	2006
Paper birch		3,427	3212
Ponderosa pine	1,041,801	1,033,380	1037516
Rocky Mountain juniper	494	188	187
White spruce	21,737	25,462	26483
Water	2,012	88	87
Reservoirs and impoundments		1,846	1848
Unknown		444	0
		1,125,157	1128858
TOTAL =	1,242,714	1,244,653	1,248,114

Monitoring Item 9: Vegetative Diversity – Structural Stages

Monitoring Item 9 displays vegetative diversity using structural stages. Structural stage is a variable for each forested stand on the Forest. The structural stage scheme is a Region Two (Rocky Mountain Region) scheme used by all National Forests in Region Two. The following is the structural stage scheme:

Region 2 Structural Stage Descriptions				
Code	**Structural Stage**	**Tree Size Class**	**Diameter Range**	**Crown Cover %**
1	grass-forb	nonstocked		0-10
2	shrub/seedling	established	less than 1 inch	11-100
3A	sapling-pole	small, medium	trees mostly 1-9	11-40
3B				41-70
3C				71-100
4A	mature	large, very large	trees mostly 9 inches	11-40
4B			and larger	41-70
4C				71-100
5	old growth	large, very large	varies	

Reference Forest Plan Monitoring Objectives:

Objectives 4.1 – 203, 5.1 – 204, 5.4 – 206, 5.43 – 204, 5.6 – 204: Manage for certain percentages of structural stages in ponderosa pine across the management area in a variety of sizes and shapes.

SS1 – grass-forb 5%
SS2 – shrub/seedling 5%
SS3A – sapling-pole 10%
SS3B – sapling-pole 15%
SS3C – sapling-pole 5%

SS4A – mature 25%
SS4B – mature 25%
SS4C – mature 5%
SS5 – old growth 5%

Objective 3.7 – 201: Manage each contiguous unit within this management area as a late-successional landscape, so that late-successional structure is always present within some portion of each unit.

Late succession is defined in the 1997 Revised Land and Resource Management Plan as Amended by the Phase II Amendment-Glossary Page 38 (USDA Forest Service 2006b). The structural stage 5 within the Regional structural stage code scheme is also used for late succession or old growth.

The Monitoring Implementation Plan identifies tracking acres of structural stage by cover type and management area. The following displays acres of structural stage by cover type and management area:

Mgmt Area	Cover Type	SS_1	SS_2	SS_3A	SS_3B	SS_3C	SS_4A	SS_4B	SS_4C	SS_5	Total
1.1A	TAA		15		10		55				80
	TBO			10							10
	TPP			308	231	389	449	2,555	8,439	28	12,398
	TWS						122				122
sum			15	317	241	389	625	2,555	8,439	28	12,609
1.1A2	TPP					17	53	108	302	370	849
sum						17	53	108	302	370	849
2.2	TAA					15					15
	TPP				30		138	294	183		644
sum					30	15	138	294	183		660
3.1	TAA		102	132	103	199		84	6		626
	TBO		177								177
	TPB		25	9	4	20		52			111
	TPP	27		196	118	489	965	2,992	2,039	25	6,851
	TWS		9				123	347			479
sum		27	313	337	225	709	1,088	3,476	2,045	25	8,243
3.2A	TPP						88	1,033			1,121
sum							88	1,033			1,121
3.31	TAA		46	68	84		40				238
	TBO	24	88	69	38	225			138		581

Mgmt Area	Cover Type	SS_1	SS_2	SS_3A	SS_3B	SS_3C	SS_4A	SS_4B	SS_4C	SS_5	Total
	TPP	492		198	433	465	687	3,429	2,588		8,292
sum		515	134	336	554	689	727	3,429	2,726		9,110
3.32	TAA	11	283	336	527	849	36	73	27		2,143
	TBO			41	42	115		70			268
	TPB		3					34			37
	TPP	116	76	116	192	684	918	1,621	3,505		7,227
sum		127	362	492	761	1,647	954	1,799	3,533		9,675
3.7	TAA	29	8	14	518	144	74	73	2		862
	TBO			16			199		74		289
	TOH	30	63		12		17	13			135
	TPB					18		14			32
	TPP	2,286	112	528	1,120	608	4,693	7,523	4,482		21,353
	TWS			24			341	105			470
sum		2,345	183	583	1,650	771	5,324	7,728	4,559		23,142
4.1	GRA	33									33
	TAA	67	210	296	647	392	127	153			1,891
	TBO			186	784	297	240	297			1,804
	TLP						60				60
	TOH		18								18
	TPB				96	97					193
	TPP	413	548	908	1,021	844	9,391	14,445	8,382	204	36,157
	TWS	34	37		104		834	898	62		1,970
sum		547	813	1,389	2,652	1,631	10,653	15,792	8,444	204	42,126
4.2A	TAA	31	79	49			62	18			238
	TBO		49	44							93
	TDF							30			30
	TOH								53		53
	TPP	121	53	245	124	185	949	4,675	3,214	19	9,584
	TWS	14		57	48		1,291	727	48		2,185
sum		165	181	395	171	185	2,303	5,450	3,314	19	12,183

Mgmt Area	Cover Type	SS_1	SS_2	SS_3A	SS_3B	SS_3C	SS_4A	SS_4B	SS_4C	SS_5	Total
4.2B	TAA							4			4
	TBO	5		31					10		47
	TPP	30	12		80	3	280	747	188	7	1,347
	TWS						60				60
sum		35	12	31	80	3	340	751	198	7	1,458
5.1	GOA	24									24
	GRA	477	8								485
	TAA	1,862	5,515	5,136	4,923	1,964	3,499	1,415	159		24,473
	TBO	71	64	105	247	305	33	242			1,065
	TLP			28							28
	TOH		102	121	3	9	149	88	25		497
	TPB	28	14	197	227	89	340	181	269		1,346
	TPP	38,308	15,453	18,371	22,827	11,675	177,660	144,167	47,617	307	476,386
	TWS	287	539	501	393	39	11,152	5,398	1,392		19,700
sum		41,058	21,695	24,458	28,620	14,080	192,832	151,491	49,462	307	524,002
5.1A	TPP	10,396	540	8,369	10,343	932	11,533	11,549	968	11	54,641
	TRJ						15				15
sum		10,396	540	8,369	10,343	932	11,548	11,549	968	11	54,656
5.2A	TAA	21		21	17						58
	TBO	5	39								44
	TOH						8				8
	TPP	5	5	209	203	81	1,020	874	792		3,189
sum		32	44	230	220	81	1,028	874	792		3,299
5.3A	TAA		14	38	15						67
	TPP	10	124	127	762	330	351	1,322	194		3,221
	TWS							41			41
sum		10	138	165	778	330	351	1,363	194		3,329
5.3B	TPP			5	69	148	112	193	543		1,070

Mgmt Area	Cover Type	SS_1	SS_2	SS_3A	SS_3B	SS_3C	SS_4A	SS_4B	SS_4C	SS_5	Total
sum				5	69	148	112	193	543		1,070
5.4	TAA	1,078	1,998	1,008	1,539	1,119	1,657	1,232	148		9,779
	TBO	376	806	1,196	2,072	1,184	1,094	957	164		7,849
	TOH		11	35	24	20	13	34	106		244
	TPB		11	119	468	22	34	273			928
	TPP	51,861	8,469	18,045	28,974	19,926	77,761	93,782	44,154	1,137	344,109
	TRJ		99	35		20	18				172
	TWS	7	31	137	57		492	183			907
sum		53,322	11,425	20,575	33,134	22,292	81,070	96,462	44,570	1,137	363,987
5.43	TAA	25	149	96			38				309
	TPP	3,162	710	491	687	397	1,322	1,780	922	52	9,521
sum		3,186	860	587	687	397	1,360	1,780	922	52	9,830
5.4A	TAA		53	146			98	4	43	6	350
	TBO	24		44							68
	TPP	448	158	318	285	316	3,014	4,428	1,390	778	11,134
	TWS						25	9		40	74
sum		472	211	508	285	316	3,138	4,440	1,432	824	11,625
5.6	TAA	44	1,766	902	778	61	335	435	48		4,369
	TBO		554				32				586
	TOH		15								15
	TPB	8	41	260	147	40	44	10	14		565
	TPP	108	246	630	167	240	4,461	9,218	4,193	507	19,769
	TWS		2				306	62			370
sum		160	2,624	1,792	1,092	341	5,178	9,725	4,256	507	25,674
8.2	TAA	1	10	46							57
	TPP	241	7	398	324	70	3,580	3,292	740		8,652
	TWS			16			11	81			108
sum		242	17	460	324	70	3,590	3,373	740		8,817

Mgmt Area	Cover Type	SS_1	SS_2	SS_3A	SS_3B	SS_3C	SS_4A	SS_4B	SS_4C	SS_5	Total
Total		112,639	39,562	61,029	81,915	45,045	322,498	323,665	137,624	3,490	1,127,467

Acres of Structural Stages of Ponderosa Pine within Management Areas 4.1, 5.1, 5.4, 5.43, 5.6												
	VSS		1	2	3A	3B	3C	4A	4B	4C	5	Total
Desired percents >			5%	5%	10%	15%	5%	25%	25%	5%	5%	100%
Management Area		Year										
4.1	acres >	2005	427	622	1,586	920	610	11,142	12,539	7,708	232	35,787
	percent >	2005	1.2%	1.7%	4.4%	2.6%	1.7%	31.1%	35.0%	21.5%	0.6%	100.0%
	acres >	2006	413	548	908	1021	844	9391	14445	8382	204	36156
	percent >	2006	1.1%	1.5%	2.5%	2.8%	2.3%	26.0%	40.0%	23.2%	0.6%	100.0%
5.1	acres >	2005	39,499	10,865	16,995	26,632	13,967	167,673	150,591	49,361	467	476,050
	percent >	2005	8.3%	2.3%	3.6%	5.6%	2.9%	35.2%	31.6%	10.4%	0.1%	100.0%
	acres >	2006	38308	15453	18371	22827	11675	177660	144167	47617	307	476385
	percent >	2006	8.0%	3.2%	3.9%	4.8%	2.5%	37.3%	30.3%	10.0%	0.1%	100.0%
5.4	acres >	2005	57,972	7,057	22,789	28,866	21,899	74,688	86,878	40,547	525	341,222
	percent >	2005	17.0%	2.1%	6.7%	8.5%	6.4%	21.9%	25.5%	11.9%	0.2%	100.0%
	acres >	2006	51861	8469	18045	28974	19926	77761	93782	44154	1137	344109
	percent >	2006	15.1%	2.5%	5.2%	8.4%	5.8%	22.6%	27.3%	12.8%	0.3%	100.0%
5.43	acres >	2005	3,743	357	504	761	418	1,665	1,521	539	52	9,559
	percent >	2005	39.2%	3.7%	5.3%	8.0%	4.4%	17.4%	15.9%	5.6%	0.5%	100.0%
	acres >	2006	448	158	318	285	316	3014	4428	1390	778	11135
	percent >	2006	4.0%	1.4%	2.9%	2.6%	2.8%	27.1%	39.8%	12.5%	7.0%	100.0%
5.6	acres >	2005	132	290	739	244	202	5,888	8,075	3,988	28	19,585
	percent >	2005	0.7%	1.5%	3.8%	1.2%	1.0%	30.1%	41.2%	20.4%	0.1%	100.0%
	acres >	2006	108	246	630	167	240	4461	9218	4193	507	19770

Acres of Structural Stages of Ponderosa Pine within Management Areas 4.1, 5.1, 5.4, 5.43, 5.6												
	VSS		**1**	**2**	**3A**	**3B**	**3C**	**4A**	**4B**	**4C**	**5**	**Total**
Desired percents >			**5%**	**5%**	**10%**	**15%**	**5%**	**25%**	**25%**	**5%**	**5%**	**100%**
Management Area		**Year**										
	percent >	**2006**	0.5%	1.2%	3.2%	0.8%	1.2%	22.6%	46.6%	21.2%	2.6%	100.0%
Total >	**acres >**	**2005**	**101,773**	**19,191**	**42,613**	**57,423**	**37,096**	**261,056**	**259,604**	**102,143**	**1,304**	**882,203**
	percent >	**2005**	**11.5%**	**2.2%**	**4.8%**	**6.5%**	**4.2%**	**29.6%**	**29.4%**	**11.6%**	**0.1%**	**100.0%**
	acres >	**2006**	**91,138**	**24,874**	**38,272**	**53,274**	**33,001**	**272,287**	**266,040**	**105,736**	**2,933**	**887,555**
	percent >	**2006**	**10.3%**	**2.8%**	**4.3%**	**6.0%**	**3.7%**	**30.7%**	**30.0%**	**11.9%**	**0.3%**	**100.0%**

While each management area is considered individually, the ponderosa pine covertype within the five management areas, generally there is too much structural stage 1, 4A, 4B and 4C, and not enough structural stage 2, 3A, 3B, 3C and 5. Structural stage 1 acres are attributable to the recent large wildfires. To achieve percents in some structural stage categories, the vegetative treatments may span decades to change to another structural stage category. For example, a 4A stand without an understory may take several decades to transition to a 4B stand. To achieve more structural stage 2 or 3A or 3B by tree harvesting, an understory must be present in a 4A/B/C stand. Structural stage 1 will grow into structural stage 2 and then on into structural stage 3's.

Monitoring Item 10: Vegetative Diversity – Large Trees

Reference Forest Plan objectives 4.1 – 203, 5.1 – 204, 5.4 – 206, 5.43 – 204, 5.6 – 204, 3.7 – 201.

10% of the structural stage 4 ponderosa pine acreage in the management area will have an average tree size of "very large".

Summary of acres of mature ponderosa pine (4A/4B/4C/5) and tree size of "very large" (the majority of tree stocking based on basal area is in live trees 9.0 inches in diameter and larger, and within that group, the majority of the basal area is in live trees 16.0 inches and larger in diameter) by the five management areas (definition of other tree size available from Forest silviculturists):

Acreage of "Very Large" – mature ponderosa pine for 2006 report:

Mgmt Area	Cover Type	SS4A	SS4B	SS4C	SS5	Total
4.1	TPP	2,111	2,640	925		5,676
5.1	TPP	27,747	11,535	3,684		42,966
5.4	TPP	7,522	7,199	2,621	104	17,446
5.43	TPP	212	16	72		300
5.6	TPP	1,771	2,122	732	191	4,817

Mgmt Area	Cover Type	SS4A	SS4B	SS4C	SS5	Total
		39,363	23,513	8,034	295	71,206

Total acreage of mature ponderosa pine in structural stage 4A/4B/4C/5 within the 5 indicated management areas is 614,574 acres.

Ten percent of 614,574 is 61,257 acres.

The above chart shows 71,206 acres of very large trees.

The number of acres exceeds the 10 percent objective by 9,949 acres.

Monitoring Item 11: Vegetative Diversity and Snag Retention

Reference Forest Plan objective 211. Within a management area in conifer forested portions of the forest, provide an average of three hard snags greater than 9-inch dbh and 25 feet high per acre, well-dispersed across the forest, 25 percent of which are greater than 14-inch dbh.

Number of snags per acre is an output for each forested stand on the forest where there is tree inventory data. Annually, approximately 5-10% of the Forest has field data collected. The year 2006 report will display two years of data, hence a yearly comparison starting next year.

From the vegetation database, the average number of standing dead trees per acre for diameter class 9 inch plus diameter trees by management area on conifer sites with a height 25 feet or greater is 1.7 snags for year 2005. For 2006 the Forest average is 1.3 snags per acre.

From the vegetation database, the average number of standing dead trees per acre for diameter class 14 inch plus diameter trees by management area on conifer sites with a height 25 feet or greater is 0.4 snags. For 2006 the Forest average is 0.3 snags per acre.

Black Hills NF
Average Number of Standing Dead Trees
Per Acre by Management Area
For Ponderosa Pine and White Spruce
With a Height Greater Than 24.9

Management Area	Trees 0-8.9 inch dbh	Trees >9-inch dbh	Trees >14-inch dbh
1.1A	23.4	1.6	0.6
2.2	4.2	2.2	1.0
3.1	3.9	1.6	0.5
3.31	2	0.4	0.1
3.32	3.8	2.4	0.7
3.7	7.5	1.4	0.4
4.1	3.3	1.2	0.3
4.2A	1.6	1.1	0.4
4.2B	2.1	2.7	0.6
5.1	10.6	1.2	0.3
5.1A	1.5	1.0	0.2

Black Hills NF Average Number of Standing Dead Trees Per Acre by Management Area For Ponderosa Pine and White Spruce With a Height Greater Than 24.9			
Management Area	Trees 0-8.9 inch dbh	Trees >9-inch dbh	Trees >14-inch dbh
5.2A	4.4	2.6	0.7
5.3A	5.2	1.1	0.3
5.3B	13.3	5.7	1.9
5.4	5.9	1.5	0.3
5.43	1.4	1.5	0.3
5.4A	2.5	2.7	1.1
5.6	2.5	1.1	0.3
8.2	2.8	2.5	0.9
Average	8.2	1.3	0.3

The Forest will continue to monitor data on snag heights and the application of appropriate scientific literature.

FIA (Forest Inventory Analysis) data has not been provided to the Forest from the Northern Research Station for the annual re-measurement update.

The above vegetation database summary numbers do not have the on-the-ground inventory data since recent fires or large tree mortality areas due to insects. Hence, the large fires of Cicero Peak, Jasper, Elk Mountain II, Roger's Shack, Cement, Ricco, Battle Creek, Grizzly Gulch which have standing dead trees from fire and the Beaver Park, Deerfield and Bugtown areas which have standing dead trees from insect mortality do not contribute to the above standing dead trees per acre. Therefore, an estimate of standing dead from recent wildfires and recent tree mortality from insects is appropriate. Wildfires since year 2000 total approximately 175,127 acres. From the Forest vegetation database a query of average number trees per acre that are 9 inches in diameter or greater resulted in an estimate of 150 trees per acre. Therefore, 150 trees per acre times 175,127 acres of wildfire 26,269,050 trees. Due to snag fall down from wind an estimate of 70% of the 26,269,050 trees remains standing or 18,388,335 trees which is applied across the Forest of 1 million forested acres results in approximately 18.4 snags per acre from wildfire. Tree mortality from insects since year 2000 is estimated at 10% of the Forest or one million forested acres times 10% or 100,000 acres. Likewise, an estimate of 150 trees per acre times 100,000 acres results in 15 million snags times 70% fall down rate equals 10.5 million divided by the Forest of one million forested acres results in 10.5 snags per acre. The 18.4 snags per acre estimate from wildfire and 10.5 snags per acre from insects is an average across the Forest. In reality, the snags are concentrated in the wildfire areas and the insect tree mortality areas. Snag density across the Forest ranges from 0-150 snags per acre.

Conclusion: The addition of recent wildfires and insect tree mortality results in above 3 snags per acre well dispersed across the Forest.

Monitoring Item 12: Burned Forest Habitat

Cause	Number of Fires	Acres Burned
Lightning	96	769
Human	16	97
Total	112	866

The 2006 acres burned and number of starts was well below 33 year average of 137 fires per year and 8,275 acres burned per year as listed in Page III-343 of the Phase II FEIS. Approximately 73% of the total acres burned in 2006 were the result of the Pass Creek Fire that burned about 633 acres (about 160 acres were severely burned ponderosa pine). Approximately 86% of all fires occurring in 2006 where lightning caused with the remaining 14% being human caused. Of the 866 acres impacted by wildfire, 0 acres were salvaged subsequently, refinement will take place for monitoring protocol related to this item.

Monitoring Item 14: Regeneration

Regeneration is not specifically referenced Forest Plan objectives 303 – 305.

Regeneration is measured from field survey or walk through survey on forested lands. When stands are stocked with a minimum of 150 trees per acre then stands are certified as regenerated. Stands are summarized annually by database query for a total number of acres certified for the Forest.

The total certified acres in fiscal year 2006 = 2,610 acres

Monitoring Item 15: Timber Production

Objectives:

303. Offer the following allowable sale quantity (ASQ) of timber on suitable and available timberlands in the next decade:

Allowable Sale Quantity From Suitable Lands: (Decade Total)	
Sawtimber	
Million Cubic Feet	181
(Million) Board Feet	838
Roundwood	
Million Cubic Feet	21
(Million) Board Feet	N/A
Total	
Million Cubic Feet	202
(Million) Board Feet	838

304. On lands not identified as suitable and available for timber harvest, timber volume may be offered as a by-product of other vegetation management objectives. This volume would be offered in addition to the ASQ.

305. The ASQ in Objective 303 includes the following non-interchangeable component in the Norbeck Wildlife Preserve. This portion of the ASQ is not interchangeable with the volume outside the Preserve.

Allowable Sale Quantity From Suitable Lands In Norbeck Wildlife Preserve: (Decade Total)	
Sawtimber	
Million Cubic Feet	5.4
(Million) Board Feet	27.0
Roundwood	
Million Cubic Feet	1.0
(Million) Board Feet	N/A
Total	
Million Cubic Feet	6.4
(Million) Board Feet	27.0

The 10-year allowable sale quantity expressed on an average annual basis:

Forest Plan	Million Cubic Feet (MMCF)	Hundred Cubic Feet (ccf)
Sawtimber	18.1	181,000
POL	2.1	21,000
Total ASQ	20.2	202,000

Monitoring:

The allowable sale quantity (ASQ) in the Forest Plan is from FY 1997 through FY 2006.

There are 865,890 acres suitable and available for timber production (Forest Plan 1997 ROD – 36).

The ASQ is a maximum level of timber that may be sold during the first decade after plan approval. A ceiling on the level of timber that can be sold, the ASQ takes into account available funding, other multiple-use values, and compliance with standards and guidelines that provide environmental protection. ASQ is not an absolute yield that must be achieved (USDA Forest Service 1997b p. ROD-35).

Harvest acreage over the decade in the Forest Plan is an estimated 255,000 acres or average 25,500 acres per year at full funding level. (USDA Forest Service 1996b Appendix H - 189).

Year 2006 Summary

Harvest acres from signed decisions (NEPA decisions) is 38,684 acres.

Year	Funded Target (Total)		Offer	Sold	Cut	Harvested
	mmbf	ccf	mmbf	mmbf	mmbf	Acres
1998	73.4	146,800	77.0	78.6	62.0	14,307
1999	70.8	141,600	82.7	73.5	73.0	14,238
2000	70.0	140,000	2.8	36.2	65.7	13,567
2001	69.0	138,000	36.5	38.2	75.4	12,442

Year	Funded Target (Total)		Offer	Sold	Cut	Harvested
	mmbf	ccf	mmbf	mmbf	mmbf	Acres
2002	60.0	120,000	49.5	52.3	62.4	15,123
2003	54.5	109,009	72.8	78.0	67.7	16,500
2004	61.1	122,200	74.5	80.0	70.0	17,795
2005	70.0	140,000	68.1	53.6	79.8	18,200
2006	88.7	177,400	92.9	75.0	76.6	22,430

Norbeck Wildlife Preserve

For the Forest Plan period of 1997-2006 (decade) in the Norbeck Wildlife Preserve, there has been 2 timber sales sold, Needles #2 and Grizzly sales. The non-interchangeable component volume is 5.4 million cubic feet (54,000 ccf) of sawtimber (Objective 305). Needles #2 sold 14,379 ccf which is all in Norbeck. Needles #2 harvested 16,385 ccf. Grizzly sold 14,923 ccf. Approximately 61% of Grizzly is in Norbeck. As of end of fiscal year 2006, approximately 3/4 of the sale volume has been harvested. The Needles #2 volume plus Grizzly volume within Norbeck is approximately 25,488 ccf (16,385 ccf + 9103 ccf).

Monitoring Item 16: Rangeland Trend

302. Maintain rangelands in satisfactory range condition.

a. *Management of rangelands determined to be neither meeting nor moving toward satisfactory rangeland condition in an acceptable timeframe, shall cause actions designed to move toward satisfactory rangeland condition within a stated timeframe to be implemented.

b. *In the absence of a site-specific planning process and an Allotment Management Plan, management direction for ongoing rangeland management activities on active allotments needed to address rangeland conditions and trends and species viability will be incorporated into the grazing permits through the annual operating instructions (AOI).

Monitoring:

This objective relates to Rangeland Trend. The Phase II Amendment to the 1997 Land and Resource Management Plan includes Guideline 2504 which also relate to trend, and the setting of desired conditions.

Historic trend studies and transects are found for many allotments. Generally, these studies were established during a timeframe of the 1950s into the early 1970s. Very few have been re-read since their inception; most have accompanying close-up and long view photographs. Specific locations of a many of these study sites are not documented well enough to find the location. In the last few years we have launched an effort, in conjunction with our Range NEPA analysis, to locate, reread, reestablish, or establish long term trend studies. These studies are planned to be reread each 5 to 10 year period. Shorter periods may not show direction of trends.

Each of the districts has been working toward collecting trend data. We will use Cover Frequency methods as a norm but other accepted methods can be used if a need arises. This information is maintained in the 2210 files at the districts, the NEPA project file and/or the district electronic range files.

Trend Collection by District:

Hell Canyon:

A portion of this trend data was collected, compared to historic data, and then analyzed to show trends in species composition for the Southeast Range EA. This data showed that trend was steady or moving towards desired condition.

Starting in 2001 the District began collecting trend data using Cover Frequency methods. Below are the number of allotments established or reread by year.

Year	# of Allotments	Acres
2001	16	121,673 acres
2002	5	65,411 acres
2003	2	7,915 acres
2004	2	4,147 acres includes riparian study
2005	1	700 acres is a riparian study.
2006	1	1,760 acres reread of 2004 riparian study.

Proper Function Condition (PFC) was also established 2005 as an indicator of trend. The Flynn/Bowman, Glen Erin and Hazelrodt pastures were completed for a total of 25,000 acres on the Cicero Allotment.

Mystic Ranger District:

In 2004 and 2005, the District's Range Staff started establishing one Cover by Life transect with photos in each allotment pasture. There are now 72 transects in place out of a possible 170 pastures. The thought was they provided a quick evaluation method of vegetative trend, and are in a format that permittees and non-range agency personnel can understand.

Trend data was collected in 2004 on 47,822 acres for 16 of 29 allotments. In 2005, another 78,085 acres of trend data was collected for 21 allotments. No trend data was collected in 2006. There has been some discussion about whether establishment of the Cover by Life transects was an appropriate response and method. Since historic trend data has not been re-visited and "Cover by Life" transects were recently established, there are no conclusive findings at this point.

Bearlodge:

In 2003 48,680 acres on six allotments were inventoried using rooted nested frequency transects. The information is not completely analyzed, but the data indicated a static or upward trend.

In 2004 60,159 acres on seven allotments were inventoried using the Cover Frequency methodology. Data has not been compiled and analyzed on the Cover-frequency transects conducted on three allotments totaling 40,132 acres. Of the other 27,027 acres all are at or moving towards desired condition (DC). These areas were analyzed in the recent North Zone 05 Range Project EIS.

Proper Function Condition (PFC) was used as an indicator of trend. PFC was conducted in three allotments (14,112 acres) during the 2003 and 2005 seasons. These evaluations were used in the analysis for the North Zone Range 05 Project.

Northern Hills:

From 2004 – 2006 monitoring to determine trend was conducted on seven allotments, totaling 72,388 acres, using the Cover Frequency methodology. Two other allotments were re-read in 2003 and the data analyzed in 2005. Four of these allotments were analyzed in the North Zone Range Project and one allotment was analyzed in the Dumont EA. Results indicate that all five of these allotments were either in a static or upward trend. Data for the remaining four allotments has not yet been analyzed.

Proper Function Condition (PFC) was completed over the past 10 years on the five allotments listed as an indicator of trend;

Higgins Gulch: 15664
Tollgate: 3897
East Rapid: 14862
Dumont: 746
Wolff: 7176

Monitoring Item 17: Forage Utilization

Objective 301. (This objective did not change with the Phase II Amendment)

Produce on a sustained basis and make available up to 233 million pounds of forage for livestock and wildlife use each year (weather permitting). The location and amount of forage produced under the forest canopy will vary with the density of the overstory. This may necessitate changes in where and how both livestock and wildlife grazing takes place on a local basis over the rotation of a stand of timber.

a. Livestock use will be up to 127 million pounds of forage per year or approximately 128,000 AUMs.

b. Wildlife use will be up to 106 million pounds of forage per year or approximate population levels of 70,000 deer and 4,500 elk or other combinations that use the same amount of forage.

Monitoring:

This objective relates to annual projected livestock forage use. The Phase II Amendment to the 1997 Land and Resource Management Plan includes Standard 2505 and Guideline 2506 which relate to annual livestock forage, and to proper use or residual levels in riparian and upland forest rangeland settings.

Following these directions the districts continue to develop Allotment Management Plans (AMPs) for allotments that have recently approved environmental assessments. The districts issue Annual Operating Instructions (AOIs) for each allotment. Utilization or residual guidelines are included in the AMPs and/or AOIs.

In fiscal year 2006 actual grazing use was 115,995 AUMs. This is approximately 91 percent of the annual projected Forest grazing capacity of 128,000 AUMs available for livestock utilization identified in the Forest Plan. Reasons for use being less than projected in the Forest Plan were loss of forage in allotments because of the dry conditions, early removal of livestock, and economic pressures in the cattle industry. The Phase II Amendment does not directly reduce the grazing levels on the Forest.

Items Monitored	2003	2004	2005	2006
Livestock AUMs Grazed	122,971	118,919	120,405	115,955

Districts monitored and evaluated approximately 611,396 acres of rangelands on 94 range allotments to determine forage utilization. Following is a breakdown of acres and grazing allotments monitored by ranger district:

Items Monitored	Hell Canyon	Mystic	Northern Hills	Bearlodge
Acres Monitored and Evaluated for Livestock Forage Utilization	137,392	131,360	229,755	112,889
Grazing Allotments Evaluated	24	28	26	16

The monitoring is completed by both Forest Service range staffs and livestock permittees. The districts collected forage utilization data by ocular estimate, photos, and stubble height measurements on key areas throughout the allotments. Forage utilization on the allotments surveyed was within Forest Plan Standards. The use on a few areas in some allotments did exceed proper allowable use guidelines; however these areas represent a small percentage of the overall utilization on the Forest.

Findings and conclusions relevant to the evaluation follow:

1. Forage utilization throughout the allotments surveyed were within Forest Plan standards (2505 – Proper Allowable use Guidelines) and allotment management objectives. Measured forage utilization exceeded proper allowable use guidelines on a small amount of areas within certain allotments surveyed (less than 5 %). Corrective action was taken. These areas will continue to be monitored to see if management changes are needed. Use was reduced on some allotments due to drought conditions.

2. The Forest continues to promote more permittee assistance in monitoring grazing allotments using the Wyoming Range Guide and Black Hills Range Guide.

Monitoring Item 18a: Emphasis Species - Sensitive Species (Plants)

General Information:

The completion of monitoring is dependent on appropriated funding and availability of personnel. A Prioritization Strategy was developed to serve as a working guide to prioritize monitoring for R2 sensitive plant species and Black Hills National Forest plant species of local concern in the event that funding/personnel are not adequate to complete the full monitoring plan. Since all monitoring was completed in 2006, it was not necessary to invoke the strategy. This working tool is expected to be updated on a periodic basis as new information becomes available and will be applied when needed in the future.

The year 2006 was considered a drought year for the State of South Dakota. This information was obtained by accessing US Drought Monitor at **www.drought.unl.edu/dm/monitor.html**.

Noxious weed information is discussed for various species. For information regarding the treatment of weeds on the Black Hills National Forest please refer to the following: Black Hills National Forest Land and Resource Management Plan as amended by the Phase II Amendment (2006) and the Black Hills National Forest Noxious Weed Management Plan (2003).

See the 2007 Sensitive Plant Monitoring Guide for the monitoring questions and protocols that will be used in 2007.

BOTRYCHIUM MULTIFIDUM (LEATHERY GRAPEFERN)

Photo by BHNF staff at *Botrychium multifidum* site BOMU-8 on September 19, 2006.

The majority of *Botrychium multifidum* occurrences on the Black Hills National Forest were discovered in 2003. Prior to the 2005 monitoring season, there were seven known occurrences, all of which were located in the Norbeck Wildlife Preserve and Black Elk Wilderness. There are similar associated habitat conditions elsewhere in the Black Elk Wilderness/Norbeck Wildlife Preserve (note: Black Elk Wilderness is entirely within the Norbeck Preserve but not all Norbeck Preserve is in the Black Elk Wilderness), and probably within Custer State Park and Mount Rushmore National Memorial; therefore, it is likely that additional occurrences are located in the general area. In 2006, an occurrence was discovered in the Bearlodge area of the Black Hills. The habitat conditions at this site (sandstone substrate, intermittent drainage, paperbirch/hazelnut forest) are very different from those at the other 7 sites in the Black Hills central core area (granite substrate, permanent streams, alluvial spruce forest). It is likely that additional occurrences will be found based on a revised search image including a broader habitat range and this is reflected in the monitoring design.

2006 Monitoring Design and Results:

1. Gather baseline data on any new occurrences that may be discovered in adjacent habitat. Assess risks to those sites.

   In 2006, one attempt was made to relocate an unverified *Botrychium multifidum* report from Butcher Gulch. No *Botrychium multifidum* individuals were located. [This site was also looked for in 2004 and 2005.]

   One new location of *Botrychium multifidum* was discovered in 2006 in the Bearlodge area of the Black Hills (BOMU-8 at Little Beaver/Bearlodge). Habitat conditions at this location are different from conditions at the other seven sites in the central core area of the Black Hills. The new occurrence is found on sandstone in a rocky, mossy bottom of an intermittent drainage in paper birch (*Betula papyrifera*)/hazelnut (*Corylus cornuta*) forest. All other occurrences are found on granite along permanent streams in alluvial spruce (*Picea glauca*) forest. Baseline data were collected for the new site. The greatest risk to the occurrence appears to be livestock grazing. Livestock trail through the drainage but the majority of impact is on an old roadbed/terrace above the drainage bottom. Livestock (and elk)

concentrate in the drainage below the occurrence where the drainage widens out and there are permanent springs. However, there are no barriers between areas of high concentration impacts and the *B. multifidum* site. The site will be monitored annually.

2. Annually check presence/absence and count individuals at four monitoring sites (BOMU-1, BOMU-4, BOMU-5, BOMU-7). These include one site that is close to heavy trail traffic areas.

   BOMU-1 (Lost Cabin Creek) – Located in the Black Elk Wilderness. 215 individuals were counted on September 12, 2006 (383 were counted in September 2005; 35 were counted in June 2004; and 65 were counted in June 2003). Large concentration areas from 2005 were relocated and new areas found downstream along Lost Cabin Creek. [Note: *Botrychium* species are known for high variability in aboveground expression between years.] A greater percentage of plants had sporophores (ca 5%) in 2006 compared to previous years.

   BOMU-4 (Iron Creek) – Located in the Black Elk Wilderness. 15 individuals were counted on September 15, 2006 (25 were counted in 2005). A large spruce tree had fallen across the site since last year, which might account for a decrease in individuals counted. Several plants were observed coming up among the spruce branches/debris that were quite large (trophophores up to 3 in across and sporophores up to 6 in tall).

   BOMU-5 (Iron Creek Tributary) – Located in the Black Elk Wilderness. 18 individuals were counted on September 15, 2006 (11 were counted in 2005).

   BOMU-7 (Upper Iron Creek) – Located in the Black Elk Wilderness. 17 individuals were counted on September 20, 2005 (14 individuals counted in 2005). Subpopulation A was located in 2003 but not found in 2004, 2005, or 2006.

3. Every five years, revisit all known *Botrychium multifidum* locations within the same year and collect data (next time in 2009).

   All *Botrychium multifidum* sites will be revisited in 2009.

4. Document any noxious weeds or invasive species. Document if the invaders are co-located with *Botrychium multifidum* or what distance they are located from occurrences if they occupy the same ecological type. Use this information to develop a weed treatment strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

   BOMU-1 (Lost Cabin Creek) – *Cirsium arvense* (Canada thistle) co-located with *Botrychium multifidum* plants. *Cynoglossum officinale* (houndstongue) located 5 ft from *B. multifidum* plants in the same ecotype.

   BOMU-4 (Iron Creek) – *Cirsium arvense* found in same ecotype within 5 m of *Botrychium multifidum*

   plants. *Cirsium vulgare* (bull thistle) found in same ecotype within 2 m of *B. multifidum* plants. *Phleum pratense* (timothy) co-located with *B. multifidum* and scattered in the floodplain area.

   BOMU-5 (Iron Creek Tributary) –*Cirsium vulgare* found in same ecotype within 2 m of *Botrychium multifidum* plants. *Cirsium arvense* was not found in the site, but a large patch 10m upstream could become a source for invasion into the site.

   BOMU-7 (Upper Iron Creek) – *Cirsium arvense* is common in the drainage and thick in areas – sometimes co-located with *Botrychium multifidum*. *Cirsium vulgare* scattered occasionally in the drainage in the same ecotype as *B. multifidum*, within 7 m of *B. multifidum* plants. *Phleum pratense* scattered in slightly drier areas, within 10 m of *B. multifidum* plants.

   BOMU-8 (Little Beaver/Bearlodge) – No weeds were observed within the site, but *Cirsium vulgare* and

Phleum pratense are found down the drainage where the drainage widens out (within 300m).

No evidence was observed of weed treatment activity affecting any *Botrychium multifidum* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

CAREX ALOPECOIDEA (FOXTAIL SEDGE)

Photographs by BHNF staff. Left: *Carex alopecoidea* in fruit at CAAL8-22 on August 24, 2006 – Right: CAAL8-16 site in Dugout Gulch Botanical Area on August 16, 2006 – habitat impacts from livestock.

Carex alopecoidea was confirmed on Black Hills National Forest in 2000 and approximately 31 occurrences documented between 2001 and 2003. Based on the number of occurrences that have been located and the amount of suitable riparian habitat in the Black Hills and Bearlodge, more occurrences are likely and this is reflected in the monitoring design.

Recent available data were used in developing a monitoring design for *Carex alopecoidea.* Occurrences for monitoring were primarily selected based on the following criteria: size (estimated number of individuals), geographic distribution of the occurrences, and location of occurrences in different drainages. Five occurrences were selected for monitoring. A second aspect of the monitoring design is to continue reconnaissance surveys to learn more about the species for future status assessments or to refine the monitoring design.

Species persistence concerns for *Carex alopecoidea* led to BHNF Standard 2505c directing implementation of additional measures to assure avoidance of livestock use on *Carex alopecoidea* by restricting livestock use of all or portions of 5 of the largest geographically spaced occurrences (site numbers: CAAL8-19, CAAL8-20, CAAL8-22, CAAL8-30, CAAL8-31). The monitoring program is not tasked with accomplishing livestock restriction (e.g. by fencing or other means) but will gather data on results when restrictions are accomplished. It is important to learn if livestock grazing causes beneficial, neutral, or negative direct impacts to *C. alopecoidea*, and understand what kind of indirect impacts to *C. alopecoidea* result from changes to habitat conditions caused by livestock grazing. Planning/design has begun on constructing fenced exclosures at the five sites but no restrictions from livestock grazing were implemented in 2006.

2006 Monitoring Design and Results:

1. Annually monitor presence/absence at sites CAAL8-16, CAAL8-20, CAAL8-22, CAAL8-30 and CAAL8-31. Document endpoints with a GPS system annually. If a contraction of the occurrence is noted, document the reason if it can be determined.

   The protocol was changed from 2005 to 2006 so that individual plants are no longer counted. It was determined that complete census counting was not reliable or repeatable given: 1) there are hundreds of plants at the large sites; and 2) there is great variability in counting individuals based on presence of reproductive structures when monitoring may be conducted before, during, or after livestock grazing in different years. The 2006 protocol involves documenting maintenance of site extent, presence of concentration areas of individuals (at comparable densities to previous years), and assessing habitat condition.

   CAAL8-16 (Dugout Gulch Botanical Area): On August 16, 2006, plants were observed in the same areas and appeared to be at the same densities as in 2005. The extent of the occurrence was stable. However, evidence of livestock grazing on CAAL-8 and other vegetation was observed. Cattle trampled and grazed along the stream. Habitat condition was degraded because of these impacts. Management does not yet meet Standard 3.1-2503 (Restrict access of domestic livestock to protect R2 sensitive and SOLC plant occurrences in designated botanical areas.)

   CAAL8-20: On August 18, 2006, plants were observed in the same areas and appeared to be at the same densities as in 2005. The extent of the occurrence was stable. Habitat condition was degraded due to herbaceous vegetation grazed by livestock to less than 1 inch in areas; shrub vegetation (willow species) showing impacts from livestock grazing; and hummocking and bank-shearing due to livestock hoof action along the stream and in contributing seeps.

   CAAL8-22: On August 24, 2006, plants were observed in the same areas and appeared to be at the same densities as in 2005. The extent of the occurrence was stable. *Carex alopecoidea* was present in all forks of the site. Habitat condition was degraded due to herbaceous vegetation grazed by livestock to less than 1 inch in areas; shrub vegetation (willows) showing impacts from livestock grazing; and hummocking and bank-shearing due to livestock hoof action along the stream and in contributing seeps. The site appeared drier in 2006 than 2005 – several seeps and other areas that were wet in 2005 were dry in 2006.

   CAAL8-30: On August 15, 2006, plants were observed in the same areas and appeared to be at the same densities as in 2005. The extent of the occurrence was stable. Habitat condition was degraded due to herbaceous vegetation grazed by livestock to less than 1 inch in areas; shrub vegetation (willows) showing impacts from livestock grazing; and hummocking and bank-shearing due to livestock hoof action along the stream. The area was very dry compared to 2005. Grass was brown and crispy except for a green ribbon along the stream. Grazing had occurred on coarse-textured or poisonous plants that cattle usually avoid (e.g. water hemlock (*Cicuta maculata*), beaked sedge (*Carex utriculata*), cattail (*Typha latifolia*). Approximately 100 cow/calf pairs were observed in the site at the time of monitoring.

   CAAL8-31: On August 14, 2006, plants were observed in the same areas and appeared to be at the same densities as in 2005. The extent of the occurrence was stable. The concentration area along Beaver Creek appeared drier than in 2005 – some areas that had water in the streambed in 2005 were dry in 2006. Livestock had not yet grazed the occurrence area when monitoring was conducted. With respect to habitat condition, the rocky streambed of Beaver Creek appears to be more stable under livestock hoof action than other streams observed in the course of monitoring.

2. Document observations at CAAL8-19, CAAL-20, CAAL8-22, CAAL8-30, CAAL8-31 regarding effects of restricting livestock grazing on all or portions of these occurrences.

   Planning/design has begun on constructing fenced exclosures at the five sites but no restrictions from

livestock grazing were implemented in 2006. Management does not yet meet Standard 2505 c.

3. Document observations whether *Carex alopecoidea* sites in Dugout Gulch Botanical Area (CAAL8-16) and Upper Sand Creek Botanical Area (CAAL8-12) Botanical Areas were grazed by livestock. [Standard 3.1-2503 - Restrict access of domestic livestock to protect R2 sensitive and SOLC plant occurrences in designated botanical areas.]

   Carex alopecoidea plants in CAAL8-16 site in Dugout Gulch Botanical Area were grazed by livestock in 2006 (see summary in item 1 above). Management does not yet meet Standard 3.1-2503.

   CAAL8-12 site in Upper Sand Creek Botanical Area was observed enroute to monitoring *Lycopodium complanatum* site LYCO3-1 on September 6, 2007. *Carex alopecoidea* plants were grazed by livestock in 2006. Management does not yet meet Standard 3.1-2503.

4. Document any noxious weeds or invasive species. Document if weeds are co-located with *Carex alopecoidea* or what distance they are located from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

   CAAL8-16 – High abundance of invasive species (including noxious weeds) in site and along drainage bottom – *Cynoglossum officinale* (houndstongue), *Cirsium arvense* (Canada thistle), *Cirsium vulgare* (bull thistle), *Arctium minus* (lesser burdock), *Rhamnus cathartica* (common buckthorn; listed as noxious/invasive in 5 states), and *Verbascum thapsus* (common mullein) all found within one ft of *C. alopecoidea*.

   CAAL8-20 – *Cirsium arvense, Cirsium vulgare,* and *Cynoglossum officinale* are all present in the same ecotype as *Carex alopecoidea*. *Cynoglossum officinale* is within 10 ft of *Carex alopecoidea* individuals, and *Cirsium arvense* and *Cirsium vulgare* are adjacent to *Carex alopecoidea* individuals.

   CAAL8-22 – *Carduus nutans, Cirsium arvense, Cirsium vulgare, Tanacetum vulgare* (common tansy), *Verbascum thapsus*, and *Artemisia absinthum* (absinth wormwood – designated noxious in North Dakota and Colorado) are all co-located with *Carex alopecoidea* in the same ecotype.

   CAAL8-30 – *Cirsium arvense, Cirsium vulgare, Cynoglossum officinale,* and *Verbascum thapsus* were present and co-located with *Carex alopecoidea* at this site.

   CAAL8-31 – *Carduus nutans, Cirsium arvense, Cynoglossum officinale* and *Tanacetum vulgare* are all present at this site, in the same ecotype as *Carex alopecoidea*. All species are within 10 ft. of *C. alopecoidea* individuals; some are found adjacent.

   No evidence was observed of weed treatment activity affecting any *Carex alopecoidea* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

EPIPACTIS GIGANTEA (STREAM ORCHID; GIANT HELLEBORINE)

Photo by BHNF staff at *Epipacts gigantea* site EPGI-1 on July 5, 2005: trampling found in 2005 and 2006 in *Epipactis gigantea* habitat by recreational users (no concentration areas of plants have disappeared due to impacts).

The only known occurrence of *Epipactis gigantea* in South Dakota is located along Cascade Creek in the southern Black Hills. This occurrence extends from Cascade Springs (on Black Hills National Forest land) downstream on private land and on The Nature Conservancy's Whitney Preserve. The population appears to be stable, but there is insufficient data to demonstrate a trend at the present time.

The confinement of *Epipactis gigantea* to a single watershed in the Black Hills makes it vulnerable to random events such as extreme drought or a disease outbreak. However, the relatively constant water from springs with origins from a deep underground source increases the likelihood of persistence of the species. In addition, the existence of multiple suboccurrences of the species in the watershed may help buffer against any catastrophic disturbances in the area.

Effects associated with ongoing recreational use and competition with, or treatment of, invasive plant species (including noxious weeds) are currently considered to be the most significant risks to *Epipactis gigantea* and its habitat on Black Hills National Forest. Footpaths and visitor-created "nick trails" (visitor created paths that have been or can be created simply by recreationists leaving the developed trail system to access sections of Cascade Creek), trampling of vegetation, and mowing near *Epipactis gigantea* patches have been identified as past or current impacts to the species and its habitat. Portions of the population occur in areas that are naturally restrictive to recreational access by dense vegetation or inaccessible slopes, and therefore are unlikely to be impacted by recreationists. *Cirsium arvense* (Canada thistle) is a SD state-listed noxious weed; *Elaeagnus angustifolia* (Russian olive) and *Tamarix* sp. (salt cedar) are non-native invasive species of concern. All of these currently occur in the Cascade Creek valley. *Lythrum salicaria* (purple loosestrife) is not known to occur within the Cascade Creek valley, or anywhere close by, but due to its aggressive nature, if it were to invade, it would have the potential to impact native riparian species such as *Epipactis gigantea*.

Quantitative monitoring is problematic as some areas at Cascade Springs and Cascade Falls are inaccessible or involve high risk of damage to the plants from trampling or dislodging them on steep slopes. Also, because the species reproduces clonally, it is not possible to determine the number of individual plants. Monitoring is most efficiently conducted during *Epipactis gigantea*'s flowering period in June

As of 2001, the U. S. Geological Services (USGS) gauging station at the southern end of J. H. Keith Cascade Springs Picnic Ground is no longer monitored by the USGS. A water level monitor had been considered for installation for 2002, but it was determined that the methodology was not appropriate for this situation. In consultation with the Rocky Mountain Research Station in 2003, the monitoring design to measure water levels was revised and included placing two permanent water level measuring devices at two of the springs (one at each of two springs) in 2003. Due to heritage resource concerns, these two water measuring devices were not installed. Permanent transects were established in 2004 and data collected from a one-time reading each in 2004, 2005, and 2006 (when the phenology of *Epipactis gigantea* was appropriate for monitoring). This protocol is not rigorous enough to determine cause and effect relationships relative to changes in water level. It is only meant to coarsely document presence/absence of water in Cascade Creek.

2006 Monitoring Design and Results:

1. Monitor presence/absence of concentration areas of *Epipactis gigantea* on an annual basis. If a decline is observed, consult on a more rigorous design with the Rocky Mountain Research Station. [Note: it was determined in the course of monitoring in 2006 that trying to capture a quantitative change (10% change) using a presence/absence protocol was not possible. The protocol was revised and will be discussed with RMRS in 2007.]

   Cascade Springs and Cascade Falls were visited for monitoring on July 14, 2006. In general, Cascade Springs appeared lush due to good spring/early summer moisture. Approximately 50% of *Epipactis gigantea* plants were in flower, 20-30% vegetative, and 10-20% with immature fruit. The site appears stable relative to concentration areas mapped in previous years – that is, areas were found as mapped for majority of concentration areas.

2. Recreation nick point: document the number of nick points that actually extend into patches of *Epipactis gigantea*.

   There is a nick point trail (observations indicate low use) that extends into an *Epipactis gigantea* patch at the uppermost headwater springs. Some trampling of orchids was observed in 2006.

   Recreation access through another nick point that was first documented during 2002 monitoring season has been limited by a fence that was constructed several years ago. In 2006, there was no evidence that the continuing recreational use on this nick point trail is extending into any *Epipactis gigantea* patches.

   A third nick point trail (first documented in 2000), continues to overgrow with shrubs; the trail leads to a cement platform below the nick point. Some trampling of orchids was observed in 2006.

   A very short nick point trail is defined near the gazebo (west of point RP6) and extends into a patch of *Epipactis gigantea*. Some trampling of orchids was observed in 2006.

   No *Epipactis gigantea* patches have disappeared in areas where nick point trails extend into them.

   New signs (Beware of poison ivy) have been posted near the spring by the gazebo to discourage foot traffic.

3. Monitor water levels at the two permanent transect locations on an annual basis at the time of appropriate phenology for monitoring *Epipactis gigantea* each year.

   On July 14, 2006, the two transects were reread - water levels were documented at 0.5 m intervals. The average stream depth on July 5, 2006 at Transect No. 1 (upstream transect) was 9.24 cm (on July 5, 2005: 12.65 cm; on July 2, 2004: 11.9 cm) and the average stream depth at Transect No. 2 (downstream transect) was 25 cm (on July 5, 2005: 27.6 cm; on July 2, 2004: 21.5 cm).

4. Document any noxious weeds and the following invasive species, *Elaeagnus angustifolia* (Russian olive), and *Tamarix* sp. (salt cedar). Document if weeds are co-located with *Epipactis gigantea* or what distance they are from the occurrence if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

   In 2006, *Cirsium arvense* (Canada thistle) continues to be present along the stream, including individuals located in patches of *Epipactis gigantea*. *Cirsium vulgare* (bull thistle) is also intermingled with *E. gigantea*. *Eleagnus angustifolia* (Russian olive) continues to be present at Cascade Springs. *Tamarix* spp. (salt cedar) was not present. Hell Canyon District staff spent one day at Cascade Springs handpulling weeds in 2006. In general, weed density appears to be much lower in the site than 2-3 years ago, likely due to consistent weed treatment efforts over the last several years.

   A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

5. Document erosion patches occurring at any *Epipactis gigantea* patch.

   No new erosion patches were observed in 2006 at any *Epipactis gigantea* concentration areas. Past documented erosion patches (erosion observed to be associated with stream movement dynamics) continue to be present.

6. Document any verifiable unauthorized collections of *Epipactis gigantea*.

   There was no evidence of unauthorized collections of *Epipactis gigantea* at the time monitoring was completed in 2006.

LYCOPODIUM COMPLANATUM (GROUNDCEDAR; TRAILING CLUBMOSS)

Photo by BHNF staff at *Lycopodium complanatum* site LYCO3-1 on September 6, 2006: pointing at one of ten stakes installed for reference point monitoring (*L. complanatum* growing next to the stake).

Prior to the 2004 monitoring season, there were four known occurrences of *Lycopodium complanatum* located on Black Hills National Forest, identified with the following site numbers: LYCO3-1, LYCO3-2, LYCO3-3 and LYCO3-4. Sites LYCO3-3 and LYCO3-4 were located in 2002. Site number LYCO3-4 was reported in an area burned by the Grizzly Gulch wildfire (2002), and it is unknown what long-term effects the fire will have on the persistence of the species at this site. LYCO3-5 and LYCO3-6 were discovered and baseline data collected in 2004. Since these occurrences are only about 200 m apart, they were combined into one site

(LYCO3-5 with subpopulations) in 2005. LYCO3-7 was discovered and baseline data collected in 2004. LYCO3-8 was discovered and baseline data collected in 2005. Sites LYCO3-5, LYCO3-7, and LYCO3-8 occur in an area with a significant amount of similar habitat (north-facing spruce (*Picea glauca*) slopes above small streams) that may reveal more occurrences when comprehensively searched. LYCO3-9 was discovered and baseline data collected in 2006.

The greatest risk identified to *Lycopodium complanatum* based on baseline data gathered from sites on Black Hills National Forest is the small number and limited size of occurrences. There are currently few apparent or ongoing risks to the species at those locations, but those locations of this boreal remnant species are small enough that random events, such as drought or fire, could eradicate them. All of the more recently located occurrences are in active grazing allotments. There is risk to these occurrences from trampling that could occur if OHV trails or timber activities open up new pathways for cattle to move between forage areas, watering areas, salting areas, etc. that are through or adjacent to *L. complanatum* sites. Although invasive plant species are not currently an immediate risk to *L. complanatum* at known occurrences, there is potential for invasion because of the presence of invasive species in nearby surrounding areas.

Lycopodium complanatum is evergreen and can be monitored at any time during the growing season (May to September). However, it is best observed in the spring or fall when overstory or other understory vegetative cover is low, yet it is still possible to detect and identify invasive plant species. Monitoring in the fall as opposed to the spring allows documentation on reproductive effort (i.e. percentage of individuals with strobili/cones). Efforts to monitor occurrences have the potential to negatively impact the occurrence through physical trampling. The monitoring design has been modified to keep site disturbance at a minimum.

2006 Monitoring Design and Results:

1. Monitor the following *Lycopodium complanatum* sites for presence/absence on an annual basis:

   - LYCO3-1 (Sand Creek),
   - LYCO3-4 (Grizzly Gulch/wildfire site)
   - LYCO3-5 (Tillson Creek)

   Lycopodium complanatum was present at LYCO3-1 on September 6, 2006.

   Lycopodium complanatum was present at LYCO3-4 on September 13, 2006.

   Lycopodium complanatum was present at LYCO3-5 on September 14, 2006.

   LYCO3-8 was visited to collect baseline data for *Lycopodium annotinum*; it was observed that *L. complanatum* was present at LYCO3-8 on September 12, 2006.

   A new occurrence was documented July 25, 2006: LYCO3-9 includes plants scattered in a 5m x 3m area just downslope from an occurrence of *Platanthera orbiculata* (lesser roundleaved orchid).

2. Once every five years, revisit all known *Lycopodium complanatum* occurrences.

   All *Lycopodium complanatum* sites will be revisited in 2009.

3. Review the series of permanent markers placed at points along the boundary edges of the Sand Creek LYCO3-1 site in 2005. Determine if a contraction or expansion of the site has occurred and document with photographs and/or drawings if there has been a change. If there has been no observable change from 2005, document presence on the data sheet but do not retake documentation photos/drawings. If there is no observable change in the occurrence in three years (2008), retake the photographs and/or drawings to document no change.

   The monitoring protocol developed in 2005 by consultation with the Rocky Mountain Research Station to

minimize damage to the LYCO3-1 site and increase repeatability of results was continued in 2006. The site appeared stable at all ten boundary markers and the extent of the site was stable. Consequently, according to the protocol, photographs/drawings were not retaken. There were a few new down trees near the site.

4. Document any noxious weeds or invasive species. Document if weeds are co-located with *Lycopodium complanatum* or what distance they are located from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

No noxious weeds were observed to occur within any of the *Lycopodium complanatum* sites in 2006.

LYCO3-1 –Several noxious weeds are abundant in the drainage below the site in a different, more open-canopy ecological type : *Tanacetum vulgare* (common tansy), *Cynoglossum officinale* (houndstongue), *Hypericum perforatum* (St. Johnswort), and *Cirsium arvense* (Canada thistle).

LYCO3-4 – *Cirsium arvense, Cynoglossum officinale, Tanacetum vulgare,* and *Leucanthemum vulgare* (ox-eye daisy) are located in a different ecological type in the drainage below the occurrence. There are some very large patches of *Cirsium arvense* and *Leucanthemum vulgare*.

LYCO3-5 – No noxious weeds were observed in this site.

LYCO3-8 – *Cynoglossum officinale* and *Leucanthemum vulgare* are scattered in the drainage bottom below the site and along the nearby road.

LYCO3-9 – No noxious weeds in the site, but several noxious weeds are abundant in the drainage below the site in more open-canopy ecological type [*Tanacetum vulgare* (common tansy), *Cynoglossum officinale* (houndstongue), *Hypericum perforatum* (St. Johnswort), and *Cirsium arvense* (Canada thistle).] Recent logging activity (2004) on the adjacent hillside has allowed concentrations of weeds to establish in skid trails near LYCO3-9.

No evidence was observed of weed treatment activity affecting any *Lycopodium complanatum* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

5. Document if there are any impacts from livestock grazing (particularly, trails through the sites) in sites visited annually, and in all *Lycopodium complanatum* sites when they are revisited every five years.

LYCO3-1 – No trails or other impacts from livestock grazing observed in the site; steep hillside prevents livestock access.

LYCO3-4 – No trails or other impacts from livestock grazing observed in the site; steep hillside prevents livestock access.

LYCO3-5 – Wildlife trails occur in and around some of the concentration areas. A few cowpies were observed on the hillside with the occurrence but not in the site itself, indicating that livestock occasionally traverse the slope. LYCO3-5 is in an active grazing allotment upslope of a drainage bottom where livestock concentrate (as evidenced by herbaceous vegetation cropped to low residual stubble height). While the spruce deadfall on the slope currently acts as an effective barrier, it is not a permanent barrier. The North Zone Range Allotment Management Plan finalized in 2006 covers management of the allotment containing LYCO3-5. The plan includes a commitment by range specialists to monitor LYCO3-5 to ensure livestock activities do not degrade the occurrence.

LYCO3-8 – The site is at the base of hillslope where it meets the drainage bottom. Livestock were present in the drainage bottom at the time of monitoring (for *Lycopodium annotinum*) and impacts such as

hummocking and bank-shearing from hoof action were observed in the riparian area. There is no barrier except some spruce deadfall to restrict livestock from the site.

LYCO3-9 – No trails or other impacts from livestock grazing were observed in the site. The dense paper birch (*Betula papyrifera*)/hazelnut (*Corylus cornuta*) forest surrounding the site has discouraged access by livestock in the past. However, recent logging activity (2004) on the hillside adjacent to the site opened up skid trails that livestock now use. Consequently, vulnerability of the site to livestock access has increased.

PLATANTHERA ORBICULATA (LESSER ROUNDLEAVED ORCHID; LARGE ROUNDLEAVED ORCHID)

Photo by BHNF staff at *Platanthera orbiculata* site PLOR4-19 on July 24, 2005: 3 vegetative plants each with a pair of leaves.

Platanthera orbiculata is relatively secure in the Black Hills based on the large number of occurrences (greater than 30) that are distributed in three geographically separated regions on Black Hills National Forest, each within a different geological area: 1) Bearlodge Mountains, 2) northwestern Black Hills (contains the largest cluster of sites), and 3) Black Elk Wilderness. The species is present in patchy, scattered occurrences on shady, northwest to northeast facing slopes and draws in strong association with *Betula papyrifera* (paper birch)/ *Corylus cornuta* (hazelnut) and *Picea glauca* (white spruce) forests. The species persistence in the Black Hills is primarily limited by the small extent of cool, moist boreal habitat, although it appears to be secure on Black Hills National Forest at this time. Long-term droughts or dramatic climate changes characterized by drier and warmer conditions may present the greatest risk to *P. orbiculata* and its habitat. Currently known occurrences are within active grazing allotments, with the exceptions of locations in the Black Elk Wilderness. Risks to most of the occurrences from this use are generally low because many of the sites are on steep slopes with dense shrub vegetation, both of which deter livestock. No ongoing recreational impacts have been documented at the Black Elk Wilderness occurrences, in spite of the close proximity of an intensively used trail. Other potential future risk factors could include plant collection and invasion by noxious weeds.

The most recent data available were used in designing monitoring for this species. Designated core occurrences of *Platanthera orbiculata* were identified using two criteria: geographic distribution of the occurrence and size (estimated number of individuals). Three occurrences from each of the three primary geographic areas listed above were designated as core occurrences for monitoring.

The monitoring was designed to assess the status of the nine core occurrences on an annual basis. The monitoring addresses three questions: 1) is the species present?; 2) is there evidence of plant collecting?; and

3) are noxious weeds and other invasive species established at the site? Although the proposed monitoring focuses on the presence or absence of a given occurrence, a count of the number of individuals is made. If any of the core occurrences are not present when monitored, the reason will be documented if it can be determined and then randomly selected additional sites will be chosen to serve as core sites.

The second aspect of the monitoring as currently designed was to provide baseline data on the persistence of *Platanthera orbiculata* during dry conditions. During a drought, the design includes monitoring three additional sites for presence/absence and to census the number of individuals during the first and second consecutive drought years. High numbers of *P. orbiculata* observed in 2000 potentially reflect several years of above average precipitation in the mid to late 1990s. The nine core sites and three other sites were monitored for presence or absence during the recent past drought years and a census was also taken during the second non-drought year following the dry period. Data on *P. orbiculata* population persistence and numbers in both wet and dry years are important for reassessing the species and for re-examining, and potentially changing, the monitoring design.

Monitoring occurred on the additional drought year monitoring sites in 2002, 2003, 2004, 2005, and 2006 because these years were considered drought years. Declines were documented in 2002, and declines in numbers occurred to a much greater extent in 2003, with plant numbers dropping to less than 10 aboveground individuals on a number of sites. Numbers of plants found in 2006 were similar to numbers in 2003, 2004, and 2005.

Monitoring of *Platanthera orbiculata* is best conducted during the blooming period in late June to July. The plant is identifiable later in the season, and monitoring could take place in early August during a cool, moist year if a need arises. Plants with single leaves, two leaves, and plants with leaves and flowering stalks are counted as individual plants.

2006 Monitoring Design and Results:

1. Annually monitor presence/absence of known site locations in the Bearlodge Mountains: site numbers PLOR4-1, PLOR4-2 and PLOR4-3. If any of the core monitoring sites is not present (refer to discussion above regarding climatic ties), document reason if it can be determined (i.e. drought, fire, noxious weeds).

   Platanthera orbiculata was present at all three sites in 2006.

2. Annually monitor presence/absence of the Black Elk Wilderness site locations: site numbers PLOR4-23, PLOR4-24 and PLOR4–25. If any of the core monitoring sites is not present (refer to discussion above regarding climatic ties), document reason if it can be determined (i.e. drought, fire, noxious weeds).

   Platanthera orbiculata was present at all three sites in 2006.

3. Annually monitor presence/absence of three key monitoring occurrence sites in the northwestern Black Hills: site numbers PLOR4-6, PLOR4-12 and PLOR4-19. If any of the key monitoring occurrence sites is not present (refer to discussion above regarding climatic ties), document reason if it can be determined (i.e. drought, fire, noxious weeds).

   Platanthera orbiculata was present at all three sites in 2006.

   Hardwood restoration activities occurred at PLOR4-6 in 2004 [conifers were falled, skidded across and down the hillside; mechanized equipment traversed a large part of the hillside, also removing paper birch (tree), beaked hazelnut (shrub), and herbaceous cover]. Two *Platanthera orbiculata* individuals were present in the treated area in 2005. In 2006, the only *P. orbiculata* plants found were in untreated areas on the hillside. Monitoring results to date suggest that hardwood restoration/treatment was not beneficial to *P. orbiculata*. The canopy of the treated area is much more open, there is a large amount of ground disturbance, and there is a good deal of slash scattered over the ground. The only type of hardwood

restoration that might be compatible with persistence of *P. orbiculata* would be to hand-fell conifers and leave them on-site.

4. If drought conditions persist, continue to monitor the three additional sites: PLOR4-4, PLOR4-21 and PLOR4-22 (these sites were chosen for variation in geographic distribution) and count individuals at all 12 locations. During the 2nd non-drought year, count individuals at the 12 sites. After the 2nd non-drought year reassess the monitoring design to determine future needs.

   The year 2006 was classified as a drought year in western South Dakota and northeastern Wyoming (see General Information at beginning of this monitoring report). *Platanthera orbiculata* was present at the additional drought monitoring sites: PLOR4-4, PLOR4-21, PLOR4-22. Individuals were counted at all 12 sites. Relative to 2000 data, 2006 counts were lower on eight sites and higher on four sites. For seven of the eight sites with declining numbers, evidence was not found of disturbances that could have affected the number of individuals except at site PLOR4-6, where canopy and soil disturbances associated with hardwood restoration activities occurred in 2004.

PLATANTHERA ORBICULATA COUNTS AT CORE MONITORING SITES DURING VARYING CLIMATIC CONDITIONS

Monitoring Years → *Platanthera orbiculata* Site Numbers:	2000 (Coming off a series of higher precipitation years)	2003 (Drought year)	2004 (Drought year)	2005 (Drought year)	2006 (Drought year)
PLOR4-1 (Bearlodge)	44 (2001)	6	9	7	7
PLOR4-2 "	37	11	15	19	17
PLOR4-3 "	51	1	2	2	2
PLOR4-6 (nw B Hills)	26	5	9 (hardwood restoration)	7	4
PLOR4-12 "	37	7	8	3	4
PLOR4-19 "	78	86	92	93	131
PLOR4-23 (Black Elk)	8	16	29	27	32
PLOR4-24 "	6	6	9	16	17
PLOR4-25 "	4	10	13	12	14
PLOR4-4*	14	1	3	5	6
PLOR4-21*	40	8	9	5	12
PLOR4-22*	1	1	3	3	3

*Additional sites monitored in drought years

5. Document observations regarding whether an occurrence in Bear/Beaver Gulches Botanical Area is grazed by livestock (PLOR4-4 or PLOR4-5). In drought years, PLOR4-4 will be monitored as per item 4 above.

   PLOR4-4 was monitored on June 14, 2006. Livestock had not yet been turned out on the pasture/allotment containing the site. Wildlife trails are present in and around the occurrence that livestock also use. Old cowpies are visible above the site. The dense paper birch (Betula *papyrifera*)/hazelnut (*Corylus cornuta*) forest surrounding the site discourages access by livestock.

Monitoring must continue to ensure that Standard 3.1-2503 is met (Standard 3.1-2503: Restrict access of domestic livestock to protect R2 sensitive and SOLC plant occurrences in designated botanical areas.)

6. Document any noxious or invasive species. Document if weeds are co-located with *Platanthera orbiculata* or what distance they are located from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

   PLOR4-1: No noxious weeds in the site, but dense *Cirsium arvense* (Canada thistle) just outside site on roadbed.

   PLOR4-2: No noxious weeds in the site.

   PLOR4-3: No noxious weeds in the site; *Cirsium vulgare* (bull thistle) and *Phleum pretense* (timothy) on lower slope and in drainage bottom below site.

   PLOR4-6: Invasive species established on newly disturbed skid trails; *Cirsium vulgare* and *Verbascum thapsus* (common mullein) within 5 m of *P. orbiculata* individuals. *Hypericum perforatum* (St. Johnswort) abundant in drainage bottom; *Cynoglossum officinale* (houndstongue) and *Carduus nutans* (musk thistle) scattered in bottom below site.

   PLOR4-12: No noxious weeds in the site.

   PLOR4-19: *Cynoglossum officinale* scattered in site and abundant in drainage below site.

   PLOR4-23: No noxious weeds in the site.

   PLOR4-24: No noxious weeds in the site.

   PLOR4-25: No noxious weeds in the site.

   PLOR4-4: *Cynoglossum officinale* within 20m of plants in the site. *Cirsium vulgare* and *Hypericum perforatum* present in the area, especially near the road above the site.

   PLOR4-21: No noxious weeds in the site; *Cirsium arvense* (Canada thistle), *Cynoglossum officinale*, and *Verbascum thapsus* on road below site.

   PLOR4-22: No noxious weeds in the site.

   No evidence was observed of weed treatment activity affecting any *Platanthera orbiculata* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

SALIX CANDIDA (SAGELEAF WILLOW; HOARY WILLOW)

Photo by BHNF staff at *Salix candida* site SACA4-1 on June 8, 2006. Right: *Salix candida* branch dying due to willow borer activity. Left: willow borer at based of branch.

Salix. candida is currently known in the Black Hills only from McIntosh Fen Botanical Area. The persistence of the species in the Black Hills is dependent on conserving this single occurrence.

Species assessments for *Salix candida* were completed in 2003 (Black Hills NF) and 2006 (Forest Service Region 2). Baseline data were collected for *Salix candida* in 2002 and 2003. Monitoring data were collected for *S. candida* from 2004 to 2006. As an obligate wetland species, the primary risk to *Salix candida*'s persistence and reproductive success is any lowering of the water table where it occurs, whether natural or human-induced. Noxious weeds or insect infestations have been identified as potential risks for this species. *Cirsium arvense* (Canada thistle) currently occurs within McIntosh Fen Botanical Area. Although high soil moisture levels in the fen itself appear to exclude *C. arvense* from the wettest part of *S. candida* habitat, *C. arvense* and *S. candida* occur within a foot of each other in drier *S. candida* locations. *Lythrum salicaria* (purple loosestrife) is not known to occur at McIntosh Fen, or anywhere close by, but is very aggressive and has the potential to out compete riparian natives, including *S. candida*. Insect infestations (willow borer) have been documented, in *S. candida* as well as other *Salix* species in McIntosh Fen and elsewhere in the Black Hills. Fishing occurs along Castle Creek (near the fen) in the McIntosh Fen Botanical Area, and a designated snowmobile trail crosses the Botanical Area but does not extend into either of the two subpopulations of the *S. candida* occurrence. No impacts have been documented to *S. candida* from either activity to date.

Monitoring design is similar to that for *Salix serissima* in attempting to detect and respond in a timely manner to changes in extent and condition of *Salix candida* and its habitat. The protocol focuses on annually monitoring: 1) the extent of the population, 2) a sampling of individuals to determine plant vigor and impacts of damaging agents (i.e. insects, rust, wildlife grazing, livestock grazing, etc.), 3) water table level, and 4) presence of invasive plant species and impacts of any treatment.

Permanent transects were placed in 2004 and data collected from a one-time reading each in 2004, 2005, and

2006 when the phenology of *Salix candida* is appropriate for monitoring. This protocol is not rigorous enough to determine cause and effect relationships relative to changes in water level. It is only meant to coarsely document presence/absence of water in McIntosh Fen.

Species persistence concerns for willow emphasis species (*Salix candida, S. serissima*, and *S. lucida* ssp. *caudata*) led to BHNF Standard 2505 e directing that no authorized utilization will be allowed by domestic livestock on known occurrences of these species. The monitoring program is not tasked with accomplishing livestock restriction (e.g. by fencing or other means) but will gather data on effectiveness of restrictions and results to the species.

2006 Monitoring Design and Results:

On an annual basis:

1. At McIntosh Fen, GPS new endpoints of the occurrence if site size has changed. Revisit markers placed in 2005 around perimeter of the largest dense patches of *Salix candida*.

    - Collect data on the five nearby plants to each marker that were tagged in 2005 and note whether they are reproductive or vegetative.

    - Assess the condition of these plants and document the number of plants at each location that is observed to be affected by some agent (e.g. rust, willow borer, wildlife grazing, livestock grazing, etc.). Specify the agent that is observed. Document observations regarding whether *S. candida* occurrence at McIntosh Fen Botanical Area is grazed by livestock.

    There was no expansion or contraction of the SACA4-1 site at McIntosh Fen detected in 2006 when the site was monitored on June 6, 2006.

    The twelve large plastic stakes installed at McIntosh Fen in 2005 (ten at the southern subpopulation and two at the northern subpopulation) were revisited on June 6, 2006. Five individuals tagged near each stake were relocated. Plants were in good flowering condition for identifying male vs. female plants. Notes were taken on 56 *Salix candida* plants: 34 female and 22 male individuals. Four tags were not found (new individuals were tagged in their place). The most striking observation was that 11 tags were found on dead branches that had to be moved to live branches. The 2005 protocol stated that tags would be placed on live branches, so it is known that the branches were alive in 2005. The data (~20% plants with new dead branches) appears to confirm monitoring observations that willow borer is having an impact on *Salix* species at McIntosh Fen. [Evidence of willow borer activity was noted on the bases of most dead branches observed.] A few *S. candida* individuals were observed that had been browsed by wildlife. No rust was observed on *S. candida* in June 2006.

    A willow defoliator beetle was observed on Rapid Creek in 2006 but did not appear to reach McIntosh Fen.

    There was no evidence of livestock grazing on *Salix candida* at the occurrence and no evidence that livestock had entered the fenced McIntosh Fen Botanical Area.

2. Measure aboveground water levels along the permanent depth point water measurement transects at McIntosh Fen described under the monitoring design for *Salix serissima.* Transects should be read when *S. candida* is in good phenological stage for monitoring.

    The permanent water transects at McIntosh Fen were read on June 6, 2006. General observation was that the fen area looked comparable to previous years, although a little drier.

    In 2006 at the southern subpopulation of McIntosh Fen, there were five points with measurable

aboveground water and eleven points documented with trace for water – out of a total of 125 depth point measurements collected along a transect length of 109 m. In 2005, there were five points with measurable aboveground water and five points documented with trace for water. In 2004, nine points had measurable above-ground water along the same transect.

In 2006, at the northern subpopulation at McIntosh Fen, four points had measurable aboveground water and four points had trace water – out of a total of 62 depth point measurements collected along a transect length of 61 m. In 2005, nine points had measurable aboveground water and four points were documented with trace water. In 2004, three points had measurable aboveground. Part of the northern transect intersects a depression feature (most likely man-made) that was holding water in 2005; the feature was dry in 2006 and 2004).

3. Document any noxious weeds or invasive species. Document if weeds are co-located with *Salix candida* or what distance they are from the occurrence if they occupy the same ecological type. Use this information to develop a strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected the occurrence.

   SACA4-1 McIntosh Fen site – *Cirsium arvense* (Canada thistle) is present in the same ecotype as *Salix candida*, within one foot of plants. It occurs in slightly drier areas where *S. candida* is at the edge of suitable habitat. Mystic Ranger District has treated *C. arvense* in the uplands of McIntosh Fen in previous years, but not in 2006. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

SALIX SERISSIMA (AUTUMN WILLOW)

Photo by BHNF staff at *Salix serissima* site SASE2-2 on July 7, 2006: live branches with catkins at right and dying branch at left (likely caused by willow borer).

Until 2002, a single occurrence of *S. serissima* was known to occur at McIntosh Fen Botanical Area. A second occurrence was discovered in 2002 within a fenced enclosure along Middle Boxelder Creek. In 2004, botanical survey for range management discovered two new occurrences of *S. serissima* – near Nahant and on Silver Creek. Both sites were visited and baseline data collected in 2005.

Because *Salix serissima* is an obligate wetland species, the primary risk to its persistence and reproductive

success is any lowering of the water table where it occurs, whether it is natural or human-induced. Noxious weeds and fungal infections or insect infestations have been identified as concerns for this species. *Cirsium arvense* (Canada thistle) currently occurs within the McIntosh Fen Botanical Area. Although high soil moisture levels in the fen itself appear to exclude *C. arvense* from the wettest part of *S. serissima* habitat, *C. arvense* and *S. serissima* occur within a foot of each other in drier *S. serissima* locations. *Lythrum salicaria* (purple loosestrife) is not known to occur at any of the sites, or anywhere close by, but is very aggressive and has the potential to out compete native riparian species, including *S. serissima*. A fungal infection was noted on the leaves of *S. serissima* at McIntosh Fen in 2001 through 2006 and willow borer has been documented at both McIntosh Fen and Middle Boxelder Creek occurrences. A willow defoliator beetle was observed at Middle Boxelder Creek occurrence in 2006. Fishing occurs along Castle Creek (near the fen) in the McIntosh Fen Botanical Area. A designated snowmobile trail crosses the Botanical Area but does not extend into the *S. serissima* occurrence. At this time, no impacts have been documented to *S. serissima* from either activity. Wildlife use and cattle use are a potential risk at all *S. serissima* sites. Minimal impacts were documented from wildlife use and no impacts from livestock grazing at McIntosh Fen in 2006. Cattle accessed *S. serissima* in the exclosure at Middle Box Elder Creek in 2005 and negatively impacted *S. serissima* and its habitat, but the fence was repaired and cattle excluded in 2006. Cattle accessed *S. serissima* at Silver Creek in 2005 and 2006 and negatively impacted *S. serissima* and its habitat. The occurrence near Nahant is in a low area bounded by a paved road and a steep rocky outcrop. There is no evidence of recent or current livestock use of the low area and it appears the occurrence location is restricted from livestock by the physical boundaries.

A monitoring strategy for *Salix serissima* was designed and implemented in 2000 for the occurrence at McIntosh Fen. It was revised to add data collection at the second *Salix serissima* occurrence and to continue to refine detection of concerns in a timely manner to changes in extent and condition of *S. serissima* and its habitat and allow appropriate/effective responses. The monitoring design was revised again in 2005 to include assessing the status of all four Black Hills National Forest occurrences on an annual basis. The monitoring was also revised at that time to reduce occurrence degradation and address reliability/repeatability issues that were resulting from full census count at the McIntosh Fen occurrence. The monitoring was designed to address four questions at each occurrence: 1) is the species present?; 2) is occurrence contraction or expansion occurring?; 3) are hydrological changes occurring?; and 4) have invasive plant species invaded the site?

The protocol designed in 2005 and used in 2006 focuses on annually monitoring: 1) the extent of all occurrences, 2) a sampling of individuals to determine plant vigor and impacts of damaging agents (i.e. insects, rust, wildlife grazing, livestock grazing, etc.) at the largest occurrence in McIntosh Fen, 3) water table level at McIntosh Fen and Middle Boxelder occurrences, and 4) presence of invasive plant species and impacts of any treatment at all occurrences.

Assessment of the contraction or expansion of the *Salix serissima* occurrence at McIntosh Fen in 2006 was based on GPS documentation of the subpopulation endpoints. In addition, markers placed at a number of locations around the perimeters of both subpopulations of *S. serissima* are used to detect any contraction or expansion that may occur, to determine an estimated percentage of stems with reproduction capability, and to determine an estimated percentage of the occurrence that may be affected by damaging agents, such as a rust fungus or willow borer.

Two piezometers were installed at McIntosh Fen in 2001 to annually monitor water levels but never functioned properly. An aboveground water level sampling method was determined appropriate and more reliable, so two permanent transects were established in 2004. Data is collected when *S. candida* is in good phenology for monitoring (*S. serissima* is generally at phenology for monitoring in mid June to mid July). This protocol is not rigorous enough to determine cause and effect relationships relative to changes in water level. It is only meant to coarsely document surface water level in McIntosh Fen.

Monitoring of *Salix serissima* occurs primarily during the blooming period (mid June to mid July) when that the total number of reproductive individuals can best be determined.

Species persistence concerns for willow emphasis species on Black Hills NF (*Salix candida, S. serissima,* and *S. lucida* ssp. *caudata*) led BHNF Standard 2505 e directing that no authorized utilization will be allowed by domestic livestock on known occurrences of these species. The monitoring program is not tasked with accomplishing livestock restriction (e.g. by fencing or other means) but will gather data on effectiveness of restrictions and results to the species.

2006 Monitoring Design and Results:

1. At McIntosh Fen, GPS new endpoints of subpopulations if site size has changed. Revisit the ten stakes placed in 2005 around the perimeter of the largest dense patches of *Salix serissima* at both subpopulations. Assess the condition of the two to six plants chosen and tagged in the vicinity of each stake; document the number of plants at each location that is observed to be affected by some agent (e.g. rust, willow borer, livestock grazing, wildlife grazing, etc.). Specify the agent that is observed. Document observations regarding whether *S. serissima* occurrence at McIntosh Fen Botanical Area is grazed by livestock.

   There was no expansion or contraction of the SASE2-1 site at McIntosh Fen detected in 2006.

   The ten large plastic stakes installed at McIntosh Fen in 2005 (at the southern subpopulation) were revisited on June 8, 2006. The two to six *Salix serissima* individuals tagged near each stake were relocated. Plants were in good flowering condition for identifying male vs. female plants (male plants appeared to be near maximum of flowering activity). Notes were taken on 47 *Salix serissima* plants: 12 female, 19 male, and 13 vegetative individuals. Three tags were not found (new individuals were tagged in their place). Three tags were found on dead branches of plants and had to be moved to live branches (the 2005 protocol stated that tags would be placed on live branches) and evidence of willow borer was noted on the bases of most dead branches. There were also other qualitative observations of willow borer impacts to plants. The data (~7% plants with new dead branches) appears to confirm monitoring observations that willow borer is having an impact on *Salix* species at McIntosh Fen. 31% of plants were observed to have some rust. A willow defoliator beetle was observed on Rapid Creek in 2006 but did not appear to reach McIntosh Fen.

   There was no evidence of livestock grazing on *Salix serissima* at the McIntosh Fen occurrence and no evidence that livestock had entered the fenced McIntosh Fen Botanical Area.

2. At Middle Boxelder Creek, Nahant, and Silver Creek, GPS new endpoints if *Salix serissima* site boundaries have changed. Count individuals during the blooming period (documenting total number of individuals and total number of reproductive individuals). Document the number of plants observed to be affected by some agent (e.g. rust, willow borer, livestock grazing, wildlife grazing, etc.). If the number of individuals declines by more than 10% at the Middle Boxelder Creek occurrence, consult on monitoring design with the Rocky Mountain Research Station.

   The Middle Boxelder site (SASE2-2) was visited July 7, 2006. The site boundaries have not changed but the site does not appear healthy – mainly due to overall dry site condition and many *Salix* species individuals affected by willow borer. The willow defoliator beetle first observed at Rapid Creek was observed here. Only a few beetles were observed but it appeared that several *Salix bebbiana* (Bebb's willow) plants had been impacted. Twelve *S. serissima* individuals were observed (5 female and 12 vegetative). Seven of the twelve were observed to have very recent or current willow borer activity. In 2005, fourteen *S. serissima* plants were found. The two "missing" plants might have been overlooked - where most of the *S. serissima* plants occur, there is a thick tangle of multiple *Salix* species with many plants about the same height. The Rocky Mountain Research Station will be consulted in spring 2007 to determine if a change in protocol is needed. The fence around the site was fortified since fall 2005 and no livestock were observed in the site in 2006.

The Nahant site (SASE2-3) was visited July 7, 2006. The two male plants documented in 2005 were observed (catkins present and at full maturity). There is some evidence of willow borer on the *S. serissima* individuals as well as other *Salix* species individuals. No defoliator beetles or rust was observed. No livestock or evidence of livestock was observed in the site.

The Silver Creek site (SASE2-4) was visited July 7, 2006. The six individuals documented in 2005 (5 females, 1 male) were observed. Evidence of willow borer was observed on *Salix serissima* individuals as well as other *Salix* species individuals. Both large *S. serissima* plants (one male and one female) had many dead branches that were newly dead since 2005 observation. No defoliator beetles were observed. There are wildlife trails in the site (identified as a fen in 2006 during consultation with Dr. David Cooper of Colorado State University). Livestock utilization of *S. serissima* and other fen vegetation was reported to range managers after baseline data collection at the site in 2005. No changes in management occurred, so impacts from livestock to *S. serissima* and fen vegetation were observed in 2006. Standard 2505 e directing no utilization of *S. serissima* by domestic livestock is not yet being met. Conifer removal [in this case, spruce (*Picea glauca*)] for meadow enhancement purposes occurred at this site since 2005 monitoring. Dr. Cooper confirmed during his site visit that spruce are a native component of the fen type at the SASE2-4 site and it is damaging to the fen to cut them down. This information is being shared with district personnel in 2006-2007.

3. Measure aboveground water levels along the permanent depth point water measurement transects at McIntosh Fen (one permanent transect at each subpopulation) and at Middle Fork Boxelder Creek (one permanent transect) occurrences. This monitoring should occur when the willow species are in good phenological stage for monitoring.

   The permanent water transects at McIntosh Fen were read on June 6, 2006. General observation was that the fen area looked comparable to previous years, although a little drier.

   In 2006 at the southern subpopulation of McIntosh Fen, there were five points with measurable aboveground water and eleven points documented with trace for water – out of a total of 125 depth point measurements collected along a transect length of 109 m. In 2005, there were five points with measurable aboveground water and five points documented with trace for water. In 2004, nine points had measurable above-ground water along the same transect.

   In 2006, at the northern subpopulation at McIntosh Fen, four points had measurable aboveground water and four points had trace water – out of a total of 62 depth point measurements collected along a transect length of 61 m. In 2005, nine points had measurable aboveground water and four points were documented with trace water. In 2004, three points had measurable aboveground. Part of the northern transect intersects a depression feature (most likely man-made) that was holding water in 2005; the feature was dry in 2006 and 2004).

   In 2006 at the Middle Fork Boxelder Creek site, five points had measurable aboveground water out of a total of 38 depth point measurements collected along a transect of 19.55m. In 2005, five points had measurable water and in 2004, four points had measurable water – collected along the same transect of 19.55 m.

4. Document any noxious weeds or invasive species. Document if weeds are co-located with *Salix serissima* or what distance they are from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected the occurrences.

   McIntosh Fen site (SASE2-1) – *Cirsium arvense* (Canada thistle) is present in the same ecotype as *Salix serissima*, within one foot of plants. It occurs in slightly drier areas where *S. serissima* is at the edge of suitable habitat. Weed treatment for *C. arvense* has occurred in the uplands in recent years, but not in 2006. *Bromus inermis* (smooth brome) is also co-located with *S. serissima* at the drier edges of suitable

habitat.

Middle Boxelder Creek site (SASE2-2) – very weedy on upland (west) side of wetland within exclosure. *Cirsium arvense* (Canada thistle), *Linaria vulgaris* (yellow toadflax), *Cynoglossum officinale* (houndstongue), and *Carduus nutans* (musk thistle) are all present in close proximity to *S. serissima* plants (within 3 m). *Linaria vulgaris* is present in abundance in the east end of the exclosure. Some of the weedy species are more common in the same ecological type as *S. serissima* (*Cirsium arvense* and *Cynoglossum officinale*) while the others are more common in slightly drier areas.

Nahant site (SASE2-3) – *Leucanthemum vulgare* (ox-eye daisy) is thick above the drainage bottom (approximately 10 m from *S. serissima* plants). *Linaria vulgaris* is found further away from *S. serissima* plants, scattered below the road. Spraying for weeds by county weed crews could impact the *S. serissima* occurrence but no effects have been observed to date.

Silver Creek site (SASE2-4) – *Linaria vulgaris, Cynoglossum officinale, and Verbascum thapsus* (common mullein) are present at the north end of the occurrence area in small amounts. *Cirsium arvense* is present in high density large patches downstream of the site on private land.

No evidence was observed of weed treatment activity affecting any *Salix serissima* occurrences except SASE2-1 where weeds have been treated in the uplands around McIntosh Fen (this has reduced weed seed introduced into McIntosh Fen). A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

SANGUINARIA CANADENSIS (BLOODROOT)

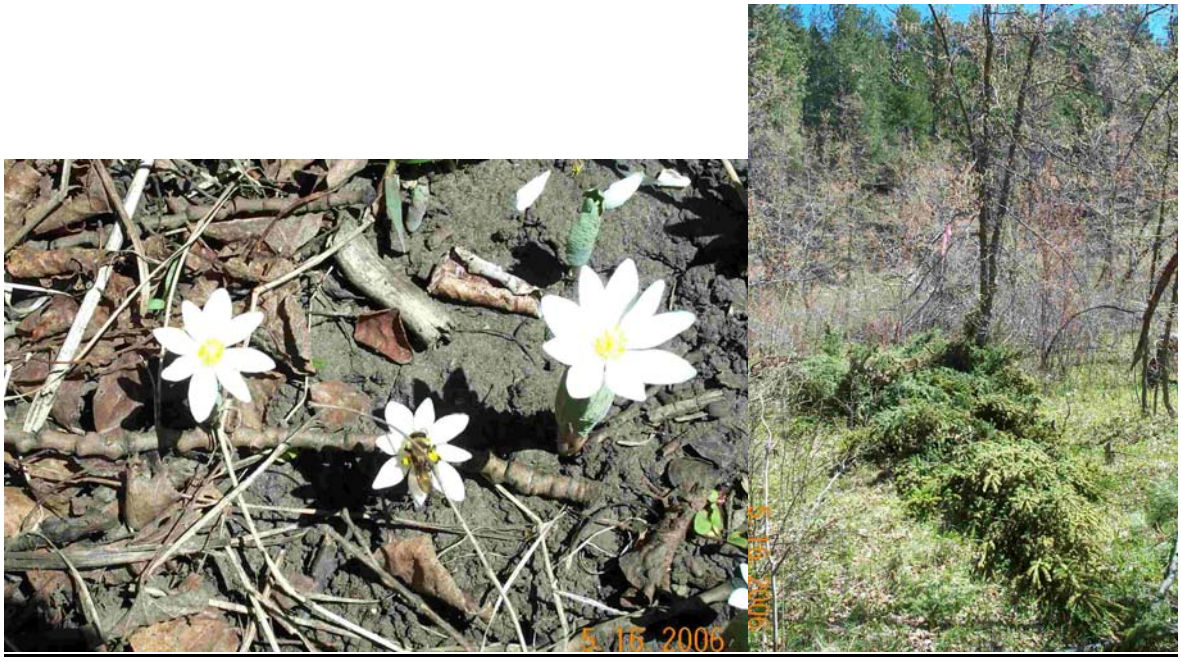


Photo by BHNF staff: left – plant and pollinator at *Sanguinaria canadensis* site SACA13-2 on May 16, 2006; right – conifer felling on SACA13-14 site observed May 16, 2006.

Sanguinaria canadensis, occurring in the northern/northeastern Black Hills, is one of the most abundant R2 sensitive plant species on Black Hills National Forest. There were 22 known occurrences of bloodroot on Black Hills National Forest lands at the time that a Black Hills NF species assessment was written (Hornbeck et al. 2003). *Sanguinaria canadensis* occurs in hardwood forests, shrub thickets and floodplain habitats. The species is considered secure on the Forest at this time. However, due to limited potential habitat and the

situation that a number of sites have characteristics lending themselves to an increase in invasive plant species, weeds and their treatment have been identified as a risk to *S. canadensis*. Persistence of *S. canadensis* on Black Hills National Forest is not currently considered at risk from livestock grazing because nine sites are currently not grazed and one site is not accessible to livestock. Timber harvest is generally not deemed a persistence risk to *S. canadensis* because occurrences are currently being avoided or mitigated, or vegetative treatments may be designed to benefit the species. Collection (or illegal *S. canadensis* harvest) is not currently an issue in the Black Hills. However, due to the value of *S. canadensis* as a medicinal herb and experiences with over-collection in other parts of the country, harvesting is a risk. If it were to occur, collection of *S. canadensis* could be detrimental to the population in the Black Hills.

Black Hills National Forest's approach for monitoring *Sanguinaria canadensis* to answer questions on species persistence involved selecting core occurrences using four criteria: size (estimated number of individuals), geographic distribution of the occurrence, potential risk from livestock grazing, and community type. The largest estimated number of individuals observed at a given site was a primary factor used in delineating potential core occurrences. To incorporate geographic distribution, sites widely distributed from one another were selected over sites in close proximity to other occurrences. Sites in allotments currently not being grazed were selected over sites grazed by livestock. Finally, the selection of core sites included at least one in each vegetative community type that is associated with occurrences of *S. canadensis*. Based on these criteria, 10 core occurrences were selected. Of these 10 occurrences, four were designated as key, that is, occurrences of over 1,000 individuals deemed most critical to maintaining the metapopulation of *S. canadensis* on the Black Hills National Forest. Based on what Black Hills National Forest has learned regarding persistence of *Sanguinaria canadensis* from monitoring during the recent series of dry years (for example, a number of occurrences have been determined to be larger than originally documented and combined; in one case, an occurrence was determined to be on private land), the monitoring design was modified to include eight core occurrences for monitoring rather than 10. The original four key occurrence locations for monitoring were retained.

The second aspect of the original monitoring design is to provide data on the extent of occurrences of *Sanguinaria canadensis* at all nine designated core sites and a reassessment of the status of each occurrence during a drought year. The assumption was that the high numbers of plants (recorded as categorical estimates) observed in 2001 were partially the result of several years of above-average precipitation. By documenting the size and extent of *S. canadensis* occurrences during dry years, it is hoped that data to support a better understanding of the role precipitation levels play in the distribution and abundance of *S. canadensis* will be generated. Any changes in the occurrence boundaries, evidence of plant collection or the presence of invasive or noxious plant species is documented during site revisits.

The third aspect of the monitoring design is to assess any additional changes in the extent of occurrences of *Sanguinaria canadensis* following a second consecutive dry, or below-average, precipitation year. Information on the extent and change of occurrences of *S. canadensis* following two drought years is critical to consider in reassessing the current monitoring strategy. Information on the extent of occurrences in both wet and dry years is expected to provide valuable data for re-examining, and potentially changing, the monitoring plan.

The 2006 monitoring design involved assessing the status of the four key occurrences. The monitoring was designed to address four questions: 1) is the species present?; 2) is there evidence of plant collecting?; 3) are there invasive plant species present in occurrences?; and 4) are there effects from weed treatment activities on the occurrences? Although the monitoring focuses on the presence or absence of a given occurrence, a categorical estimate of each occurrence is recorded.

Key monitoring sites (populations over 1,000 individuals) for *Sanguinaria canadensis*:

S. canadensis site SACA13-1 (False Bottom site)
S. canadensis site SACA13-2 (Lost Gulch/Pillar Peak Allotment site)

S. canadensis site SACA13-3 (Meadow Creek site)
S. canadensis site SACA13-14 (Park Creek site)
Core monitoring sites for *Sanguinaria canadensis:*
SACA13-4 (Deadman Gulch – south site)
SACA13-5 (Deadman Gulch – central site)
SACA13-9 (North Deadman Gulch tributary site)

SACA13-10 (Boulder Canyon site)

2006 Monitoring Design and Results:

1. Annually monitor presence/absence of the 4 key sites. If relocated, collect data (5-page form) and gather GPS data at the endpoints if the site is large (over ½ acre) or collect GPS points if the site is less than ½ acre.

   Sanguinaria canadensis was present at all four key monitoring sites in 2006 (SACA13-1, SACA13-2, SACA13-3, SACA13-14). Occurrence extent at all key sites was comparable to previous years (i.e., no new endpoints were GPSd).

   SACA13-2 was on the edge of the Camp Five wildfire that burned in April 2005. When this site was monitored on June 6, 2006, it was observed that the majority of areas where *S. canadensis* was found near the burn were not actually burned. The burn edge was patchy in the moist drainage bottom and *S. canadensis* appears to have been unaffected. Consequently, this site will not be useful for gathering information on effects of wildfire on *S. canadensis*, as had been hoped.

   Meadow/hardwood enhancement activity occurred at SACA13-14 a few weeks before the site was monitored on May 16, 2006. While dropping conifers (spruce and pine) in *S. canadensis* sites may improve habitat by reducing permanent shade, trees were dropped directly on *S. canadensis* plants/populations. This is not expected to be beneficial to the occurrence. Monitoring staff interacted with district to educate so that this type of impact will not occur in the future.

2. During a drought year, monitor presence/absence of all key and core sites. If any key or core sites are absent, select another known site to monitor presence/absence.

   2006 was a drought year. Core sites SACA13-4, SACA13-5, SACA13-6, SACA13-9 and SACA13-10 were monitored during 2006 and were present at extent and population numbers comparable to previous years.

3. Document any noxious weeds or invasive species at the key monitoring sites. Document if weeds are co-located with *Sanguinaria canadensis* or what distance they are located from occurrences if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

   SACA13-1 –*Tanacetum vulgare* (common tansy) and *Hypericum perforatum* (St. Johnswort) are very abundant in the drainage bottom and often extend up onto the benches were *Sanguinaria canadensis* occurs. Thick patches are scattered in the same ecotype as *S. canadensis*, within a couple feet of *S. canadensis* plants. *Cynoglossum officinale* (houndstongue) is also present at the site.

   SACA13-2 –*Centaurea maculosa* (spotted knapweed) present along the road; *Cynoglossum officinale* present within 1 ft of *S. canadensis* plants; *Linaria dalmatica* (dalmation toadflax) occasional on road; *Tanacetum vulgare* present at the site.

   SACA13-3 – *Tanacetum vulgare* abundant in the bottoms, also extending occasionally up onto the benches where *S. canadensis* occurs. *Cynoglossum officinale* is scattered frequently throughout the site,

found within one ft of *S. canadensis* individuals.

SACA13–14 - *Cynoglossum officinale* and *Cirsium arvense* (Canada thistle) present at the site and co-located with *S. canadensis* . *Centaurea maculosa* present in the vicinity near roads and on beaver dams.

No evidence was observed of weed treatment activity affecting any *Sanguinaria canadensis* occurrences. Noxious weeds are a growing concern in the key *S. canadensis* sites. Black Hills National Forest plant monitoring personnel are working on developing a strategy with prioritization for weed treatment in all R2 sensitive and SOLC plant occurrences. While reducing weeds will be beneficial to native plant species including *Sanguinaria canadensis*, weed treatment could be an added risk to *S. canadensis* individuals. Possible impacts include direct effects from the tools chosen (i.e., handpulling (proper ID skills needed), chemical application, etc.) as well as the indirect effects from delivering the treatments (i.e., added trampling in and around the sites by personnel on foot and in vehicles, etc.). Monitoring the success of weed treatment as well as possible impacts to the health/vigor of *S. canadensis* sites will be critical to successfully developing effective treatments that are conservative of *S. canadensis* while reducing weed populations/sources.

4. Document any evidence of *Sanguinaria canadensis* collection at the four key monitoring sites.

There was no evidence of collection at any of the four key monitoring sites in 2006.

VIOLA SELKIRKII (SELKIRK'S VIOLET; GREAT-SPURRED VIOLET)

Photos by BHNF staff at *Viola selkirkii* site VISE2-13 on May 26, 2006: *Viola selkirkii* adjacent to *Cirsium vulgare* (bull thistle).

Thirteen occurrences of *Viola selkirkii* are known to occur in four distinct watersheds in the Black Hills National Forest, within the Black Elk Wilderness and Norbeck Wildlife Preserve. Additional occurrences are known from Custer State Park and Mt. Rushmore National Memorial in the Black Hills. A 2003 late summer observation was made of a likely *V. selkirkii* occurrence (individuals estimated in the 500-1000 range) in the Upper Pine Creek Research Natural Area. The identification was confirmed in 2004 and it was noted that part of the occurrence was inside the Elkhorn Mountain Fire area. The occurrence was revisited in 2005 and 2006 to observing impacts from the fire (if any). Because additional potential habitat is believed to occur in relatively remote areas of the Black Elk Wilderness, there may be additional occurrences of *V. selkirkii* yet to be discovered and documented.

On Black Hills National Forest, *Viola selkirkii* is relatively secure from most potential risks, with the potential

exception of extreme climatic change. Most of the known occurrences on Black Hills National Forest lands are not considered to be at risk from management activities (i.e. timber management and grazing is not currently occurring at known occurrences). However, one site was in an active zone of fuel reduction activity in 2005, with some individuals covered by slash piles. Due to expected severe impacts from pile burning to the ground and immediate vegetation, several of these piles were scattered and not burned. Other occurrences may be vulnerable to impacts from hikers and rock climbers in the future. In addition, invasion by noxious weeds or other invasive plant species and efforts to control them, trampling or browsing by elk or mountain goats, and future fire suppression efforts are potential risks at some sites. Naturally occurring periodic flooding may reduce the size and extent of some occurrences, but may also create habitat.

The monitoring strategy for this species on Forest Service land currently includes: 1) surveys for additional occurrences, 2) inventory of new and currently known occurrences on a periodic basis, and 3) annual monitoring of one of the three largest occurrences. The 2005 monitoring design included annual monitoring of the new Sunday Gulch occurrence. Potential survey sites include watersheds where the species is known to occur, as well as other high elevation watersheds with deep canyons and boreal vegetation. Surveys and monitoring occur during *Viola selkirkii*'s flowering period (generally between May 10 and May 30) when the species can most easily be identified.

The current monitoring design includes revisiting all known Black Hills National Forest occurrences at least every five years (last done in 2003). In addition to periodic revisits, monitoring includes obtaining baseline data on known Black Hills National Forest occurrences during and following a drought cycle (or at least two consecutive years of below average precipitation). Occurrence numbers (recorded as categorical estimates) collected in 2000 and 2001 may be a reflection of a series of relatively wet years since 1996 (NOAA 1996-2001). Documenting relative number of individuals and occurrence extent at *Viola selkirkii* sites during dry years may provide insights into the role that precipitation plays in the distribution and abundance of the species. Finally, the monitoring design includes monitoring *V. selkirkii* sites that are affected by a fire or significant flood event.

The current protocol design includes annual monitoring of VISE2-2 in the Norbeck Wildlife Preserve. This site was selected because it is one of the three largest occurrences of *Viola selkirkii* on Black Hills National Forest lands, it is relatively accessible, and it has the largest combination of potential risks from hikers, elk, random stochastic events (i.e. wildfire, flooding), and invasive plant species (includes noxious weeds). Annual monitoring of the Sunday Gulch occurrence is included in the protocol because of the combination of potential risks associated with powerline activities and human trampling disturbances. Although no weeds were observed at the Sunday Gulch site, there is potential for increase in invasive plant species. Further, because these are two of the lowest elevation sites, it is likely that any declines associated with drought conditions would occur here before they would occur at higher elevations. VISE2-2 and Sunday Gulch locations are used as triggers for determining if additional occurrences should be monitored. The decision for additional monitoring is based on whether there is an absence of one or more of the four largest sub-occurrences (there are nine distinct sub-occurrences) at the VISE2-2 site, or the absence of one of the two sub-occurrences at the Sunday Gulch site. If any are absent, an effort will be made to document the reason (that is, drought, elk, weeds, etc.) and two additional *V. selkirkii* occurrences selected to monitor based on the cause of the disruption and current information on known risks to other sites.

2006 Monitoring Design and Results:

1. Annually monitor presence/absence of the four largest sub-occurrences at site number VISE2-2 and the two sub-occurrences at VISE2-11 (Sunday Gulch). If one or more of the four largest sub-occurrences at VISE2-2 or one of the two sub-occurrences at Sunday Gulch are not present, document the reason (i.e. drought, elk, noxious weeds) if it can be determined. Select two other sites in other drainages to monitor presence/absence to determine if other populations are being affected in the same way. Revisit all known Black Hills NF occurrences at least every five years.

Monitoring of *Viola selkirkii* at site number VISE2-2, occurred on May 22, 2006. The four largest sub-occurrences were present.

Monitoring of *Viola selkirkii* at site number VISE2-11 (Sunday Gulch) occurred on May 17, 2006. Both sub-occurrences were present as well as individuals and patches between the sub-occurrences, extending into Custer State Park. The site extends along a power line. Trees have been trimmed under the powerline the last several years and last year there was thinning for fuels reduction in some spruce areas of the site. Much of the resulting slash was piled in 2004-2005, including some in the drainage bottom in mossy areas under spruce. Some of the piles are within a few feet of *V. selkirkii* patches and some are covering *V. selkirkii* plants. Monitoring staff expressed concern to Hell Canyon District staff in June and revisited the site in September to scatter two slash piles that were right next to/on *V. selkirkii* patches. If the remaining piles are burned, they may not directly impact *V. selkirkii* plants. However, the burned ground may provide a foothold for weed species in *V. selkirkii* habitat.

All *Viola selkirkii* occurrences will be revisited in 2008.

2. Document any noxious weeds or invasive species. Document if weeds are co-located with *Viola selkirkii* or what distance they are found from occurrences in the same ecotype. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

   In the VISE2-2 site, *Cirsium arvense* (Canada thistle; SD and WY noxious weed) was observed to occur in small patches approximately 10 ft from *Viola selkirkii* individuals (based on identification of weed material left from last year). Other invasive plant species observed occurring in the same ecotype were *Cirsium vulgare* (bull thistle; within 5 ft of *V. selkirkii* plants) and *Caragana arborescens* (Caragana; adult plants scattered throughout the drainage; new plants becoming established). The Caragana was reported to Hell Canyon Ranger District staff in 2004 and treatment is on their list of projects, but it didn't appear in 2006 that any work had been accomplished.

   In the VISE2-11 site, *Cirsium vulgare* (bull thistle) individuals were observed scattered along the drainage in the same ecotype as VISE2 (within 10 ft of plants). *Bromus inermis* (smooth brome) occurs on mossy, grassy benches with VISE2 in some areas.

   In the VISE2-13 site, several invasive plant species were observed on June 1, 2005 in the same ecotype as *V. selkirkii*, including:

   a) *Cirsium arvense* (Canada thistle). A few *C. arvense* were found on the edge of the burned area, some intermingled with *V. selkirkii* individuals. *Cirsium arvense* occurs upslope from the large *V. selkirkii* patches, so there is high potential for the species to spread down-drainage into the site. Observers spent time handpulling all the small *C. arvense* plants that could be spotted in 2005 and 2006. Because there were no mature plants of the weed species in 2006, it appears the weed pulling done in 2005 was effective.

   b) *Verbascum thapsus* (common mullein). Several plants were observed approximately 20 ft from *V. selkirkii* plants. Dense patches of *V. thapsus* were observed in the fire area, which provide a ready seed source to the occurrence site.

   and

   c) *Cirsium vulgare* (bull thistle). A few rosettes were found in the occurrence area, approximately 20 ft from *V. selkirkii* plants.

   A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

3. On any currently known *Viola selkirkii* site that is affected by a flood or fire event, monitor for presence/absence.

   Site VISE2-13 (which was partially burned in the Elkhorn Mountain Fire of October 9, 2003) was revisited and observed on May 25, 2006. *Viola selkirkii* is very dense in areas. It does not appear that the site was adversely affected by the direct effects of the fire. In 2005, it was observed that most plants occurred out of the actual burned area although several plants were seen coming up in burned ground (> 50 plants). In 2006, it was difficult to tell burned ground from unburned ground because new pine needle litter had covered up the bare ground and charcoal. No abnormal flooding was apparent, but the nature of the site (e.g., loose soil, lots of gullies for runoff) appears conducive to a possible flooding event. Several invasive plant species (discussed above) were found in the same ecotype as *V. selkirkii*. Their density in the site appears to be an indirect effect of the disturbance caused by the fire – a result of the massive seed source produced by the frequent patches of these species in the surrounding burned area.

   No other occurrences were known to be affected by a flood or fire event prior to the monitoring period. No flood or fire disturbances were observed at any of the *V. selkirkii* sites monitored in 2006.

Species in preparation for protocol development: collecting baseline data

In general, as identified in the monitoring designs, the main focus for the 2006 monitoring season was to attempt to relocate a number of previously reported locations of the following species and to find new locations. Plans included gathering baseline data and assessing risks at occurrences that were relocated/discovered.

BOTRYCHIUM CAMPESTRE (PRAIRIE MOONWORT; IOWA MOONWORT)

Photograph by BHNF staff of *Botrychium campestre* at BOCA5-1 site on May 28, 2006.

Botrychium campestre was confirmed in March 2006 (through genetic analysis by Dr. Don Farrar, Iowa State University) to occur on the Black Hills National Forest at two locations (one in previously known *B. lineare* site BOLI7-1 in the Bearlodge Ranger District in Wyoming and one at new location in Hell Canyon Ranger District in South Dakota). Two locations were also found and confirmed by Dr. Farrar in 2005 at Wind Cave National Park (one location with *B. lineare* as well as *B. campestre*). Baseline data were gathered at these sites in 2005. Four new occurrences were discovered by Dr. Farrar and Black Hills NF staff in 2006 (one in the Bearlodge Mountains of Bearlodge Ranger District; one adjacent to Northern Hills District on private land on the eastern flank of the Black Hills; and two on Hell Canyon Ranger District, one estimated to have approximately 1,000 individuals and including both *B. campestre* and *B. lineare*). As with other *Botrychium*

species, dry conditions are expected to limit the emergence of aboveground stems and individuals may not emerge during a succession of dry or drought years.

2006 Monitoring Design and Results:

1. Revisit the known *Botrychium campestre* occurrences on Black Hills National Forest annually. Document any new disturbances or changed levels of pre-existing disturbances.

   BOCA5-1 – Revisited May 28, 2006. Extent of site and population number determined to be comparable to 2005. No changes in disturbance regime were observed.

   BOLI7-1 – Revisited May 31, 2006. Extent of site and population number determined to be comparable to 2005. *Botrychium campestre* and *B. lineare* both present. No changes in disturbance regime were observed.

2. Gather baseline data on any new occurrences that may be located. Assess risks to those sites.

   BOCA5-5 – The site was discovered and baseline data collected on May 28, 2006. Genetic analysis in June confirmed the presence of *Botrychium campestre*. The site is in a southwest-facing swale with little bluestem (*Schizachyrium scoparium*) on limestone within the perimeter of the Jasper Fire area (burned in 2001). The site is in an active livestock allotment but appears to be in a location where cattle do not concentrate.

   BOCA5-6 – The site was discovered and baseline data collected on May 28, 2006. Genetic analysis in June confirmed the presence of *Botrychium campestre* and *B. lineare*. The site is on a north-facing grassland slope with little bluestem and western snowberry (*Symphoricarpos occidentalis*) patches. The site is in an active livestock allotment but appears to be in a location where cattle do not concentrate.

   BOCA5-7 – The sites was discovered and baseline data collected on May 30, 2006. Genetic analysis in June confirmed the presence of *Botrychium campestre*. The site is on a rocky, north-facing slope on limestone with smooth brome (*Bromus inermis*) and a diversity of native forb species. The site is in an active livestock allotment but very remote from water and rarely accessed by livestock.

   Potential risks to *Botrychium campestre/B. lineare* at the known locations on Black Hills National Forest, as determined through discussion with Dr. Farrar, could include succession of the sites to later vegetative successional stages, changes to the hydrology of the sites, noxious weed invasion, or alterations from the small amounts of low level of disturbances currently existing at the sites.

3. Document any noxious weeds or invasive species. Document if weeds are co-located with *Botrychium campestre* or what distance they are found from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

   BOCA5-1: No noxious weeds present in the site; *Bromus inermis* (smooth brome) is present along the roadside but decreasing into the site.

   BOLI7-1: *Cynoglossum officinale* (houndstongue) and *Tanacetum vulgare* (common tansy) were observed to be occasional in the same ecological type as *Botrychium campestre*. It is difficult to identify and characterize weed presence accurately at the early date this site is visited.

   BOCA5-5: *Cirsium arvense* (Canada thistle) on roadside and approximately 50 m from plants. *Hyoscyamus niger* (black henbane) also on road and approximately 50m from plants.

   BOCA5-6: No noxious weeds observed in May, but should be reassessed later in the growing season to accurately characterize weed presence.

BOCA5-7: *Bromus inermis* (smooth brome) present, likely seeded after the Sundance Fire on the 1940's.

No evidence was observed of weed treatment activity affecting any *Botrychium campestre* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

BOTRYCHIUM LINEARE (NARROWLEAF GRAPEFERN; SLENDER MOONWORT)

Photograph by BHNF staff of *Botrychium lineare* at BOCA5-1 site on May 28, 2006. Plants (aboveground parts only) collected for genetic analysis by Dr. Don Farrar, Iowa State University.

Botrychium lineare was determined in December 2003 to occur on the Black Hills National Forest at a single location in the Bearlodge Ranger District in Wyoming. Three locations were found in 2005 – one in Bearlodge Ranger District in Wyoming, one in Hell Canyon Ranger District in South Dakota, and one in Wind Cave National Park (South Dakota). One location was found in 2006 – on Hell Canyon Ranger District in South Dakota (Note: all identifications have been confirmed by genetic analysis by Dr. Don Farrar, Iowa State University).

Baseline data were gathered at sites in 2003, 2004, 2005, and 2006. As with other *Botrychium* species, dry conditions are expected to limit the emergence of aboveground stems and individuals may not emerge during a succession of dry or drought years.

2006 Monitoring Design and Results:

1. Revisit the known *Botrychium lineare* occurrences on Black Hills National Forest annually. Document new disturbances or changed levels of pre-existing disturbances.

   BOLI7-1 – Revisited May 31, 2006. Extent of site and population number determined to be comparable to 2005. *Botrychium campestre* and *B. lineare* both present. No changes in disturbance regime were observed.

   BOLI7-2 – Revisited May 31, 2006. The occurrence was drastically changed by firefighting, rehab, and follow-up engineering activities related to the Cement Fire in late July 2005. The old roadbed was bladed to bare ground and there was heavy vehicle traffic on the road for several months before it was closed off again. The slopes adjacent to the roadbed were burned. Herbaceous species are starting to grow back on the roadbed. Pin flags marking *Botrychium lineare* individuals survived the disturbances but no plants were found in 2006. Dr. Farrar suggests that *B. lineare* may be in recovery mode. Compaction may have

broken mycorrhizal fungi connections that could take several years to reestablish. Dr. Farrar suggests checking the site for several years to see if the occurrence persists.

BOCA5-1: Revisited May 28, 2006. Extent of site and population number determined to be comparable to 2005. *Botrychium campestre* and *B. lineare* both present. No changes in disturbance regime were observed.

2. Gather baseline data on any new occurrences that may be discovered. Assess risks.

   BOCA5-6 – The site was discovered and baseline data collected on May 28, 2006. Genetic analysis in June confirmed the presence of *Botrychium campestre* and *B. lineare*. The site is on a north-facing grassland slope with little bluestem (*Schizachyrium scoparium*) and western snowberry (*Symphoricarpos occidentalis*) patches. The site is in an active livestock allotment but appears to be in a location where cattle do not concentrate.

   Potential risks to the *Botrychium lineare*/*B. campestre* at the known locations on Black Hills National Forest, as determined through discussion with Dr. Farrar, could include succession of the sites to later vegetative successional stages, changes to the hydrology of the sites, noxious weed invasion, or alterations from the small amounts of low level disturbances currently existing at the sites.

3. Document any noxious weeds or invasive species. Document if weeds are co-located with *Botrychium lineare* or what distance they are found from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

   BOLI7-1: *Cynoglossum officinale* (houndstongue) and *Tanacetum vulgare* (common tansy) were observed to be occasional in the same ecological type as *Botrychium lineare*. It is difficult to identify and characterize weed presence accurately at the early date this site is visited.

   BOLI7-2: *Cynoglossum officinale* present, located 20 ft from pin flags. *Capsella bursa-pastoris* (shepherd's purse) present in the site. *Cirsium vulgare* (bull thistle) 50 m from pin flags.

   BOCA5-1: No noxious weeds present in the site; *Bromus inermis* (smooth brome) is present along the roadside but decreasing into the site.

   BOCA5-6: No noxious weeds observed in May, but should be reassessed later in the growing season to accurately characterize weed presence.

   No evidence was observed of weed treatment activity affecting any *Botrychium lineare* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

CYPRIPEDIUM PARVIFLORUM (LESSER YELLOW LADY'S SLIPPER)

Photo by BHNF staff at *Cypripedium parviflorum* site CYPA19-21 in Dugout Gulch Botanical Area on August 16, 2006: plant trampled and chewed by livestock.

A minimum of 50 occurrences of *Cypripedium parviflorum* are located in the Black Hills. Based on a Black Hills NF assessment in 2003, a Forest Service Region 2 assessment in 2006, and some recent evaluations completed for this species, the total number of sites reported varies widely from greater than 50 to approximately 100 occurrences. The variability in numbers is largely the result of different ways sites have been documented in the field. It may be that a number of adjacent smaller sites are actually portions of larger occurrences.

Reports indicate that *Cypripedium parviflorum* is primarily associated with mesic conditions on limestone rock outcrop areas, often on north-facing slopes, and on mesic to saturated conditions in and adjacent to riparian areas. The species is widely dispersed geographically across the northern and central Black Hills and is likely under-reported because it has not been targeted for survey until recently.

Cypripedium parviflorum is easily identifiable during its flowering period. Individuals flower as early as late May at lower elevations, and in early July at higher elevations. Seed structures and leaves can also be used to identify this species during July and August.

2006 Monitoring Design and Results:

1. Relocate at least five geographically spaced occurrences of the previously reported locations (or a combination of previously located sites and newly located sites) when the plant is most identifiable (primarily during the flowering period) and gather baseline data. Try to include reported occurrences in Bear/Beaver Gulches Botanical Area and Higgins Gulch Botanical Area or revisit CYPA19-6 in Englewood Springs Botanical Area. Assess risks to those sites.

   Baseline data were collected at four sites in 2006, which were a combination of previously reported sites and new locations. Three of the sites are in Bear/Beaver Gulches Botanical Area. One site was revisited in Dugout Gulch Botanical Area.

   The new occurrences ranged in size from 4 to approximately 100 individuals. The only risk common to all occurrences was invasive plant species. See Item 4 below for more details. Another low risk observed was steep slopes/erosive soils (making impacts from even simple monitoring unavoidable at some sites).

Risks to the occurrences in Bear/Beaver Gulches Botanical Area from livestock grazing appeared to be low due to the steep, rocky nature of Bear and Beaver Gulches. There was no evidence of livestock access or impact to the occurrences. Management is meeting Standard 3.1-2503 – Restrict access of domestic livestock to protect R2 sensitive and SOLC plant occurrences in designated botanical areas.

The occurrence revisited in Dugout Gulch Botanical Area was documented with baseline data collection in 2005. It was noted in 2005 that the occurrence was not in preferred habitat for livestock but at risk because it is accessible and in the drainage bottom. On August 16, 2006, the occurrence was revisited and severe impacts observed from livestock. Plants had been trampled and cropped by livestock moving in and out of the stream bottom. See Item 3 below. Management is not yet meeting Standard 3.1-2503.

2. Document any evidence of collection at any of the sites.

   There was no evidence of collection of *Cypripedium parviflorum* individuals at any sites observed in 2006.

3. Document any evidence of livestock grazing on occurrences in botanical areas.

   CYPA19-21 in Dugout Gulch Botanical Area was documented with baseline data collection in 2005. It was noted in 2005 that the occurrence was not in preferred habitat for livestock but at risk because it is accessible and in the drainage bottom. On August 16, 2006, the occurrence was revisited and severe impacts observed from livestock. Plants had been trampled and cropped by livestock moving in and out of the stream bottom. Management is not yet meeting Standard 3.1-2503.

   Risks to occurrences CYPA19-24, CAPA19-25, and CYPA19-26 in Bear/Beaver Gulches Botanical Area from livestock grazing appeared to be low due to the steep, rocky nature of Bear and Beaver Gulches. There was no evidence of livestock access or impact to the occurrences. Management is meeting Standard 3.1-2503.

4. Document any noxious weeds or invasive species. Document if weeds are co-located with *Cypripedium parviflorum* or what distance they are found from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

   CYPA19-23 – *Cynoglossum officinale* (houdstongue) occasionally co-located with *Cypridedium parviflorum* plants, especially on bench closer to the drainage bottom. *Bromus inermis* (smooth brome) also on bench above bottom. *Tanacetum vulgare* (common tansy) and *Verbascum thapsus* (common mullein) abundant in the drainage bottom.

   CYPA19-24 – No noxious weed species observed in the site, but weeds noted at spring up drainage from the site (*Tanacetum vulgare, Verbascum thapsus*, *Cirsium arvense* (Canada thistle).

   CYPA19-25 – No noxious weed species observed in the site. *Tanacetum vulgare* in drainage bottom below site.

   CYPA19-26 – No noxious weed species observed in the site. *Tanacetum vulgare* in drainage bottom below site, approximately 30 ft from *C. parviflorum* plants.

   CYPA19-21 - *Cynoglossum officinale* abundant in the drainage bottom and co-located with *Cypripedium parviflorum*. *Arctium minus* (burdock) in same ecotype within 7 m of *C. parviflorum* plants.

   No evidence was observed of weed treatment activity affecting any *Cypripedium parviflorum* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

VIBURNUM OPULUS VAR. AMERICANUM (AMERICAN CRANBERRYBUSH; HIGHBUSH CRANBERRY)

Photo by BHNF staff at *Viburnum opulus* var. *americanum* site VIOPA2-28 in Upper Sand Creek Botanical Area on September 6, 2006.

Prior to the 2006 season, there were more than 30 occurrences of *Viburnum opulus* var. *americanum* reported on the Black Hills National Forest. Approximately 80 percent of the Black Hills National Forest occurrences were reported in 2002 and 2003. Known locations are geographically dispersed and are located in at least ten sixth level watersheds in the Northern Hills in South Dakota and Wyoming (Lawrence, Meade, Pennington and Crook counties). There are reports of this species from private land in the Black Hills as well. Van Bruggen (1996) stated that *V. opulus* var. *americanum* was frequent in rich wooded ravines in the Black Hills, but this has not been substantiated to date in Black Hills National Forest monitoring. This shrub species is often intermingled with a number of other shrub species in dense thickets. Unless the species is specifically targeted during surveys, there are times when it would likely not be noticed in high density thickets. Many thickets are so dense they are basically impenetrable; it is likely that the numbers of individuals reported at occurrences is a conservative number.

2006 Monitoring Design and Results:

1. Relocate at least five geographically spaced occurrences of previously reported locations (or a combination of previously located sites and newly located sites) when *Viburnum opulus* var. *americanum* is most identifiable (during the flowering period) and gather baseline data. Try to include reported occurrences in Bear/Beaver Gulches Botanical Area and Higgins Gulch Botanical Area. Assess risks to sites.

   Baseline data were collected for five locations: VIOPA2-24, VIOPA2-25, VIOPA2-26, VIOPA2-27, VIOPA2-28. Some sites were previously located in botanical surveys and some were newly found sites. Two sites contained approximately 50 individuals each and three sites were composed of populations numbering in the mid teens.

   Insect predation (holes in the leaves) was observed at two of the five occurrences.

   Noxious weeds were documented in three of the five sites. See Item 2 below for more information.

   Three occurrences are in Bear/Beaver Gulches Botanical Area and one is in Upper Sand Creek Botanical Area. There was no evidence of livestock in any of the sites or any impacts from livestock. Risks from

livestock grazing appear to be low due to high density of shrubs and downed trees in the drainages, very steep drainage sides, and very rocky drainage bottom. Management is meeting Standard 3.1-2503– Restrict access of domestic livestock to protect R2 sensitive and SOLC plant occurrences in designated botanical areas.

2. Document any noxious weeds or invasive species. Document if weeds are co-located with *Viburnum opulus* var. *americanum* or what distance they are located from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

   VIOPA2-24 -- No noxious weeds in the site,. At the spring below the site, weed species present include: *Tanacetum vulgare* (tansy) - within 50 ft of *Viburnum opulus* var. *americanum* plants; *Verbascum thapsus* (common mullein); *Medicago lupinula* (black medic); and *Trifolium* sp. (non-native clover species).

   VIOPA2-25 – No noxious weed species observed in the site.

   VIOPA2-26 – *Tanacetum vulgare* in rocky bottom within 1 m of *V. opulus* var. *americanum* plants.

   VIOPA2-27 – *Cirsium arvense* (Canada thistle) within 1 ft of *V. opulus* var. *americanum* plants; *Tanacetum vulgare* within 2 ft of *V. opulus* var. *americanum* plants.

   VIOPA2-28 – *Cirsium vulgare* (bull thistle) occasional in the drainage; also a patch of *Cirsium arvense* in the same ecotype but not in direct vicinity of *V. opulus* var. *americanum* plants.

   No evidence was observed of weed treatment activity affecting any *Viburnum opulus* var. *americanum* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

Black Hills National Forest plant species of local concern (SOLC)

In general, the main focus for these species in 2006 was to relocate previously reported locations in combination with locating new sites. Plans included gathering baseline data and assessing risks at locations, with a goal of eventually designing and implementing a monitoring protocol for each species.

ADIANTUM CAPILLUS-VENERIS (SOUTHERN MAIDENHAIR FERN)

Photo by BHNF staff at *Adiantum capillus-veneris* site ADCA-1 at Cascade Springs on July 6, 2006.

The Forest Service administers developed picnic grounds at two ends of the only known *Adiantum capillus-veneris* occurrence located within the Black Hills. The majority of the central portion of the occurrence is located along Cascade Creek on the Whitney Preserve managed by The Nature Conservancy. Recent data (since 2000) document increased extent of the fern on lands administered by the Forest in comparison to earlier reports. However, the current size of the fern occurrence could be in response to several recent years of higher than average moisture in the Black Hills (NOAA 1996-2001), as well as recent conservation activities taking place in the Cascade Creek valley. The population appears to be stable or increasing, but there is insufficient data to demonstrate a trend at the present time.

This plant species had been included on the R2 Sensitive Species list until 2003, therefore, baseline data and a monitoring design are available. The current monitoring design involves assessing the status of the two ends of the Cascade Creek occurrence that is located on lands administered by the Black Hills National Forest. The monitoring is designed to address the following questions: 1) is the species present?; 2) is recreation or erosion resulting in loss of patches?; 3) have invasive species invaded the sites?; has treatment of invasive plant species affected the occurrence?; 4) is there evidence of changes in the water table?; and 5) is there evidence of plant collection?

2006 Monitoring Design and Results:

1. Monitor presence/absence of *Adiantum capillus-veneris* patches along stream transects on an annual basis. If the number of patches decline by 10% or more, consult on a more rigorous design with the Rocky Mountain Research Station. [Note: it was determined in the course of monitoring in 2006 that trying to capture a quantitative change (10% change) using a presence/absence protocol was not possible. The protocol was revised and will be discussed with RMRS in 2007.]

Cascade Springs (ADCA-1) and Cascade Falls (ADCA-2) were visited for monitoring on July 14, 2006. In general, Cascade Springs appeared lush due to good spring/early summer moisture. Cascade Falls appeared comparable in condition to recent years. The sites appeared stable relative to concentration areas of *Adiantum capillus-veneris* mapped in previous years – that is, areas were found as mapped for majority of concentration areas.

2. Recreation nick point: Document the number of nick point trails that actually extend into *Adiantum capillus-veneris* patches.

Since *Adiantum capillus-veneris* must grow within the spray zone of the stream, it is found in a tight streamside zone at Cascade Springs. It is less likely to be impacted by recreation nick trails than *Epipactis gigantea* (which is found in a broader riparian zone) at Cascade Springs because recreational use generally doesn't involve people getting in the water.

A very short nick point trail is defined near the gazebo and extends into a patch of *Epipactis gigantea* and *Adiantum capillus-veneris*. Some trampling of the fern and orchids was observed in 2006.

At Cascade Falls, there are patches of *Adiantum capillus-veneris* on the rocks that create the falls, which people climb on/over to swim below the falls. These patches have been persisting and were present in 2006.

No *Adiantum capillus-veneris* patches have disappeared in areas where nick point trails extend into them.

New signs (Beware of poison ivy) have been posted at Cascade Springs near the spring by the gazebo. Perhaps these will discourage people from trailing around the spring and trampling the fern and orchids.

3. Monitor water levels at the two permanent transect locations on an annual basis at the time of appropriate phenology for monitoring *Adiantum capillus-veneris* each year.

On July 14, 2006, the two transects at Cascade Springs were reread - water levels were documented at 0.5 m intervals. The average stream depth on July 5, 2006 at Transect No. 1 (upstream transect) was 9.24 cm (on July 5, 2005: 12.65 cm; on July 2, 2004: 11.9 cm) and the average stream depth at Transect No. 2 (downstream transect) was 25 cm (on July 5, 2005: 27.6 cm; on July 2, 2004: 21.5 cm).

4. Document any noxious weeds and the following invasive species: *Elaeagnus angustifolia* (Russian olive), and *Tamarix* sp. (salt cedar). Document if weeds are co-located or the distance they are located from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species Document if any weed treatment activity has affected occurrences.

In 2006, *Cirsium arvense* (Canada thistle) continues to be present along the stream, including individuals located adjacent to *Adiantum capillus-veneris*. *Cirsium vulgare* (bull thistle) is also intermingled. *Eleagnus angustifolia* (Russian olive) continues to be present at Cascade Springs. *Tamarix* spp. (salt cedar) was not present. Hell Canyon District staff spent one day at Cascade Springs handpulling weeds in 2006. In general, weed density appear to be much less in the site than 2-3 years ago, likely due to consistent weed treatment efforts over the last several years.

A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

5. Document erosion patches occurring at any *Adiantum capillus-veneris* patch.

No new erosion patches were observed in 2006 at any *Adiantum capillus-veneris* concentration areas. Past documented erosion patches (erosion observed to be associated with stream movement dynamics) continue to be present.

6. Document any verifiable unauthorized collections of *Adiantum capillus-veneris*.

There was no evidence of unauthorized collections of *Adiantum capillus-veneris* at the time monitoring was completed in 2006.

CAREX BELLA (SOUTHWESTERN SHOWY SEDGE)

Photo by BHNF staff at *Carex bella* site CABE3-1 in Black Elk Wilderness on July 13, 2006. *Carex bella* reproductive structure is in the center, with the more common *Carex sprengelii* shown to right and left for comparison purposes.

Three *Carex bella* occurrences are located on lands administered by the Black Hills National Forest are all located within a single square mile section at the highest elevations of the Forest, with all reported locations

occurring within Pennington County, South Dakota on the Hell Canyon Ranger District. These occurrences are located near Harney Peak, Nelson Creek and Lost Cabin Creek within the Black Elk Wilderness Area.

In the Black Hills, occupied sites have been documented among granitic outcrops and bouldery areas of low order streams (uppermost portions of high elevation Black Hills watershed streams). The reported occurrence locations are cool and moist, in *Picea glauca* (white spruce) or *Betula papyrifera* (paper birch) forests with shaded conditions. The occurrences range from small, clustered stands to scattered individuals and reportedly range in size from fewer than 25 plants to over 200 flowering stems. The occurrences are located at some of the highest elevations in the Black Hills (between 6,600 and 7,100 feet) but are considered low elevations for occurrences of this sedge in the main portion of its range (reports from elsewhere range from 9,000 to 10,000 feet).

2006 Monitoring Design and Results:

1. Relocate the three previously reported *Carex bella* locations in the Black Elk Wilderness when the plant is most identifiable (primarily during the flowering period) and gather baseline data through full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form, including collecting herbarium vouchers and completing photo documentation. Assess risks to the species at these sites.

Baseline data were collected for three locations on July 13 and 14, 2006: CABE3-1, CABE3-2, CABE3-3. Some sites were previously located in botanical surveys and some were newly found sites. Two sites contained approximately 100-500 individuals and one site 50-100 individuals. Sites were fully documented using BHNF plant monitoring protocol.

Carex bella appears to be relatively secure from most potential risks in the Black Elk Wilderness, with the exception of extreme climate change. *Carex bella* is reportedly intolerant to drought. The likelihood that a single, high-intensity, localized event may result in the loss of all occurrences is small but possible because the sites are located within a limited geographic area. Other risks include increased activity associated with recreational rock climbing and hikers, browsing by non-native mountain goats (*Oreamnos americanus*), invasion by noxious weeds or other invasive species, and efforts to control them. In addition, fire suppression efforts might be a risk at some sites.

2. Document any noxious weeds or invasive species. Document if invaders are co-located with *Carex bella* or what distance they are located from the occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

No noxious weeds or invasive species were observed in any *Carex bella* site. *Bromus inermis* (smooth brome) was observed above the CABE3-1 site but in a slightly different ecotype.

No evidence was observed of weed treatment activity affecting any *Carex bella* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

ELEOCHARIS ROSTELLATA (BEAKED SPIKERUSH)

Photo by BHNF staff at *Eleocharis rostellata* site ELRO2-1 at Cascade Springs on July 6, 2006. The rooting tip at left is a diagnostic character of *E. rostellata*. Saturated habitat is shown at right.

The only known occurrence of *Eleocharis rostellata* in the Black Hills was first documented in 1966 along Cascade Creek in Fall River County. Subsequent surveys have documented an expansion of its previously known extent at this location. *Eleocharis rostellata* is located on Black Hills National Forest lands, The Nature Conservancy's Whitney Preserve, and other private lands along Cascade Creek. Black Hills National Forest administers only a small percentage (approximately 10 percent) of the *E. rostellata* occurrence along Cascade Creek.

Eleocharis rostellata is an obligate wetland species that occurs in saturated to inundated conditions and its roots are shallow. Year-round flows of warm spring water in Cascade Creek may be an important component of *E. rostellata*'s survival in the Black Hills area. *Eleocharis rostellata* reproduces from seed or vegetatively by sprouting from short rhizomes or from apical bulbils at the tips of elongated culms (stems) that arch to the ground.

2006 Monitoring Design and Results:

1. Relocate the previously reported *Eleocharis rostellata* location at Cascade Falls when the plant is most identifiable (primarily during the flowering period) and gather baseline data through the full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form. Determine if it is appropriate to map the species using a similar process as is being used for *Adiantum capillus-veneris* and *Epipactis gigantea*. Collect herbarium vouchers and complete photo documentation. Assess risks to the species at the site.

Cascade Springs (ELRO2-1) and Cascade Falls (ELRO2-2) were visited for monitoring on July 14, 2006. In general, Cascade Springs appeared lush due to good spring/early summer moisture. Cascade Falls appeared comparable in condition to recent years. *Eleocharis rostellata* was observed in great abundance along streambanks of Cascade Creek and in floodplain areas where the ground is nearly saturated with water. The sites were fully documented according to BHNF plant monitoring protocol. Concentration areas were mapped following the protocol for *Epipactis gigantea* and *Adiantum capillus-veneris* as a baseline for future monitoring.

Potential impacts to *Eleocharis rostellata* on Black Hills NF land could be associated with changes in climatic conditions (such as drought), alterations to the hydrologic system of Cascade Creek, trampling by humans, wildlife use, invasion by noxious weeds and other non-native invasive plants, and collection/harvest. It did not appear that any of these risk factors were negatively impacting *E. rostellata* in 2006. No evidence of collection was observed.

2. Document any noxious weeds and the following invasive species: *Elaeagnus angustifolia* (Russian olive) and *Tamarix* sp. (salt cedar). Document if any weeds are co-located with *Eleocharis rostellata* or the distance weed species are located from occurrences if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

In 2006, *Cirsium arvense* (Canada thistle) continues to be present along the stream, including individuals located adjacent to *Eleocharis elliptica*. *Cirsium vulgare* (bull thistle) is also intermingled. *Eleagnus angustifolia* (Russian olive) continues to be present at Cascade Springs. *Tamarix* spp. (salt cedar) was not present. Hell Canyon District staff spent one day at Cascade Springs handpulling weeds in 2006. In general, weed density appear to be much less in the site than 2-3 years ago, likely due to consistent weed treatment efforts over the last several years.

GENTIANA AFFINIS (NORTHERN GENTIAN)

Photo by BHNF staff of *Gentiana affinis* at GEAF-1 site on Rapid Creek, taken July 26, 2006.

Less than 10 *Gentiana affinis* occurrences have been reported on Black Hills National Forest, primarily in limestone areas at elevations from approximately 5,000 to 6,500 feet of elevation on the Mystic and Northern Hills Districts. *Gentiana affinis* flowers from July through September and produces seeds in capsules from September through October. It is considered a facultative upland species in South Dakota and eastern Wyoming, meaning that it can occur in wetland habitats but typically occurs in upland areas. In the Black Hills, this gentian is reported to occur in moist (not saturated) areas in open conditions (no tree canopy), sometimes near wet meadows, fens, and stream margins in limestone areas.

2006 Monitoring Design and Results:

1. Relocate the eight previously reported locations of *Gentiana affinis* on Black Hills National Forest when the species is most identifiable (primarily during the flowering period) and gather baseline data through the full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form, including collecting herbarium vouchers and completing photo documentation. Assess risks to the species at these sites.

In 2006, seven occurrences of *Gentiana affinis* were fully documented according to Black Hills NF plant

monitoring protocols, including some previously reported locations and some new locations. Locations were documented on Northern Hills, Mystic, and Hell Canyon Ranger District. Numbers of individuals at sites varied from less than 10 individuals to near 1,000 individuals. (GEAF-1: 100-500 individuals; GEAF-2: 500-1,000 individuals; GEAF-3: 100-500 individuals; GEAF-4: 11-50 individuals; GEAF-5: 500-1,000 individuals; GEAF-6: 1-10 individuals; GEAF-7: 100-500 individuals)

The primary risks for *Gentiana affinis* were expected to be related to intensive grazing or trampling by livestock since the species is sensitive to disturbance, including trampling by animals. Thus, *G. affinis* is expected to decline with heavy grazing (Larson and Johnson 1999). The large occurrences documented in 2006 were located in exclosures from livestock grazing. This species is reported to occur mainly in areas without tree canopies, or in areas of full or almost full sun condition. Consequently, conifer encroachment may present a risk to this species. Other risks include invasion by noxious weeds and invasive species, drought, and wildfire and suppression activities.

Some *Gentiana affinis* individuals observed at the seven sites were very robust – leading to identification confusion with *Gentiana puberulenta* (prairie or downy gentian). In fact, some of the previously reported occurrences visited were identified as *G. puberulenta* in the BHNF plant database. Several floras used in identifying Black Hills plants do not give comparative characteristics for *G. affinis* and *G. puberulenta* since *G. affinis* is generally considered a higher elevation species than the normally prairie-dwelling *G. puberulenta* and the species don't occur together (or even near each other) in most places. *Gentiana puberulenta* blooms in September-October (compared to July-August for *G. affinis*). Several occurrences of *G. puberulenta* were documented by BHNF plant monitoring staff in the eastern foothills of the Black Hills in September – clearing up any identification confusion and allowing confirmation of all seven sites documented earlier in the summer as *G. affinis* sites.

2. Document any noxious weeds or invasive species. Document if invaders are co-located with *Gentiana affinis* or what distance they are located from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

GEAF-1: *Cirsium arvense* (Canada thistle) within 1 ft of plants.

GEAF-2: *Cirsium arvense* in a few thick patches and scattered throughout site in same ecotype. *Linaria vulgaris* (yellow toadflax) and *Cirsium vulgare* (bull thistle) located in the same ecotype about 7 m from plants. *Cynoglossum officinale* (houndstongue) located in slightly drier ecotype nearby.

GEAF-3: Area not very weedy except for non-native grasses (*Bromus inermis* (smooth brome), *Phleum pratense* (timothy), *Poa pratensis* (Kentucky bluegrass)). *Cynoglossum officinale* on roadside nearby.

GEAF-4: Area not very weedy except for non-native grass *Phleum pratense*.

GEAF-5: Many non-native species present in the site which is a large exclosure around spring area with lots of past disturbance. *Cirsium arvense* abundant (20-40% cover) and intermingled with *G. affinis* plants. Other non-native species: *Bromus inermis*, *Caragan arborescens* (Caragana), and *Agrostis stolonifera* (redtop).

GEAF-6: *Phleum pratense* present.

GEAF-7: *Cirsium arvense* co-occurs with *G. affinis*. *Linaria vulgaris* occurs in occasional patches in slightly drier ecotype.

No evidence was observed of weed treatment activity affecting any *Gentiana affinis* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

LISTERA CONVALLARIOIDES (BROADLIPPED TWAYBLADE)

Photo by BHNF staff of *Listera convallarioides* at LICO5-2 site in Englewood Springs Botanical Area, taken August 3, 2006.

In the Black Hills, *Listera convallarioides* was first discovered in 1970 at Englewood Springs and a second site located in 1994 along West Strawberry Creek. Both sites are located within Lawrence County. Both were thought to occur on land administered by the Black Hills National Forest but recent use of technical mapping equipment (Global Positioning System) has revealed that the plants at West Strawberry Creek location are on land administered by the Bureau of Land Management (BLM) and adjacent Black Hills National Forest land.

The Englewood Springs occurrence is within the Englewood Springs Botanical Area. This occurrence has been visited multiple times over the years, with greater than 1,000 individuals estimated to occur at the site.The elevation range of the sites administered by Forest Service and Bureau of Land Management is from 5,800 to 6,200 feet. *Listera convallarioides* individuals are located in saturated soil conditions adjacent to wet springs, and under tree canopies composed mostly of *Picea glauca* (white spruce).

2006 Monitoring Design and Results:

1. Relocate the previously reported *Listera convallarioides* occurrences on Black Hills National Forest when the species is most identifiable (primarily during the flowering period) and gather baseline data through the full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form, including collecting herbarium vouchers and completing photo documentation. Assess risks to the species at these sites.

The two previously reported *Listera convallarioides* occurrences were visited on August 3, 2006 and fully documented according to BHNF plant monitoring protocol (sites LICO5-1 and LICO5-2). Plant numbers were estimated to be 500-1,000 at the Strawberry Creek site and 1,000 to 10,000 at the Englewood Springs site.

Risks to the occurrences include invasion by noxious weeds or other non-native invasive plant species, grazing or trampling by livestock or wildlife, collection, loss of riparian habitat, or alteration of hydrologic function in the species habitat. The steep slope and spruce deadfall at Englewood Springs site appeared to be an effective barrier to livestock from the surrounding allotment in 2006 (there was no evidence of livestock access or impacts). The Strawberry Creek site is located between private land and BLM land and is not easily accessed by livestock. Also, the stream bottom site is dense with vegetation and deadfall. There was no evidence that livestock have accessed the site in recent times. The greatest risk to the species in the Black Hills may be that it is currently limited to two known occurrences. Therefore, high intensity disturbance events such as a crown fire during drought or sediment covering the sites could result in the loss of both

occurrences. Another risk identified for northern boreal plant species including *L. convallarioides* is a climatic trend towards warming and drying conditions. The species may not be able to persist in the Black Hills under this type of climatic trend.

2. Document any noxious weeds or invasive species. Document if invaders are co-located with *Listera convallarioides* or the distance they are located from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

LICO5-1: *Cirsium arvense* (Canada thistle) and *Leucanthemum vulgare* (ox-eye daisy) co-located with *Listera convallarioides*. *Tanacetum vulgare* within 10 ft of *L. convallarioides* plants. *Linaria vulgaris* in the vicinity but in drier ecotype.

LICO5-2: *Cirsium arvense* and *Cynoglossum officinale* co-located with *L. convallarioides*. BHNF plant monitorinand district personnel hand-pulled weeds for 2 hours in 2006 (also hand-pulled weeds for ½ day in 2005).

No evidence was observed of weed treatment activity affecting any *Listera convallarioides* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

LYCOPODIUM ANNOTINUM (STIFF CLUBMOSS)

Photo by BHNF staff of *Lycopodium annotinum* at site LYAN2-1, taken September 6, 2006.

At the time a recent assessment was prepared (2003) for this species, only two occurrences were included in the Black Hills National Forest plant database. Since that time, additional new occurrences have been discovered and additional information has become available. Some of the reported occurrences are located very close to each other and once baseline data are gathered, locations may be combined into fewer larger occurrences composed of sub-components.

Lycopodium annotinum is circumboreal and widely distributed in boreal habitats of North America. Elsewhere within its range, *L. annotinum* also occurs in swampy or moist coniferous forests, mountain forests, and exposed grassy or rocky sites. Currently, little is known about the basic ecology of this species on

Black Hills National Forest. Known occurrences of *L. annotinum* are associated with high moisture microhabitat conditions within remnant boreal *Picea glauca* (white spruce) and *Betula papyrifera* (paper birch)/*Corylus cornuta* (beaked hazelnut) communities. These sites are sheltered microsites that are considerably cooler and moister than surrounding areas and are likely associated with isolated frost pockets. The currently known sites on lands administered by Black Hills National Forest are located at elevations from 5,100 feet to approximately 6,300 feet.

2006 Monitoring Design and Results:

1. Relocate at least 50% of the previously reported *Lycopodium annotinum* locations and gather baseline data through the full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form, including collecting herbarium vouchers and completing photo documentation. Assess risks to these sites.

Four occurrences of *Lycopodium annotinum* were fully documented in 2006 according to BHNF plant monitoring protocol. One occurrence is in the Upper Sand Creek Botanical Area. In three of the occurrences, *L annotinum* is co-located with *L. complanatum* (R2 sensitive plant species). Occurrence size varies from 20 x 30 ft to smaller scattered patches (Note: *Lycopodium* species have a clonal growth form so it is not possible to estimate individuals).

The persistence of *Lycopodium annotinum* in the Black Hills is at risk due to both the small number and small size of occurrences, which makes the species vulnerable to random stochastic events (such as from high intensity fire events) and invasion by noxious weeds and invasive plant species or weed treatment. Some sites are at risk from livestock impacts, particularly trailing. LYAN2-3 and LYAN2-4 are in active grazing allotments and in proximity to riparian areas where livestock concentrate. Spruce deadfall on the moderate slopes where the sites are found are the current deterrent to livestock access. The North Zone Range Allotment Management Plan finalized in 2006 covers management of the allotment containing LYAN2-3. The plan includes a commitment by range specialists to monitor the LYCO3-5/LYAN2-3 site to ensure livestock activities do not degrade the occurrence.

LYAN2-2 is above a steep bank from the Upper Sand Creek drainage in Upper Sand Creek Botanical Area. Livestock trail in the drainage bottom.

No impacts from livestock were observed in any *Lycopodium annotinum* sites in 2006. Other risks to *L. annotinum* include firefighting and fire suppression activities and vegetation treatment activities to enhance regeneration of hardwood habitats (remove conifers).

2. Document any noxious weeds or invasive species. Document if invaders are co-located with *Lycopodium annotinum* or what distance they are located from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

LYAN2-1: No noxious weeds in the site, but weeds abundant in drainage below site: *Tanacetum vulgare* (tansy), *Cynoglossum officinale* (houndstongue), *Hypericum perforatum* (St. Johnswort), *Cirsium arvense* (Canada thistle).

LYAN2-2: No noxious weeds in the site, but weeds abundant in the drainage below the site: *Tanacetum vulgare, Linaria vulgaris* (yellow toadflax), and *Hypericum perforatum*.

LYAN2-3: No noxious weeds in the site.

LYAN2-4: No noxious weeds in the site, but weeds scattered in drainage bottom below site and along nearby road: *Verbascum thapsus* (common mullein), *Cirsium vulgare* (bull thistle), *Leucanthemum vulgare* (ox-eye

daisy), and *Cynoglossum officinale* (houndstongue).

No evidence was observed of weed treatment activity affecting any *Lycopodium annotinum* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

OXYRIA DIGYNA (ALPINE MOUNTAINSORREL)

Photo by BHNF staff of *Oxyria digyna* at site OXDI3-3, taken July 14, 2006.

First documented in the Black Hills in 1983, this species is currently known from four occurrences in a limited geographic range within the Harney Peak area: three on lands administered by the Black Hills National Forest in the Black Elk Wilderness and one on lands administered by the state of South Dakota in Custer State Park. All currently known Black Hills National Forest occurrences are located at the highest elevations in the Black Hills (6,800 – 7,200 feet); are located within areas of coarse textured soils in steep, granite outcrop areas and narrow gullies; and have partial to full shade conditions.

2006 Monitoring Design and Results:

1. Relocate the three previously reported *Oxyria digyna* locations in the Black Elk Wilderness when the plant is most identifiable (primarily during the flowering period) and gather baseline data through the full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form, including collecting herbarium vouchers and completing photo documentation. Assess risks to the species at these sites.

The three previously reported locations were visited on July 13 and July 14, 2006. All occurrences are in the Black Elk Wilderness. Population estimates vary from 50-100 individuals (OXDI3-1) to 100-500 individuals (OXDI3-2 and OXDI3-3). All occurrences were fully documented according to BHNF plant monitoring protocol.

In the Black Elk Wilderness, risks to *Oxyria digyna* may include disturbance by hikers and climbers, and trampling and browsing from non-native mountain goats (*Oreamnos americanus*) or browsing by elk (*Cervus elaphus*). Due to the limited number of occurrences, disturbances at or near sites could pose significant risks to species persistence. In addition, invasion by noxious weeds and invasive plant species, weed treatment, and fire suppression efforts are risks. No impacts from any of these risk factors (except light grazing by mountain goats at OXDI3-2) were observed at occurrences in 2006.

2. Document any noxious weeds or invasive species. Document if invaders are co-located with *Oxyria digyna* or what distance they are located from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2

sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

OXDI3-1: No noxious weeds in the site.

OXDI3-2: No noxious weeds in the site.

OXDI3-3: No noxious weeds in the site.

No evidence was observed of weed treatment activity affecting any *Oxyria digyna* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

PETASITES SAGITTATUS (ARROWLEAF SWEET COLTSFOOT)

Photographs by BHNF staff. Left: *Petasites sagittatus* at PESA5-4 on August 2, 2006 with impacts from livestock. Right: *Petasites sagittatus* at PESA5-1 on July 21, 2006.

Per Rydberg first documented *Petasites sagittatus* from the Black Hills in 1892. There are 15 fairly recent reports (1994-2004) currently listed in the Black Hills National Forest plant database on lands administered by Black Hills National Forest. Some of these reports are from adjacent locations and it is likely that some will be combined into larger occurrences following collection of baseline data. The reports are distributed in six watersheds (sixth order) located in the central Black Hills in Pennington and Lawrence Counties, South Dakota, from the Northern Hills and Mystic Ranger Districts.

A variety of associated conditions have been recorded for this boreal species in the Black Hills. Sites are characterized by open to partial tree canopies and range in elevation from 5,400 to 6,750 feet. Individuals are associated with dry to mesic to wet meadows and gentle slope areas along streams with saturated soils. *Picea glauca* (white spruce) is the tree species documented at several sites (with very low canopy conditions); however, *Populus tremuloides* (aspen) and *Pinus ponderosa* (ponderosa pine) are also documented. A variety of *Salix* (willow) species are documented at a majority of reported locations.

2006 Monitoring Design and Results:

1. Relocate at least 50% of the previously reported locations when the plant is most identifiable (primarily during the flowering period) and gather baseline data through the full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form, including collecting herbarium vouchers and completing photo documentation. Assess risks to these sites.

Five occurrences of *Petasites sagittatus* were fully documented in 2006 according to BHNF plant monitoring protocol. One occurrence (PESA5-2) combined three reported occurrences into a single occurrence several miles long on Rapid Creek. One occurrence is in Black Fox Botanical Area (PESA5-5). Livestock grazing impacts (trampling of plants and habitat) were observed at occurrence PESA5-5 in 2006. Management does not yet meet BHNF Standard 3.1-2503 (Restrict access of domestic livestock to protect R2 sensitive and SOLC plant occurrences in designated botanical areas.)

Population estimates at the sites vary but are generally high:

PESA5-1: 1,000 to 10,000 plants

PESA5-2: 1,000 to 10,000 plants

PESA5-3: 1,000 to 10,000 plants

PESA5-4: 100 to 500 plants

PESA5-5: 1,000 to 10,000 plants

Since this species is a facultative wetland species, the primary risk to its persistence and reproductive success is any lowering of the water table or altered hydrology where it occurs, whether natural or human-induced. Noxious weeds and other invasive species, effects associated with intensive livestock use, recreational impacts (potentially associated with the adjacent Black Fox Campground, Off Road Vehicle use, and the Mickelson Trail) and climatic change (drought stress) are also risks. *Lythrum salicaria* (purple loosestrife) is not reported to occur at any of the larger sites, or anywhere close by, but is very aggressive and has the potential to out-compete riparian native species, including *Petasites sagittatus*.

2. Document any noxious weeds or invasive species. Document if invaders are co-located with *Petasites sagittatus* or what distance they are located from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

PESA5-1: *Cirsium arvense* (Canada thistle) scattered and co-located with *Petasites sagittatus*. *Phleum pratense* (timothy) co-located. *Bromus inermis* (smooth brome) found in drier areas nearby.

PESA5-2: *Cirsium arvense* co-located and intermingled. *Linaria vulgaris* (yellow toadflax) in occasional patches on drier streambanks. *Verbascum thapsus* (common mullein) scattered in drier parts of the site. *Leucanthemum vulgare* (ox-eye daisy) found in the same ecotype, 2 m from *Petasites sagittatus*.

PESA5-3: *Cirsium arvense* co-located and intermingled. *Cirsium vulgare* (bull thistle) scattered and co-located. *Leucanthemum vulgare* thick in patches and co-located. *Verbascum thapsus* and *Cynoglossum officinale* (houndstongue) occasional in same ecotype.

PESA5-4: *Cirsium arvense* in thick patches in same ecotype (2 m from *Petasites sagittatus*). *Cynoglossum officinale* scattered in same ecotype, within 5 m of *P. sagittatus*. *Verbascum thapsus* within 15 m of *P. sagitattus*. *Phleum pratense* co-located with *P. sagittatus*.

PESA5-5: *Cirsium arvense* co-located and intermingled. *Cirsium vulgare* and *Cynoglossum officinale* occasional in same ecotype.

No evidence was observed of weed treatment activity affecting any *Petasites sagittatus* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

POLYSTICHUM LONCHITIS (NORTHERN HOLLYFERN)

Photo by BHNF staff of *Polystichum lonchitis* (dark green fern; *Botrychium virginianum* is light green plant in the center) at site POLO4-4, taken August 9, 2006.

Black Hills National Forest has information on 19 records for this species on Black Hills National Forest. Reported sites are located in the northern Black Hills and Bearlodge Mountains (Lawrence County, SD and Crook County, WY).

A circumboreal and subalpine forest fern, *Polystichum lonchitis* is commonly associated with *Picea glauca* (white spruce), *Betula papyrifera* (paper birch), and *Corylus cornuta* (beaked hazel). In the Black Hills, *P. lonchitis* is associated with moist, shaded, north facing slopes in forested ravines and gulches on limestone substrates at elevations from 4,160 to 5,540 feet. Some occurrences consist of one or few individuals; others have dozens to greater than 50 individuals; and the largest occurrence in Griggs and Higgins Gulches is estimated to have greater than a hundred individuals. Nine sites were located in 2002 and 2003. A number of older reports lack information regarding abundance and total size estimates. Approximately 35 percent of the reported locations are distributed within three Black Hills National Forest designated Botanical Areas.

2006 Monitoring Design and Results:

1. Relocate at least 50% of the previously reported *Polystichum lonchitis* locations when the species is most identifiable (fronds present) and gather baseline data through the full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form, including collecting herbarium vouchers and completing photo documentation. Assess risks to these sites.

Eight occurrences of *Polystichum lonchitis* were fully documented in 2006 according to BHNF plant monitoring protocol.

Population estimates at the sites varied:
POLO4-1: 1 plant

POLO4-2: 1 plant

POLO4-3: 10 plants

POLO4-4: 500 – 1,000 plants

POLO4-5: 11-50 plants

POLO4-6: 2 plants

POLO4-7: 50-100 plants

POLO4-8: 2 plants

Polystichum lonchitis in the Black Hills is limited by the small extent of cool, moist boreal habitat. As with other boreal remnant species, long-term drought or dramatic climate changes characterized by drier and warmer conditions may present the greatest risk to *Polystichum lonchitis* and its habitat. Other risks are associated with the potential for Off Road Vehicle impacts, livestock trampling, water developments, and activities associated with road construction. Noxious weeds and invasive species are a risk to occurrences and wildfire and suppression activities can also be considered a risk to occurrences. Collectors may desire the species and depending on the level of interest, so collection could present a risk. No impacts from any of these risk factors were observed at occurrences in 2006.

2. Document any noxious weeds or invasive species. Document if invaders are co-located with *Polystichum lonchitis* or what distance they are located from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

POLO4-1: *Taraxacum* sp. (dandelion) and *Trifolium* sp. (non-native clover) present in trace amounts.

POLO4-2: No noxious weeds in the site itself. *Tanacetum vulgare* (tansy) frequent in drainage bottom below site.

POLO4-3: No noxious weeds in the site.

POLO4-4: No noxious weeds in the site.

POLO4-5: No noxious weeds in the site. *Cirsium vulgare* (bull thistle) found up drainage (approximately 100 m) in same ecotype, but not abundant.

POLO4-6: No noxious weeds in the site. *Tanacetum vulgare, Cynoglossum officinale* (houndstongue), and *Cirsium vulgare* in drainage bottom below site. *Linaria vulgaris* (yellow toadflax) on old roadbed nearby.

POLO4-7: *Cirsium vulgare* within 5 ft of *Polystichum lonchitis* plants, but side drainage with the site is generally weed-free. The main Sand Creek drainage, however, has abundant *Tanacetum vulgare, Cynoglossum officinale, Hypericum perforatum,* and *Cirsium arvense*.

POLO4-8: *Cirsium arvense* 50 ft from *Polystichum lonchitis* plants. *Cynoglossum officinale* scattered in the vicinity.

No evidence was observed of weed treatment activity affecting any *Polystichum lonchitis* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

SALIX LUCIDA SSP. CAUDATA (SHINING WILLOW)

Photo by BHNF staff of *Salix lucida* ssp. *caudata* at site SALU-3 in Spearfish Canyon, taken June 16, 2006.

This species (but a different subspecies – ssp. *lucida*) was historically documented (1913) from the Black Hills but has never been relocated. *Salix lucida* ssp. *caudata* was thought not to exist in the Black Hills until an individual was located along a small tributary of Iron Creek in 1993. Since that time, three additional occurrences were discovered (2002 and 2003). Two occurrences were located in the Bearlodge Mountains north of Sundance, Wyoming. The other two occurrences were located within the central granitic core area of the Black Hills, northeast of Custer, South Dakota. Dr. Robert Dorn, *Salix* species expert, visited the Black Hills in June 2006 and visited known sites with Black Hills NF botanists. The two occurrences in the central granitic core were identified to be comprised of *Salix* species other than *S. lucida* spp. *caudata*. One occurrence in the Bearlodge was visited and confirmed (a single male plant). The other Bearlodge occurrence was not relocated, but the voucher specimen was confirmed by Dr. Dorn [there were many small *Salix* sp. shrubs at the location but they were browsed too heavily to positively identify]. Lastly, Dr. Dorn shared a new location for *S. lucida* spp. *caudata* that he had recently found in Spearfish Canyon (2 plants: one female and one male). In summary, as of the end of field season in 2006, there are two confirmed occurrences of *S. lucida* spp. *caudata* on Black Hills NF and one occurrence with a confirmed voucher that has not been relocated yet.

Salix lucida ssp. *caudata* is commonly associated with streambanks, shores, wet meadows, and seeps and is a facultative wetland species. It is at the easternmost extent of its range in the Black Hills of South Dakota. The occurrences in the Bearlodge Mountains (Crook County, Wyoming) are located at some of the lower elevations (4,200 and 4,800 feet) of the Black Hills National Forest The occurrence in the Northern Hills District in Spearfish Canyon is located at 4,800 ft.

Individuals occur in open (full sun) to partially shaded conditions, on streambanks immediately next to fast-flowing water. Less than five individual plants are reported at each of the occurrence locations. Due to the small number of individuals known, it is uncertain if there is a breeding population with potential for seed production. There is, however, a good deal of suitable habitat yet to be searched, particularly in Spearfish Canyon.

A temporary cage was erected around the Bearlodge occurrence/plant in 2005 to restrict livestock from grazing. A beaver, however, entered the cage in spring 2005 and chewed off several stems. The stems were retrieved and sent to USFS Bessey Nursery for propagation. In spring 2006, the nursery had propagated 36 plants. The Bearlodge District Ranger decided to plant some of the rooted stock at the known occurrence and some at a location approximately three miles away in an exclosure around a spring/old beaver pond. *Salix lucida* ssp. *caudata* has not been recorded previously from this location. There are biogeographical concerns with planting an uncommon species in locations where it has not been previously known. The site will be documented in the BHNF plant monitoring program and the success of the planting tracked.

2006 Monitoring Design and Results:

1. Relocate the four previously reported *Salix lucida* locations when the plant is most identifiable (primarily during the flowering period) and gather baseline data through the full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form, including collecting herbarium vouchers and completing photo documentation. Assess risks to these sites.

As described above, the four previously reported *Salix lucida* ssp. *caudata* sites were visited with *Salix* species expert Dr. Robert Dorn in June 2006. After analysis of vouchers and plants on site, the total number of confirmed occurrences on Black Hills NF is two:

SALU-2: Bearlodge. One male plant present.

SALU-3: Spearfish Canyon. One female plant and one male plant present.

A third location in the Bearlodge has not been relocated yet but the voucher specimen collected in 2002 was confirmed by Dr. Dorn as *S. lucida* spp. *caudata*. Efforts to relocate the occurrence will continue in 2007.

Both occurrences were fully documented on June 16, 2006, following BHNF plant monitoring protocol.

Salix species are preferred forage by livestock and wildlife. Concern for emphasis *Salix* species on Black Hills NF led to BHNF Standard 2505 e directing no utilization of emphasis willow (*Salix*) species (including *S. candida, S. serissima,* and *S. lucida* ssp. *caudata*) by domestic livestock. A temporary cage was constructed in 2005 around the SALU-2 plant to restrict livestock. A larger exclosure that will adequately protect the occurrence and habitat has yet to be put in place. The SALU-3 occurrence along Spearfish Creek in Spearfish Canyon is not in an active allotment so it is not at risk from livestock grazing. Spearfish Creek is very close to Highway 14A in Spearfish Canyon and while the *S. lucida* spp. *caudata* plants are on the opposite side of the creek from the highway, there are still risks from proximity to the road. Those risks include runoff of road chemicals to the stream, introduction of noxious weeds and invasive species, and impacts from noxious weed treatment. Based on the distribution now known, *S. lucida* ssp. *caudata* is vulnerable to catastrophic and stochastic events. The primary risk to this facultative wetland species' persistence and reproductive success is any lowering of the water table where it occurs, whether natural or human induced. No impacts from these risks were observed in 2006.

The long-term persistence of *Salix lucida* ssp. *caudata* in the Black Hills is uncertain since less than a total of 10 individuals are currently known to exist. Since only two occurrences of S. *lucida* ssp. *caudata* have been documented on Black Hills National Forest with a limited number of individuals, it is possible that specific microsite conditions associated with this species may be very limited within more general riparian conditions across Black Hills National Forest. However, there is a large area of suitable habitat along Spearfish Creek yet to be searched. Plant material (retrieved from beaver pruning) is being stored and propagated at USFS Bessey Nursery. It is premature to start a restoration program until native distribution is more clearly established through additional survey. Biogeography, or the pattern of plants on the landscape without human intervention, is particularly important and informative for uncommon native species such as S. *lucida* ssp. *caudata*. Results of the pilot planting project in 2007 (at the known Bearlodge site and within an exclosure in the same larger watershed) using some of the propagated material should be carefully examined before considering any expansion of the project.

2. Document any noxious weeds or invasive species. Document if invaders are co-located with *Salix lucida* ssp. *caudata* or what distance they are located from occurrences if they occupy the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

SALU-2: *Cirsium arvense* (Canada thistle) scattered throughout the drainage. *Cynoglossum officinale*

(houndstongue) within 10 m of plant; *Carduus nutans* (musk thistle) 50 m from *Salix lucida* ssp. *caudata* plant.

SALU-3: *Tanacetum vulgare* (tansy) on the same side of the creek and 20 ft from *Salix lucida* ssp. *caudata* plants. *Leucanthemum vulgare* (ox-eye daisy) abundant on opposite side of creek from plants.

No evidence was observed of weed treatment activity affecting any *Salix lucida* ssp. *caudata* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

Monitoring Item 18b: Emphasis Species - Sensitive Species (Wildlife)

Objective 221. Conserve or enhance habitat for R2 sensitive species and species of local concern (SOLC). Monitoring will be conducted at a Forest-wide level, not at the project level, and will be done for habitats or populations.

Objective 221 is applicable to all sensitive species. There are two other types of objectives that are relevant to some, but not all, sensitive species. The first type is species-specific objectives that are directly applicable to one or more species (e.g., Objective 237 for prairie dogs). These are evaluated below under the appropriate species headings. The second type of objectives are not specific to or in direct reference to sensitive species (e.g., vegetation Objectives 201 and 239-LVD), but are relevant habitat considerations for some sensitive species. Full evaluations of this last type of objectives are found under other monitoring items, but a summary may be provided below when appropriate.

Mammals -- American Marten

The American marten monitoring protocol focuses on the amount of preferred habitat. In the Black Hills, marten are highly associated with white spruce forests, and this is considered preferred habitat.

Amount of Preferred Habitat: As disclosed in monitoring item 8, the spruce covertype is found on 26,483 acres of the Forest. This is greater than what is called for in Objective 239-LVD (20,000 acres) and an increase of about 1000 acres over the amount reported in 2005. In 1995, there were 21,737 acres of spruce, and in 1899, it was estimated at 15,000 acres (USDA Forest Service 1996b). This indicates a long-term increase in spruce. Fire suppression during the last century has allowed spruce to increase in abundance and density in the Black Hills. Relative to ponderosa pine, spruce is patchily distributed and in low abundance (USDA Forest Service 2005b p. III-24).

The Forest is conserving habitat for the American marten.

Mammals -- Townsend's Big-eared Bat and Fringe-tailed Myotis

The sensitive bats monitoring protocol focuses on three items: protective measures, disturbance, and snags. Roost protection measures stem from Standards 3208 and 3209. Snag data are found in monitoring item 11, and correspond to Objective 211.

Protective Measures: There are three types of protective measures that are reported here: pre-closure mine evaluations, bat passage devices installed, and bat passage devices maintained. The table below shows the number of bat passage devices installed in caves and mines across the Forest. In 2006, seven mines were evaluated for bat habitat. One of these was recommended for a bat passage device in the future, the others were recommended for closure. In 2006, bat passage devices were installed at two mines. Several mines were closed (without passage) for public safety

reasons. All of these mines were previously evaluated for bat habitat.

Number of Bat Passage Devices Installed in Caves and Mines				
	Installed Prior to 2005	2005	2006	Total
Caves	6	0	0	6
Mines	6	5	2	13

Disturbance: Seven bat roosts and/or bat passage devices (four caves and three mines) were monitored for signs of vandalism, incompatible uses, and non-compliance with established closure dates. All of these are protected with bat passage devices. Only one site, Davenport Cave, showed evidence of disturbance. The bat gate at Davenport Cave was repaired in FY 2006.

Snags: Monitoring item 11 displays that in FY06, there were 1.3 snags per acre >9" dbh and greater that 25 feet tall across conifer portions of the Forest, 23% of which (0.3 snags/acre) were >14" dbh (vegetation database, excluding large burned areas and mortality from insects). Both of these figures are lower than called for under Objective 211 (3 snags per acre, 25% of which are >14 inches dbh). The addition of recent wildfires and insect tree mortality results in more than three snags per acre well dispersed across the Forest (see Monitoring Item 11). It appears the Forest is meeting Objective 211.

The Forest is largely conserving and enhancing habitat for the Townsend's big-eared bat and fringe-tailed myotis.

Mammals -- Black-tailed Prairie Dog

This monitoring item was not scheduled for reporting in the Fiscal Year 2006 Report. See the Fiscal Year 2005 Monitoring Report on the Forest's web page http://www.fs.fed.us/r2/blackhills/projects/planning/index.shtml for the latest report on this monitoring item.

Birds -- American Three-toed Woodpecker

There are two components to the three-toed woodpecker monitoring protocol: relative density of woodpeckers in white spruce (preferred habitat), and the amount of white spruce.

Relative Density in Preferred Habitat: Relative density of this species is monitored through the Monitoring Birds of the Black Hills (MBBH) program. See monitoring item 21 (Emphasis Species – MIS, Non-game Birds section) for more information on MBBH. White spruce habitat was not sampled in 2006. White spruce habitat was sampled in the MBBH program during 2005, as well as in 2001, 2002, and 2003. Estimated woodpecker densities have ranged from approximately 2-4 birds/km^2 (see chart). The species has also been detected in several of the remaining habitats sampled by MBBH, but spruce trees were either present or in close proximity. The habitats were: late successional, montane riparian, pine north, and aspen. As expected, detections were too infrequent in these marginal habitats to allow density estimates to be calculated.

Habitat	Estimated Relative Densities of American Three-toed Woodpeckers (birds/km^2)					
	2001	2002	2003	2004	2005	2006
White Spruce	ID	1.8	3.64	NM	2.66	NM
ID = Insufficient Data, NM = Not Monitored						

Amount of Preferred Habitat: As disclosed in monitoring item 8, the spruce covertype is found on 26,483 acres of the Forest. This is greater than the amount called for in Objective 239-LVD (20,000 acres) and an increase of about 1000 acres over the amount reported in 2005. In 1995, there were 21,737 acres of spruce, and in 1899, it was estimated at 15,000 acres (USDA Forest Service 1996b). Fire suppression during the last century has allowed spruce to increase in abundance and density in the Black Hills. Relative to ponderosa pine, spruce is patchily distributed and in low abundance (USDA Forest Service 2005b p. III-24).

The Forest is conserving habitat for the American three-toed woodpecker.

Birds -- Northern Goshawk

There are three components to the goshawk monitoring protocol: nest stand habitat, overall habitat diversity, and territory occupancy.

Nest Stand Habitat: This monitoring component measures the amount and trend of structural stages 4B, 4C, and 5 within designated goshawk nest stands. It will not be evaluated in this monitoring report, because designated nest stands have not been entered into the corporate wildlife database yet, and are therefore not available in a format necessary for this type of analysis. When funding becomes available, nest stand boundaries will be obtained from the administrative records of district-level projects, and entered into the corporate wildlife database. A GIS analysis can then be performed to provide information for this monitoring component.

Habitat Diversity: Habitat diversity is provided through the Forest Plan Structural Stage Objectives (Objectives 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204). Monitoring Item 9 (Vegetative Diversity – Structural Stages) provides a structural stage comparison between the current condition and the desired condition in ponderosa pine forests as defined in Forest Plan Objectives 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204. Monitoring Item 9 discusses the Forest's progress towards the structural stage objectives. Habitat diversity is being provided and progress is being made towards Objective 221, though it may take some time to achieve the desired amounts of some structural stages. For detailed information, see Monitoring Item 9.

Occupancy: This component measures the presence of territorial goshawks within known territories. If a territory has territorial birds within it, it is said to be occupied. Some signs of territorial behavior are aggressiveness (e.g., vocalizations and physical movement toward surveyors), prey remains around nest sites, and molted feathers around nests. Territoriality is a good indicator that an established (capable of breeding) pair exists in an area, and is easier to detect than breeding status or nest success (Woodbridge and Hargis 2005). Therefore, territory occupancy is what the Forest evaluates to demonstrate persistence of breeding goshawks on the Forest.

In 2005, 34 goshawk territories were monitored by Forest biologists in 2005. Of the 34 total territories, 9 (26%) were active. The territory occupancy rate of 26% is consistent with data since 2000 (see table below). The rate was not determined in 2004. Woodbridge and Hargis (2005) disclose territory occupancy rates between 39% and 100% in two Western study areas from 1992 to 1996. This may suggest that the recent rates on Black Hills NF may be relatively low. However, the frequency and intensity of monitoring in those studies were much higher than what is performed in the Black Hills, which would lead to higher (and more accurate) occupancy rates. Forest Service monitoring in the Black Hills is typified by only one or two visits to a subsample of nests each season, with each visit lasting less than one full person-day. Furthermore, goshawk territoriality and nest attempts show high annual variation, and may be closely tied to annual precipitation fluxes that affect prey abundance (Salafsky et al. 2005). Therefore, drought conditions over the past several years may also be affecting goshawks.

Goshawk Territories Occupied 2003-2006						
	2000	2001	2002	2003	2005	2006
Territories Monitored	42	46	84	74	56	34
Territories Occupied	12	9	20	25	23	9
Percent of territories Occupied	29%	20%	24%	34%	41%	26%
Source: FAUNA database (2006) and previous Monitoring reports.						

Knowles and Knowles (2007) monitored 18 active goshawk territories in the Black Hills in 2006, seven of which were active. Since 2003, Knowles and Knowles (2007) have found that 69 percent of the nesting attempts successfully fledged chicks. However, the SDGFP reported that at least one young fledged from 5 of the 6 active nests that they monitored.

The Forest is conserving habitat for the northern goshawk, but progress toward achieving structural stage objectives is still needed.

Birds -- Rare Birds (Peregrine Falcon, Burrowing Owl, Flammulated Owl, Lewis's Woodpecker, Loggerhead Shrike, Northern Harrier, Yellow-billed Cuckoo, Long-billed Curlew

Each of the species included in this monitoring item are considered uncommon, rare, casual or accidental to the Black Hills (Tallman et al. 2002). The Forest uses incidental observations to track them. Incidental observations include data collected through the MBBH program. See monitoring item 21 (Emphasis Species – MIS, Non-game Birds section) for more information on MBBH.

Rare Bird Incidental Observations, 2005-2006		
	2005	2006
Peregrine Falcon	0	0
Burrowing Owl	0	7
Flammulated Owl	0	0
Lewis' Woodpecker	14	13
Loggerhead Shrike	0	1
Northern Harrier	2	1
Yellow-billed Cuckoo	0	0
Long-billed Curlew	0	8
Source: NRIS FAUNA Database, MBBH data		

There were five of these sensitive bird species confirmed in 2006: burrowing owl, Lewis's woodpecker, loggerhead shrike, northern harrier and long-billed curlew.

Seven burrowing owls were observed on the Forest in 2006. Two adults and three chicks were observed at two nests. These are the first nesting burrowing owls documented on the Forest for quite some time.

There were a total of 13 woodpeckers observed in 2006. Six of the observations occurred in the vicinity of Jasper Burn (FAUNA Database). The other seven occurred along one montane riparian transect (Hutton et al. 2007), also near the Jasper Burn. The Jasper Burn occurred in 2000. This is consistent with reports from other literature that this species prefers older burns (Anderson 2003). As discussed in Monitoring Items 9 and 11, the Forest continues to move towards the structural stage and snag objectives, which were designed to provide habitat for forest dwelling species such as Lewis's woodpeckers.

There were eight long-billed curlews observed during the MBBH program. These are the first observations of this species on the Forest since the MBBH program began. All observations occurred in the Southern Black Hills, in grassland habitat. Since the observations were made during the breeding season, it is likely this species bred this year on the Forest in grassland habitats in the Southern Black Hills. Addition monitoring is needed in the future to determine whether this is a single-year occurrence, as a result of drought conditions in the surrounding Great Plains, or a more common occurrence.

None of the other rare sensitive birds (flammulated owl, peregrine falcon, or yellow-billed cuckoo) were recorded on the Forest in 2006.

The Forest appears to be conserving habitat for burrowing owls, Lewis's Woodpeckers, and long-billed curlews. There is no data to support an assessment for the other rare species.

Reptiles -- Black Hills Redbelly Snake

There are two indicators for the redbelly snake: trend of riparian habitat condition, and amount of hardwood habitats on the Forest. These indicators are in direct reference to monitoring items 6 and 8, respectively.

No Forest-wide data on riparian resource condition was collected in FY2006. However, an indicator different than any of those disclosed in the monitoring implementation guide was reported under item 7 of this report: projects to restore riparian and wetland habitat or rehabilitate stream reaches. This can also be used to partially indicate trend of redbelly snake habitat. According to monitoring item 7, there were seven projects implemented that protected a total of three acres and 1.5 miles of riparian habitats across the Forest in FY06. These projects may have a small positive influence on the habitat trend for Black Hills redbelly snake.

According to monitoring item 8, stands dominated by aspen currently occupy approximately 45,559 acres on the Forest. This is a decline of about 600 acres from the amount reported in 2005 (46,172 acres). In 1995, they occupied 48,224 acres (USDA Forest Service 1996b). This is a decline of 2,665 acres since 1995, or five percent. Aspen stands have been replaced by pine and spruce in many areas of the Forest, and may have declined since pre-settlement times (USDA Forest Service 2005b p. 111-28). This may have resulted in a net loss of redbelly snake habitat. Objective 201 calls for the Forest to double the number or aspen acres. The Forest should strive toward that objective in order to improve habitat for the redbelly snake.

The Forest appears to be conserving habitat for the redbelly snake, but more progress is needed toward demonstrating improved riparian condition and increasing aspen habitats to enhance habitat.

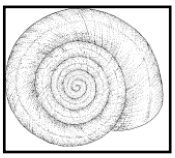
Amphibians -- Northern Leopard Frog

The leopard frog monitoring protocol calls for determining continued persistence at a rotating sample of 8 known occupied habitats (index sites) annually. The protocol was not funded in 2006. However, biologists did visit nine index sites. Leopard frogs were observed at seven of the nine sites. Of the two sites that did not have leopard frog present, one had no free water and one was visited in early spring which may have been too early to detect frog presence.

Five projects were implemented in 2006 that improved habitat conditions for leopard frogs by protecting stream or lake shorelines and upland vegetation. These projects improved habitat 18 acres of upland habitat and associated shoreline habitat along three miles of streams and 0.5 acre of ponds. These projects move the Forest towards achieving Forest Plan Objective 240-HAB.

Limited data suggest that the Forest is conserving habitat for the leopard frog, but additional monitoring is needed for a full assessment.

Invertebrates – Cooper's Mountainsnail



The Cooper's mountainsnail monitoring protocol calls for monitoring 20% of all known (Frest and Johannes 2002) mountainsnail sites annually, and tracking newly discovered sites. The protocol was not funded in 2006. See the Fiscal Year 2005 Monitoring Report on the Forest's web page http://www.fs.fed.us/r2/blackhills/projects/planning/index.shtml for the

latest report on this monitoring item.

Invertebrates – Regal Fritillary

The amount of grassland habitat on the Forest is the monitoring indicator for the regal fritillary. It is unlikely that all of the prairie grassland cover types offer suitable habitat for the regal fritillary, but refined habitat associations are not known in the Black Hills. As disclosed in monitoring item 8, grassland covertypes are found on 109,829 acres of the Forest, excluding wetland graminoids such as sedges and rushes. This is a slight decrease from 2005 estimates (109,888 acres), but is still higher than 1997 estimates (104,174 acres). The increase since 1995 could be due to mapping and reporting differences, since the general perception among Forest employees is that grassland habitats have actually been declining due to pine encroachment. Of the total grassland cover types, 84,013 acres are considered prairie grasslands, which are more likely than the other category (meadows) to provide fritillary habitat. This is a slight increase from 2005 estimates (83,559 acres). Projects across the Forest have been emphasizing meadow and grassland restoration through removal of pine encroachment. Some of this, particularly pine removal on the periphery of prairies, may contribute to habitat enhancement for the regal fritillary.

It appears that the Forest is conserving, and possibly enhancing habitat for the regal fritillary through meadow and grassland restoration projects. Better data on grassland associations, condition and trend are needed for a more accurate assessment.

Sub-Item: Fish – Finescale Dace and Lake Chub

Monitoring:

Finescale Dace

No new distribution, abundance or habitat data was collected in FY2006. See the Fiscal Year 2005 Monitoring Report on the Forest's web page http://www.fs.fed.us/r2.blackhills/projects/planning/index.shtml for the latest report on this species.

Evaluation:

Current finescale dace distribution is sporadic and has been influenced by past transplantation efforts primarily in the Redwater River Drainage. No finescale dace populations occur on the South Dakota portion of the Forest. Abundance is affected by natural events such as drought and presence of standing water habitat. This species' distribution and abundance will likely be improved by management efforts that enhance or create standing water habitat, such as beaver ponds, within the stream network.

Lake Chub

Historic accounts suggest the lake chub was more widely distributed across the Black Hills (Isaak et al. 2003). The only population of lake chub known to occur on the Forest is currently restricted to Deerfield Reservoir (Isaak et al. 2003), which impounds upper Castle Creek on the Mystic Ranger District.

Lake chub monitoring data has been collected by SDGFP on Deerfield Reservoir since 1994. The table below shows the number of lake chub collected and the Catch per Unit Effort (CPUE) based on gillnet sampling.

Gillnet sampling	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
# caught	N/A	N/A	N/A	15	155	55	11	6	4	3	1	2	1
CPUE*	114.3	105.5	109.0	3.8	38.8	13.8	2.8	1.5	0.6	0.8	0.3	0.5	0.25

*Catch Per Unit Effort equals the number of fish caught per gillnet set overnight.
Source: SDGFP 2001, SDGFP 2006 and SDGFP unpublished data

Evaluation:

The lake chub population in Deerfield Reservoir is in a downward trend, but it is certainly greater than when the reservoir was chemically renovated in 1982 to reduce the white sucker population (Isaak et al. 2003). Lake chub numbers declined substantially in 2000 and continue to remain low (SDGFP 2006). Deerfield Reservoir continues to fully support its assigned beneficial use of coldwater permanent fish propagation based on physical, chemical and biological criteria monitored by the State of South Dakota (SD DENR 2006). The downward population trend may be due to non-habitat related conditions, such as the interaction with other native or non-native aquatic species, but this is unknown. White suckers were first sampled in 1993 following the 1982 chemical treatment of the reservoir (SDGFP 2006) and their populations have increased. The SDGFP continued to remove white suckers in 2006 in order to reduce their numbers.

Monitoring Item 19: Emphasis Species - Species of Local Concern

Objective 221. Conserve or enhance habitat for R2 sensitive species and species of local concern (SOLC). Monitoring will be conducted at a Forest-wide level, not at the project level, and will be done for habitats or populations.

Mammals – Bats (Long-eared Myotis, Long-Legged Myotis, Northern Myotis, Small-Footed Myotis)

There are two monitoring indicators for the SOLC bats: roost protection measures, and availability of snags. Roost protection measures stem from Standards 3208 and 3209. Snag data are found in monitoring item 11, and correspond to Objective 211.

Protective Measures: There are three types of protective measures that are reported here: pre-closure mine evaluations, bat passage devices installed, and bat passage devices maintained. The table below shows the number of bat passage devices installed in caves and mines across the Forest. In 2006, seven mines were evaluated for bat habitat. One of these was recommended for a bat passage device in the future, the others were recommended for closure. In 2006, bat passage devices were installed at two mines. Several mines were closed (without passage) for public safety reasons. All of these mines were previously evaluated for bat habitat.

Disturbance: Seven bat roosts and/or bat passage devices (four caves and three mines) were monitored for signs of vandalism, incompatible uses, and non-compliance with established closure dates. All of these are protected with bat passage devices. Only one site, Davenport Cave, showed evidence of disturbance. The bat gate at Davenport Cave was repaired in FY 2006.

Snags: Monitoring item 11 displays that in FY06, there were 1.3 snags per acre >9" dbh and greater that 25 feet tall across conifer portions of the Forest, 23% of which (0.3 snags/acre) were >14" dbh (vegetation database, excluding large burned areas and mortality from insects). Both of these figures are lower than called for under Objective 211 (3 snags per acre, 25% of which are >14 inches dbh). The addition of recent wildfires and insect tree mortality results in more than three snags per acre well dispersed across the Forest (see Monitoring Item 11).

The Forest is largely conserving habitat for the SOLC bats.

Mammals – Meadow Jumping Mouse

The jumping mouse protocol tiers directly to monitoring item 6 (Riparian – Condition and Trend). No Forest-wide data on riparian resource condition was collected in FY2006. However, an indicator different than any of those disclosed in the monitoring implementation guide was

reported under item 7 of this report: projects to restore riparian and wetland habitat or rehabilitate stream reaches. This can also be used to partially indicate trend of jumping mouse habitat. According to monitoring item 7, there were seven projects implemented that protected a total of three acres and 1.5 miles of riparian habitats across the Forest in FY06. These projects may have a small positive influence on the habitat trend for meadow jumping mouse.

Limited data suggest that the Forest is conserving habitat for the meadow jumping mouse, but additional monitoring is needed for a full assessment. More progress is needed toward demonstrating improved riparian condition and increasing aspen habitats to enhance habitat.

Mammals – Northern Flying Squirrel

The flying squirrel monitoring indicator is the amount of preferred habitat. Preferred habitat is quantified in three ways: Acres of spruce cover type; acres of ponderosa pine in structural stage 5; and acres of ponderosa pine with very large tree size in structural stage 4C. These components tier directly to monitoring items 8, 9, and 10, respectively.

Acres of Spruce Covertype: As disclosed in monitoring item 8, the spruce covertype is found on 26,483 acres of the Forest. This is greater than the amount called for in Objective 239-LVD (20,000 acres) and an increase of about 1000 acres over the amount reported in 2005. In 1995, there were 21,737 acres of spruce, and in 1899, it was estimated at 15,000 acres (USDA Forest Service 1996b). This indicates a long-term increase in spruce. Fire suppression during the last century has allowed spruce to increase in abundance and density in the Black Hills. Relative to ponderosa pine, spruce is patchily distributed and in low abundance (USDA Forest Service 2005b p. III-24).

Acres of Structural Stage 5 Pine Stands: Structural Stage 5 is provided through Forest Plan Objectives 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204. These objectives guide the Forest to provide 5% of the pine in the five corresponding management areas in Structural Stage 5. The table below shows the amount of Structural Stage 5 in each of these Management Areas and Forest-wide. The Forest is below the Structural Stage 5 Objectives for Management Areas 4.1, 5.1, 5.4, 5.43, and 5.6. Progress towards the objective (5%) has been made for Management Areas 5.4 and 5.6, while acres of Structural Stage 5 have declined in Management Areas 4.1 and 5.1. Forest-wide there has been an increase in Structural Stage 5. Some of the change in acreage is likely due to efforts to more accurately inventory Structural Stage 5, rather than an increase in the amount occurring on the ground. For more information on structural stages, see Monitoring Item 9.

Acres of Structural Stage 5 for Management Areas with Structural Stage Objectives and Forest-wide, 2005-2006.

Management Area	2005[1]	2006[2]
4.1	232 (0.6%)	204 (0.6%)
5.1	467 (0.1%)	307 (0.1%)
5.4	525 (0.2%)	778 (0.3%)
5.43	52 (0.5%)	52 (0.5%)
5.6	28 (0.1%)	507 (2.6%)
Forest-wide	2,677	3,445

[1]Source: USDA Forest Service 2006
[2]See Monitoring Item 9

Acres of Structural Stage 4C Pine Stands with a Tree Size of Very large: Forest Plan Objectives 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204 guide the Forest to provide 10% of the combined structural stage 4 pine acreage (i.e., 4A, 4B and 4C) within the five corresponding management areas to have an average tree size of "very large" (i.e., ≥16" dbh). The Forest is above large tree objective for Management Areas 4.1, 5.1 and 5.6 (18%, 12% and 26%, respectively) and below the objective for Management Areas 5.4 and 5.43 (8% and 7%, respectively). Monitoring Item 10 shows that the Forest is above the large tree objectives for these

five management areas combined.

The table below shows the amount of Structural Stage 4C Forest-wide with a tree size of very large. The table shows an increase in the acres of Structural Stage 4C with a tree size of very large since 2005. For more information on stands with very large trees, see Monitoring Item 10.

Forest-wide Acres of Structural Stage 4C with a Tree Size of Very Large, 2005-2006.	
2005[1]	2006[2]
7,800	10,631
[1]Source: USDA Forest Service 2006 [2]Vegetation database	

The Forest is conserving habitat for the northern flying squirrel, but considerable progress toward meeting Structural Stage Objectives, particularly for Structural Stage 5, is still needed to enhance habitat.

Mammals – Ungulates (Rocky Mountain Bighorn Sheep, Mountain Goat)

The monitoring indicator for bighorn sheep and mountain goat are population estimates provided by the SDGFP. Both species are classified as big game animals by the state wildlife agency, and are hunted through a limited permit system.

The bighorn sheep is native to the Black Hills, but the original subspecies (Audubon's race) is no longer present here. The animals inhabiting the Forest today descended from introductions of the Rocky Mountain race (Higgins et al. 2000). In 2004, the bighorn sheep population estimate for the Forest (excluding Custer State Park) was 270 sheep (Huxoll 2005). The estimate in 2005 was 300 sheep. The estimate in 2000 was 175-200 animals (Smith 2001), indicating there has been a population increase. This information is summarized in the table below. The recent bighorn die-off from pneumonia that was observed in Custer State has not been recorded on the Forest.

Black Hills Bighorn Sheep Population Estimates, 2000-2005		
2000	2004	2005
175-200	270	300

Mountain goats are not native to the Black Hills, but were introduced in 1924 (Higgins et al. 2000). In 2005, the population estimate for mountain goats in the Black Hills was 90 animals (Huxoll 2006). In 2000, the estimate was 140-180 animals, indicating there has been a recent population decrease. These population estimates are summarized in the table below. Hunter harvest has been very low for this species (i.e., less than 5 animals per year; Huxoll 2005), so this is not likely the cause of the decline. Classic mountain goat habitat includes rocky subalpine and alpine zones above treeline, which does not exist in the Black Hills. Here, the species is associated primarily with rocky areas in the Harney Range (southern Hills), where it feeds on chokecherry and a tree lichen called old-man's beard (Higgins et al. 2000). Optimal habitat may be limited for this species in the Black Hills.

Black Hills Mountain Goat Populations Estimates, 2000-2005		
2000	2004	2005
140-180	125	90

It appears that the Forest is conserving habitat for the bighorn sheep. The cause of the decline of mountain goat populations is unknown. Potential theories on the cause for the decline include, high predator (mountain lion) numbers, genetics (all descendants from a small number of goats in 1924), or loss of habitat. The Forest

should work with South Dakota Game, Fish and Parks to determine if a change in habitat management is needed.

Birds – (American Dipper, Black-and-White Warbler, Broad-winged Hawk, Cooper's Hawk, Northern Saw-whet Owl, Pygmy Nuthatch, Sharp-shinned Hawk)

All of these bird species are considered uncommon or rare in the Black Hills (Tallman et al. 2002), and are typically too difficult and/or expensive to effectively monitor. Because little data is better than no data, the Forest will monitor all of these species except the American dipper through incidental observations. This type of monitoring does not allow meaningful assessment of Forest Plan objectives; therefore no attempt is made to do this. Incidental observations include data collected through the MBBH program. See monitoring item 21 (Emphasis Species – MIS, Non-game Birds section) for more information on the MBBH program.

American Dipper: Although the dipper is uncommon, it is easier to monitor than the other SOLC birds because it has a limited distribution and is fairly conspicuous in its stream habitat. Its breeding distribution in the Black Hills (and all of South Dakota) is limited primarily to Spearfish and Whitewood Creeks. No breeding population exists in the Bearlodge Mountains. The SDGFP monitors dipper during the breeding season and during winter. Lovett (2007) summarizes the information from 2006 monitoring.

American Dipper Nest Monitoring Results, 2004-2006			
	2004	2005	2006
Spearfish Creek			
Nesting Attempts[1]	39	42	36
Successful nests[1]	15	24	21
Nesting Success	39%	57%	51%
Whitewood Creek			
Nesting Attempts[1]	13	7	3
Successful nests[1]	9	5	1
Nesting Success	69%	71%	33%
[1]Source: Lovett 2007, Table 4			

Based on information from Lovett (2007), nesting attempts in Spearfish Creek have remained fairly stable over the last three years. Nesting success has increased, but additional monitoring is needed to determine long-term trends. Nesting attempts in Whitewood Creek have declined over the last three years and nesting success has been variable. The cause of this decline is unknown. Additional monitoring is needed to determine long-term trends.

Species of Local Concern Bird Incidental Observations, 2005-2006		
	2005	2006
Black-and-white Warbler	6	7
Broad-winged Hawk	21	3
Cooper's Hawk	13	6
Northern Saw-whet Owl	1	0
Pygmy Nuthatch	4	11
Sharp-shinned hawk	3	1
Source: NRIS FAUNA Database, MBBH data (Hutton et al. 2007)		

Black-and-White Warbler: This warbler is found mostly at lower elevations in the Black Hills. They are found primarily in bur oak woodlands and associated edges. Because these woodlands occur in canyon bottoms at low elevations, much of this species habitat may be on private land (Hutton et al. 2007). Seven were observed in 2006. Six observations were recorded along foothills riparian transects and one was recorded along a montane riparian transect. Most were in the Bear Lodge Mountains. The vegetative composition of these habitats has not been analyzed, but it is suspected that bur oak, green ash, aspen, and

other hardwoods are important, as is a dense understory of shrubs such as ninebark, chokecherry, hawthorn, and currants.

According to Monitoring Items 6, the Forest continues to move towards and riparian objectives. This is expected to help conserve and improve habitat for black-and-white warbler. Additional effort is needed to move towards the hardwood objective (201).

Broad-winged Hawk: This hawk is restricted primarily to the northern Black Hills and Bearlodge Mountains. Hutton et al. (2007) observed three broad-winged hawks along three montane riparian transects in 2006. This is lower than the number observed in riparian transects in 2005.

Monitoring Item 9 discusses the Forest's progress towards the structural stage objectives for Management Areas 4.1, 5.1, 5.4, 5.43 and 5.6. Progress is being made towards Objective 221, though it may take some time to achieve the desired amounts of some structural stages. For detailed information, see Monitoring Item 9.

Coopers Hawk: The Cooper's Hawk appears to be distributed through most of the Black Hills and Bearlodge Mountains, though it is fairly uncommon. The MBBH program has recorded the species in all of the major habitat types, with no obvious affinity for any one. Other Forest records show a majority of observations in the central Hills, but this may be an artifact of data entry patterns into the corporate database. Hutton et al. (2007) observed two individuals in 2006. One was along a montane riparian transect and one was along a foothills riparian transect. Four others were recorded in the NRIS FAUNA database. Monitoring Item 9 discusses the Forest's progress towards the structural stage objectives for Management Areas 4.1, 5.1, 5.4, 5.43 and 5.6. Progress is being made towards Objective 221, though it may take some time to achieve the desired amounts of some structural stages. For detailed information, see Monitoring Item 9.

Northern Saw-whet Owl: There are few documented observations of the saw-whet owl on the Forest, mainly because of the bird's nocturnal habits. None were reported in 2006. The saw-whet has been encountered four times by MBBH program surveyors, and two of these observations were not associated with any transect. However, according to Panjabi (2005), this species may be fairly common throughout most of the Black Hills forest types. Monitoring Item 9 discusses the Forest's progress towards the structural stage objectives for Management Areas 4.1, 5.1, 5.4, 5.43 and 5.6. Progress is being made towards Objective 221, though it may take some time to achieve the desired amounts of some structural stages. For detailed information on structural stages, see Monitoring Item 9.

Pygmy Nuthatch: The pygmy nuthatch is a rare but regular and widespread resident in the Black Hills. There are a total of 34 pygmy nuthatch records in the MBBH and NRIS Fauna wildlife databases. The three MBBH observations (Hutton et al. 2007) occurred along mixed-grass prairie and foothills riparian transects. The eight reported in the NRIS FAUNA database were observed just outside the Deadwood Gulch Motel in December, 2005.

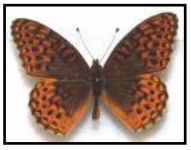
Forested habitats were not monitored by Hutton et al. (2007) in 2006. Monitoring Item 9 discusses the Forest's progress towards the structural stage objectives for Management Areas 4.1, 5.1, 5.4, 5.43 and 5.6. Progress is being made towards Objective 221, though it may take some time to achieve the desired amounts of some structural stages. For detailed information, see Monitoring Item 9.

Sharp-shinned Hawk: The sharp-shinned hawk occurs throughout the Black Hills, but is perhaps the rarest of the three accipiters. No sharp-shinned hawks were recorded during the MBBH (Hutton et al. 2007), but forested habitats were not monitored in 2006. One sharp-shinned hawk was observed in the Norbeck Wildlife Preserve by a Forest Service biologist.

Monitoring Item 9 discusses the Forest's progress towards the structural stage objectives for Management Areas 4.1, 5.1, 5.4, 5.43 and 5.6. Progress is being made towards Objective 221, though it may take some time to achieve the desired amounts of some structural stages. For detailed information, see Monitoring Item 9.

It is difficult to determine whether the Forest is achieving Objective 221 (conserve or enhance habitat) by examining incidental observations. The Forest appears to be achieving Objective 221 for these species through the achievement of hardwood, riparian, and structural stage objectives (see Monitoring Items 6, 8 and 9).

Invertebrates – Butterflies (Atlantis Fritillary, Tawny Crescent)



The monitoring indicator for the Atlantis fritillary tiers directly to monitoring item 6, which is the trend of riparian condition. No Forest-wide data on riparian resource condition was collected in FY2006. However, an indicator different than any of those disclosed in the monitoring implementation guide was reported under item 7 of this report: projects to restore riparian and wetland habitat or rehabilitate stream reaches. This can also be used to partially indicate trend of butterfly habitat. According to monitoring item 7, there were seven projects implemented that protected a total of three acres and 1.5 miles of riparian habitats across the Forest in FY06. These projects may have a small positive influence on the habitat trend for these butterflies.

Invertebrates – Snails (Callused Vertigo, Frigid Ambersnail, Mystery Vertigo, Striate Disc)

This monitoring protocol was not funded in 2006. There is no data to assess whether the Forest is achieving Objective 221 (conserve or enhance habitat) for the SOLC snails.

Monitoring Item 20: Emphasis Species – Threatened and Endangered Species

Objective 220. Conserve or enhance habitat for federally listed threatened, endangered and proposed species.

Threatened and Endangered Species

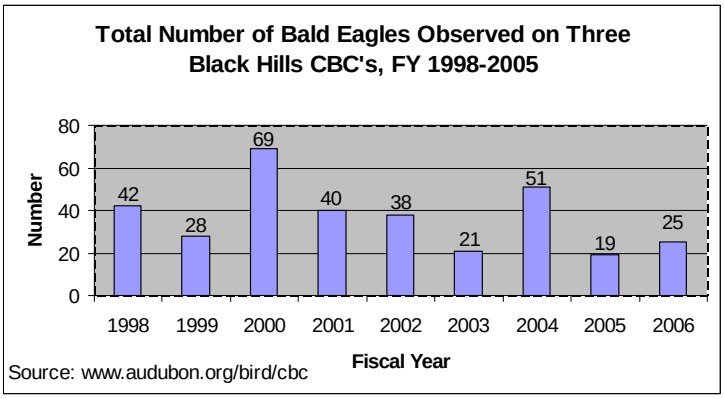
The bald eagle is the only threatened (T) or endangered (E) species with documented occurrence or suitable habitat in the Black Hills. Therefore, it is the only T or E species the Forest monitors.

Bald eagles winter in and migrate through the Black Hills. From October through March, eagles can frequently be seen feeding on road-killed animals (carrion), perched near unfrozen lakes or streams, or soaring in the sky.

Prior to FY 2005, the Forest monitored wintering bald eagles by recording sightings during normal work activities (i.e., incidental observations). While this method showed that eagles consistently use the Black Hills in high numbers, it did not provide a standardized or consistent effort in quantifying eagle numbers. Therefore, beginning with the FY 2005 monitoring report, the Forest has used data collected through the Audubon Christmas Bird Count (CBC) program. This change is not reflected in the current monitoring guide; therefore a summary of the protocol is provided below.

The CBC program is coordinated by the National Audubon Society. Volunteers choose one day between December 14th and January 5th annually, and tally all individual and species of birds observed in their designated CBC circle on that day. The circles are 15 miles in diameter, with permanent center points. Although the location and general timing of the surveys remain constant, other factors do not, and are a source of variation to the data. This includes the number of participants, observer skill levels, and weather.

Three CBC circles have been consistently monitored in the Black Hills region since the current Forest Plan has been in place. These are Rapid City, Spearfish and Sturgis. The total number of eagles observed on these three CBCs during this time period is presented in the chart below.



The chart shows that the number of eagles observed varies from year to year, despite a reasonably consistent method of tracking them. In point, the last three years have produced among the highest and lowest numbers of observations recorded during the past 9 years. This could be interpreted as a varying (non-linear) trend, but could just be a reflection of other factors that affect eagle detection or distribution, such as observer variability, the availability or distribution of carrion, or variability in weather conditions during the CBC counts.

Prior to FY 2006, there were no known traditional (repeated use) or communal roost sites in the Black Hills. In 2006, a night roosting area was discovered at Pactola Reservoir. Approximately 18 – 22 eagles were observed at the roost on four separate occasions between late December 2005 and late January 2006. The roost covers at least 100 acres of mature to late-successional ponderosa pine forest on very steep slopes. Large trees and snags are abundant. The site is adjacent to Pactola Reservoir, parts of which were not frozen during the time of the discovery. Further monitoring of this roost is needed to clarify the full extent of the roost and its importance to bald eagles.

In addition to the roost described above, bald eagles are also known to use transitory roost sites on the Forest. These are roosts that are not used repeatedly or on a consistent basis, and may be chosen based on proximity to a temporary food supply (e.g., carrion). Mature ponderosa pine trees provide suitable roost sites, and they are abundant across the landscape. Therefore, transitory roost sites do not appear to be a limiting factor on the Forest.

No nesting attempts had been recorded in the Black Hills until 2004, when a pair of bald eagles tended a nest in the southern Black Hills (USDA Forest Service 2005b). The eagles left the area later that spring without successfully nesting, and a subsequent attempt was not observed in 2005 or 2006. Neither the contents of the 2004 nest nor the reasons for the failed attempt are known. The nest site was approximately ¼ mile outside the Forest boundary on a reservoir in Custer State Park. Due to the close proximity to the Forest and the unprecedented reproductive behavior, eagles observed on the Forest during spring should be evaluated for potential nesting activity.

Monitoring Item 21: Emphasis Species – Management Indicator Species

Objectives:

238. The following are objectives for management indicator species (MIS). MIS will be monitored using trends in habitat; however, when available, population trends may be used as a strong indicator of management response. Monitoring will be conducted at a Forest scale and not at the project level. Population monitoring will be discretionary as provided by 219.14f.

a. Maintain or enhance habitat for ruffed grouse, beaver, song sparrow, grasshopper sparrow, white-tailed deer and brown creeper; as outlined in specific direction pertaining to aspen, other

hardwoods, riparian areas, grasslands, spruce and ponderosa pine (e.g., Objectives 201, 205, 211, 239-LVD, 5.1-204).

b. Maintain habitat opportunities for black-backed woodpeckers across the Forest, as outlined in specific direction pertaining to conifer habitat, snags and recently burned habitat (e.g., Objectives 211, 11-03, 5.1-204, Standard 2301).

c. Maintain habitat for golden-crowned kinglets, as outlined in specific direction pertaining to spruce habitat (e.g., Objective 239-LVD).

d. Maintain or enhance habitat quality and connectivity for mountain suckers, as outlined in specific direction pertaining to aquatic resources (e.g., Objectives 103, 104, 215, Standards 1201, 1203, 1205, Guideline 1115).

The MIS list was updated in the Phase II Forest Plan Amendment, and now includes nine species. These are: beaver, white-tailed deer, black-backed woodpecker, brown creeper, golden-crowned kinglet, grasshopper sparrow, ruffed grouse, song sparrow, and mountain sucker. Species-specific monitoring data follow below. Because some of these species have not been previously monitored, habitat and/or population trends may not yet be available.

Monitoring:

Mammals -- Beaver

Beaver are found in suitable habitat throughout much of North America. They use riparian habitats dominated by stands of willow, aspen or cottonwood (Streubel 1989). Beaver are absent from areas lacking permanent water and an adequate supply of suitable woody vegetation. The beaver's strong association with hardwood riparian areas is the basis for its selection as an MIS.

As outlined in the 2005 Monitoring Implementation Guide, both a habitat and population indicator will be used to monitor beaver on the Forest. The amount of aspen stands within 600 feet of perennial waters was identified to indicate maintenance or enhancement of beaver habitat on the Forest (Objective 238a) and progress toward restoring hardwoods in potential beaver habitat (Objective 201). Beaver food caches are used as an indicator of abundance.

Historically, beaver were heavily trapped in the Black Hills. By the late 1880s, populations were low and restricted to remote areas (Parrish et al. 1996). Beaver have increased since then and are now widely distributed in both South Dakota (Higgins et al. 2000) and Wyoming (Cerovski et al. 2004). Beaver can be legally harvested in both states, but hunting regulations moderate the effect on populations.

Food cache or other beaver population index monitoring did not occur in FY 2006. Baseline beaver surveys were conducted on the Forest during September 2004 (see FY 2004 monitoring report). Beaver and their habitats were most common in the Bearlodge Mountains and in the central Black Hills, although they were present in other areas as well. A total of 74 active and 5 inactive beaver colonies were observed on National Forest System lands during aerial and ground-based surveys. The current monitoring protocol specifies that food caches, not beaver colonies, be monitored. However, there is typically one food cache per active colony per year, so it can be assumed that 74 food caches were present in 2004. Assuming an average of 3.5 to 5.3 beaver per colony (Payne 1981), the current estimated population size in these colonies is between 259 and 392 beaver.

The reduction in beaver activity that occurred from heavy trapping likely caused a lowering of water tables and a subsequent loss of willows and other riparian vegetation (Parrish et al. 1996). These native plant species have often been replaced by less desirable non-native species such as Kentucky bluegrass and smooth brome. This, in conjunction with other factors, has resulted in reduced riparian habitat quality in the Black Hills since pre-European settlement occurred. The amount of aspen and other hardwoods on the Forest has

also declined (USDA Forest Service 2005b).

The habitat monitoring protocol specifies that the acres of aspen stands within 600' of perennial water will be monitored. This item was not monitored in FY2006. In FY2005, on the Black Hills National Forest, this amounted to 9,656 acres (See FY2005 Monitoring and Evaluation Report). An overlay of known beaver colonies on top of the aspen stands revealed that less than ¼ of the colonies coincided with the aspen. This indicates that the combination of aspen and perennial water is not a good predictor of beaver habitat. Therefore, the monitoring protocol will require revision in order to provide a better indicator of beaver habitat. Until that is completed, we will also present data on the total amount of aspen, and riparian condition as indicators of beaver habitat trend.

According to monitoring item 8, stands dominated by aspen currently occupy approximately 45,559 acres on the Forest. This is a decline of about 600 acres from the amount reported in 2005 (46,172 acres). In 1995, they occupied 48,224 acres (USDA Forest Service 1996b). This is a decline of 2,665 acres since 1995, or five percent. Aspen stands have been replaced by pine and spruce in many areas of the Forest, and may have declined since pre-settlement times (USDA Forest Service 2005, p. 111-28). This may have resulted in a net loss of beaver habitat. Objective 201 calls for the Forest to double the number or aspen acres. The Forest should strive toward that objective in order to improve habitat for beaver.

Acres Dominated by Aspen on the Black Hills National Forest, 1995-2006		
1995[1]	2005[2]	2006[3]
48,224	46,172	45,559
[1]Source: USDA Forest Service 1996 [2]Source: USDA Forest Service 2006 [3]See Monitoring Item 8		

No Forest-wide data on riparian resource condition was collected in FY2006. However, an indicator different than any of those disclosed in the monitoring implementation guide was reported under item 7 of this report: projects to restore riparian and wetland habitat or rehabilitate stream reaches. This can also be used to partially indicate trend of beaver habitat. According to monitoring item 7, there were seven projects implemented that protected a total of three acres and 1.5 miles of riparian habitats across the Forest in FY06. These projects may have a small positive influence on the habitat trend for beaver.

Evaluation:

The long-term beaver population trend has increased in the Black Hills since heavy trapping has been moderated by hunting regulations. The Beaver Monitoring Protocol was not implemented in FY2006.

Riparian habitats have decreased in quality since European settlement, and the total amount of aspen has decreased over at least the past 30 years. Both of these indicate a long-term declining habitat trend for beaver. More recent, shorter-term riparian trends are unknown but are important to determine through monitoring items 6 and 7. Small riparian protection projects that have improved riparian conditions in some areas contribute to achievement of Objective 238, but additional riparian monitoring and habitat restoration projects are warranted for a better assessment of benefits to beaver. According to USDA Forest Service (2005b), changes in habitats and populations will likely be slow, and may take decades to distinguish.

Mammals -- White-tailed Deer

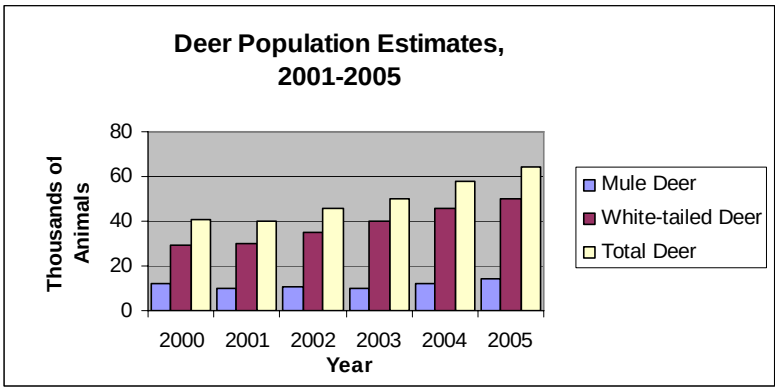
Forest Plan Objective 217 supports habitat management for 60,000 white-tailed and mule deer combined in South Dakota. This figure matches the SDGFP population objective for the Black Hills (USDA Forest Service 1996b p. 349). The WYGFD has not set a specific Black Hills population objective. Neither state agency has released 2006 population estimates; therefore, 2005 is the latest data reported here. The South Dakota white-tailed deer population is almost

four times larger than the mule deer population, and has increased since 2000 (see chart). In 2005, there were an estimated 14,000 mule deer, 50,000 white-tailed deer, and 64,000 total deer (Huxoll 2006). The combined deer populations are now above state's objective.

The Arc Habitat Suitability Index (ArcHSI) model was not scheduled for reporting in the Fiscal Year 2006 Report. See the Fiscal Year 2005 Monitoring Report on the Forest's web page http://www.fs.fed.us/r2/blackhills/projects/planning/index.shtml for the latest report on Habitat Suitability Index.

Evaluation:

The Black Hills white-tailed deer population trend has increased about 20,000 animals (66%) between 2000 and 2005. The Forest-wide summer habitat trend is increasing, and winter habitat trend is stable to slightly decreasing (see Fiscal Year 2005 Monitoring report). The Forest is meeting Objective 217. The Forest is meeting Objective 238a with respect to summer habitat, but may not be maintaining winter habitat.



NON-GAME BIRDS

In 2001 the Forest began funding the Rocky Mountain Bird Observatory (RMBO) to monitor long-term trends of bird populations through point-count transect surveys. The monitoring program is titled *Monitoring Birds of the Black Hills* (MBBH). Results are reported to the Forest annually (Panjabi 2001, 2003, 2004, and 2005; Beason et al. 2006; Hutton et al. 2007). Ten habitats throughout the Forest are being monitored: white spruce, northern hills ponderosa pine, southern hills ponderosa pine, late-successional ponderosa pine, aspen, pine-juniper shrubland, mixed-grass prairie, montane riparian, foothill riparian, and burn area (mainly the Jasper fire of 2000). Not all habitats will be monitored in all years, and adjustments in habitat classifications and transect locations have been and may continue to be necessary as we refine the monitoring program. The monitoring is designed to provide rigorous population trend data on most regularly occurring diurnal (day active) breeding species in the Black Hills using a statistically sound sampling design. The species sampled include all of the non-game MIS birds (i.e., black-backed woodpecker, brown creeper, golden-crowned kinglet, grasshopper sparrow, and song sparrow). Trends in abundance may be less clear for rare species or those with highly variable occurrences; however, the monitoring program will provide insight into other population characteristics such as distribution and habitat associations.

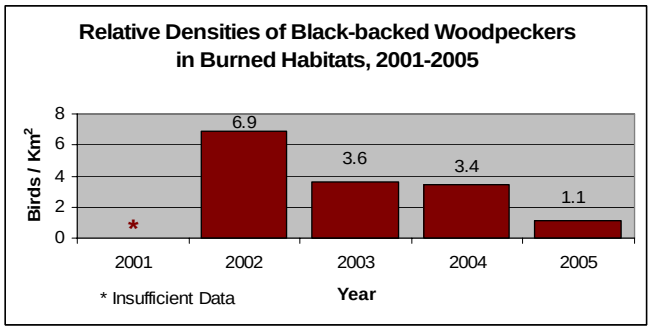
In 2006, RMBO sampled 1,148 point-count stations along 80 transects in three habitats. The habitats were: foothills riparian, montane riparian, and mixed-grass prairie. A total of 124 breeding bird species were detected, including several of the MIS species discussed below. Additional results are found in Hutton et al. (2007). This was the sixth year of a long-term monitoring effort; continued monitoring is needed to detect long-term trends. However the Forest is obtaining valuable preliminary data on species densities and habitat associations crucial to long-term trend detection and evaluation of management effects.

The MBBH program is the source of data for all of the non-game bird MIS accounts provided below, unless otherwise indicated. This includes the distribution maps displayed in each "Evaluation" section.

Non-Game Birds -- Black-backed Woodpecker

Relative Densities in Preferred Habitats: In the Black Hills, black-backed woodpeckers are highly associated with ponderosa pine forests that: 1) are recently burned (i.e., within 5 yrs), or 2) have high

bark beetle populations. Another important habitat for this woodpecker is healthy ponderosa pine forests that have dense mature or late successional structure (i.e., structural stages 4c and 5). This third habitat type is especially important when neither recently burned areas or high beetle populations are available.

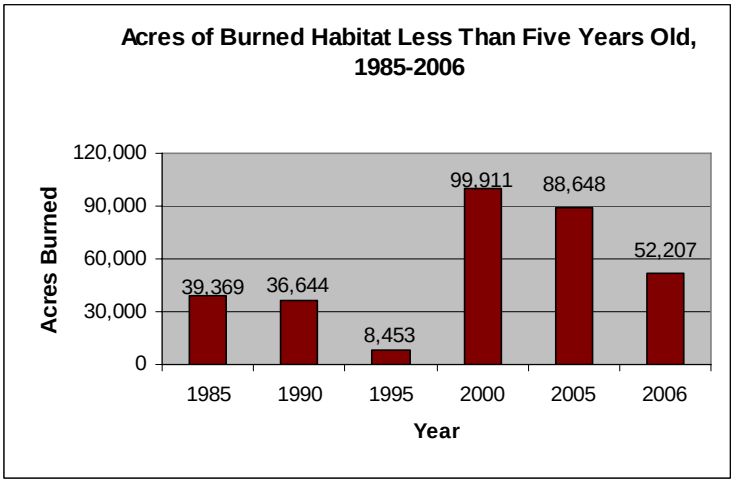


Burned habitats were not monitored in 2006. Burned areas were monitored from 2001 through 2005. Burned area transects are located almost exclusively within the Jasper Burn. This burn is now seven years old, and exceeds the age preferred by black-backed woodpeckers. Also, because the Jasper Burn is limited to the southwestern Black Hills, the transects are not well-distributed across the Forest. Density data for burned habitat (Jasper Burn) for 2001-2005 are provided in the adjacent chart. Black-backed woodpecker observations were too infrequent in 2001 to calculate a reliable density estimate, but by 2002, populations soared to their all-time high of almost 7 birds per km^2. Each year since then, the density estimate has dropped, and in 2005, just over 1 bird per km^2 was recorded.

Structural stages 4c and 5 are both included in MBBH's late successional habitat. Although this is different than how the Forest defines late succession, it matches the third habitat definition given above for black-backed woodpeckers. Late succession by the MBBH definition was monitored in 2001, 2002, and 2004. The habitat was not monitored in 2003, 2005 or 2006. Of the years monitored, black-backed woodpecker observations were sufficient for density estimate calculations only in 2002. In that year, 1.3 birds per km^2 were estimated to occur in MBBH's late successional habitat.

The MBBH program does not specifically monitor areas with high mountain beetle populations, so no density estimates are available from this methodology. However, Rumble (2002) used Emlen transects to measure black-backed woodpecker densities in the heavily infested Beaver Park area of the Black Hills. He found approximately 9 birds per km^2 in the areas with the highest beetle activity. No subsequent estimates are available beyond this 2002 data.

Acres of Preferred Habitat – Burned Areas: According to monitoring item 12, a total of 866 acres were burned by wildfires in 2006. None of these acres were subsequently salvaged. The total acreage of these fires that was stand-replacing is unknown. A total of 52,207 acres of large wildfires have burned in the preceding five years (i.e., 2002-2006), which is the time period considered to be 'recently burned' in Objective 11-03. However approximately 160 acres of the 633 acre Pass Creek Fire was stand-replacing.



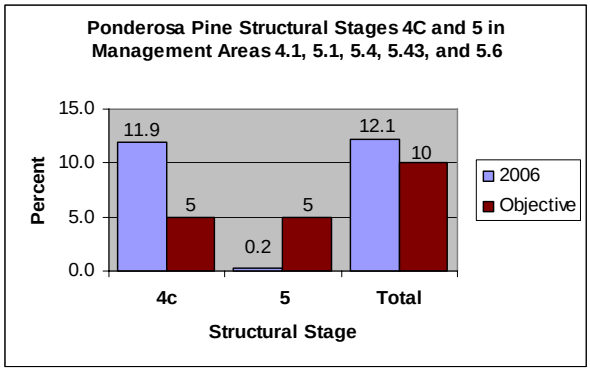
The adjacent chart displays the number of acres affected by large wildfires over the past 25 years. The data were obtained from the corporate GIS fire coverage, and include all covertypes, fire intensities, and salvage status because more specific data were not available. Given the preponderance of ponderosa pine across the Forest, and the low salvage rate demonstrated over the past five years, it is assumed that most of these areas could have provided foraging habitat for black-backed woodpeckers.

The Roger's Shack and Elk Mountain II

fires (2001) are no longer considered recent fires as defined in Objective 11-03. Still, because of other fires since 2002 (Grizzly Gulch, Battle Creek, Little Elk, Sheldon, Red Point Ricco, and Cement), there is a relatively high amount of potential burned habitat available on the Forest.

Acres of Preferred Habitat – Bark Beetle Infestations: As shown in the graph in monitoring item 23, beetle-caused tree mortality became notable in 2001. In 2006, estimated beetle caused tree mortality was lower than estimates 2001 - 2004. However, this may be due to a number of factors, including removal of green infested trees prior to beetle flight and differences in mapping techniques. According to monitoring item 23, the overall trend of the Forest is still for an increasing beetle situation.

Acres of Preferred Habitat – Dense Mature and Late Successional Stands: Forest Plan Objectives 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204 guide the Forest to providing 5% of the pine in these management areas in structural stages 4C and 5 (i.e., 10% total), partly to ensure habitat for the woodpecker. Monitoring item 9 displays structural stage data, and pertinent parts of it are summarized in the subsequent text and chart. In 2006, there was almost twice as much 4c available (105,268 acres) than is desired by the Forest Plan objectives, and very little structural stage 5 exists (2,207 acres). The structural stages are not well balanced when judged against the objectives (see chart). However, when added together, 12.1% of the management areas provide woodpecker habitat. This is slightly more than the 10% specified by the Forest Plan. Assuming these structural stages are equal in habitat quality, there is currently about 2% more woodpecker habitat available than called for by the Plan.

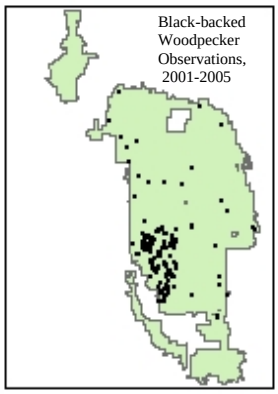


Structural stage data by covertype and management area are not available for 1995, and therefore a direct comparison can not be made to that time period. However, structural stage data are available for all management areas combined (i.e., Forest-wide). The adjacent table shows the amount of Structural Stage 4C and 5 Forest-wide, 1995-2006. Structural Stage 5 decreased from 1995 to 2005, but has begun to increase again in 2006. Similarly, Structural Stage 4C has increased since 1995. Some of this change is likely due to mapping and database corrections rather than a change on the ground. The total combined 4C and 5 has remained fairly stable since 1995. Monitoring Item 9 discusses the Forest's progress towards the structural stage objectives for Management Areas 4.1, 5.1, 5.4, 5.43 and 5.6. Progress is being made towards Objective 238, though it may take some time to achieve the desired amounts of some structural stages. For detailed information, see Monitoring Item 9.

Structural Stage 4C and 5 Forest-wide, 1995-2006

	1995*	2005**	2006
Structural Stage 4C	114,798	135,694	134,533
Structural Stage 5	22,409	2,677	3,445
4C & 5 Combined	137,207	138,371	137,978

*Source: USDA Forest Service 1996
**Source; 2005 Monitoring report



Evaluation:

The black-backed woodpecker is distributed widely in low densities throughout most of the Black Hills. In the southwestern portion of the Forest, where numerous wildfires have recently occurred, the species has been observed much more frequently, and in higher densities. The adjacent map, which was generated from MBBH data, does not show occurrences in the Bearlodge Mountains; however, other Forest records confirm species presence there as well (Stefanich 2006).

The MBBH program was designed to statistically detect population trends over a longer time period than the five years that it has been implemented. Natural variability in the data and other factors preclude a short-term, meaningful analysis. However, a less rigorous population trend analysis reveals a notable increase and subsequent decrease in black-backed woodpecker densities over the past five years in burned habitat. This pattern of rapid colonization and subsequent decline is consistent with findings of other studies (Anderson 2003), and is not a cause for alarm. As displayed under the burned habitat analysis above, the Jasper Burn is not a recent burn anymore, and it stands to reason that the sampled transects revealed low woodpecker densities this year.

The MBBH program did not monitor burned habitat in 2006.

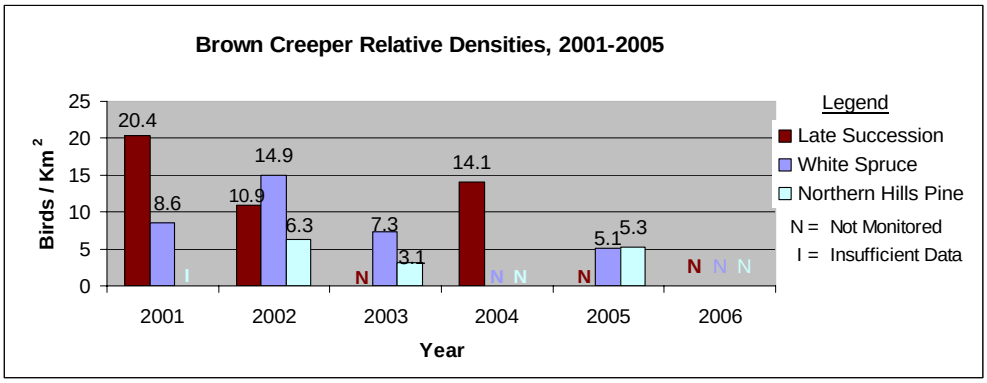
Burned habitat has declined as large fires that burned prior to 2002 have aged and become less valuable as Black-backed habitat. Still, because of other fires since 2002, there is a relatively high amount of potential habitat available on the Forest.

Habitat provided from mountain pine beetle is abundant when compared to 10 years ago and appears to be increasing. Forest-wide, dense mature and late successional habitats appear stable over the past decade. Structural stages 4C and 5 are considerably out of balance, but when combined, they slightly exceed the total amount called for in Objectives 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204.

Determining a Forest-wide habitat trend that combines all three habitat types is difficult at best. However, given that all types are relatively abundant when compared to 10-25 years ago, the long-term (10-25 year) habitat trend has shown a large increase. In the past few years, the habitat trend appears to be stable as recently burned areas have declined (aged) and insect caused tree mortality continues to increase. Monitoring Item 9 discusses the Forest's progress towards the structural stage objectives for Management Areas 4.1, 5.1, 5.4, 5.43 and 5.6. Progress is being made towards the structural stage objectives, though it may take some time to achieve the desired amounts of some structural stages. Additional time is needed to inventory and grow more Structural Stage 5. For detailed information, see Monitoring Item 9. Overall, habitat is relatively abundant, and it appears that Objective 238b is being met.

Non-Game Birds -- Brown Creeper

Relative Densities in Preferred Habitats: In the Black Hills, brown creepers are highly associated with late successional pine forests (structural stages 4C and 5) and spruce forests (Panjabi 2005). These habitats were not monitored in 2006 (Hutton et al. 2007). See the chart below for annual density estimates for spruce, late successional pine, and pine north habitat types since 2001.



Acres of Preferred Habitats: The table below is based on information from Monitoring Items 8 and 9 and USDA Forest Service (1996b, p. III-134). Based on this information, brown creeper habitat appears relatively stable on the Forest. Preferred habitat has increased about three percent since 1995.

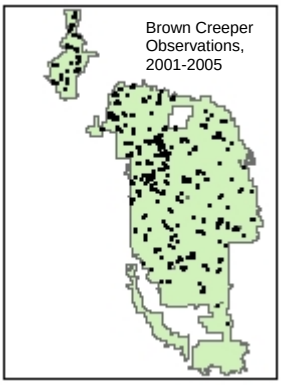
Acres of Preferred Brown Creeper Habitat, 1995-2006			
	1995[1]	2005[2]	2006[3]
White Spruce	21,737	25,462	26,483
Late Successional Pine	137, 207	134,129	137,978
Total	158,944	159,591	164,461
[1]Source: USDA Forest Service 1996 [2]Source: USDA Forest Service 2006 [3]See Monitoring Items 8 and 9			

Large trees are also an important habitat component for brown creepers. Forest Plan Objectives 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204 guide the Forest to provide 10% of the combined structural stage 4 pine acreage (i.e., 4A, 4B and 4C) within the five corresponding management areas to have an average tree size of "very large" (i.e., ≥16" dbh). Forest is above large tree objective for Management Areas 4.1, 5.1 and 5.6 (18%, 12% and 26%, respectively) and below the objective for Management Areas 5.4 and 5.43 (8% and 7%, respectively). Monitoring Item 10 shows that the Forest is above the large tree objectives for these five management areas combined. The table below shows the amount of Structural Stage 4C Forest-wide with a tree size of very large. The table shows an increase in the acres of Structural Stage 4C with a tree size of very large since 2005. For more information on stands with very large trees, see Monitoring Item 10.

Forest-wide Acres of Structural Stage 4C with a Tree Size of Very Large, 2005-2006.	
2005[1]	**2006[2]**
7,800	10,631
[1]Source: USDA Forest Service 2006 [2]Vegetation database	

Evaluation:

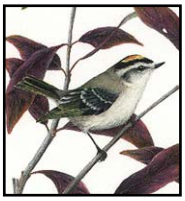
Five years of MBBH data suggests the brown creeper is well distributed throughout the Black Hills (see map). Overall, the species occurs in fairly low densities across the Forest, but it is most abundant in late successional pine forests and white spruce habitats.



The MBBH program was designed to statistically detect population trends over a longer time period than the five years that it has been implemented. Natural variability in the data and other factors preclude a short-term, meaningful analysis. However, a less rigorous analysis of the data presented in the chart above reveals varying densities across the years, with no obvious upward or downward Forest-wide population trend.

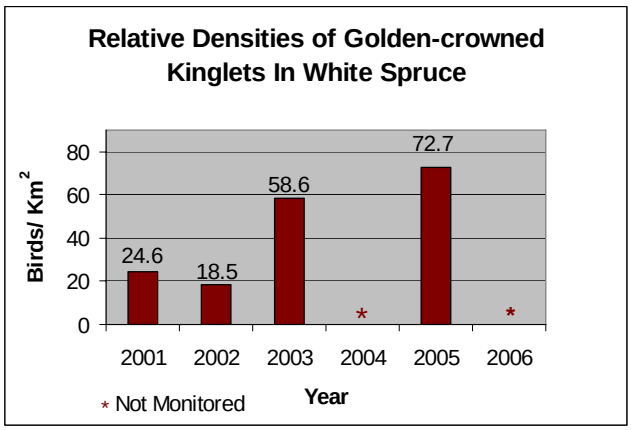
The Forest-wide habitat trend, as determined by comparing acres of preferred habitat available in 2006 with that in 1995, is stable. Monitoring Item 9 discusses the Forest's progress towards the structural stage objectives for Management Areas 4.1, 5.1, 5.4, 5.43 and 5.6. Progress is being made towards the structural stage objectives, though it may take some time to achieve the desired amounts of some structural stages. Continued effort is needed to promote Structural Stage 5. For detailed information, see Monitoring Item 9. It appears that Objective 238a is being met, though efforts are still needed to promote Structural Stage 5.

Non-Game Birds -- Golden-crowned Kinglet



Relative Densities in Preferred Habitats: In the Black Hills, the golden-crowned kinglet is highly associated with white spruce. This is the basis for its MIS status. Spruce was not monitored in 2006 in the MBBH program. The most recent data is from 2005. Kinglet densities were higher in spruce in 2005 than in any other year, with 72.7 birds detected per km^2. This is approximately four times higher than it was in 2002, which was the year with the lowest recorded density thus far.

In 2005, kinglets were numerous enough to calculate density estimates in other habitats besides spruce or late successional pine. The habitats (and density estimates in birds/km^2) were: pine north (19.3), foothills riparian (9.0), and montane riparian (5.2). Birds were also detected in pine south, but in insufficient density to calculate an estimate. In previous years, the birds have also been detected in low numbers in aspen habitats. These habitats were not monitored in 2006

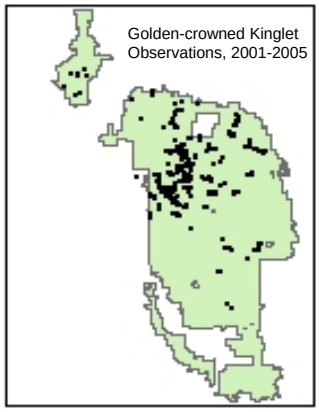


Acres of Preferred Habitat: The table below shows the acres of white spruce habitat based on information from Monitoring Item 8. In 1995, there were 21,737 acres of spruce, and in 1899, it was estimated at 15,000 acres (USDA Forest Service 1996b). Based on this information, kinglet habitat appears relatively stable or slowly increasing on the Forest. Fire suppression during the last century has allowed spruce to increase in abundance and density in the Black Hills. Relative to ponderosa pine, spruce is patchily distributed and in low abundance (USDA Forest Service 2005b p. III-24).

Acres of Preferred Golden-crowned Kinglet Habitat, 1995-2006			
	1995[1]	2005[2]	2006[3]
White Spruce	21,737	25,462	26,483

[1]Source: USDA Forest Service 1996
[2]Source: USDA Forest Service 2006
[3]See Monitoring Items 8

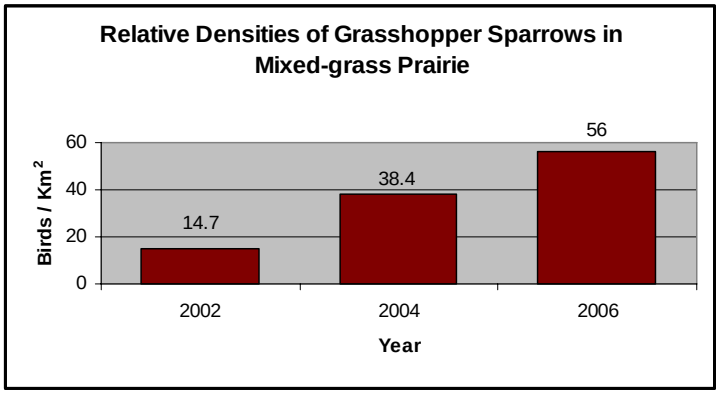
Evaluation:



Four years of MBBH data suggests the golden-crowned kinglet is distributed primarily in the northern half of the Black Hills, although it is also found in more localized areas of the southern Hills and Bearlodge Mountains as well (see map). The MBBH program was designed to statistically detect population trends over a longer time period than the five years that it has been implemented. Natural variability in the data and other factors preclude a short-term, meaningful analysis. However, a less rigorous population trend analysis suggests an increase over the past five years. Habitat trend for the golden-crowned kinglet has increased over the long-term. More recent trends appear to be stable. It appears the Forest is meeting objective 238a.

Non-Game Birds -- Grasshopper Sparrow

Relative Densities in Preferred Habitats: In the Black Hills, the grasshopper sparrow is highly associated with mixed-grass prairie. This is the basis for its MIS status. Mixed-grass prairie was monitored this year in the MBBH program, as it was in 2002 and 2004. Results from those years are presented in the chart below. Density estimates have continued to increase since first monitored in 2002. According to Panjabi (2003), this could be a temporary phenomenon attributable to the prolonged drought that has occurred over much of the western Great Plains, which normally provide better breeding habitat than the Black Hills. Refined and expanded sampling may also explain some of the change (Panjabi 2004).

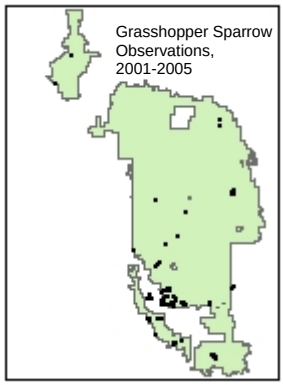


In addition to being found in the mixed-grass prairie habitat, the grasshopper sparrow has also been recorded in small numbers within burned, foothills riparian, montane riparian, pine north, and shrub habitats. Density estimates cannot be calculated for those habitats due to the small number of individuals observed.

Acres of Preferred Habitat: As disclosed in monitoring item 8, grassland cover types are found on 109,829 acres of the Forest, excluding wetland graminoids such as sedges and rushes. This is a slight decrease from 2005 estimates (109,888 acres), but is still higher than 1997 estimates (104,174 acres). The increase since 1995 could be due to mapping and reporting differences, since the general perception among Forest employees is that grassland habitats have actually been declining due to pine encroachment. Of the total grassland cover types, 84,013 acres are considered prairie grasslands, which are more likely than the other category (meadows) to provide sparrow habitat. This is a slight increase from 2005 estimates (83,559 acres). Projects across the Forest have been emphasizing meadow and grassland restoration through removal of pine encroachment. Some of this, particularly pine removal on the periphery of prairies, may contribute to habitat enhancement for the grasshopper sparrow.

Evaluation:

The MBBH program shows that the grasshopper sparrow is well distributed in the native mixed-grass prairies of the southern Black Hills and Elk Mountains, and locally in the isolated prairies further north (see map).



The MBBH program was designed to statistically detect population trends over a longer time period than it has been implemented. Natural variability in the data and other factors preclude a short-term, meaningful analysis. However, a less rigorous analysis of the data presented in the table above suggests an upward Forest-wide population trend between 2002 and 2004. However, this may not be a trend, but instead a short-term phenomenon. According to Panjabi (2003), it is possible that numbers will decrease in future years as habitat becomes more suitable again on the Great Plains. Further monitoring through the MBBH program is expected to clarify trends.

The Forest's vegetation database shows increased acres of Black Hills grassland covertypes since 1995 (See Monitoring Item 8). Projects across the Forest have been emphasizing meadow and grassland restoration through removal of pine encroachment. Some of this, particularly pine removal on the periphery of prairies, is likely contributing to an increased habitat trend for the grasshopper sparrow. However, changes in mapping and reporting methods

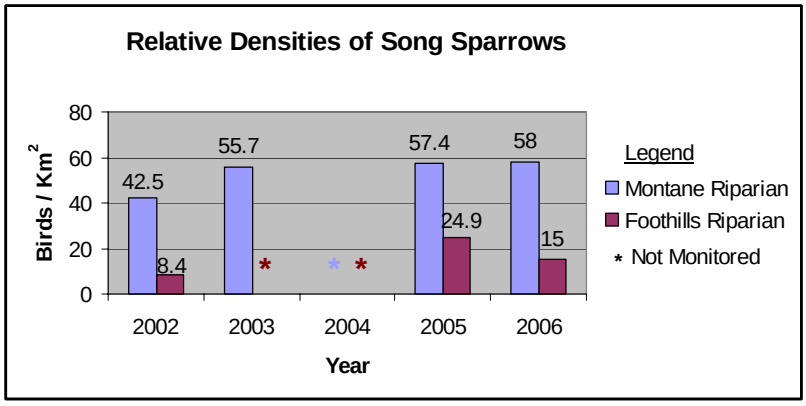
might contribute to at least some of the difference. More consistent habitat monitoring and mapping techniques are expected to provide clearer habitat trends in the future.

Non-Game Birds -- Song Sparrow

Relative Densities in Preferred Habitats: In the Black Hills, the song sparrow is strongly associated with riparian habitats. This is the basis for its MIS status. Both the foothills and montane riparian habitats were monitored in 2006.

Density data from 2006 and other years in which monitoring occurred are presented in the chart below. Densities have been considerably (2 to 5 times) higher in montane riparian than in foothills riparian. Montane riparian habitats show relatively stable song sparrow densities since 2003, with only small increases. Foothills riparian habitat shows a decrease in song sparrow densities compared to 2005, but is still higher than 2002.

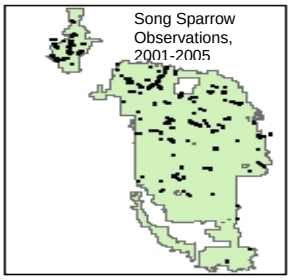
The song sparrow has also been detected within each of the remaining eight habitats sampled by the MBBH program since monitoring began in 2001. However, the sparrow's occurrence in these habitats is more likely an artifact of adjacent riparian vegetation than a preference for the sampled habitats. Furthermore, observations are usually too infrequent to calculate a reliable density estimate. Therefore, no data on these habitats is presented here.



Trend in Condition of Preferred Habitat: This sub-item tiers directly to monitoring item 6: Riparian – Condition and Trend. No Forest-wide data on riparian resource condition was collected in FY2006. However, an indicator different than any of those disclosed in the monitoring implementation guide was reported under item 7 of this report: projects to restore riparian and wetland habitat or rehabilitate stream reaches. This can also be used to partially indicate trend of song sparrow habitat. According to monitoring item 7, there were seven projects implemented that protected a total of three acres and 1.5 miles of riparian habitats across the Forest in FY06. These projects may have a small positive influence on the habitat trend for song sparrows.

A long-term evaluation of riparian areas shows a decline in habitat quality compared to pre-settlement conditions (i.e., 120 years ago). Willows have decreased, and less desirable non-native species such as Kentucky bluegrass and smooth brome have increased. This, in conjunction with other factors, has resulted in reduced riparian habitat quality in the Black Hills since pre-European settlement occurred (Parrish et al. 1996; see beaver section in this monitoring item for more information).

Evaluation:



Data from the MBBH program show that the song sparrow is well distributed throughout the northern Black Hills and Bearlodge Mountains, with a more localized distribution in the central and southern Hills (see map).

The MBBH program was designed to statistically detect population trends over a longer time period than it has been implemented. Natural variability in the data and other factors preclude a short-term, meaningful analysis. However, a less rigorous analysis of the data presented in the chart above suggests stable

Forest-wide population trend since 2003. Riparian habitats have decreased in quality since the pre-European settlement era, indicating a long-term declining habitat trend. More recent, shorter-term riparian trends are unknown but are important to determine through monitoring items 6 and 7. Small riparian protection projects that have improved riparian conditions in some areas may contribute to achievement of Objective 238a, but additional monitoring and habitat restoration projects are warranted for a better assessment.

GAME BIRDS

Monitoring:

Game Birds – Ruffed Grouse

The ruffed grouse is a year-round resident in the Black Hills. It occurs widely but in low abundance (Panjabi 2003). The species may require a variety of aspen structural stages to thrive, including late successional aspen for drumming logs and most other stages for buds and catkins (SAIC 2005). The strong association between ruffed grouse and aspen is the basis for the bird's MIS status.

The SDGFP collected ruffed grouse data along transects in 2003 (Wrede 2004). These transects crossed a variety of habitat types in the northern and central Black Hills, and are presented in the adjacent table.

Ruffed Grouse	Estimated Density in 2003 (birds/lineal mile)
All Routes Combined	0.16
Routes - Grouse Detected	0.28

The Forest is currently working with the SDGFP and the Rocky Mountain Research Station to develop a new monitoring protocol for ruffed grouse. Data is expected to be collected for the first time in April, 2007. The data collected through this protocol will serve as baseline data for trend assessments.

Ruffed grouse are also detected through the MBBH program. However, because the peak period for detecting grouse occurs before the MBBH sampling season starts, it is a less accurate method for estimating densities. Therefore, no MBBH data are presented for ruffed grouse.

According to monitoring item 8, stands dominated by aspen currently occupy approximately 45,559 acres on the Forest. This is a decline of about 600 acres from the amount reported in 2005 (46,172 acres). In 1995, they occupied 48,224 acres (USDA Forest Service 1996b). This is a decline of 2,665 acres since 1995, or five percent. Aspen stands have been replaced by pine and spruce in many areas of the Forest, and may have declined since pre-settlement times (USDA Forest Service 2005b p. 111-28). This may have resulted in a net loss of ruffed grouse habitat. Objective 201 calls for the Forest to double the number or aspen acres. The Forest should strive toward that objective in order to improve habitat for ruffed grouse.

Acres Dominated by Aspen on the Black Hills National Forest, 1995-2006		
1995[1]	2005[2]	2006[3]
48,224	46,172	45,559

[1]Source: USDA Forest Service 1996
[2]Source: USDA Forest Service 2006
[3]See Monitoring Item 8

Evaluation:

The monitoring program for ruffed grouse is in its infancy, and information presented here are considered baseline data. Forest-wide population trend data are not yet available, but a monitoring protocol to collect the necessary information is currently being developed. The Forest-wide habitat trend loss of aspen over the past 11 years is slightly downward.

Sub-Item: Fish – Mountain Sucker

Objective 238d. Maintain or enhance habitat quality and connectivity for mountain suckers, as outlined in specific direction pertaining to aquatic resources (e.g. Objectives 103, 104, 215, Standards 1201, 1203, 1205, Guideline 1115).

Monitoring:

The SDGFP sampled fish populations on eight streams where mountain suckers have been historically recorded on the Forest. A total of 24 sites were sampled. Mountain sucker were collected at only one site on North Fork Rapid Creek.

In 2006, data was collected to assess stream connectivity and fish passage at road-stream crossings in the Mitchell and Norbeck project areas. Mountain suckers are documented in Battle, Iron and Spring creeks in or adjacent to these project areas. See Monitoring Item 4 (Stream Health) for additional information on the road-stream crossing inventory.

Evaluation:

The Forest-wide population trend for mountain sucker is one of decline when comparing present occurrence to past distribution from surveys in the 1960s and mid-1980s. Quantitative population trend data for the mountain sucker was presented in the Forest Plan Phase II Amendment Final Environmental Impact Statement (USDA Forest Service 2005b). Mountain sucker numbers and distribution are affected by the ongoing drought, which reduces or eliminates stream habitat. Reoccupancy of this habitat may be limited due to instream barriers that prohibit the movement of mountain suckers when more favorable stream flows return. Interaction with non-native fish species may also have reduced the number and/or distribution of mountain suckers over time. The implementation of Forest Plan standards and guidelines, Regional Watershed Conservation Practices and Best Management Practices contribute to maintaining or enhancing aquatic and riparian habitat for the mountain sucker.

The majority of road-stream crossings (Battle Creek ≈65%, Iron Creek ≈84% and Spring Creek ≈90%) surveyed in the two project areas maintain stream connectivity because they mimic the natural stream condition. Fish passage problems were generally associated with metal culverts, whereas bridges and low-water crossings (fords) usually are not a problem. Some “problem” crossings occur on roads under state or county jurisdiction. Other instream structures, such as Mitchell Dam on Spring Creek and Lakota Dam on Iron Creek, negatively affect stream connectivity because mountain sucker passage at these structures is restricted or lacking.

Monitoring Item 22: Noxious Weeds

230. Eradicate or limit spread (acres) of new introductions of non-native pests (insects, diseases, plants) to minimize ecosystem disruption.

231. *Prevent new infestations and manage to reduce established noxious-weed infestations. Treat at least 8,000 acres per year during the next ten years to limit noxious-weed infestations.

These Objectives relate to Noxious Weed prevention and treatment. Objective 230 deals with all non-native pests but this discussion is on Noxious Weeds only. The Phase II Amendment to the 1997 Land and Resource Management Plan includes several Standards and Guidelines in the 4300 category which relates to weed prevention and treatment. In particular Guideline 4303 from the Phase II amendment sets the new priority for management of invasive species;

Control noxious-weeds using the following priority order:

R2 sensitive and species of local concern occurrences of snails and plants.
Research Natural Areas.
Botanical Areas.
New invaders.
New areas of infestation.
Spreading or expanding infestations.
Existing infestations.

Treatment 2002-2006

Objective 231 discusses treatment of at least 8000 acres, as you can see we have been above the level since 2003 and plan to continue to increase the program, as funding allows.

Year of Treatment	Acres Treated
2002	7,515
2003	14,700
2004	15,744
2005	13,882
2006	15,685

Infestation acreage is difficult to measure, and our inventory methods and tracking continue to improve. The Weed Environmental Assessment signed in January 2003 has an estimate of approximately 82,000 acres. Our current estimate is closer to 100,000 acres. A portion of the increase in our acreage estimates is due to the spread of weeds, but much of this increase is because of improved inventory methods. Historical data is being compiled into the Terra database, and the estimated acreage of infestation by species will continue to be updated. This information should reflect better inventory and additional infestations because of better tracking. Some of the new infestations are a result of large fires over the past seven years.

An additional item to note would be the formation of an over arching weed group, the "Black Hills Invasive Weed Management Coalition" to discuss and cooperate in weed work within the "Hills" area. A draft mission statement was presented for review and comment at the first meeting in November 2006. The following text was agreed upon for a mission statement for the Black Hills Invasive Weed Management Coalition (BHIWMC):

BHIWMC – Invasive weed managers within the Black Hills and adjacent lands from local, state, federal agencies, and other stakeholders, along with private individuals working together on common inventories, establishment of cooperative weed management areas, development of best treatment practices, creation of education and information materials, identify funding sources, and an integrated management approach to reduce and prevent the spread of invasive weeds.

Involvement by locals was mentioned as a necessary component to make this effort work. The following goals were tentatively identified for the coalition:

1. Consolidating data bases (GIS, paper data).

2. Fostering cooperation between landowners, agency and private.

3. Promoting education and awareness (signs, publications).

Monitoring Item 23: Insects And Diseases - Population, Damage Trend, and Hazard

Sub-Item: Population, Mountain pine beetle and Ips

Biological evaluations of mountain pine beetle were conducted in the Deerfield, Bugtown Gulch, and Harney Peak areas. These evaluations consisted of ground surveys to estimate the level of infestations and how they have changed over the past three years. Based on the ground surveys, beetle-caused mortality is increasing in all these areas; however, much of the work was done prior to management activities occurring. Removal of infested trees has occurred at a large scale in both the Bugtown Gulch and in parts of the Deerfield area. These management activities will reduce the overall beetle population at some level.

Studies looking at alternative control measures, such as preventative sprays for high value trees, anti-aggregation pheromones, and mass trapping pheromones, have been ongoing for mountain pine beetle. For preventative sprays, two chemicals proved to be effective, depending on dose, at protecting trees from attack for one season, and one of them may be effective for two seasons. These insecticides are effective for treating individual, high value trees but are not practical for widespread use. The use of anti-aggregation pheromones for protecting trees from beetle attack has been looked at. These pheromones have shown some promise in reducing attacks from mountain pine beetle in whitebark and lodgepole pines; however, they appear to be ineffective at protecting ponderosa pine in the Black Hills from attack (Negron et al. 2006). Also, we have been testing different combinations of beetle-produced pheromones and pine tree monoterpenes for use in funnel traps in hopes of identifying a combination that is effective at mass trapping beetles out of an area. To date, none of the combinations we have tried has been effective at pulling beetles away from host trees.

The level of tree mortality caused by Ips beetles has declined some in recent years, but still remains at above average levels. There still are trees dying in urban interface areas and in areas where more recent fires have occurred. Ips populations are largely driven by drought conditions. As long as we have years have below average moisture, Ips will continue to be a problem. Also, we started a study looking at using traps to detect density of Ips beetles in areas with high levels of slash (both large and small piles), areas affected by mountain pine beetle and in general forest areas. After the first year, areas with fresh slash piles (either large or small) were more attractive to Ips. We will follow these areas in the future to see how the behavior changes as the slash gets older or is burned and gone.

Findings in a study of fire and subsequent tree mortality and insect infestations indicates that the most effective measures for predicting ponderosa pine mortality for up to 3 years post-fire are crown scorch and crown consumption. Adding DBH and Ips attack increased the accuracy of the predictions (Sieg et al. 2006).

Wood Borers:

Wood boring insects (beetles in the families Cerambycidae and Buprestidae) are still present in large numbers in burned areas and in mountain pine beetle killed trees.

Boring insects play a large role in lumber quality. Since these insects actually bore into the wood of a tree as opposed to just living under the bark, as do bark beetles, they cause serious degradation of lumber after they have attacked a tree. Over the past few years trees have died and become infested with borers so rapidly that in some cases, the trees did not hold lumber value for more than two to three months after they were killed.

Evaluation:

The mountain pine beetle is surging across many areas on the forest. At this time, it shows no signs of slowing down as far as number of trees killed or acres affected. Both tree mortality and acres affected will continue to increase over the next year. Effective and economical pheromone or chemical treatments for widespread use on the Forest to reduce or eliminate pests have not been found. Some existing chemical methods that protect individual high-value trees are available for use.

Armillaria Root Disease:

Armillaria root disease is common throughout the Black Hills on all tree species, conifers and hardwoods alike. Typically, it is not considered a killer of large trees; however, it does kill seedlings and saplings regularly. In larger trees, it acts more to reduce growth rates and stress the trees, which can make them more susceptible to bark-beetle attack. In the general forest, it can be found almost anywhere; however, it appears there are places where it may be more of a problem. Known areas of greater Armillaria activity include the Bearlodge Mountains, Medicine Mountain, and generally, the Limestone Plateau. Armillaria is a concern in areas that have experienced fires. Armillaria could kill some of the fire-weakened trees that may have otherwise survived. A series of plots were established in the Jasper Fire area to look at how Armillaria responds to wildland fire. The abundance of Armillaria increased as fire intensity increased. Results show that Armillaria can survive intense fires and can readily colonize roots of trees killed by fire. Therefore, wildfires can increase Armillaria inoculum, which might result in increased future fire-related Armillaria mortality.

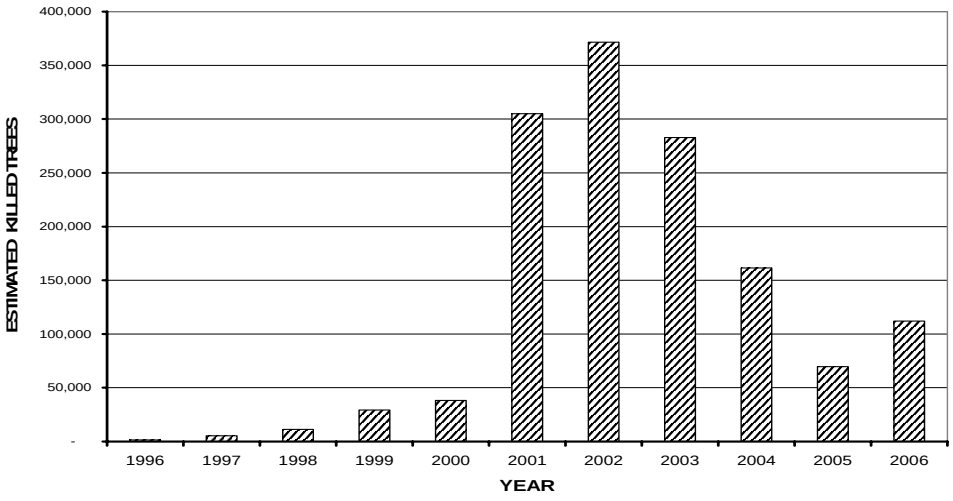
Overall, the above factors generally do not lead to large-scale tree mortality; however, conditions on the Forest over the past few years have led to concerns.

Evaluation:

Fire can result in an increase in the Armillaria pathogen. This mortality agent plays a role in creating snags and providing other benefits for wildlife. Armillaria also can significantly change the look and function of the forest at a landscape level. What is apparent is that there are major changes taking place across the landscape of the Black Hills.

Sub-Item: Tree Mortality

Figure 1. Estimated amount of ponderosa pine mortality due to mountain pine beetle from 1996 to 2006, based on aerial surveys over the entire Black Hills of South Dakota and Wyoming.



The above graph shows the estimated number of trees killed based on aerial surveys for the past 10 years. There is an appearance that mortality has declined in recent years, however, that may be due to a number of factors, including removal of large numbers of green infested trees prior to beetle flight and differences in timing and mapping techniques employed by different mappers.

Evaluation:

The mountain pine beetle outbreak we have been experiencing the past few years continues to grow bigger in

number of trees killed and acres affected. It may be down in some areas, but it has increased in just as many or more areas. There were noted increases in the Northern Hills in the O'Neill Pass area and also in the Black Elk Wilderness. Other places such as Deerfield and Bear Mountain have continued high levels of beetle activity and tree mortality. It is likely that we are only about mid-point in the cycle of this current outbreak, and so higher levels of beetle mortality are likely to continue into the coming few years.

Sub-Item: Hazard

The R2 FSVEG database was used to rate the overall hazard of the Forest. These ratings are based on structural stages and how susceptible they are to beetle attack. In this system all ponderosa pine stands are rated. Stands that are structural stage 1 and 2 and 3A are considered low susceptibility. Stands that are stage 3B and 4A are rated as medium susceptibility. Stands in stages 3C, 4B, 5 and 4C are rated as high. Based on that data, 183,999 acres or 18% were rated as low hazard, 367,247 acres or 35% were rated as medium hazard and 485,629 acres or 47% were rated as high hazard to mountain pine beetle.

The most problematic of the categories is those stands that are in the medium range. The range is fairly narrow and where the cutoff should be between low and medium, and medium and high is a changing number. In the future, breaking the rating down to just low and high and splitting the medium between them may make more sense. As more data is collected on the rating categories, what is considered as low and high may also change in the future.

Finally, one should note that generally hazard is based solely on stand conditions, with no inference of beetle pressure or activity in the area. During times, such as now, when there are outbreak beetle populations in any number of areas throughout the Black Hills, almost any stand over 60 basal area can be susceptible to beetle mortality. To get a true risk factor, the stand conditions (as noted in hazard ratings above) and the beetle conditions both need to be considered. Based on this, the current situation is one of elevated risk over the coming year that beetle infestations will continue to be present and expand into almost any of the pine that is near infestations.

Monitoring Item 24: Exotics

Gypsy Moth

Detection surveys for the gypsy moth were continued at recreation and administrative sites on the Forest in 2005. No moths were caught in recreation sites on the National Forest; however, we continue to catch moths in other nearby camping areas. Since these are single moth catches, it is assumed that these are transient and there is no local population established at this time. Another exotic insect that is gaining more attention regionally is the emerald ash borer. This insect has caused widespread destruction of ash stands in Michigan. At this time, it is not known to occur in the Black Hills, and by and large there is little host for the insect on the Forest (native ash), however, one of the main ways the insect is spread is through firewood that is infected and brought into new areas. With the amount of recreationists visiting the Black Hills every year, there could be avenue for this insect to affect nearby native ash stands and community forests. See also Monitoring Item 19 noxious weeds.

Monitoring Item 25: Fire Hazard

Objective: 10-01. Manage for 50 to 75 percent moderate-to-low fire hazard in the wildland-urban interface and reduce fire hazard within proximity of structures to current NFPA standards and manage the remainder of the Forest for 50 percent moderate-to-low fire hazard except for specific Management Areas listed in the Forest Plan.

Fire Hazard Rating Acres

(All cover types and structural stages)

Year	Low	Medium	High/Very High	Total
Baseline 1995	23,669	509,578	696,524	1,229,771
2006	108,365	421,218	712,459	1,242,042

Note: Difference in total acres may be due to land acquisitions, trades, and record keeping. Monitoring protocols for this objective will be refined to reflect wildland urban interface (WUI) and non-WUI acreage following the 2007 season.

Monitoring Item 26: Fuel Treatment

Objective: 10-04. Reduce or otherwise treat fuels commensurate with risks (fire occurrence), hazard (fuel flammability), and land and resource values common to the area, using the criteria in Forest-wide Guideline 4110.

Monitoring:

The Forest accomplished fuel-treatment-related activities on a total of 50,536 acres of the National Forest in FY2006. Included in this work were activities as listed below:

Category	Mechanical	Prescribed Fire
Fuels Program (WFHF) WUI Non-WUI Total	 4,158 Acres 1,374 Acres 5532 Acres	 7,713 Acres 359 Acres 8072 Acres
Other Vegetation Treatments (FN-Other) WUI Non-WUI Total	 18,835 Acres 18,097 Acres 36,932 Acres	 0 Acres 0 Acres 0 Acres
Grand Total (50,536)	42,464 Acres	8,072 Acres

Mechanical treatments include a broad spectrum of treatment methods including, thinning, hand piling, machine piling, mastication, lop and scatter, chipping, and others.

Prescribed fire treatments are defined as broadcast burning, machine pile burning, hand pile burning, and jackpot burning.

(Source: Database of Record, NFPORS, 1/31/2007).

Monitoring Item 27: Fire - Prevention and Suppression

Sub Item: Prevention

Objective 10-06. Develop fuel management and protection strategies for intermixed land ownerships in partnership with private, state, and other federal agencies.

Monitoring:

- Status of fire management agreements with partner agencies;

All cooperator agreements and annual operating plans were reviewed and signed as required in 2006.

- Involvement in interagency fire training exercises;

  The Forest continues to play a lead role in interagency fire training by providing qualified instructors, financial support, and course coordination for fire training offered in the Black Hills and surrounding areas in 2006.

  An example was Forest participation in the Annual Custer State Park Interagency Fire Training Exercise. This exercise is developed around a Type 2 Incident scenario providing training for team cadre, engines, crews and aviation exercises.

- Involvement in South Dakota Interagency Fire Council (SDIFC) meetings and other interagency activities;

  The Forest is a member of the SDIFC and an ad hoc member of the Black Hills Fire Advisory Board (BHFAB). Both of these organizations provide interagency coordination of prevention, pre-suppression, and suppression activities in the Black Hills and surrounding areas. The Forest has representation at all meetings and participates in and provides representation to various committees and task groups of these two active organizations.

- All other information, which might cast light on the Forest's record of performance related to efficiency of operation in the fire management arena through interagency cooperation and prevention activities.

  The Forest completed reviews of various fire incidents during the course of the 2006 fire season in compliance with findings and abatement requirements of the Thirty-Mile incident.

  The escaped fires (from initial attack) on the Black Hills (two) were managed utilizing Type 2 and local Type III Incident Management Teams. The teams were interagency in composition and performed successfully.

Evaluation:

The Forest has cooperated with private, state, and other federal agencies to develop joint fuel management and protection strategies for intermixed landownership and was involved in development of Wildfire Community Fire Protection Plans during 2006.

Sub Item: Suppression

Objective 10-05. Manage wildfires using the appropriate response based on management area emphasis, existing values, risk of ignition and fuel hazards within a given area. (See also Standard 4101).

Monitoring:

All wildfires on the Black Hills National Forest in 2006 were suppressed through appropriate suppression responses in accordance with management area emphasis, existing values, and fuel hazards within the incident area. Total acres burned was 7,409 acres less than the 33 year average of 8,275 acres burned per year.

Confined: **All** Contained: **All** Controlled: **All**

Monitoring Item 28: Fire – Non-emergency Watershed Condition

Report not available, limited Forest Plan Monitoring funding was devoted to more critical monitoring items.

Monitoring Item 29: Scenery – Scenic Integrity

Report not available, limited Forest Plan Monitoring funding was devoted to more critical monitoring items.

Monitoring Item 30: Heritage Resources

Objectives:

403. Improve the management of heritage resources and integrate them with recreation and education while providing for compliance with all applicable laws and regulations.

a. Increase numbers and types of heritage resource interpretive sites and opportunities. Provide five projects per year during the plan period.

b. Conduct six heritage resource stabilization and rehabilitation projects per year during the plan period.

c. Nominate eligible sites (approximately five per year in the plan period) to the National Register of Historic places.

d. Inventory 50,000 acres each year in the plan period for heritage resource sites.

404. Conduct three research projects each year to support heritage resource management.

405. Manage all heritage sites listed in the National Register of Historic Places in consultation with the State Historical Preservation Officer (SHPO) and the President's Advisory Council on Historic Preservation (ACHP).

406. Provide opportunities for the public to participate in heritage management activities, including the monitoring, excavation, and protection of archeological sites.

Monitoring:

Introduction

Heritage monitoring efforts are used to measure the level of success in meeting management goals and objectives for heritage resources. The level of success can be measured each year and, more importantly, over a five-year period. For this report, the results of monitoring over a five-year period will be reviewed as a measure of movement toward heritage resource management goals and objectives.

Direction for management of heritage resources is provided in Goal 4 of the Forest Plan: "Heritage resources will be protected and interpreted so that visitors can better understand their environment and how heritage resources fit into the context of multiple use management" (USDA Forest Service 1997a p.I-23). Heritage objectives are listed above.

Monitoring items for heritage resources measure two areas of emphasis for the program. Monitoring Items 1 through 4 reflect our responsibility to comply with Federal law and regulation for the protection of heritage resources under Section 106 of the National Historic Preservation Act (NHPA) (See Table 1.) The relatively large numbers exhibited in Monitoring Items 1 through 4 are in themselves a reflection of the large number of undertakings conducted on the Black Hills National Forest each year and funded through other resource programs such as timber, fire/fuels, recreation, wildlife, lands/minerals, and range. Completion of heritage compliance protocols is required before project implementation. In FY2005 an increased emphasis was placed on monitoring site avoidance plans (Item #2), and protection of previously recorded sites (Item #4), this was carried through Fiscal Year 2006. Monitoring Items 5 through 7 reflect the agency's responsibility to preserve and interpret heritage resources for public benefit under Section 110 of the NHPA. These activities are funded directly by heritage program funds as the primary purpose function. The relatively low numbers exhibited in Monitoring Items 5 through 7 indicate a lack of adequate funding to meet proposed accomplishments in the Section 110 portion of the heritage resource program.

Table 1. Heritage Monitoring Accomplishments.

Monitoring Items	FY2006
1. Heritage resources compliance process completed prior to signing of environmental decision document (comply with NEPA, NHPA, and Chiefs Direction).	119
2. Avoidance or mitigation requirements effectively implemented prior to, during, and after project (comply with NHPA/NEPA).	34
3. Inventories conducted to comply with the Archaeological Resource Protection Act, as amended 1988.	48
4. Protection of heritage resources listed in, or eligible for listing on the National Register of Historic Places. May or may not be associated with project specific activities (comply with NHPA).	19

5. Number of heritage resource interpretive sites provided (including sites, signs, roadside pullouts, brochures, public participation opportunities, sponsorship of heritage activities, etc.).	31
6. Number of heritage resource stabilization and rehabilitation projects conducted (comply with NHPA).	2
7. Increase in heritage resources listed on the National Register of Historic Places (comply with NHPA).	0

Evaluation:

403. Improve the management of heritage resources and integrate them with recreation and education while providing for compliance with all applicable laws and regulations.

403.a. Over twenty interpretive opportunities per year have been provided during the five-year monitoring period including 24 in FY2005. Many of the opportunities have involved interpretive programs such as school programs, interpretive pamphlets, public tours, moonwalks, and presentation of research papers at professional conferences. The Forest objective is being met, and in some cases, exceeded by utilizing off-site activities and programs. In 2005 interpretive site and educational opportunity goals were met through field tours of the Craven Canyon pertroglyphs, papers presented at the Island In the Plains Conference which is co-sponsored by the Forest, school programs, and the successful implementation of three Passport In Time volunteer projects including the Miller Ranch restoration project, the Southern Hills Rock art project, and the Williams Spring Archaeology project.

403.b. No stabilization and rehabilitation projects were conducted in 2006.

403.c. No new National Register nominations were initiated in FY2006. An increase in heritage program funding will be needed in order to meet Forest Plan objectives over the planning period.

403.d. There were 89,381 acres inventoried during fiscal year 2006. This was a combination of acres accomplished by Forest personnel and contracts. A sharp increase in acres surveyed has occurred over the past four years. This trend is expected to continue over the remaining years of the planning period due to increased fire risk, insect epidemics, and the implementation of forest health and watershed restoration initiatives.

404. Conduct three research projects each year to support heritage resource management.

Beginning in FY 2005 the Forest, in partnership with the University of Wyoming and the Crook County Resource Advisory Committee continued field research and educational programs under a cost-share agreement, at the prehistoric Williams Spring site. In 2006 this work was continued with the production of the documentation and analysis of the artifactual collection from the site. Additional work was completed on the development of educational materials for schools as was agreed upon with the Resource Advisory Committee. The Hell Canyon District completed a field survey and recording project for sensitive rock art sites in the Southern Hills. The project was conducted as a cost-share partnership with leading rock art expert Dr. Linea Sundstrom. This project was implemented as a Passport In Time program. On the Mystic Ranger District a new partnership agreement was established with the South Dakota State archaeological Research Center to conduct extensive evaluations at the Ditch Creek Complex. This work was accomplished using another Passport in Time project. The State will analyze and catalog the results and provide the Forest with a report on the findings. In order to meet the Forest objective of three research projects per year, an increase in heritage program funding is needed. The Forest is currently meeting this objective at a minimum level through cost-share agreements with individual scientists and institutions.

405. Manage all heritage sites listed in the National Register of Historic Places in consultation with the State Historic Preservation Officer (SHPO) and the President's Advisory Council on Historic Preservation (ACHP).

The Forest maintains a strong relationship with the South Dakota and Wyoming SHPOs, Advisory

Council on Historic Preservation, and Tribal Historic Preservation Officers (THPO) on listed and eligible properties. The heritage program is meeting this objective.

406. Provide opportunities for the public to participate in heritage management activities, including the monitoring, excavation, and protection of archaeological sites.

The Forest successfully participated in two Passport in Time projects including the Ditch Creek Complex Evaluation and the Southern Hills Rock Art Survey. Volunteers contributed 1,556 hours of labor.

Table 2. 2006 Heritage Forest Plan Objectives Accomplishments

Accomplished	FY2006
Obj 403a.: Heritage Sites Interpreted	34
Obj 403c.: Eligible Sites Nominated	0
Obj 403d.: Heritage Inventory (Acres)	96030.6

Monitoring Item 32: Recreation Opportunities

Objectives:

407. Provide the following Recreation Opportunity Spectrum (ROS):

Recreation Opportunity Spectrum (ROS) (Thousands of Acres)	
Primitive	11
Semi-Primitive Non-Motorized	18
Semi-Primitive Motorized	12
Roaded Natural	1107
Roaded Natural Non-Motorized	95
Rural	1

408. Manage recreation use to stay within the capacity for the ROS class:

ROS Class	Capacity Range Recreation Visitor Days (RVDs/Acre)		
	Low	Moderate	High
Primitive	0.25	0.5	0.75
Semi-Primitive Non-Motorized	1.00	2.0	3.00
Semi-Primitive Motorized	1.50	3.0	4.50
Roaded Natural Non-Motorized	1.50	3.0	4.50
Roaded Natural	3.00	6.0	9.00
Rural	<<<< Design Capacity >>>>>		

Monitoring:

Recreation Activity: Recreation Opportunities across the Forest

The 1997 Forest Plan, Phase II amendment identifies objectives for capacities of the ROS classes expressed in recreation visitor days (RVDs). No monitoring data or techniques concerning this data were conducted in FY2006 to determine the degree to which the Forest is meeting this objective.

Evaluation:

Recreation opportunity spectrum capacity objectives by ROS class have not been monitored.

General anecdotal evidence of how well the Forest is meeting these objectives may be evident through monitoring of developed recreation use, dispersed recreation activities, and trail counter data from wilderness use.

Monitoring:

Developed Recreation Discussion

The backlog of deferred maintenance needs for our developed sites continues to be a major concern related to meeting Forest Plan standards for maintaining developed recreation sites. Operation and maintenance funding from appropriated dollars has been historically insufficient to meet the needs. The Forest makes use of service partners wherever possible, such as our campground concessionaire. Forest-wide, our fee sites are paying for day-to-day operation through the concession permit. Special-use fees paid to the Forest from the concessionaire are re-invested into our developed sites through the Granger-Thye fee offset program. In 2006, this fee system enabled the Forest to re-invest approximately $55,000 in permit fees back into our developed sites. The Black Hills National Forest Visitor Information Center overlooking scenic Pactola Lake and satellite visitor information stations at our district offices provided significant developed and dispersed recreation information for the visiting public. During 2006, the Forest compiled information on recreation site annual and deferred maintenance for use in preparing an action plan for the Recreation Site Facilities Master Plan. Public involvement will be initiated in 2007.

Evaluation:

The success of the Forest's developed recreation management program could be considered an indication the Forest is meeting Forest Plan objectives in providing urban and roaded natural recreation opportunities within the capacity objective.

Monitoring:

Dispersed Recreation Discussion

The Black Hills National Forest continues to be a leader in providing dispersed recreation as evidenced by the following opportunities: Mickelson and Centennial National Recreation Trails, snowmobiling, cross-country skiing, ATV and ORV routes, an established network of Forest roads and hiking trails, the Peter Norbeck Scenic Byway, a multitude of fishing opportunities at National Forest lakes, and some of the best elk and deer hunting in South Dakota and Wyoming.

The Black Hills National Forest is well roaded with over 6,000 miles of federal, state, county and Forest Service roads serving approximately 1.2 million acres of National Forest land. Restrictions on motorized use have been established in areas where resource damage is occurring due to increased ORV/ATV use.

Evaluation:

The dispersed recreation opportunities discussed here provide background information that the Forest is providing a wide range of ROS classes but with emphasis on roaded recreation opportunities, both roaded natural and/or semi-primitive motorized. How the Forest is doing in meeting the overall Forest Plan ROS objectives cannot be determined using the monitoring data currently gathered.

Monitoring Item 33: Recreation Use, Trends, and Demographics

Objectives:

413. Provide interpretation, information and environmental education as an important part of outdoor recreation. Use "Tread Lightly", "Leave No Trace" and other techniques.

417. Coordinate trail development with the State Comprehensive Outdoor Recreation Plan (SCORP). Develop trail facilities in cooperation with other agencies and partners.

419. Provide for the annual designation and management of 350 miles of snowmobile trail by the States of Wyoming and South Dakota. Annual changes to the trail system should be limited.

Monitoring:

Objective 413

The Forest's information and environmental education efforts are monitored through the number of products offered. Recreation funding (NFRW) provided a target of 15 interpretation and environmental education products to standard, which was met and reported in the Forest's annual Management Attainment Report (MAR).

The Moon Walk program, spearheaded by the Mystic Ranger District, presented six programs during the spring, summer, and fall across the Forest with participation by all districts. The visitor information center, located along Highway 385, was open seven days a week from the middle of May to the end of September. This facility provided information, education, and interpretation exhibits, including "Tread Lightly" messages and literature, and averages over 60,000 visitors each year. The Dakota Digital Network reaches more than 30 classrooms annually on a wide range of subjects like fire, weeds, and fire prevention.

Evaluation:

Through its visitor information station at Pactola Lake, moon walks, wilderness education, and interpretive portal signs throughout the forest along with other information and education efforts, the Forest continues to meet this Forest Plan objective. The Forest's partnership with the Black Hills Parks and Forest Association also provided staffing assistance at the visitor center, publications and interpretive products at forest outlets, and supplemental funding for an interpretive exhibit at Mount Roosevelt historical site.

Monitoring:

Objective 417

The Forest provided its share of management of the Centennial Trail, a designated National Recreation Trail (NRT) jointly managed by Custer State Park, Black Hills National Forest, Bureau of Land Management, and the National Park Service. Trail work included annual trail maintenance and trail reconstruction efforts on the trail portions located on National Forest System lands. The Forest supported the Game, Fish, and Parks Mickelson Trail rail trail by providing engineering expertise for bridge inspections.

Evaluation:

The Forest is meeting this Forest Plan objective through its cooperative management of the Mickelson Trail and the Centennial Trail, along with its input to the South Dakota State Comprehensive Outdoor Recreation Plan (SCORP).

Monitoring:

Objective 419

The Forest continued its participation in a Memorandum of Understanding (MOU) with the Wyoming and South Dakota Snowmobile Trail programs with snowmobile trails located, signed, managed, and groomed on the Bearlodge Ranger District by the State of Wyoming and on the Northern Hills, Mystic, and Hell Canyon Ranger Districts in South Dakota. The Forest issued its annual winter travel management special order, which provides for snowmobile and cross-country ski trails on the Forest.

Evaluation:

This Forest Plan objective is being met through the Forest's fulfillment of its responsibilities outlined in its MOUs with the Wyoming and South Dakota snowmobile programs.

Monitoring Item 34: Access - Road Mileage

Objectives:

309. Provide the following changes to the National Forest System roads in support of long-term sustainable production of commodities.

Road Construction	280 miles/decade
Road Reconstruction	870 miles/decade
Road Obliteration	140 miles/decade
Two-track Obliteration	270 miles/decade

420. Manage travel corridors for federal, state and county roads.

a. Meet a scenic integrity objective of high.

b. Provide recreation facilities, trailheads, trail crossings and other road corridor components to meet demand.

c. Include opportunities for pedestrians and bicycle ways.

d. Use cooperative opportunities for development of outdoor facilities, such as provided for in the Intermodal Surface Transportation Efficiency Act (ISTEA) as an integral part of corridor planning.

421. Provide the following road system:

Roads (By End of the First Decade)		
Suitable for Public Use		4,700 miles
Passenger Car	1,200 miles	
High Clearance Vehicles	3,500 miles	
Roads Closed to Vehicles		500 miles
TOTAL		5,200 miles

Monitoring:

Objective 309 and 421:

The following is the status of the National Forest System (NFS) roads in FY2005:

	FY02 Miles	**FY03 Miles**	**FY04 Miles**	**FY05 Miles**	**FY06 Miles**
NFS Maintenance Levels 1,2,3,4,5	5,397.1	5,449.0	5,443.0	5503.1	5478.9

	FY02 Miles	FY03 Miles	FY04 Miles	FY05 Miles	FY06 Miles
NFS Miles Constructed	7.0	9.0	8.5	4.7	4.2
NFS Miles Reconstructed	75.7	87.0	102.0	27.1	19.9
NFS Miles Under Forest Service Jurisdiction	4,812.0	4,839.0	4,910.1	4951.2	4961.5
NFS Miles Under Local Government Jurisdiction	585.1	610.0	538.9	527.0	531.1
NFS Miles Obliterated	0	3.7	0.0	28.6	25.0
NFS Miles Open Year Long, Seasonally For Low Clearance Vehicles	718.0	715.0	673.5	675.6	680.0
NFS Miles Open Year Long, Seasonally Which Are Accessible To High Clearance Vehicles Only	3,258.0	3158.0	3,129.0	3086.9	3036.0

	1997 Revised Forest Plan (Miles/decade)	Accomplished FY2002 (Miles)	Accomplished FY2003 (Miles)	Accomplished FY2004 (Miles)	Accomplished FY2005 (Miles)	Accomplished FY2006 (Miles)
Road Construction	***280***	7.0	9.0	8.5	4.7	4.2
Road Reconstruction	***870***	75.7	87.0	48.8	27.1	19.9
Road Obliteration	***140***	0	3.7	0	28.6	25.0
Two-track Obliteration	***270***	6.0	9.0	10.0	70.8	58.0

Evaluation:

Objectives 309 and 421

Forest Plan Activities (Miles)	Accomplished FY1998-FY2006	Percent of Annual Compliance FY1998 – FY2006	Current Level -Percent of Total Goal
Road Construction	7.4 miles/yr	26%	24%
Road Reconstruction	68.1 miles/yr	78%	71%
Road Obliteration	13.6 miles/yr	97%	88%
Two-track Obliteration	24.5 miles/yr	91%	82%
	Current Inventory		
Suitable for Public Use	3,716 miles		79%
Passenger Car	980 miles		82%
High Clearance Vehicles	3,036 miles		87%
Roads Closed To Vehicles	1,213 miles		243%

Monitoring Item 35: Access - Off-Road Vehicle Access

Objective 422. Provide the following off-road travel opportunities:

Category	Percentage of Forest
All Motorized Travel Allowed Yearlong	59.1%

Seasonal Restrictions Apply	22.8%
Seasonal Restrictions - No Off-road Travel	3.2%
Backcountry Motorized Recreation on Designated Trails	1.0%
Only OHV Travel Prohibited	11.4%
Motorized Travel Prohibited Except Snowmobiles	1.2%
All Motorized Travel Prohibited	1.3%

Monitoring:

Travel management maps are being distributed for the Forest. The map for the Bearlodge Ranger District in Wyoming is also a travel order. The map for Northern Hills, Mystic, and Hell Canyon Ranger District in South Dakota depicts the effects of existing travel orders. These maps are available free to the public. District Travel Management teams are monitoring off-road vehicle use on the forest. As a result, Special Orders were published in FY06 restricting motorized access in two additional areas of the forest due to OHV-related resource concerns.

Evaluation:

The Forest continues to address the issue of unmanaged recreation. The Forest is continuing to compile data and develop processes for analyzing travel management issues on both Forest-wide and project levels. Several projects included travel management data collection and analysis in FY06. A number of collaborative public meetings are scheduled for October and November in FY07. The Forest has also initiated partnerships with several local stakeholder groups to facilitate travel management planning data collection and identifying issues, interests, and other potential partners. As a result of these efforts, the Forest expects to initiate the NEPA process to amend the current Forest Plan and designate a motorized transportation system in FY07, in accordance with the 2005 Travel Management Rule.

Monitoring Item 36: Access - Trail Opportunities

Objectives.

416. Maintain and construct trails as displayed in the following table:

Non-motorized Trails (1996)	293 miles
Motorized Trails (1996)	14 miles
Non-motorized Trail Construction	204 miles
Motorized Trail Construction or Conversion from Road to Motorized Trail	15 miles
Total Forest Trail System	526 miles
Reconstruction	100 miles

418. Enhance the trail system to disperse use away from the Black Elk Wilderness.

Monitoring:

Objective 416

1997 Revised Forest Plan			FY2002	FY2003	FY2004	FY2005	FY2006
Existing Trail Inventory:							
Non-motorized Trails (1996)	293 miles		318.6	332.8	332.8	332.8	309.2
Motorized Trails (1996)	14 miles		14.2	13.7	13.7	13.7	13.7

New Trail Construction:	~		~	~	~	~	~
Non-motorized Trail Construction	204 miles[1]		0.0	0.0	0.0	0.0	7.0
Motorized Trail Construction or Conversion from Road to Motorized Trail	15 miles [1]		0.0	0.0	0.0	0.0	0.0
Total Forest Trail System	526 miles [2]		332.8	346.5	346.5	346.5	322.9
Reconstruction	100 miles[1]		4.2	10.2	11.4	1.6	2.9

[1]Per decade

[2]Total Miles at End of Decade

Evaluation:

Objective 416

Forest Plan Objective	Percent Compliance FY1998 – FY2006
Non-motorized Trail Construction	[1]0%
Motorized Trail Construction or Conversion from Road to Motorized Trail	[2]0%
Reconstruction	[3]103.0%

Figures are based on the following goals by the end of the first decade:
[1] increase of 20.4 miles per year
[2] increase of 1.5 miles per year
[3] increase of 10 miles per year

Monitoring Item 37: Access - Right-Of-Way Acquisition

Objective 503. Acquire approximately 25 rights-of-way each year to improve Forest access.

Monitoring:

			FY2001				FY2002	
Type		**Cases**	**Miles**	**Acres**		**Cases**	**Miles**	**Acres**
Acquired		12	6.2	24.6		3	4.2	10.6
FLPMA*		~	~	~		~	~	~
Forest Road Easements Conveyed		4	3.5	14.1		1	.09	.69
Private Road Easements Conveyed		3	6.7	26.7		17	6.06	25.8
FRTA** Easements[1]		0	0	0		0	0	0

			FY2003				FY2004	
Type		**Cases**	**Miles**	**Acres**		**Cases**	**Miles**	**Acres**
Acquired		2	2.9	11.8		3	1.05	4.37
FLPMA*		~	~	~		~	~	~
Forest Road Easements Conveyed		6	2.5	20.08		7	13.8	57.51

Private Road Easements Conveyed		14	1.9	15.37		14	5.0	20.82
FRTA** Easements[1]		2	0.3	2.52		1	0.18	0.75

			FY2005				FY2006	
Type		**Cases**	**Miles**	**Acres**		**Cases**	**Miles**	**Acres**
Acquired		2	.38	3.04		1	.06	0.47
FLPMA*		~	~	~		~	~	~
Forest Road Easements Conveyed		8	2.91	23.36		1	0.24	1.87
Private Road Easements Conveyed		5	1.85	10.02		3	0.52	4.18
FRTA** Easements[1]		1	1.51	12.1		1	0.33	2.66

*FLPMA - Forest Land Policy Management Act
**FRTA - Forest Road and Trail Act

1Previously under special use permit that was converted to easements in 1998

Monitoring Item 38: Land Adjustment

Objectives:

501. Conduct approximately 500 to 1000 acres of land exchange each year over the decade, such as through purchase, exchange or donation, whenever lands meet land-adjustment criteria in Guidelines 8101 through 8104.

502. Provide timely response to landowner requests for access across the National Forest.

504. Actively seek local government and tribal government input and support for those exchanges that substantially change the balance of federal and private lands.

505. Work with conservation groups, state agencies and others to develop and implement cost-effective land and resource protection measures such as conservation easements, etc.

Monitoring:

Land Acquired Through Acquisition

	FY2002	FY2003	FY2004	FY2005	FY2006
Land Adjustment Completed	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**
Land Acquired through Purchase	259	966	282	69	0
Land Acquired through Exchange	330	433	0	0	320
Land Acquired through Donation	0	80	0	0	0
Total Acquired	589	1,479	0	69	320
LESS:	~	~	~	~	~
Land Conveyed Out	176	475	11	0	5
NET CHANGE	+413	+1,004	+271	+69	+315

Land Being Acquired Through Acquisition

	FY2002	FY2003	FY2004	FY2005	FY2006
Land Adjustment Being Processed	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**
Land Acquiring through Purchase	1,156	280	0	2,434	280
Land Acquiring through Exchange	473	1,020	900	678	0
Land Acquiring through Donation	80	0	0	0	0
Total Acquiring	1,709	1,300	900	3,112	280
LESS:	~	~	~	~	~
Land Conveying Out	504	1,070	1,376	850	0
NET CHANGE	+1,205	+230	-476	+2,262	+280

Evaluation:

The Forest has continued to foster communication with several conservation groups and state agencies with the objective of completing land adjustment exchanges and/or conservation easements for everyone's benefit. The Forest is a member of the Black Hills Conservation Initiative, which is a partnership of private landowners, communities, state and federal agencies, and other conservation groups, to protect wildlife habitat and open space. The Forest has stressed land exchanges over conservation easements as the means to benefit the public. These exchanges can be time consuming (sometimes as long as three to ten years), but the outcome of a more efficient and manageable land pattern is worth the time and effort expended.

Landowner requests for access across the National Forest are increasing. The Forest has also been delegated the authority to sign the permits authorizing this use. Changes in the Lands staff has slowed the processing of applications. New staff is in place and being trained at the end of the fiscal year. The Forest is implementing cost recovery for all new applications.

The Forest actively seeks input and support from local and tribal governments with respect to land exchanges. The local and tribal governments are notified early in the exchange process and asked if they have any concerns or recommendations regarding the exchange proposal. Any concerns or recommendations related are considered and evaluated throughout the exchange process. The governments are again notified during the NEPA phase of the project and again at the time of a decision being made.

Monitoring Item 39: Economic Efficiency

Report not available, limited Forest Plan Monitoring funding was devoted to more critical monitoring items.

List of Preparers

Item Number	Monitoring Item	Preparers
Introduction	What This Document Is	Jeffrey Ulrich
	Forest Plan Amendments	Edward Fischer
1	Air Quality	Todd Pechota
2	Soil Productivity	Deanna Reyher
3	Soils Revegetation	Deanna Reyher
4	Watershed Health	Steve Hirtzel and Deanna Reyher
6	Riparian – Condition and Trend	Steve Hirtzel
7	Riparian Wetlands	Steve Hirtzel
8	Vegetative Diversity – Vegetation Species Composition	Blaine Cook
9	Vegetative Diversity – Structural Stages	Blaine Cook
10	Vegetative Diversity – Large Trees	Blaine Cook
11	Vegetative Diversity and Snag Retention	Blaine Cook
12	Vegetative Diversity – Burned Forest Habitat	Blaine Cook
14	Regeneration	Blaine Cook
15	Timber Production	Blaine Cook
16	Rangeland Trend	Craig Beckner
17	Forage Utilization	Craig Beckner
18a	Sensitive Species (Plants)	Beth Burkhart
18b	Sensitive Species (Wildlife)	Kerry Burns and Steve Hirtzel
19	Species of Local Concern	Kerry Burns
20	Threatened and Endangered Species	Kerry Burns
21	Management Indicator Species	Kerry Burns and Steve Hirtzel
22	Noxious Weeds	Craig Beckner
23	Insect and Disease – Population, Damage, Trend, and Hazard	Blaine Cook
24	Exotics	Blaine Cook
25	Fire Hazard	Todd Pechota
26	Fuel Treatment	Todd Pechota
27	Fire Prevention and Suppression	Todd Pechota
28	Fire – Non-emergency Watershed Condition	Deanna Reyher
29	Scenery – Scenic Integrity	Steve Keegan
30	Heritage Resources	Juanita Garcia
32	Recreation Opportunities	Craig Kjar
33	Recreation Use, Trend, and Demographics	Craig Kjar

Item Number	Monitoring Item	Preparers
34	Access - Road Mileage	Craig Kjar
35	Access - Off-Road Vehicle Access	Craig Kjar
36	Access - Trail Opportunities	Craig Kjar
37	Access - Right-of-Way Acquisition	Craig Kjar
38	Land Adjustment	Craig Kjar
39	Economic Effieciency	Jamie Appelhans
	Compiling and Editing	Jamie Appelhans

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