United States
Department of
Agriculture

Forest
Service

Black Hills
National
Forest

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BLACK HILLS NATIONAL FOREST

Plant inventory and monitoring on Cement Ridge. Inset: Pale Moonwort (*Botrychium pallidum*)

FY 2008 MONITORING AND EVALUATION REPORT

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Black Hills Forest Plan
Monitoring and Five-Year Evaluation Report
Fiscal Year 2007
(October 2007 through September 2008)

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. This report follows the second, five year evaluation of the Forest Plan completed in 2007 as required by the National Forest Management Act (36 CFR 219.10g - … "The Forest Supervisor shall review the conditions on the land covered by the plan at least every 5 years to determine whether conditions or demands of the public have changed significantly"). Some objectives are an outcome of the Phase II amendment completed in 2005. As such, limited data may be available for some of these new objectives.

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. Monitoring items not included in this report were either not scheduled for reporting or there was insufficient funds to collect relevant data.

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.

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

CRAIG BOBZIEN
Forest Supervisor

September 30, 2009

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 in 2008. There were no formal air quality complaints in 2008 (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 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.

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

Prior to implementing a 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. Criteria Pollutant Area Summary Report. Green Book. URL: http://www.epa.gov/air/oaqps/greenbk/anc12.html. February 6). 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-2.5, 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 System land in the Rapid City air shed. The Forest continues to work with the Pennington County Air Quality Office and the SD Department of Environment and Natural Resources in mitigating known 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 (Soil Bulk Density)

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

This monitoring item had previously been included in the 2002 Monitoring and Five Year Evaluation Report, and the 2006 and 2007 Monitoring and Evaluation Reports (USDA Forest Service 2004, 2007, 2008). The 2006 Monitoring Report included information that had been discovered as inaccurate or missing from the 2002 Monitoring reported (e.g. sites presented as timber monitoring sites which had been range monitoring sites; missing 1998 information). The 2007 Monitoring Report was updated with additional sampling information that had occurred in 2007. Any Forest watershed or soil reports that addressed soil bulk density since the 2006 monitoring report was issued was to tier to the more complete 2006 monitoring report as having the most complete soil bulk density sampling and evaluation information through 2006 for the Black Hills National Forest. That now holds true for the 2007 report. The 2008 soil bulk density information has been combined into this report to provide an updated complete source of information that Forest analyses can reference for various projects.

Background and General Soil Bulk Density Sampling Design Description

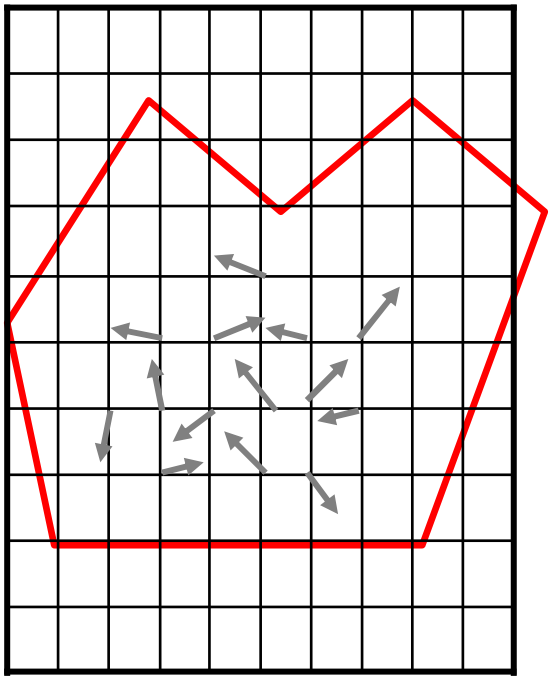
The Region 2 Supplement to the Forest Service Soil Management Handbook (FSH 2509.18-92-1) (USDA Forest Service 1992) identifies "Guidelines for Sampling Some Physical Conditions of Surface Soils" (USDA Forest Service 1983) as a reference for soil bulk density sampling techniques. The Region 2 Regional Office Soils Program Staff 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 monitoring design through consultation with the USFS Rocky Mountain Research Station. The current monitoring design generally utilizes a grid design (see diagram below) for collection of soil core 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 for the calculation of bulk densities. The average soil bulk density of the disturbed activity areas is compared to the pre-disturbance conditions or adjacent sites that are generally 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 the Black Hills National Forest, i.e. 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 current timber harvest sampling design includes sampling cutting units prior to and following harvest activities to assess any change in soil bulk densities. The sample design for livestock use areas has included sampling within exclosures (generally ungrazed areas) and adjacent grazed areas within the same soil series and within the same general topographic position. The sampling associated with livestock use has been focused on open grasslands in the Black Hills. Open prairie grasslands and meadows are generally where the soils and site conditions support the most forage production as compared areas with some level of conifer overstory (see various range project analyses). The moist meadows generally occur as concave positions on the landscape and often have

deep soils that have higher moisture holding capacities than soils on surrounding slopes that may have a combination of features that limit water holding capacities (such as greater amount of rock fragments in the soil profile, are of a shallower depth, have a higher runoff potential). For similar reasons why open meadows and grasslands receive the majority of vegetation monitoring for forage use (livestock primary use areas of the allotment with the greatest concentration or abundance of palatable forage species) is similar to the reasons for monitoring soils in similar portions of the pastures. In addition to the harvest and livestock use target sampling described above, the Jasper Fire (occurred in 2000) offered opportunities for sampling within burned areas that were salvage harvested.

The Black Hills National Forest Land and Resource Management Plan (Forest Plan) (USDA Forest Service 2006b) and the Region 2 Watershed Conservation Handbook (Forest Service Handbook 2509.25, Rocky Mountain Region Watershed Conservation Practices Handbook, effective April 20, 2006) contain direction to be used to prevent increased soil bulk density conditions to the levels of what is defined as detrimental soil compaction. In addition, the USDA Forest Service Region 2 (Rocky Mountain Region) Rangeland Analysis and Management Training Guide (USDA Forest Service 1996) provides additional direction targeted directly at grazing implementation activities for conserving or obtaining soil quality conditions on Forest Service administered lands within the Rocky Mountain Region. 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 average increase of 15% in bulk density associated with Forest Service administered land management activities and uses 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 various Forest Service Handbook direction to lower the soil bulk densities to restore productivity and infiltration of impacted sites.

Example of General Grid Placement with Random Transects For Collecting Soil Samples



Timber Harvest Activity Sampling

Monitoring:

As documented in the table below, the data collected for timber harvesting activities since this method of soil bulk density sampling began occurred primarily since 2000. It is important to note that this period of time has been 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 there would be little evidence of increases in soil bulk density for the activity areas sampled from 2000-2006. However, a noticeable increase in soil 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). Along with the percentage of bulk density increase measured, the sampling report documented visible 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). After operations resumed, the 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 during a prior higher precipitation year as compared 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 soil 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 the pre-harvest soil bulk density measurements for that timber harvest entry).

Evaluation:

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

1. That sampling results are generally 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 describes 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. Sample sites that provided evidence for this conclusion include Uncle Unit # 16 and the Baldman Cutting Unit (see table below).

2. Also consistent with the same Forest Service Handbook, 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. Sample sites that provided evidence for this conclusion include the following cutting unit areas from the Jasper Fire salvage area: Dumbuk II, Gillette West, Gillette East, Hell Canyon; and other units: Uncle #1 Uncle #2, Mallo, Duck #1, Dombuk #1 and Hellsgate.

3. 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 type of soil , 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 potentially the decrease 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) that was observed on site may have contributed to the decline in soil bulk density levels. The evidence for conclusion was based on sampling of the Baldman Cutting Unit.

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
2008	Burner Unit #3	Larson-Lakoa loams	2008 was the pre-harvest sample year for this unit
2008	Geranium # 23	Vanocker-Citadel	2008 was the pre-harvest sample year for this unit
2008	Geranium # 32	Lail-Stovho	2008 was the pre-harvest sample year for this unit
2007	Fanny Unit #4 T2S, R1E, Sections 8 and 9 Hell Canyon District	Stovho and Citadel loams	2007 was the pre-harvest sample year for this unit
2007	Wish Unit #52 T50N, R61W, Sections 14 and 15 Bearlodge District	Larkson and Citadel loams	2007 was the pre-harvest sample year for this unit
2007	Wish Unit #61 T50N, R61W, Section 21 Bearlodge District	Larkson loam	2007 was the pre-harvest sample year for this unit
2004	Uncle #16 T1S, R2E, Section 19 Mystic District	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%

Post Harvest Sample Year	Timber Harvest Units Sample Locations	Soil Sampled	Bulk Density Increase from Pre-harvest Sampling to Post-Harvest Sampling
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 Mystic District	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 Mystic District	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

- *– This was the initiation year of this soil bulk density sampling method (pre-harvest sampling occurred).*

2008 – Since none of the pre-harvest sample sites from the previous year had been harvested there were no post-harvest sample sites in 2008.

Livestock Use Activity Area Sampling

Monitoring:

As displayed in the Range Allotment Soil Bulk Density Sampling table further in this document, data has been collected for livestock use activities since this sampling began in 1998. Sampling has occurred during years that have been documented as having higher than average precipitation for the Black Hills area as well as during years of lower than average precipitation years (see the precipitation graph towards the end of this document). Although soil moisture conditions fluctuate with precipitation and temperature levels throughout the year, soil moisture conditions are generally greater in years with higher precipitation (or immediately following higher precipitation years) and lower soil moisture conditions are generally associated with below average precipitation patterns. Some of the soil data sheets for the sampling period noted dry soil moisture conditions during the below average precipitation years.

The Wolff Range Allotment (located approximately 13 miles south of Lead, SD) was sampled in 1998 during a period of above average precipitation (see precipitation chart at the end of this soil bulk density sampling section). The bulk density calculated in 1998 was 15.5% greater in the grazed area compared to the ungrazed exclosure. A drought started in the Black Hills in 2000 so the Wolff Range allotment was sampled again in 2006 to compare to 1998 bulk densities. The bulk density was slightly lower (approx. 1%) in 2006 as compared to the 1998 results. No single factor can be associated with this approximate 1% change since there were other contributing factors that could have altered soil bulk densities at this site. One factor for example, cattle had been in the exclosure for at least two weeks of the 2005 season, thus potentially increasing the "ungrazed" 2006 bulk densities. Gopher activity was prevalent both within and outside of the exclosure in 2006 and may be contributing to bulk density level changes. Following the 2006 sampling year, cattle were in the Wolff Allotment exclosure for approximately two weeks during the grazing season in 2007. The exclosure fence was apparently repaired in 2008.

The Crows Nest/Upper Beaver Allotment was also sampled in 1998 during the climatic cycle period with above average precipitation. The bulk density calculated for the area from the data collected in 1998 was approximately 18% greater in the grazed area in the vicinity of the exclosure compared to the ungrazed exclosure. The site was re-sampled in 2007 for similar reasons as described for the Wolff Allotment. In addition to sampling similarly to 1998, additional transects were sampled further to the east and west of the original grazed 1998 sample site, within the same soil map unit, to gather more information on extent of increased bulk density levels compared to the exclosure. Data from the additional sampling also indicated average bulk density levels were above the 15% threshold level for those soils in the soil map unit.

Evaluation:

Based on a relatively limited number of sites there is some evidence to support:

4. Sampling results are generally consistent with statements made in the Forest Service Handbook that soil compaction is caused by the weight of vehicles and animals on the ground and compact when soil moisture exceeds the plastic limit. 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. Sample sites that provided evidence for this conclusion include the Crows Nest/Upper Beaver, Wolff, Ditch Creek, Higgins, Castle Creek and Divide Allotments.

5. Soil bulk density changes have been documented to increase to or exceed the Region 2 soil quality standards level on areas of two of the sampled range allotments. These allotments are both located at relatively higher elevations in the Black Hills that have longer snow and soil moisture retention as compared to other lower elevation or lower precipitation zones. Meadow areas within both of the allotments were sampled during a cycle of higher than average precipitation and again following a cycle of lower than average precipitation. Both periods of data collection indicated soil bulk density levels at or above the Region 2 Soil Quality Standard average bulk density increases threshold. The site characteristics and conditions in association with various livestock numbers and management practices at those sites are expected to have contributed to the soil bulk density level changes, although it is not certain when the increases occurred, i.e. recent years or 10-20 or more years ago.

Range Allotment (Livestock Grazing Areas) Soil Bulk Density Sampling

Year Sampled	Range Sample Site	Soil sampled	Average Difference in Soil Bulk Density in Grazed Compared to Ungrazed Areas
2008	Crows Nest/Upper Beaver Allotment * All range sample sites in 2008 were located within this allotment to supplement 1998 and 2007 data that identified bulk density increases above 15%.	Redbird/Heath silt loams	26%, 9%, 31%
2007	Crows Nest/Upper Beaver Allotment T1N, R2E, Sections 31 and 32 Hell Canyon District Elevation:~6,600'	Redbird/Heath silt loams	Unit 5: +18.7% at same location sampled in 1998; +16.3% in additional extent. Unit 4: +24.3%
2007	Hell Canyon Allotment T5S, R2E, Section 22 Hell Canyon District Elevation: 4,680'	Paunsaugunt gravelly loam and gravelly silt loam and Gurney loam and silt loam	No difference
2007	Robinson Flats T7S, R2E, Section 14 Hell Canyon District Elevation: 4,300'	Butche and Boneek loams	+5.2%
2006	Wolff Range Allotment (T3N, R3E, Section 26) Northern Hills District, Elev. ~ 5900'	Cordeston loam	+14%*
2002	Baseline Range Allotment (T1N, R2E, Section 23) Mystic District 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 Hell Canyon District Elevation: 6529'	Redbird loam	+5%
2000	Divide Allotment (Lytle Creek Exclosure) Bearlodge District Elevation: 5583'	Cordeston loam	+6%

Year Sampled	Range Sample Site	Soil sampled	Average Difference in Soil Bulk Density in Grazed Compared to Ungrazed Areas
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, Elev.: ~ 6565'	Cordeston loam	+18%
1998	Wolff Range Allotment (T3N, R3E, Section 26) Northern Hills District Elevation: ~5900'	Cordeston loam	+15%*

SUMMARY OF 2008 SOIL BULK DENSITY RESULTS FOR CROWS NEST/UPPER BEAVER RANGE ALLOTMENT

Sample Locations	Mean Bulk Density (gm/cc)	Exclosure Mean Bulk Density	Difference in Soil Bulk Density in Grazed Compared to Ungrazed Area	Site 29 with ATV sample locations eliminated and sample results recalculated
Section 29	1.30	1.02	+27%	+26%
Section 32	1.11	1.02	+9%	See column to left
Section 34	1.34	1.02	+31%	See column to left

Crows Nest/ Upper Beaver Range Allotment

Crows Nest/ Upper Beaver Ungrazed Reference Exclosure (referred to on available allotment maps as "South Fork Castle Creek Study Plot Exclosure" (T.1N, R. 2E, Portions of E1/2 of Section 31 and SW ¼ of Section 32) - Transect for sample collections originated on the north side of the exclosure with a 176 degrees heading. The ground cover was 100% along all transects. Vegetation identified this year included a mix of bearded needlegrass, green needlegrass, sedges and forbs. Sedges and forbs seemed to be more dominant this year as compared to years when it was previously sampled. It is unknown but this may have been associated with the amount of precipitation received during the spring of 2008 as compared to that received in 2007. Although samples were collected at a similar time of the year as those collected in 2007 (2007 exclosure sampling dates of July 19-20; 2008 exclosure sampling date of July 24, 2008), small animal disturbances (possibly by gophers) seemed to be less in the exclosure as compared to what was observed in 2007.

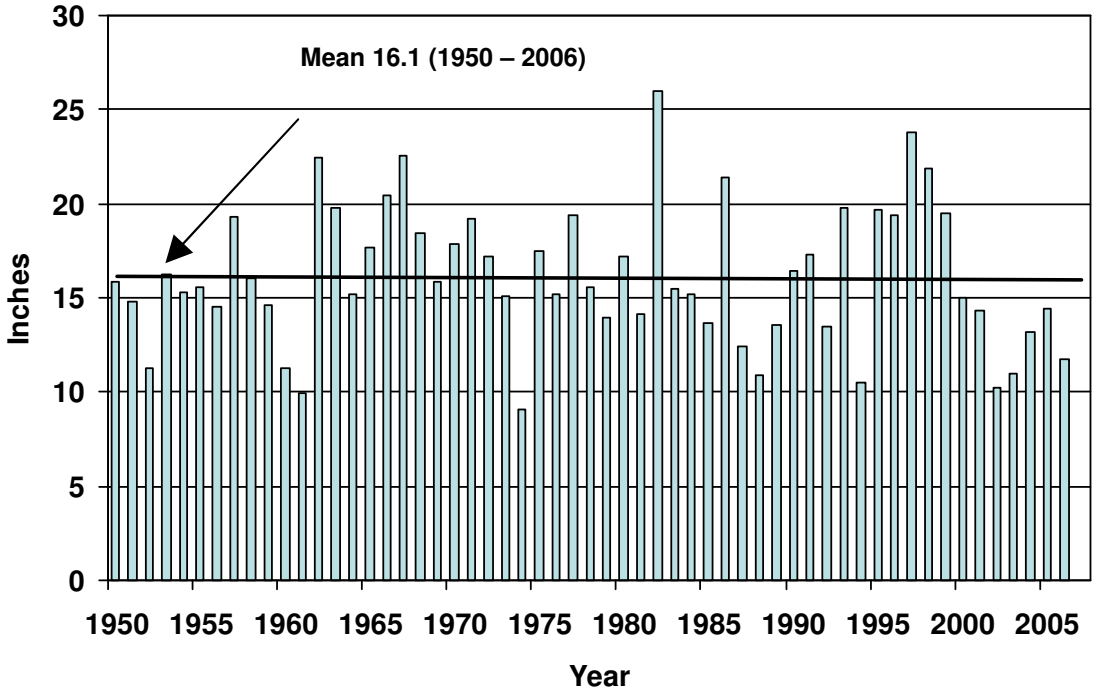
Allotment Sample Site in T.1N, R.1E., Section 29 – The results of the sampling at this location documents bulk density levels above the 15% threshold (see Forest Service Handbook 2509.18 – Soil Management Handbook, R2 Supplement No. 2509.18-92-1). The site characteristics of this location include a narrow grassland meadow area with adjacent fairly steep forested side-slopes

which may contribute for the cattle to concentrate here. Also, recent logging activity may have contributed as there were a few slash piles located in the meadow. Vegetative ground cover varied from 95 to 100% along transects. The area was a lane for cattle to reach the watering facility on the south end of the meadow. An ATV trail was also noted on the transect forms (see transect data forms included with this report). The vegetation in the area was a mix of vegetation typical of the High Country Silty range site as described in the Custer and Pennington Counties, Black Hills Parts Soil Survey.

Allotment Sample Site T. 1N., R.2E, Section 32 – This sample area had some evidence of prior disturbance from logging activities, however native grass regeneration is happening. Vegetative ground cover along transects varied from 95 to 100%. No recent slash piles associated with timber vegetation management activities were observed in this area. Prior and current small animal activity disturbance (thought to be gopher activity) were documented on two transects. The vegetation was similar to what was observed at the sample location in Section 29.

Allotment Sample Site T. 1N., R. 1E., Section 34 – The sample area location originally provided by the District was a v-shaped valley with a very narrow area of the Redbird-Heath soils mapping unit. The new sampling area was relocated over the ridge to the East tributary where the map unit valley was of a greater width and provided a greater extent of an area that could be sampled. Vegetative ground cover estimates along transects varied from 90 to 100%. The lab processing results of documented soil bulk density levels above the 15% threshold.

Annual precipitation for Rapid City, SD from 1950-2006



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 latest information that had been submitted for the Forest Plan monitoring report regarding revegetation was for the submittal to the FY2006 monitoring report (can be accessed at: http://www.fs.fed.us/r2/blackhills/projects/planning/fy2006_report.pdf). Prior to that, this monitoring item had been reported on in the Black Hills National Forest 2002 Monitoring and Five Year Evaluation Report (can be accessed at: http://www.fs.fed.us/r2/blackhills/projects/planning/2002Monitor/all.pdf). Funding was not available in FY07 or FY08 for Monitoring Item 3: Soils – Revegetation. The most recent information for this specific monitoring item is the Black Hills National Forest FY2006 Monitoring and Evaluation Report (can be accessed at: http://www.fs.fed.us/r2/blackhills/projects/planning/fy2006_report.pdf).

Evaluation:

As indicated in 2006 Monitoring Report, the vegetation management areas (primarily those associated with timber harvest) that have been reviewed at the Forest Plan level have generally been observed to be achieving vegetation cover or effective ground cover at levels expected to protect soil resources from detrimental erosion conditions. In addition, Monitoring Item 4d: Best Management Practices (BMP) has been reported on a number of times in previous monitoring reports that indicate that the Forest has generally been meeting BMPs and that they are effective. BMP Implementation and Effectiveness monitoring includes reviewing sites for revegetation or ground cover. The level of sampling that has been documented indicates that such practices as full implementation of Forest Plan Standards and Guidelines and project specifications based on implementation such as Watershed Conservation Practices and Best Management Practices for Silviculture can be successful at meeting the Region's Soil Quality Standards. Information gathered for project analyses include some level of sampling to indicate existing condition and further information may be obtained by reviewing those documents or by reviewing project implementation monitoring documents available on the various Districts. While vegetation management disturbances have generally been documented to retain ground cover or revegetate and redevelop vegetative ground cover within a few years, it should also be noted that areas with high burn severity conditions, such as areas within the Jasper Fire (2000) area, are much slower to re-establish vegetation and effective ground cover (tables displaying information for the Jasper Fire area were available in the regetation section in the 2007 Forest Plan Annual Monitoring report). The data collection period for the post-fire conditions occurred during years that received below normal precipitation (see http://www.hprcc.unl.edu/) therefore it is unknown how vegetation and forest floor (vegetative litter layers) development may

have occurred during an average precipitation year.

Monitoring Item 4: Watershed Health

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

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 addresses Objective 104b and the Clean Water Act. While the reporting frequency for this monitoring item is to occur every 2-10 years (refer to Chapter 4 of the Forest Plan), this monitoring item has been reported on a number of times in recent years (2006, 2007 and 2008) in the Black Hills National Forest FY 2005, 2006 and 2007 Monitoring and Evaluation Reports (USDA Forest Service 2006; 2007; 2008). In 2008, the implementation and effectiveness monitoring review for BMPs and WCPs occurred within sample areas of the following timber sales and prescribed burn units: Sundance Burn (two units), Snapper Timber Sale (two units), Sleez Timber Sale Units (three units) (USDA Forest Service 2008b).

Evaluation:

This evaluation is a summary of the implementation and effectiveness information gathered on BMPs/WCPs applied to silviculture activities. Similar to what had been written in the Black Hills National Forest FY 2005, 2006 and 2007 Monitoring and Evaluation Reports (USDA Forest Service 2007a; USDA Forest Service 2007b), the 2008 field season information suggest that the effects of logging activities, through the implementation of BMPs, have generally had limited negative impacts on watersheds and/or streams at the sites that were monitored (USDA Forest Service 2008b). The 2008 information collected reveal that BMPs and WCPs are generally being implemented and when implemented are effective in the timber sale units that were inspected. As identified in previous years reports, while BMPs and WCPs are generally being implemented on road systems and are generally effective, there were areas with documented drainage issues such as ruts, rills and gullies on roads and/or more effective road drainage features (such as crowning, drainage dips, etc) or hardening (such as gravel application) need to be incorporated on some of the roads. In 2008, some erosion on some skid trails within the Sleez Timber Sale monitoring sites that were documented.

The Forest internally actively monitors BMP implementation and effectiveness. Also, various personnel have also participated in Best Management Practices field audits that have been completed in 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), the Wyoming State Forestry Division and non-state and non-federal cooperators (see the audit report for participants). Since initiated, these audits have generally been completed on a 3-year cycle. Audits were completed for both states in 2004 and an audit was completed in Wyoming in 2007 (Wyoming State Forestry Division 2007). The audit included a review of two sites

within the Snapper Timber Sale on the Bearlodge District. Based on the process used, the audit indicated that the two Forest locations evaluated met the BMPs over 90% of the time and were evaluated to be over 90% effective. Review of the audit information for all sites evaluated (federal, state and private) indicate that while BMPs are implemented and generally effective, that road drainage needs greater focus from the standpoint of BMPs. South Dakota plans to have a Best Management Practices Field Audit for harvested areas in August/September 2009.

Through this multiple year review and evaluation of BMP and WCP implementation and effectiveness monitoring, and the need for more attention place on BMPs/WCPs associated with road drainage, the Forest had Resources Staff and Physical Resources Staff (engineering design) personnel met June 24, 2009 to review the road drainage concerns. Following that a letter was sent to the Forest Supervisor of recommended actions to be taken to address road drainage issues (USDA Forest Service 2009).

Monitoring Item 5: Water Quantity (Water Yield)

Objective 108: Manage for sustained or improved water flows.

Monitoring and Evaluation:

Water Quantity or Water Yield has generally been assessed as part of the process for the development of a Land and Resource Management Plan, or a revision of the plan. Water yield was included in the process for the 1997 Revised Black Hills Land and Resource Management plan (see Chapter 3 of the associated Final Environmental Impact Statement). Since it is expected to be assessed again during the next revision process, there has not been additional assessment during the last five years.

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.

1. **Raise the water table to saturate historically inundated soils.**
2. **Convert drier-site vegetation to native wet-meadow species.**
3. **Reintroduce beaver into the drainage once suitable habitat is developed.**
4. **Design management to maintain wet-meadow conditions.**

Monitoring:

Projects to restore or enhance riparian and wetland habitat or to 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 following table shows projects that contributed to riparian/wetland habitat restoration in FY 2008.

Project	District	Funding Source	Target
Beaver Creek riparian exclosure	Hell Canyon	NFWF	0.2 acres
Black Fox Wetland exclosure	Mystic	NFVW	55 acres
Mahrt Spring enhancement	Hell Canyon	NWFW	1 acre
Silver Spring riparian exclosure	Bearlodge	NFWF	3 acres
Twin Springs riparian exclosure	Bearlodge	NFWF	5 acres

The following table summarizes the acres of riparian habitat restored or enhanced from FY2003-2008. Some projects are long-term and restoration activities may occur in multiple years. Subsequently, some project acres may be counted in multiple years.

ACTIVITY	2003	2004	2005	2006	2007	2008	TOTAL
Riparian acres restored	53	32	55	3	112	64	319

Evaluation:

Progress is being made in achieving Objective 214. Efforts to restore McIntosh Fen or to protect the Black Fox fen/wetland complex achieved the most target acres, but the smaller spring protection projects also provide ecological diversity benefits exceeding their small size.

Monitoring Item 8: Vegetative Diversity – Vegetation Species Composition

Objective 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.

The table below shows the 1997 Forest Plan cover types and acreages with the vegetation database outputs since the Phase II Amendment decision for the years 2005, 2006, 2007 and 2008.

Acres Dominated by Aspen or Bur Oak on the Black Hills National Forest					
Cover Type	**1997**	**2005**	**2006**	**2007**	**2008**
Aspen	48,224	46,172	45,559	45,843	45,111
Bur oak	9,243	12,477	12,879	13,021	13,132

Evaluation:

There was a slight decrease (732 acres) in aspen acres in 2008, and about a seven percent decline compared to 1997. Forest database stand mapping is more accurate today than the mid-1990s for the 1997 forest plan. Prolific pine regeneration is contributing to the decrease of aspen acres. Likewise the pine removal of mixed pine and oak stands are resulting in more oak stands. The increase in aspen or bur oak cover type is achieved generally by removing pine from mixed species stands. Aspen is a disturbance-dependant species. Wildland fire and/or prescribed burning also promote aspen regeneration. Forest land management treatments and natural disturbances will create more acres of hardwoods. Additional time is needed to meet Objective 201.

Objective 202: Conserve and manage existing mountain mahogany stands. Manage a minimum of 10 percent of the site in cover (mature and over mature shrubs).

Evaluation:

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.

Objective 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.

Evaluation:

The bur oak cover type is 13,132 acres (see cover type chart). There are 8,083 acres of bur oak with stand age determination. Of the 8,083 acres, there are 1,467 acres of bur oak that is 100 years or older.

Objective 204: Conserve and manage birch/hazelnut, lodgepole pine, limber pine, and Douglas-fir. These cover types have the following acres:

Paper birch	3423
Lodgepole pine	103
Limber pine	-0-
Douglas-fir	30

Objective 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.

The table below shows the cover types and acreages for the 1997 Forest Plan and for the vegetation database since the Phase II Amendment decision for the years 2005, 2006, 2007 and 2008. Meadow acreage for the 1997 Forest Plan was not available.

Acres Dominated by Grassland or Meadow on the Black Hills National Forest					
Cover Type	**1997**	**2005**	**2006**	**2007**	**2008**
Grassland	104,174	109,888	109,829	103,026	104,181
Meadow	n/a	26,089	24,849	6,449	6,876

Evaluation:

The Forest is approximately 18,000 acres short of the grassland objective. The Forest has 3,276 acres more than the objective acres for meadow. For the ten-year period, grassland acreages have shown an increase then a decrease that is likely explained by inconsistencies in what cover types have been queried in the vegetation database. The acres of meadow dropped considerably in 2007 compared to 2005 and 2006. This is explained by the cover types that were queried from the vegetation database. In 2005 and 2006, bluegrass and blue grama represented the meadow habitat. Starting in 2007, cover types more representative of wet meadows were queried.

To insure more consistent future reporting, the following covertypes will represent grassland habitat (both interior and prairie, as defined in the Phase II Amendment Final Environmental Impact Statement) and meadows.

Habitat	Vegetation Database Cover Types
Grassland	GBG (blue grama, buffalo grass), GBL (big and sand bluestems), GEX (planted grassland – exotic species), GLB (little and silver bluestems), GNE (needlegrasses), GOA (oatgrass),GRA (grasslands), GSO (sideoats grama), GWH (wheatgrass)
Meadow	FCA (cattails), GPO (bluegrass), GWE (rush species; wet sedge species)

Objective 205: 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.

The table below shows the acres of spruce for the 1997 Forest Plan and from the vegetation database since the Phase II Amendment decision for the years 2005, 2006, 2007 and 2008. To increase the acres of spruce cover type is to generally remove pine from a mixed spruce/pine stand.

Acres Dominated by Spruce on the Black Hills National Forest					
Cover Type	**1997**	**2005**	**2006**	**2007**	**2008**
Spruce	21,737	25,462	26,483	26,110	25,724

Evaluation:

The Forest is over 5,724 acres above or 28% greater than the objective of 20,000 acres of

spruce.

Monitoring Item 9: Vegetative Diversity – Structural Stages

Monitoring Item 9 uses vegetative diversity defined by structural stage applied to all forested stands.

Structural Stage Descriptions[1]				
Code	**Structural Stage**	**Tree Size Class**	**Diameter Range**	**Crown Cover %**
1	grass-forb	non-stocked	NA	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"	11-40
4B				41-70
4C				71-100
5	late succession	large, very large	varies	varies

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 – late succesional	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.

The Monitoring Implementation Plan identifies tracking acres of structural stage by cover type within 5 selected management areas as identified in the Phase II Amendment. Results are shown on the following table.

Monitoring:

While each management area is considered individually for the ponderosa pine cover type within the five management areas, the data table below indicates there is generally too much structural stage 1,

[1] Land and Resource Management Plan Phase II Amendment, glossary pages 67-68.

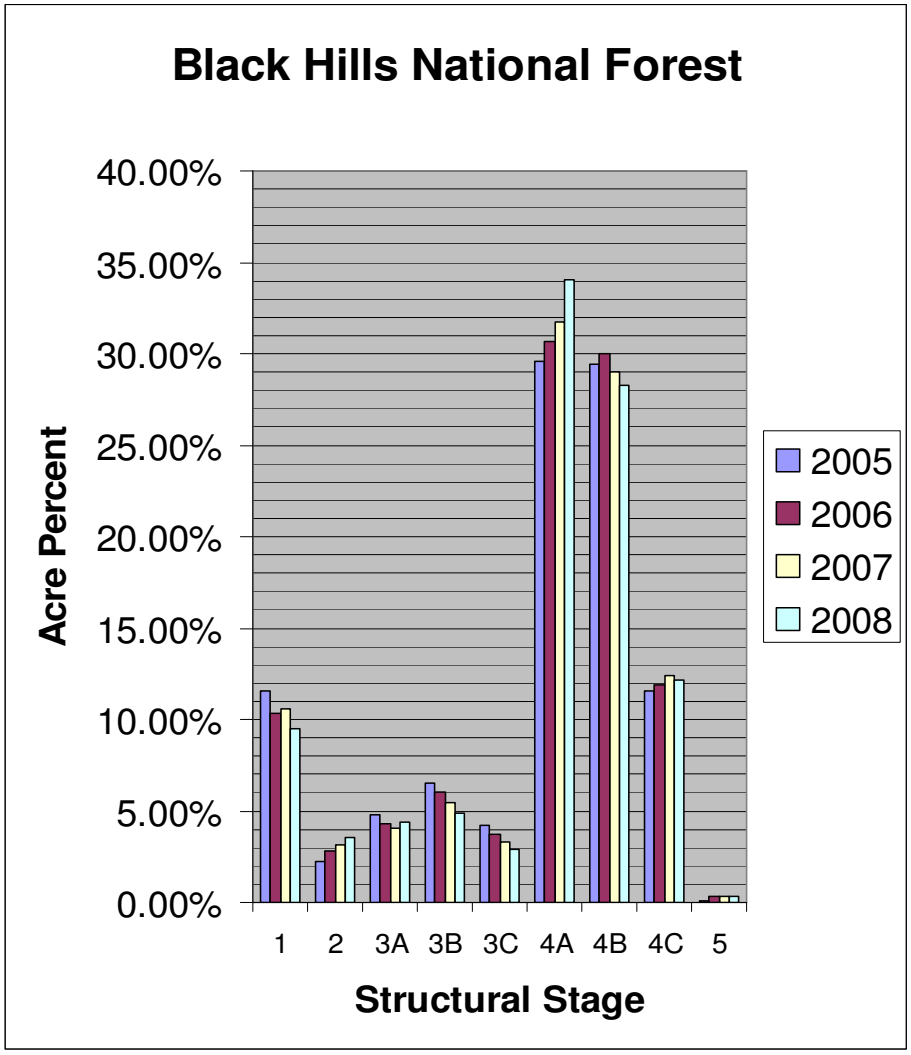
4A, 4B and 4C, and not enough structural stage 2, 3A, 3B, 3C and 5. Structural stage 1 acres are attributable to the recent large wildfires or stand mortality due to insects. To achieve percents in some structural stage categories, the vegetative treatments may span decades to change to another structural 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, tree harvest methods of overstory removal are used. To implement an overstory removal an understory must be present in a 4A/B/C stand. Overstory removal harvests will reduce the structural stage 4's and increase the structural stage 3's. Structural stage 1 will grow into structural stage 2 and then on into structural stage 3's generally within 20-30 years. Overstory removal and seed cut are the highest projected harvest methods from the last forest planning analysis (USDA Forest Service 1996b Ch.II-36 Table II-6).

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**	1.20%	1.70%	4.40%	2.60%	1.70%	31.10%	35.00%	21.50%	0.60%	100.00%
	acres >	**2006**	413	548	908	1021	844	9391	14445	8382	204	36156
	percent >	**2006**	1.10%	1.50%	2.50%	2.80%	2.30%	26.00%	40.00%	23.20%	0.60%	100.00%
	acres >	**2007**	393	512	583	1,311	1,033	8,783	14,257	8,982	302	36,156
	percent >	**2007**	1.09%	1.42%	1.61%	3.63%	2.86%	24.29%	39.43%	24.84%	0.84%	100.00%
	acres >	**2008**	388	441	744	1254	981	9060	13831	8984	430	36113
	percent >	**2008**	1.07%	1.22%	2.06%	3.47%	2.72%	25.09%	38.30%	24.88%	1.19%	100.00%
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**	8.30%	2.30%	3.60%	5.60%	2.90%	35.20%	31.60%	10.40%	0.10%	100.00%
	acres >	**2006**	38308	15453	18371	22827	11675	177660	144167	47617	307	476385
	percent >	**2006**	8.00%	3.20%	3.90%	4.80%	2.50%	37.30%	30.30%	10.00%	0.10%	100.00%
	acres >	**2007**	37,468	16,378	18,123	21,319	11,176	181,254	141,541	49,337	798	477,394
	percent >	**2007**	7.85%	3.43%	3.80%	4.47%	2.34%	37.97%	29.65%	10.33%	0.17%	100.00%
	acres >	**2008**	30261	18827	18558	18949	9624	194353	137839	48654	869	477934
	percent >	**2008**	6.33%	3.94%	3.88%	3.96%	2.01%	40.67%	28.84%	10.18%	0.18%	100.00%

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										
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	17.00%	2.10%	6.70%	8.50%	6.40%	21.90%	25.50%	11.90%	0.20%	100.00%
	acres >	2006	51861	8469	18045	28974	19926	77761	93782	44154	1137	344109
	percent >	2006	15.10%	2.50%	5.20%	8.40%	5.80%	22.60%	27.30%	12.80%	0.30%	100.00%
	acres >	2007	52,651	9,183	16,358	24,827	16,303	84,731	90,839	48,084	1,196	344,172
	percent >	2007	15.30%	2.67%	4.75%	7.21%	4.74%	24.62%	26.39%	13.97%	0.35%	100.00%
	acres >	2008	50491	10621	18947	22263	14450	92131	88796	46638	1299	345636
	percent >	2008	14.61%	3.07%	5.48%	6.44%	4.18%	26.66%	25.69%	13.49%	0.38%	100.00%
5.43	acres >	2005	3,743	357	504	761	418	1,665	1,521	539	52	9,559
	percent >	2005	39.20%	3.70%	5.30%	8.00%	4.40%	17.40%	15.90%	5.60%	0.50%	100.00%
	acres >	2006	448	158	318	285	316	3014	4428	1390	52	10409
	percent >	2006	4.30%	1.50%	3.10%	2.70%	3.00%	28.96%	42.54%	13.35%	0.50%	100.00%
	acres >	2007	3,217	589	525	743	351	1,079	1,854	1,143	52	9,553
	percent >	2007	33.68%	6.17%	5.50%	7.78%	3.67%	11.29%	19.41%	11.96%	0.54%	100.00%
	acres >	2008	3217	589	548	795	275	1242	1743	1069	72	9550
	percent >	2008	33.69%	6.17%	5.74%	8.32%	2.88%	13.01%	18.25%	11.19%	0.75%	100.00%
5.6	acres >	2005	132	290	739	244	202	5,888	8,075	3,988	28	19,585
	percent >	2005	0.70%	1.50%	3.80%	1.20%	1.00%	30.10%	41.20%	20.40%	0.10%	100.00%

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										
5.6	acres >	2006	108	246	630	167	240	4461	9218	4193	507	19770
	percent >	2006	0.50%	1.20%	3.20%	0.80%	1.20%	22.60%	46.60%	21.20%	2.60%	100.00%
	acres >	2007	122	949	555	250	240	5,759	9,038	2,567	638	20,118
	percent >	2007	0.61%	4.72%	2.76%	1.24%	1.19%	28.63%	44.92%	12.76%	3.17%	100.00%
	acres >	2008	105	949	555	250	240	5776	9038	2567	638	20118
	percent >	2008	0.52%	4.72%	2.76%	1.24%	1.19%	28.71%	44.92%	12.76%	3.17%	100.00%
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**	**11.53%**	**2.20%**	**4.83%**	**6.51%**	**4.20%**	**29.60%**	**29.43%**	**11.60%**	**0.10%**	**100.00%**
	acres >	**2006**	**91,138**	**24,874**	**38,272**	**53,274**	**33,001**	**272,287**	**266,040**	**105,736**	**2,933**	**887,555**
	percent >	**2006**	**10.30%**	**2.80%**	**4.30%**	**6.00%**	**3.70%**	**30.70%**	**30.00%**	**11.90%**	**0.30%**	**100.00%**
	acres >	**2007**	**93,851**	**27,611**	**36,144**	**48,450**	**29,103**	**281,606**	**257,529**	**110,113**	**2,986**	**887,393**
	percent >	**2007**	**10.58%**	**3.11%**	**4.07%**	**5.46%**	**3.28%**	**31.73%**	**29.02%**	**12.41%**	**0.34%**	**100.00%**
	acres >	**2008**	**84,462**	**31,427**	**39,352**	**43,511**	**25,570**	**302,562**	**251,247**	**107,912**	**3,308**	**889,351**
	percent >	**2008**	**9.50%**	**3.53%**	**4.42%**	**4.89%**	**2.88%**	**34.02%**	**28.25%**	**12.13%**	**0.37%**	**100.00%**

	Structural Stage									Percent
Year	1	2	3A	3B	3C	4A	4B	4C	5	Total
2005	11.53%	2.20%	4.83%	6.51%	4.20%	29.60%	29.43%	11.60%	0.10%	100.00%
2006	10.30%	2.80%	4.30%	6.00%	3.70%	30.70%	30.00%	11.90%	0.30%	100.00%
2007	10.58%	3.11%	4.07%	5.46%	3.28%	31.73%	29.02%	12.41%	0.34%	100.00%
2008	9.50%	3.53%	4.42%	4.89%	2.88%	34.03%	28.25%	12.13%	0.37%	100.00%



Evaluation:

The Forest is commercially harvesting approximately 20,000 acres per year or 2 percent of the suitable forestlands per year. The Forest is presently using commercial thin as the dominant tree harvest prescription. In order to move towards more structural stage 3's and less structural stage 4's, the Forest could implement more overstory removals or harvest methods which the understory is the dominant structural stage. There is concern that large trees may not be as readily apparent across the landscape. Highways, county roads and gravel roads are areas of high visibility where there is sensitivity to implementation of overstory removals. Where large trees are left to soften the sensitivity of forest land treatments, the residual basal area of the overstory needs to be 10 or below in order to change structural stage 4 to a structural stage 2 or 3. In most cases, sensitive visual areas having a commercial harvest and retaining a large tree component will be a structural stage 4A.

Hence, overstory removals with reserve trees, seed cuts and commercial thinning are significant contributors to the upward trend of structural stage 4A. Areas that are not visually sensitive could be considered to move to structural stage 2 or 3.

Monitoring Item 10: Vegetative Diversity – Large Trees

Objectives 4.1 – 203, 5.1 – 204, 5.4 – 206, 5.43 – 204, 5.6 – 204: 10% of the structural stage 4 ponderosa pine acreage in the management area will have an average tree size of "very large".

Very Large tree size is defined as 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.

Monitoring:

The percent of very large trees in structural stage 4 by management area from 2005 to 2008 is shown below. No data is provided prior to 2005 because this is a new objective under the Phase II Amendment. In 1995 the forest database has 28,076 acres of "very large" trees. The management areas have changed labels and boundaries from the 1995 database to today's forest plan scheme. Therefore, it is not possible to determine 1997 acres by today's management areas.

Management Area	Percentage SS4 in *very large trees* by year			
	2005	2006	2007	2008
4.1	18.3	17.6	17.5	17.9
5.1	11.1	11.6	11.8	12.0
5.4	8.7	8.0	9.5	9.1
5.43	6.5	3.4	5.5	3.7
5.6	26.8	25.9	29.1	29.1

Evaluation:

In FY 2008, Management Areas 5.4 and 5.43 are not meeting the 10% objective. There appears to be an increasing trend in MA 4.1, 5.1 and 5.6 in the last three years. Management Area 5.43 represents 0.8 percent of the Forest. Subsequently, a large tree deficiency in this management area has a minor effect Forestwide.

Monitoring Item 11: Vegetative Diversity and Snag Retention

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 where there is tree inventory data. Annually, approximately 5-10% of the Forest has field data collected. The table below displays the

2006, 2007 and 2008 data.

In 2005, the average number of standing dead trees per acre for diameter class 9 inch plus by management area on conifer sites with a height 25 feet or greater is 1.7 snags/acre. 2006, 2007 and 2008 averages are shown below. Values highlighted in yellow indicate where the objective is not being met on a management area basis.

Average number of standing dead trees per acre by Management Area for ponderosa pine and white spruce with a height greater than 24.9 feet.

Year >>>	2006		2007		2008	
Management Area	# of Trees >9-inch dbh	% Trees >14-inch dbh	# of Trees >9-inch dbh	% Trees >14-inch dbh	# of Trees >9-inch dbh	% Trees >14-inch dbh
1.1A	1.6	37.5	3.0	43.3	3.0	43.3
2.2	2.2	45.5	4.4	43.2	4.4	43.2
3.1	1.6	31.2	7.3	32.9	7.2	33.3
3.31	0.4	25.0	1.4	14.3	1.4	14.3
3.32	2.4	29.2	5.8	29.3	5.8	29.3
3.7	1.4	28.6	4.9	32.7	4.6	34.8
4.1	1.2	25.0	3.6	27.8	3.6	30.6
4.2A	1.1	36.4	5.6	35.7	5.6	35.7
4.2B	2.7	22.2	5.1	11.8	5.1	11.8
5.1	1.2	25.0	3.7	21.6	3.7	21.6
5.1A	1.0	20.0	1.1	18.2	1.1	18.2
5.2A	2.6	26.9	4.2	28.6	4.2	28.6
5.3A	1.1	27.3	2.3	21.7	2.3	21.7
5.3B	5.7	33.3	14.2	34.5	14.5	34.5
5.4	1.5	20.0	3.1	22.6	3.0	23.3
5.43	1.5	20.0	2.2	31.8	2.0	25.0
5.4A	2.7	40.7	5.2	44.2	5.3	43.4
5.6	1.1	27.3	3.5	28.6	3.5	28.6
8.2	2.5	23.1	3.2	40.6	3.2	40.6
Total/Average	**1.3**	**28.6**	**3.6**	**29.7**	**3.6**	**23.6**

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

Forest Inventory Analysis (FIA) published report data has not been provided from the Northern Research Station for the re-measurement update for the Black Hills National Forest.

This data 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 are not included in the standing dead trees per acre. Some of the above mentioned wildfire areas are currently under stand exam contract for updating the vegetation database. 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 which is 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 and the cumulative recent past fall downs an estimate of 25% of the 11,033,001 trees remains standing or 2,758,250 for year 2008. For year 2007, 60% of the 18,388,335 trees remains standing (11,033,001) and for year 2006 an estimate of 70% (26,269,050 x 0.7 = 18,388,335) trees is remaining. For year 2008, the estimated number of wildfire created snags applied across the Forest of 1 million forested acres results in approximately 2.7 snags per acre from wildfire (2,758,250 / 1 million acres). Tree mortality impacted from insects since year 1996-2008 is estimated at 369,000 acres (reference the 2008 Aerial Detection Survey Summary by Forest Health).

Likewise, an estimate of 150 trees per acre times 369,000 acres results in 55 million snags times 70% fall down rate equals 16.6 million standing snags (369,000 x 150 = 55,350000 x 0.3 = 16,605,000 standing snags) divided by one million forested acres results in 16 snags per acre. The 2.7 snags per acre estimate from wildfire and 16 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. Some areas have been logged through timber sales which cut trees which may have been recently hit by insects but still merchantable for lumber. Also, snags are created from prescribed fire and burning of large slash piles. Snag density across the Forest ranges from 0-150 snags per acre. There have been no recent very large wildfires. Therefore the number of snags created from wildfires is decreasing due to fall downs. Most snags break down and snap off below 25 feet in height. Strong winds often break the standing snags from 15-25 feet in height.

Evaluation:

Wildfires and insect tree mortality results in well above 3 snags per acre for the Forest. Cutting standing dead trees for firewood, particularly where they could be a safety hazard along roads, would likely have minimal effect on total snag numbers.

Monitoring Item 12: Burned Forest Habitat

Objective 11-03: **"Following a wildfire, dead trees will be available for value recovery. Retain 50% of the recent (0-5 years) stand-replacing fire acreage up to 10,000 acres Forest-wide."** Generally the highest priority areas to retain are those with greater than 70-percent pre-fire canopy closure…"

Following is a summary of the number of fires, total burned acreage, and acreage retained for habitat for the last five years. This objective was effective in 2006 (after the 10/05 Phase II decision), but earlier years are included to indicate available habitat. Relatively large, contiguous blocks of bark beetle killed trees are not included (the geographical analysis tool is yet to be refined).

FISCAL YEAR	NUMBER OF FIRES (NFS lands)	ACRES BURNED (NFS lands)	ACRES (%) RETAINED FOR HABITAT
2003	96	10,773	10,525 (97%)
2004	122	143	143 (100%)
2005	127	6,201	6,201 (100%)
2006	112	866	866 (100%)

FISCAL YEAR	NUMBER OF FIRES (NFS lands)	ACRES BURNED (NFS lands)	ACRES (%) RETAINED FOR HABITAT
2007	108	368	338 (92%)
2008	42	192	192 (100%)
Total	**607**	**18,543 acres**	**18,265 (98%)**

Evaluation:

A total of 18,543 acres of burned forest habitat was created and largely retained over the last 6 years, exceeding the 10,000 acre objective. Approximately 200 acres in the Red Point Salvage Sale (2003 Fire) and 30 acres in an existing sale within the Boxelder Fire (2007) were salvaged. The total burned acreage does not differentiate stand-replacing fire, and does not include any relatively large (>1,000 acres), contiguous blocks of insect-killed trees which has also created habitat. Ponderosa pine killed in fire loses marketability very quickly due to wood borers and blue stain, thus very little has been salvaged.

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 they 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 2008 = 17,622 acres.

Monitoring Item 15: Timber Production

Objective 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)		
	Million cubic feet	**Million board feet**
Sawtimber	181	838
Roundwood	21	NA
Total	**202**	**838**

Objective 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.

Objective 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)		
	Million cubic feet	**Million board feet**
Sawtimber	5.4	27.0
Roundwood	1.0	NA
Total	**6.4**	**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**

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 provides 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).

Since ASQ is for one decade and it may be longer before the Plan is again revised, I am establishing guideline 2402 which limits harvest in the decade beginning in fiscal year 2007 to less than 202 million cubic feet. (USDA Forest Service 1996b p. ROD - 35).

Year 2008 Summary

There were 5 management decisions addressing 168,790 acres in planning areas. Harvest acres from signed decisions (NEPA decisions) is 66,620 acres.

1997 Forest Plan Objective 303						
Year		**Sold**		**Cut**		**Harvested**
1st Decade		**ccf**		**ccf**		**Acres**
1997		166,538		119,231		15,307
1998		154,149		116,202		14,307
1999		144,956		140,003		14,238
2000		76,307		131,080		13,567
2001		20,725		157,508		12,442
2002		91,212		123,595		15,123
2003		81,443		135,619		16,500
2004		171,032		149,378		17,795
2005		145,082		165,741		18,200
2006		147,790		154,065		22,430
Decade Total		1,199,234		1,392,422		159,909
Decade Average		119,923		139,242		15,991
2nd Decade						
2007		177,878		180,219		18,286
2008		254,294		192,861		26,844

Evaluation:

The first decade average annual sold volume is 119.9 million cubic feet which is below the objective of 181 million cubic feet. The 2nd decade is increasing in volume sold and volume cut.

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 Grizzly2. 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 Grizzly2 is in Norbeck. Grizzly2 has been harvested at 12,672 ccf. The portion of Grizzly2 in Norbeck is 7,730 ccf (12,672 ccf times 61%). As of end of fiscal year 2007, approximately 80% of the sale volume has been harvested. The Needles #2 volume plus Grizzly2 volume within Norbeck is approximately 24,115 ccf (16,385 ccf + 7,730 ccf).

Evaluation:

Needles2 completed sawtimber harvest in the 1st decade at 16,385 ccf. Grizzly2 completed sawtimber harvest in the 2nd decade at 7,730 ccf. The objective 303 is for 5.4 million cubic feet per decade. Each timber sale is below the objective for the decade.

Monitoring Item 16: Rangeland Trend

Objective 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 on 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 launch 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, a shorter period than that may not show a real directions of trend.

Each of the districts has been working toward collecting trend data. We currently use Cover Frequency methodology as a norm but other accepted methods can and have been used as the need arises. In 2007 we began the use of "Multiple Indicator Monitoring (MIM)" a process of several monitoring methods that can be done at onetime; you can read any or all items depending on the monitoring question(s) being ask. If you are interested in more information on MIM, you can read BLM "Technical Bulletin 2007-01" or go to:
http://www.blm.gov/id/st/en/info/publications/technical_buttetins/tb_07-01.html.

The monitoring 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 Ranger District

Starting in 2001, he District began collecting trend data using the Cover Frequency methodology. Between 2001 and 2007, the District accomplished transects on 28 allotment and some have been re-read. This data shows that trend was steady or moving towards desired condition. In 2008, 21 transects on 4 allotments were completed. Also Ocular Plant

Composition transect were done on 3 allotments. Proper Function Condition (PFC) has been done as an indicator of trend. The 9786 acres French Creek Allotment was done in 2008. The Flynn/Bowman, Glen Erin and Hazelrodt pastures were completed for a total of 25,000 acres on the Cicero Allotment (2005).

Mystic Ranger District

In 2008, nine Multiple Indicator Monitoring (MIM) transects were established on seven allotments involved in the Mystic Range Rescission Project. These transects provide baseline data for riparian and stream conditions. These MIM transects and Proper Functioning Condition (PFC) assessments were completed in the summer and fall of 2008.

Findings: MIM data, PFC assessments, and historic trend data are currently being analyzed as part of the planning process for the Mystic Range Project. Monitoring plans for the eight allotments in the Mystic Range.

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 new transects were read in 2007. In 2004 and 2005, the District's Range Staff established 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 fast evaluation method of vegetative trend, and are in a format that permittees and non-range agency personnel can understand. 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 Ranger District

In 2003, 48,680 acres on 6 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 7 allotments were inventoried using the Cover Frequency methodology. Data has not been compiled and analyzed on the Cover-frequency transects conducted on 3 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. To monitor in riparian areas MIM was done in 2 pastures totaling 3,535 acres.

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. Two (2) additional PFC transects were accomplished in 2007. In 2008 the District established one MIM transect on the Willow Springs Allotment and 2 additional Cover Frequency 4 sets on Beaver Creek and 1 in Divide.

Northern Hills Ranger District

From 2004 to 2006, monitoring to determine trend was conducted on 7 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 5 of these allotments were either in a static or upward trend. Data for the remaining four allotments has not yet been analyzed. To monitor in riparian areas, MIM was done in 4 pastures totaling 21,474 acres.

Proper Function Condition (PFC) was completed over the past 10 years on the 5 allotments totaling 42,345 acres. In 2007, PFC was accomplished on 4 allotments totaling 17,751 acres.

Monitoring Item 17: Forage Utilization

Objective 301: 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 Land and Resource Management Plan (Forest 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 on the Forest.

In fiscal year 2008, actual grazing use on the Forest was 124,642 AUMs. This is approximately 97 percent of the annual projected Forest grazing capacity of 128,000 AUMs available for livestock utilization identified in the Forest Plan.

Items Monitored	2003	2004	2005	2006	2007	2008
Livestock AUMs Grazed	122,971	118,919	120,405	115,955	126,186	124,642

Districts monitored and evaluated approximately 780,266 acres of rangelands on 92 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	109,924	94,157	304,387	81,675
Grazing Allotments Evaluated	24	24	26	13

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. Utilization and stubble height measurements are and indicator of move times between and off the pastures; it is not to be used as a compliance tool.

Findings and conclusions relevant to the evaluation follow:

1. Forage utilization throughout most of 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 pastures and some allotments surveyed (approximately 10 %). Corrective action was and is being taken; these areas will continue to be monitored to see if management changes are needed.

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)

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.

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 Region 2 (R2) sensitive plant species and Black Hills National Forest plant species of local concern (SOLC) in the event that funding/personnel are not adequate to complete the full monitoring plan. The prioritization strategy was last updated in 2008. This working tool is updated on a periodic basis as new information becomes available and will be applied as needed in the future.

The months of January through April of 2008 were classified as abnormally dry to moderate drought in the Black Hills. However in the spring precipitation increased and May through December of 2008 were not classified as drought. www.drought.unl.edu/dm/monitor.html. For the Black Hills, the months of May through December of 2008 were classified as moderately moist to very moist on the Palmer Hydrologic Drought Index. http://lwf.ncdc.noaa.gov/oa/climate/research/prelim/drought/phdiimage.html.

Noxious weeds and invasive species are discussed below in relation to R2 sensitive and plant SOLC. 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 (1997) as amended by Phase II (2005), Black Hills National Forest Noxious Weed Management Plan (2003), and Monitoring Item 22. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and plant SOLC.

The following report focuses on monitoring results for 2008. For a more detailed overview of monitoring history and protocol development for each species, refer to the 2008 Sensitive Plant and Plant Species of Local Concern Monitoring Guide.

Data used to compile this report is found in the Black Hills National Forest Plant Database.

Monitoring and Evaluation of Sensitive Species with Developed Protocol

Sensitive Species: *Carex alopecoidea* (foxtail sedge)

Carex alopecoidea was confirmed on the Black Hills National Forest in 2000. Currently, more than 30 occurrences have been documented on the Forest (Northern Hills and Bearlodge Ranger Districts). In the Black Hills, *C. alopecoidea* is currently known from two general areas: The Cement Ridge area (along the South Dakota – Wyoming border) and the Bearlodge Mountains of Wyoming. *C. alopecoidea* is primarily found along open, perennial streams, often with old beaver dams or ponds. Occurrences have also been found in white spruce (*Picea glauca*) dominated riparian areas and in drainages with dense shrub cover. Plants are primarily documented in the transitional areas between saturated soils and the more mesic upland areas. Black Hills occurrences range in elevation from 3,840 to 5,900 ft.

2008 Monitoring Design and Results Evaluation:

1. **Annually monitor presence/absence at sites CAAL8-16, CAAL8-19, CAAL8-20, CAAL8-22, CAAL8-30 and CAAL8-31. Document site endpoints with GPS (if changes in site extent are observed). If a contraction of the occurrence is noted, document the reason if it can be determined. Observe density of concentration areas and compare to previous years. Assess habitat condition.**

   Carex alopecoidea was present at sites CAAL8-16, CAAL8-19, CAAL8-20, CAAL8-2, CAAL8-30 and CAAL8-31. See table below for site assessments.

2. **Implement monitoring at CAAL8-19, CAAL8-20, CAAL8-22, CAAL8-30, and CAAL8-31 regarding effects of restricting livestock grazing on all or portions of these occurrences as Standard 2505f is met. At a minimum, establish photopoint monitoring. Implement monitoring before exclosures are built when possible to generate baseline data for comparison to data collected after exclosures are built.**

Species persistence concerns for *Carex alopecoidea* led to Black Hills National Forest Standard 2505f directing implementation of additional measures to ensure that impacts of livestock use on *C. alopecoidea* would be minimized by restricting livestock use of all or portions of five 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 unknown if livestock grazing causes beneficial, neutral, or negative effects to *C. alopecoidea* or what kind of indirect effects result from changes to habitat conditions caused by livestock grazing. Monitoring will provide data to begin answering these questions.

Site CAAL8-22 was monitored to determine the effects of fence installation. See table below for details on the status of monitoring and livestock restriction at sites CAAL8-19, CAAL8-20, CAAL8-22, CAAL8-30, and CAAL8-31.

3. **Document observations regarding whether *C. alopecoidea* sites in Dugout Gulch Botanical Area (CAAL8-16) and Upper Sand Creek Botanical Area (CAAL8-12) are accessed by livestock to assess status of Forest Plan Standard 3.1-2503 (Restrict access of domestic livestock use to protect the R2 sensitive and species of local concern plant occurrences in designated botanical areas).**

   Site CAAL8-16 was accessed by livestock in 2008. (See table below for details.) Site CAAL8-12 was not visited in 2008.

4. **Document any noxious weeds or invasive plant 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 update a weed strategy with prioritization for all R2 sensitive and Black Hills National Forest SOLC plant species. Document if any weed treatment activity has affected occurrences.**

   See table below. In 2008 there was no evidence of weed treatment activity adversely affecting any *C. alopecoidea* occurrences.

Site ID # (Location – Ranger Dist.)	***Carex alopecoidea* (foxtail sedge)**
CAAL8-16 (Dugout Gulch – Northern Hills)	• **Date Monitored:** 8/26/2008 • **Site Assessment:** *C. alopecoidea* was present in site (51-100 plants observed). For unknown reasons, *C. alopecoidea* were not as dense this year as in 2007. Very few reproductive structures were observed, which made positive identification difficult. Positive identification was further complicated by thick vegetation and similar looking sedge species co-occurring with *C. alopecoidea*. Flowing water was observed in a longer stretch of the drainage in 2008 than in 2007. There was evidence of high water, but only a small amount of sediment deposition.

	Botanical Area Livestock Monitoring (item 3 above): Livestock access to area evident; scattered manure (some only a few days old) and light grazing of *C. alopecoidea* plants was observed. Wandering livestock have also caused habitat disturbance in the immediate area of *C. alopecoidea* plants, through trampling and bank shear. A fence that was observed to be cut in 2007 was repaired. However, a wire gate was left open allowing access by livestock. • **Weeds:** High abundance of invasive species in the site and along drainage bottom, predominantly at the western end of the site. *Cynoglossum officinale* (houndstongue), *Cirsium arvense* (Canada thistle), *Cirsium vulgare* (bull thistle), *Arctium minus* (lesser burdock), *Rhamnus cathartica* (common buckthorn - listed as noxious/invasive in five states), and *Verbascum thapsus* (common mullein) all found in the site area in same ecotype as *C. alopecoidea*. *Bromus tectorum* (cheatgrass) found on trail adjacent to drainage.
CAAL8-19 (Ladyfinger Gulch – Northern Hills)	• **Date Monitored:** 8/26/2008 • **Site Assessment:** *C. alopecoidea* was present in the site (101-500 plants observed). Site extent comparable to 2007. An estimated 30% of *C. alopecoidea* observed outside the exclosure had been grazed. Evidence of trampling, trailing, and bedding by livestock but overall utilization fairly light. Streambanks were fairly stable in areas where downfall blocked access, but streambank alteration from livestock was very evident in several concentrated areas and estimated at 20-40% overall. Use by wildlife also observed – elk scat and tracks. • **Livestock Restriction Monitoring (item 2 above):** A small exclosure (enclosing .13 acres) was constructed in 2007 to exclude livestock from one concentration area of *C. alopecoidea.* In 2008 the *C. alopecoidea* plants inside the exclosure were large, healthy and had lots of seed heads. (In the North Zone Range 08 Project, it was decided that this exclosure would remain and additional annual monitoring of streambank conditions in the drainage would take place. If during the grazing season streambank alteration exceeds 26%, then livestock will be moved from the area.) No additional monitoring with regards to livestock restriction was established in 2008. • **Weeds:** Weeds were present but not as abundant as many of the other *C. alopecoidea* sites. *Cirsium arvense* (Canada thistle), *Cirsium vulgare, Cynoglossum officinale*, and *Tanacetum vulgare* occurred occasionally in the site and found in same ecotype as *C. alopecoidea.*
CAAL8-20 (Pettigrew Gulch – Northern Hills)	• **Date Monitored:** 8/25/2008 • **Site Assessment:** *C. alopecoidea* was present in the site (101-500 plants observed). Site extent comparable to last monitoring visit (2007). Livestock were present in the site this year outside the new exclosure (>50 head), but utilization was still very light and vegetation thick. In previous years, heavy livestock use of this drainage has been observed – old streambank alteration and hummocking still evident under vegetation. Some concentrated impacts from livestock trampling were evident in saturated wetland areas, and there was considerable new streambank alteration/hummocking just north of the new exclosure. In most areas the *C.*

	alopecoidea plants were tall, robust and ungrazed. However in some areas where *C. alopecoidea* was very dense and concentrated, there was evidence of cropping and direct trampling, several plants were covered with manure. This site is one of the monitoring sites for the North Zone Range 08 project. Botany staff observed several young northern leopard frogs during the survey. • **Livestock Restriction Monitoring (item 2 above):** A new exclosure had been constructed since last monitoring visit. The exclosure covers a large area, encompassing approximately 50% of the site. Vegetation inside the exclosure was thick and lush. New trampling and hummocking from livestock especially evident near new fence at northern end of exclosure. Since the monitoring crew was unaware that this exclosure had been constructed, no additional monitoring was established in 2008. Additional monitoring should be initiated in 2009. • **Weeds:** Site with thick weeds in areas. *Cirsium arvense* – frequent patches throughout drainage, thick in exclosure and in other areas. Co-occurs with *C. alopecoidea*. *Cirsium vulgare*, *Cynoglossum officinale, Verbascum Thapsus, Carduus nutans* – all scattered occasionally throughout drainage and co-located with *C. alopecoidea*. *Potentilla recta* (sulphur cinquefoil) – occasional in drainage in new exclosure.
CAAL8-22 (Pole Cabin Gulch - Bearlodge)	• **Date Monitored:** 8/25/2008 • **Site Assessment:** *C. alopecoidea* was present in the site (1001-10,000 clumps observed). Site extent comparable to last monitoring visit (2007). *C. alopecoidea* plants reproducing well this year – many with reproductive stalks. Individual *C. alopecoidea* plants do not appear as heavily grazed as previous year (although some plants cropped) – but impacts from livestock to habitat and riparian area still extensive. Heavy livestock utilization (vegetation grazed to less than two inches in many areas), high % streambank alteration, unstable streambanks (estimated to be <76% stable), bank sloughing and shearing. Species composition in areas adjacent to *C. alopecoidea* is often dominated by weedy species and species that are increasers with grazing. This year's browsing on *Salix* spp. in drainage estimated at 50-70% of current years leaders browsed. Livestock were present in the site at time of survey – approximately 30 head observed. Some use by wildlife also evident - elk scat, tracks, one wallow. Northern leopard frogs observed in the site. • **Livestock Restriction Monitoring (Item 2 above):** In fall of 2007 a buck and pole exclosure was constructed at the east end of the site. Grass within the new exclosure was much thicker and more robust than outside exclosure. *C. alopecoidea* was present and robust within the exclosure (2.5-3.5 feet tall) with good foliage health and good reproduction. There was some new livestock trailing along the exclosure fence at the base of a *Corylus cornuta* (hazelnut) slope. In 2008, nine photos were retaken around the margins of the exclosure at the seven photopoint locations established in 2007. Additionally, two line-intercept transects for *C. alopecoidea* (one inside and one outside the

	exclosure) were established. Cover-frequency data was also recorded along the two transects. • **Weeds:** Entire site very weedy. *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 *C. alopecoidea.*
CAAL8-30 (Deer Creek - Bearlodge)	• **Date Monitored:** 8/26/2008 • **Site Assessment:** *C. alopecoidea* was present in the site (501-1000 plants observed). Site extent comparable to 2007. Some evidence of high water in drainage this year - gravel/sediment on some banks, light debris in vegetation, some erosion and undercut banks. Grass and vegetation thick and lush this year. Livestock utilization very light. Some light livestock trailing (matted grass) evident. Only a few *C. alopecoidea* plants were grazed and/or trampled. In previous years, heavy livestock use of this drainage has been observed – old streambank alteration and hummocking still evident under vegetation. Northern leopard frogs observed in the site. • **Livestock Restriction Monitoring (Item 2 above):** Plans for a livestock exclosure on a portion of the site were made in 2007. At the time of 2008 monitoring, the exclosure had not yet been constructed, therefore, no monitoring of *C. alopecoidea* response to livestock restriction took place at this site in 2008. • **Weeds:** *Cirsium arvense* (Canada thistle) was scattered in bottom and co-located with *C. alopecoidea* (dense on an old dam at west end of the site). *Cynoglossum officinale* (Houndstongue) was scattered in the drainage bottom with some dense patches. It was co-located with *C. alopecoidea* *Verbascum thapsus* (Common mullein) was scattered occasionally in the drainage bottom and co-located with CAAL8 *Cirsium vulgare* (Bull thistle) was occasionally observed in the drainage bottom, within three meters of *C. alopecoidea*. *Carduus nutans* (Musk thistle) was scattered throughout the site and co-located with *C. alopecoidea*.
CAAL8-31 (Beaver Creek - Bearlodge)	• **Date Monitored:** 8/26/2008 • **Site Assessment:** *C. alopecoidea* was present in the site (501-1000 plants observed). Site extent comparable to 2007, however overall density seemed lower and a lower percentage of plants were reproducing than previous years. Plants cropped short from livestock grazing and the overall lack of reproductive structures made positive identification difficult. Impacts to *C. alopecoidea* plants and habitat from livestock were observed – streambank alteration/bank shear, trampling and direct grazing of *C. alopecoidea*, hummocking in wetland, utilization locally heavy with vegetation grazed to less than two inches in areas, some areas to bare ground. High water events the past two years have scoured and undercut banks, making the site less resilient to livestock impacts. The regeneration of riparian vegetation and recovery of riparian areas following high water flow would likely be faster if the area was rested or grazed only lightly until it is reestablished. • **Livestock Restriction Monitoring (item 2 above):** Design plans for livestock exclosures on portions of the site were discussed in 2007 but not yet

	finalized or constructed. Therefore, no monitoring of *C. alopecoidea* with regards to livestock restriction took place at this site in 2008. • **Weeds:** Weeds were common throughout the site. *Cirsium arvense*, *Cirsium vulgare*, *Cynoglossum officinale*, *Carduus nutans*, *Tanacetum vulgare* (common tansy), and *Verbascum thapsus* were all present in same ecotype as *C. alopecoidea* and within 10 feet. *Linaria vulgaris* (butter and eggs) was observed on roadbed adjacent to drainage.

Sensitive Species: *Epipactis gigantea* (stream orchid; giant helleborine)

Epipactis gigantea occurs in western North America from British Columbia to California and east to Texas. Rangewide, it is known from wet meadows, seepage slopes, and the base of cliffs along streams and rivers. In the Black Hills it is known only from Cascade Springs in Fall River County, South Dakota at 3,400 ft. It is likely dependent upon the constant moisture and warmth provided by the springs. No other warm springs are known on Forest Service administered land in the Black Hills.

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.

The Alabaugh Wildfire of July 7-13, 2007 burned approximately 10,300 acres, including areas immediately adjacent to Black Hills National Forest land along Cascade Creek. In 2008, the monitoring protocol was modified to document effects of the fire. The fire did not burn any of the *E. gigantea* plants or associated riparian vegetation, but slopes adjacent to the site were burned. Several high precipitation events occurred after the fire resulting in increased sediment and ash input into the creek. Since this landscape is naturally erosive, the plant species/communities present have adapted to occasional intense events. Long-term negative impacts are not expected, but the site will continue to be monitored.

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 ongoing risks to *Epipactis gigantea* and its habitat on Black Hills National Forest. *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. In 2008 Hell Canyon Ranger District initiated a restoration program that will gradually replace non-native tree and shrub species with native ones [e.g. *Fraxinus pennsylvanica* (green ash), *Acer negundo* (boxelder), *Ulmus americana* (elm)].

2008 Monitoring Design and Results Evaluation:

1. **Monitor presence/absence of *Epipactis gigantea* concentration areas along stream transects on an annual basis. If plants or areas are observed to decline, consult on a more rigorous design with the RMRS.**

   E. gigantea was present at a majority of the concentration areas. However, several concentration areas were not found in 2008. There were many less plants than usually observed. In the past several years, site size (number of stems) was noted as 501-1,000 and 1,001-10,000, this year it was estimated at < 500. (The density of *E. gigantea* was reported to be lower from 2006 to 2007 also.)

Consultation with RMRS will take place in 2009 to determine if any changes should be made to the monitoring protocol for the 2009 season.

2. **Recreation nick point: document the number of nick point trails that extend into *Epipactis gigantea* concentration areas.**

   Several previously noted recreation nick points were still present in 2008 – no significant new use/trails noted.

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.**

   Two permanent water transects along Cascade Creek at J. H. Keith Picnic Ground were established in 2004. Water level measurements were recorded in 2004, 2005, 2006, 2007, and 2008 to coarsely document changes in water level in Cascade Creek. In 2008, due to concerns about impacts to groundwater from the fire and expected future development in the southern Hills, USGS reactivated the gauging station at the southern end the picnic ground (discontinued in 2001). Data from this gauging station is available online at http://waterdata.usgs.gov/sd/nwis/measurements/?site_no=432012103331100

   On July 28, 2008, the two water transects at Cascade Springs were read – water levels were documented at 0.5 meter intervals. Transect No. 1 is the upstream transect; Transect No. 2 is downstream. The mean of the measurable readings at each transect were calculated to obtain the average stream depths in the table below. Readings of "Trace" were not included in the average.

	2004 (July 2)	2005 (July 5)	2006 (July 14)	2007 (July 2)	2008 (July 28)
Transect No. 1: Average stream depth (cm)	**11.9**	**12.6**	**10**	**12.8**	**8.5**
Transect No. 2: Average stream depth (cm)	**21.5**	**27.6**	**25**	**22.3**	**25.4**

4. **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 *Epipactis gigantea*. Document if weeds are co-located or what distance they are located from the occurrence if they occupy the same ecological type. Use this information to update a weed strategy with prioritization for all R2 sensitive and BHNF SOLC plant species. Document if any weed treatment activity has affected the occurrence.**

   There seems to be much lower weed abundance at the site since annual weed-pulling was initiated several years ago. In 2008, Hell Canyon district botanist and weed personnel performed hand-pulling and chemical treatment of *Cirsium arvense* at both Cascade Springs and Cascade Falls. Additionally, stem miner weevils (*Ceutorhynchus litura*) were released at Cascade Springs for biological control of *C. arvense*. *C. arvense* and *C. vulgare* were found scattered among *E.*

gigantea at the time of monitoring. *Elaeagnus angustifolia* (Russian olive) continues to be present at Cascade Springs and *Tamarix* spp. (salt cedar) was still not present.

In 2008, there was no evidence of weed treatment activity adversely affecting *E. gigantea.*

5. **Document erosion occurring at any *Epipactis gigantea* concentration area.**

   There was evidence of new erosion on streambanks from recent high water events. No observations were made about streambank erosion directly impacting *E. gigantea* individuals, however deposition of sediment/debris have covered *E. gigantea* individuals in areas downstream.

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

   No evidence of collection of *E. gigantea* was observed in 2008.

Sensitive Species: *Lycopodium complanatum* (groundcedar; trailing clubmoss)

Lycopodium complanatum is circumboreal and common across northern latitudes but disjunct or sparse at the southern limits of the species' distribution, such as in the Black Hills. Rangewide, it is restricted to moist microhabitats within boreal plant communities in ravines, steep drainages, and on moist streamside benches. There are approximately ten known occurrences of *L. complanatum* on Black Hills National Forest lands. These occurrences are located in the northern Black Hills (on the Northern Hills and Bearlodge Ranger Districts) on shaded, north-facing, white spruce dominated slopes often with paper birch (*Betula papyrifera*) or quaking aspen (*Populus tremuloides*). Black Hills occurrences range in elevation from 4,960 to 6,340 ft.

The persistence of *Lycopodium complanatum* in the Black Hills is currently known to be contingent on conserving occurrences on public land. Over the past several years, the monitoring design has been modified based on discovery of new occurrences and to minimize site disturbance associated with monitoring. The number of occurrences, geographic distribution, elevation, occurrence size, and assessment of risks were primary considerations in the design. A subset of five occurrences has been selected as core sites and plans are to monitor them on an annual basis.

2008 Monitoring Design and Results Evaluation:

1. **Monitor the following core *Lycopodium complanatum* sites for presence/absence on an annual basis: LYCO3-1, LYCO3-4, LYCO3-5, LYCO3-8, LYCO3-9.**

   Lycopodium complanatum was present at four of five core sites (LYCO3-1, LYCO3-4, LYCO3-5, LYCO3-9) and absent at one site (LYCO3-8) in 2008. Absence of *L. complanatum* at site LYCO3-8 may be related to recent livestock activity and recent down trees. See table below for further details and site assessments.

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

   All sites are scheduled to be revisited in 2009.

3. **Review the series of permanent markers placed at points along the boundary edges of the Sand Creek *Lycopodium complanatum* occurrence (site number LYCO3-1) 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 photographs/drawings. If there is no observable change in the occurrence in three years (from 2005), retake photographs and/or drawings to document no change. This should be done in 2008.

Photographs at the permanent markers were retaken in 2008. See table below for further discussion.

4. **Document any noxious weeds or invasive plant 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 update a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.**

   See table below. In 2008 there was no evidence of weed treatment adversely affecting any *Lycopodium complanatum* occurrences.

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 revisited every five years.**

   See table below.

Site ID # (Location Ranger dist.)	***Lycopodium complanatum* (groundcedar; trailing clubmoss)**
LYCO3-1 (Sand Creek – Bearlodge)	• **Date Monitored:** 9/17/2008 • **Site Assessment:** *L. complanatum* was present in the site. Site appeared healthy, stable, and similar in extent to 2007. About 5% of plants were observed with fruiting structures and the rest were vegetative. • **Additional Monitoring (item 3 above):** In order to minimize impacts from surveyors and increase repeatability of results, a new monitoring protocol for this site was developed in 2005. As per the new protocol, photos were retaken at the ten permanent marker locations. In some photo frames the extent of *L. complanatum* expanded and in others it contracted. Some plants that were green in 2005 photos were brown in 2008, but generally the condition and extent of *L. complanatum* looked stable between the two sets of photos. • **Weeds:** No weeds observed in the site. Noxious weeds were, however, abundant in the drainage below the site (*Tanacetum vulgare, Cynoglossum officinale, Hypericum perforatum,* and *Cirsium arvense*). • **Livestock Use (item 5 above):** None observed in the site.

LYCO3-4 (Butcher Gulch – Northern Hills)	• **Date Monitored:** 9/18/2008 • **Site Assessment:** *L. complanatum* was present in the site with a similar extent as 2007. *L. complanatum* patchy in the site. Plants healthier and more abundant in unburned area. Only a few plants observed with fruiting structures (found in unburned area). No new significant disturbances observed in the site in 2008. Continued occasional downfall of burned/dead trees expected. The site is very steep with loose erosive soils – care must be taken not to over-trample when surveying. • **Weeds:** *Verbascum thapsus* occurred occasionally in the site in same ecotype as *L. complanatum*. Drainage bottom below the site area is quite weedy in spots with *Cirsium arvense*, *Leucanthemum vulgare*, *Cynoglossum officinale, Cirsium vulgare*, *Tanacetum vulgare*, and *Centaurea nigrescens* (Tyrol knapweed). • **Livestock Use (item 5 above):** None observed in the site.
LYCO3- 5 (Tilson Creek – Northern Hills)	• **Date Monitored:** 9/15/2008 • **Site Assessment:** *L. complanatum* was present in the site. Site appeared healthy, stable, and similar in extent to 2007. Only a trace of *L. complanatum* plants observed had fruiting structures the rest were vegetative. Estimated 10% of plants were brown and dry. Abundant spruce blow-down occurs in the site area with additional fresh blow-down noted in 2008. Light wildlife use observed in the site – a few faint game trails and deer rubbed trees. • **Weeds:** *Phleum pratense* (timothy) was observed sparsely scattered in same ecotype. No other weeds observed in the site area. • **Livestock Use (item 5 above):** Some fresh manure in the site area, but livestock access to the site appears only occasional. Heavy livestock use was observed in the drainage bottom below the site with vegetation cropped to less than two inches in areas, as well as hummocking and streambank trampling.
LYCO3-8 (N. Fork Rapid Creek tributary – Northern Hills)	• **Date Monitored:** 9/15/2008 • **Site Assessment:** *L. complanatum* was **not present in the site**. Some *L. complanatum* plants may have been destroyed by livestock trailing through the site (see details below). There is also new spruce downfall (natural) in the site area that may have partially covered some plants with bark and debris. *L. complanatum* may still persist in the site but without evidence of above ground expression at the time of monitoring. The site should be visited again in 2009. • **Weeds:** No weeds observed directly in the site. *Verbascum thapsus, Cirsium vulgare, Leucanthemum vulgare,* and *Cynoglossum officinale* were all observed scattered occasionally in adjacent drainage bottom and along nearby road. • **Livestock Use (item 5 above):** In 2007 impacts to the site from livestock trailing and trampling, thought to be related to a new private/FS boundary fence, were observed. In an attempt to restrict further access, trees were felled along the fence and in the site vicinity in 2008. This appears to have limited livestock access, however, as of 2008 monitoring, there was an opening in the

	brush where cows could access the site. Some trailing in this opening near the site looks recent, but most appears to be from 2007. Coordination with Northern Hills district personnel about further restriction of livestock from this site has been initiated.
LYCO3-9 (Chicago Gulch – Northern Hills)	• **Date Monitored:** 8/8/2008 • **Site Assessment:** *L. complanatum* was present in the site – similar in extent to 2007. Plants generally green and healthy looking, with only a few browned stems. No plants were observed with fruiting structures – all vegetative. Total area of occurrence small – 15 x15 ft. • **Weeds:** No weeds observed directly in the site. *Cirsium vulgare, Verbascum thapsus, Carduus nutans, Hypericum perforatum, Cynoglossum officinale* and *Cirsium arvense* was present in drainage bottom and/or in adjacent area where 2004 logging occurred – abundant in some areas. • **Livestock Use (item 5 above):** Some well used wildlife/livestock trails on slope and on adjacent skid trails. Occasionally manure was observed on slope in the site vicinity and in logged area, but livestock use appears limited. Drainage bottom below the site more heavily grazed – streambank alteration from livestock evident.

Sensitive Species: *Platanthera orbiculata* (lesser roundleaved orchid; large roundleaved orchid)

Platanthera orbiculata is endemic to the boreal regions of northern North America, with a more southern distribution in the eastern United States. Black Hills occurrences are found primarily on shady, north-facing slopes in paper birch/hardwood or white spruce forests on moist, rich, humus soil. Black Hills occurrences are found on three ranger districts (Northern Hills, Bearlodge, Hell Canyon) and range in elevation from 4,350 to 6,150 ft.

Platanthera orbiculata is relatively secure in the Black Hills based on the fairly 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, and 3) Black Elk Wilderness. In the Black Hills, the species is primarily limited by the small extent of cool, moist boreal habitat. Long-term droughts or dramatic climate changes characterized by drier and warmer conditions may present the greatest risk to *P. orbiculata* and its habitat.

The nine core occurrences were identified using two criteria: size (estimated number of individuals) and geographic distribution of the occurrences. Three occurrences from each of the three primary geographic areas were designated as core occurrences for annual monitoring. Although monitoring focuses on the presence or absence of a given occurrence, a count of the total number of individuals observed at each site is collected (if time permits). If any of the core occurrences are exterpated, then the probable reason will be documented and new sites will be selected to keep a total of nine core sites.

The second purpose of monitoring, as originally designed, is to provide baseline data on the persistence of *Platanthera orbiculata* during dry conditions. During a drought and during the first and second consecutive non-drought years, the design includes monitoring three additional sites (PLOR4-4, PLOR4-21, PLOR4-22) for

presence/absence and counting the total number of individuals observed at all 12 sites. The assumption was that the high numbers of *P. orbiculata* observed in 2000 were partially reflective of several years of above average precipitation. Additional drought year monitoring has taken place from 2002 through 2008. These data on *P. orbiculata* population persistence and numbers in both wet and dry years are important for reassessing the species and for annually re-examining the monitoring design. It remains unknown whether absence of *P. orbiculata* individuals indicates dormancy or mortality. The following table shows numbers of *P. orbiculata* individuals observed at monitoring sites from 2002 to 2008.

***Platanthera orbiculata* monitoring counts at core monitoring sites during varying climatic conditions:**

Monitoring Years → ***Platanthera orbiculata*** **Site Number**	**2000** **(moist yr after several very moist years)**	**2001** **(moist)**	**2002** **(mod. to severe drought)**	**2003** **(mod. drought)**	**2004** **(mod. drought)**	**2005** **(mid range to moderate drought)**	**2006** **(mid range to moderate drought)**	**2007** **(mid range to mod. drought)**	**2008** **(moist)**
PLOR4-1 (Bearlodge)	**-**	**44**	**23**	**6**	**9**	**7**	**7**	**6**	**4**
PLOR4-2 **(Bearlodge)**	**51**	**-**	**1**	**11**	**15**	**19**	**17**	**11**	**23**
Monitoring Years → ***Platanthera orbiculata*** **Site Number**	**2000** **(moist yr after several very moist years)**	**2001** **(moist)**	**2002** **(mod. to severe drought)**	**2003** **(mod. drought)**	**2004** **(mod. drought)**	**2005** **(mid range to moderate drought)**	**2006** **(mid range to moderate drought)**	**2007** **(mid range to mod. drought)**	**2008** **(moist)**
PLOR4-3 **(Bearlodge)**	**37**		**7**	**1**	**2**	**2**	**2**	**2**	**4**
PLOR4-4* **(Northern Hills**	**14**	**-**	**4**	**1**	**3**	**5**	**6**	**not visited**	**4**
PLOR4-6 **(Northern Hills)**	**26**	**24**	**31**	**5**	**9** **(tmt. occurred)**	**7 (5 in untreated area)**	**4 (all in untreated area)**	**7 (5 in untreate d area)**	**7**
PLOR4-12 **(Northern Hills)**	**37**	**124**	**17**	**7**	**8**	**3**	**4**	**3**	**5**

PLOR4-19 (Northern Hills)	**78**	**126**	**115**	**86**	**92**	**93**	**131**	**130**	**123**
PLOR4-21* (Northern Hills)	**40**	**-**	**19**	**8**	**9**	**5**	**12**	**10**	**13**
PLOR4-22* (Northern Hills)	**1**	**-**	**3**	**1**	**3**	**3**	**3**	**3**	**3**
PLOR4-23 (Black Elk Wilderness)	**8**	**30**	**-**	**16**	**29**	**27**	**32**	**6 (short search)**	**34**
Monitoring Years → *Platanthera orbiculata* Site Number	**2000 (moist yr after several very moist years)**	**2001 (moist)**	**2002 (mod. to severe drought)**	**2003 (mod. drought)**	**2004 (mod. drought)**	**2005 (mid range to moderate drought)**	**2006 (mid range to moderate drought)**	**2007 (mid range to mod. drought)**	**2008 (moist)**
PLOR4-24 (Black Elk Wilderness)	**6**	**-**	**10**	**6**	**9**	**16**	**17**	**3 (short search)**	**16**
PLOR4-25 (Black Elk Wilderness)	**4**	**10**	**9**	**10**	**13**	**12**	**14**	**10 (short search)**	**17**

*Additional drought monitoring sites.

2008 Monitoring Design and Results Evaluation:

1. **Annually monitor presence/absence of known core 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).**

   P. orbiculata was present at sites PLOR4-1, PLOR4-2 and PLOR4-3 in 2008. See table below for site assessments.

2. **Annually monitor presence/absence of the Black Elk Wilderness core 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).**

P. orbiculata was present at sites PLOR4-23, PLOR4-24 and PLOR4-25 in 2008. See table below for site assessments.

3. **Annually monitor presence/absence of three core monitoring occurrence sites in the northwestern Black Hills: site numbers PLOR4-6, PLOR4-12 and PLOR4-19. If any of the core monitoring occurrence sites are not present (refer to discussion above regarding climatic ties), document reason if it can be determined (i.e. drought, fire, noxious weeds). Continue to record site changes at PLOR4-6 relative to 2004 hardwood restoration treatment.**

   P. orbiculata was present at sites PLOR4-6, PLOR4-12 and PLOR4-19 in 2008. See table below for site assessments.

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 second non-drought year, count individuals at the 12 sites. After the second non-drought year reassess the monitoring design to determine future needs.**

   Since 2007 was designated as a drought year in western South Dakota and northeastern Wyoming the three additional sites (PLOR4-4, PLOR4-12, PLOR4-2) were visited in 2008 (first non-drought year), and plants were counted at all 12 sites. www.drought.unl.edu/dm/monitor.html. *P. orbiculata* was present at all three sites. See table below for site assessments and number of individuals observed.

5. **Document observations for at least one occurrence in Bear/Beaver Gulch Botanical Area regarding whether the occurrence is accessed by livestock (PLOR4-4 or PLOR4-5) to assess the status of meeting Forest Plan Standard 3.1-2503 (Restrict access of domestic livestock use to protect the R2 sensitive and species of local concern plant occurrences in designated botanical areas). In drought years, PLOR4-4 will be monitored as per item 4 above. In non-drought years, either PLOR4-4 or PLOR4-5 may be monitored.**

   Site PLOR4-4 was visited. There was no evidence of livestock use in the site.

6. **Document any noxious weeds or invasive plant 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 update a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.**

   See table below. In 2008 there was no evidence of weed treatment adversely affecting any *P. orbiculata* occurrences.

Site ID # (Location – Ranger Dist.)	***Platanthera orbiculata*** **(lesser roundleaved orchid; large roundleaved orchid)**
PLOR4-1 (upper N. Redwater – Bearlodge)	• **Date Monitored:** 9/17/2008 • **Site Assessment:** *P. orbiculata* was present in the site (four plants in 2008) and was similar in extent to 2007. Site appeared drier in 2008 when compared to previous visits. Most of the vegetation in the site, including *P. orbiculata,* was either affected by hail or insects (tattered leaves). Standing, dead *Corylus cornuta* (hazelnut) was observed in the site. Faint game trails and elk scat indicate that the site is used by wildlife. No evidence of livestock accessing the site was observed in 2008. • **Weeds:** No weeds were observed directly in the site; however *Cynoglossum officinale* was scattered along the drainage bottom (in the same ecotype). The closest individual was found over 30 meters from a *P. orbiculata* individual. *Cirsium arvense* (Canada thistle) was fairly thick along the roadbed adjacent to the site.
PLOR4-2 (Fawn Creek – Bearlodge)	• **Date Monitored:** 8/7/2008 • **Site Assessment:** *P. orbiculata* was present in the site (23 plants in 2008) and was similar in extent to 2007. Plants looked healthy and had good color. One plant with severe insect damage (<40% of leaf damaged) was observed. The site is steep and fragile (up to 80% slope), so botany personnel need to be careful not to damage area when surveying. The drainage below the site showed signs of use by livestock (trampling and manure), but livestock use of the site itself was not evident. • **Weeds:** No weeds observed in the site.
PLOR4-3 (Cub Creek – Bearlodge)	• **Date Monitored:** 8/6/2008 • **Site Assessment:** *P. orbiculata* was present in the site (four plants in 2008) and was similar in extent to 2007. A few well used wildlife trails bisect the site area. No sign of recent livestock use was observed. • **Weeds:** No weeds were observed in the site. *Cirsium vulgare* (bull thistle) and *Phleum pretense* (timothy) occurred occasionally on lower slope and in drainage bottom below the site.
PLOR4-4 (Beaver Gulch – Northern Hills)	• **Date Monitored:** 8/15/2008 • **Site Assessment:** *P. orbiculata* was present in the site (four plants in 2008) with a similar extent to 2006. Some minor insect damage on leaves was observed. No evidence that livestock access the site was observed. • **Weeds:** *Cynoglossum officinale* was observed in the site about 16 meters from the nearest *P. orbiculata* plant.
PLOR4-6 (Chicago Gulch –	• **Date Monitored:** 8/8/2008 • **Site Assessment:** *P. orbiculata* was present in the site (seven plants in 2008) and was similar in extent to 2007. However, no plants were observed in the

Northern Hills)	logged area in 2008 (two found in 2007). Monitoring revealed slight yellowing or browning of some plants (possible hail damage). • **Weeds:** No weeds were observed directly in the site. Invasive species abundant in drainage bottom below the site and on recently disturbed skid trails. *Cirsium vulgare, Verbascum thapsus* (common mullein), *Carduus nutans* (musk thistle), *Cirsium arvense, Hypericum perforatum* (St. Johnswort), and *Cynoglossum officinale* (houndstongue) were all found in the vicinity of the site.
PLOR4-12 (Robison Gulch – Northern Hills)	• **Date Monitored:** 7/23/2008 • **Site Assessment:** *P. orbiculata* was present in the site (five plants in 2008) with a similar extent to 2007. One instance of manure was observed in the site, but livestock use of the site appears minimal. Monitoring revealed minor insect damage on some *P. orbiculata* leaves. • **Weeds:** *Phleum pratense* was located infrequently in the site and vicinity. *Carduus nutans, Cynoglossum officinale, Tanacetum vulgare* and *Potentilla recta* (sulphur cinquefoil) were observed below the site along the road in Robison Gulch.
PLOR4-13 (Robison Gulch – Northern Hills)	• **Date Monitored:** 7/23/2008 • **Site Assessment:** *P. orbiculata* was present in the site (six plants in 2008) and similar in extent to 2007. *P. orbiculata* leaves were large and healthy looking with some minor tears and insect damage. • **Weeds:** No weeds were observed in the site. *Carduus nutans, Cynoglossum officinale, Tanacetum vulgare,* and *Potentilla recta* (sulphur cinquefoil) were observed along the road in the Robison Gulch area below the site.
PLOR4-19 (Higgins Gulch – Northern Hills)	• **Date Monitored:** 8/5/2008 • **Site Assessment:** *P. orbiculata* was present in the site (123 plants in 2008) and similar in extent to 2007. Several plants observed with varying degrees of insect damage, as much as 75% of leaf tissue was missing on some individuals. In 2008, a new network of livestock trails was observed on the lower third of the site, with several trails directly adjacent to *P. orbiculata* plants. Manure was scattered consistently throughout the site – within a foot of *P. orbiculata* plants on several occasions. Thirteen total *P. orbiculata* plants were observed to be within a foot of livestock trails and nine individuals had evidence of direct trampling. Several faint game trails bisect the site and vicinity. This is a monitoring site for the North Zone Range 05 project. • **Weeds:** *Cynoglossum officinale* was observed infrequently in site, but was abundant in the drainage below the site. *Phleum pretense* was observed occasionally in the site.
PLOR4-21 (Seamore Gulch – Northern	• **Date Monitored:** 8/15/2008 • **Site Assessment:** *P. orbiculata* was present in the site (13 plants in 2008) and similar in extent to 2007. One instance of manure was found within the vicinity of the site. Based on

Hills)	this and other observations, the area experiences infrequent livestock use. Use was more evident along the road, below the site. A few scattered, faint game trails were observed on the slope within the site. Some *P. orbiculata* individuals were found within 15 meters of the road. • **Weeds:** No weeds were observed in the site. *Verbascum thapsus, Cirsium arvense,* and *Cynoglossum officinale* individuals were occasionally observed along the road, below the site.
PLOR4-22 (Higgins Gulch – Northern Hills)	• **Date Monitored:** 8/15/2008 • **Site Assessment:** *P. orbiculata* was present in the site (three plants in 2008) and similar in extent to 2007. Minor insect damage was observed on one plant. • **Weeds:** No weeds were observed in the site.
PLOR4-23 (Grizzly Creek – Hell Canyon)	• **Date Monitored:** 7/25/2008 • **Site Assessment:** *P. orbiculata* was present in the site (34 plants in 2008) and was similar in extent to previous years. Monitoring revealed some insect damage and browning of leaves (some with more than 40% of leaf tissue removed). In spite of this, the site appears stable and the plants are healthy. The site occurs in the Black Elk Wilderness. Some plants within one meter of a hiking trail. • **Weeds:** *Phleum pratense* scattered along trail in the site area.
PLOR4-24 (Grizzly Creek – Hell Canyon)	• **Date Monitored:** 7/25/2008 • **Site Assessment:** *P. orbiculata* was present in the site (16 plants in 2008) and was similar in extent to previous years. The site appears healthy with many plants producing flower stalks. Monitoring revealed individuals with slightly brown and tattered leaves. This damage was attributed to hail. Other leaves had several insect holes. A few plants had considerable insect damage, but not more than the range observed in previous years. Site occurs in the Black Elk Wilderness. • **Weeds:** No weeds were observed in the site.
PLOR4-25 (Grizzly Creek – Hell Canyon)	• **Date Monitored:** 7/25/2008 • **Site Assessment:** *P. orbiculata* was present in the site (17 plants in 2008) and was similar in extent to previous years. The site appears healthy with many plants in flower. Some leaves were observed with slight brown spots and insect damage but not severe. Site occurs in the Black Elk Wilderness. All plants found within about 12 meters of a hiking trail. • **Weeds:** No weeds were observed in the site.

Sensitive Species: *Salix candida* (sageleaf willow; hoary willow)

Salix candida is an obligate wetland species known to occur from eastern Canada to Alaska and across the northern United States. In the Black Hills it is limited to one verified extant occurrence west of Deerfield

(McIntosh Fen Botanical Area, 6,000 ft.). The persistence of the species in the Black Hills is dependent on conserving this single occurrence. Habitat includes cold seep or spring-fed saturated substrates produced by unusual hydrologic conditions where sedimentary layers of the Limestone Plateau intersect impermeable schist or shale of the crystalline Central Core. Community type associated with the occurrence is wet meadow and associated fens.

As an obligate wetland species, the primary risk to *S. candida*'s persistence and reproductive success is lowering of the water table where it occurs, whether natural or human-induced. Noxious weeds, insects and fungal infestations have also been identified as potential risks for this species. In 2007 Region 2 Forest Health scientists completed a willow health assessment at McIntosh Fen. Their final conclusion was that weevils, rust, and several other diseases and insects were present at McIntosh Fen, but were not causing widespread damage to the willows. It was noted that likely the biggest reason for the suspected rise in insect and disease activity at McIntosh Fen is the relatively dry conditions the willows have been experiencing for several years. Improving the site hydrology would help restore environmental conditions more suitable for willow and result in fewer insect and disease problems.

Mystic Ranger District personnel have initiated a project at McIntosh Fen in consultation with Dr. David Cooper, Colorado State University, to improve site hydrology. In 2007, metal plates were installed along one artificial drainage ditch to slow water flow out of the fen. Piezometers were also installed to track groundwater level changes. The District proposes to install additional piezometers and plates along other artificial drainage ditches in the wetland at a later date.

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. Minimal impacts from wildlife use and no impacts from livestock use have been observed since McIntosh Fen was designated a Botanical Area in 1997. If impacts from use by either wildlife or livestock increases, it could pose a threat to the site.

2008 Monitoring Design and Results Evaluation:

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 the perimeter of the largest dense patches of *Salix candida*.**

- **Collect data on the two to six nearby plants to each marker that were tagged in 2005 and note whether they are reproductive or vegetative. Tags should be on live branches. Replace tag on live branch if branch is dead when monitored and document that the tag was moved from dead to live branch.**

- **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, livestock grazing, wildlife grazing, etc.). Specify the agent that is observed. Document observations regarding whether *S. candida* occurrence at McIntosh Fen Botanical Area is grazed by livestock.**

  In 2008, there was no expansion or contraction of *S. candida* detected at McIntosh Fen site SACA4-1.

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 July 2, 2008. The five tagged individuals near each stake were relocated, and condition of each plant was documented. Plants had appropriate structures for differentiating male individuals from female individuals. Observations were taken on 54 tagged *Salix candida* plants: 32 female, 21 male, one vegetative. Six of the tagged plants were not relocated in 2008, and eight tags were found on dead branches that were moved to live branches (16 tags were moved from dead to live branches in 2007). The 2005 protocol states that tags would be placed on live branches, so it is known that the branches were alive when originally tagged. The data (15% of plants with new dead branches in 2008 [28% in 2007]) supports monitoring observations that willow borer is effecting *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, and some rust (but not severe) was observed on *S. candida* at the time of monitoring.

There was no evidence of livestock grazing on *S. candida* at the occurrence and no evidence that livestock had entered the fenced McIntosh Fen Botanical Area. The site is meeting Forest Plan Standard 3.1-2503 (restrict access of domestic livestock use to protect the R2 sensitive and species of local concern plant occurrences in designated botanical areas).

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

   For water transect data, see monitoring item number three below under *Salix serissima.*

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

   McIntosh Fen (site SACA4-1) – *Cirsium arvense* (Canada thistle) is present in the same ecotype and co-located with *S. candida* in some areas. 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. District weed personnel reported a high level of success with biological control releases of stem miner weevil (*Ceutorhynchus litura*) in 2007. No additional weed treatment took place in 2008. *Bromus inermis* (smooth brome) is abundant in drier upland areas adjacent to the site and is occasionally co-located with *S. candida* on the margins of the site.

   In 2008, there was no evidence of weed treatment adversely affecting *S. candida*.

Sensitive Species: *Salix serissima* (autumn willow)

Salix serissima occurs primarily in northern boreal bogs throughout its range and is a disjunct relic in the Black Hills. There are four known occurrences on Black Hills National Forest lands in fens and wet meadows often dominated by *Carex* spp. and other *Salix* spp. *S. serissima* is known from McIntosh Fen, Middle Fork of Boxelder Creek, Nahant and Silver Creek and appears to occur in the same unique hydrologic conditions as *Salix*

candida. Black Hills occurrences range in elevation from 5,620 to 6,000 ft.

Since *S. serissima* has similar habitat requirements as *Salix candida*, the primary risks to the persistence and reproductive success of the two species are also similar. Refer to the discussion under *S. candida* above.

2008 Monitoring Design and Results Evaluation:

1. **At McIntosh Fen, GPS new endpoints of subpopulations if site size has changed. Revisit the twelve stakes (or other landmark (electric pole) in the northern subpopulation) placed in 2005 near 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, wildlife grazing, etc.). Specify the agent that is observed. Document observations regarding whether *Salix 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 2008.

   The ten large plastic stakes installed at McIntosh Fen in 2005 (and additional reference point at the northern subpopulation) were revisited on July 2, 2008. The two to six *Salix serissima* individuals tagged near each stake were relocated. Plants had appropriate structures to differentiate male individuals from female individuals. Notes were taken on 51 *S. serissima* plants in 2008: 13 female, 10 male, and 28 vegetative individuals. In 2008 19 tags were found on dead branches and were moved to live branches of the same plant. In 2007 only three tags were found on dead branches. (2005 protocol states that tags will be placed on live branches). Evidence of willow borer was noted at the bases of many of the dead branches. There were also other qualitative observations of willow borer impacts to plants. The data (37% plants with new dead branches in 2008) appears to confirm monitoring observations that willow borer is having an impact on *Salix* species at McIntosh Fen. 65% of *S. serissima* plants were observed to have some rust in 2008. Despite this, the 2007 health assessment conducted at McIntosh Fen by Region 2 Forest Health scientists, concluded that the insect and disease agents present were not causing widespread damage to the willows. It was noted that likely the biggest reason for the suspected rise in insect and disease activity at McIntosh Fen is the relatively dry conditions the willows have been experiencing for several years.

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, wildlife grazing, etc.). Document observations regarding if *Salix serissima* plants are grazed by livestock to assess the status of meeting Standard 2505 e. [No authorized utilization will be allowed by domestic livestock on known occurrences of willow emphasis species (e.g. *Salix candida*, *Salix serissima*, *Salix lucida*).]**

   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 2, 2008. The site boundaries have not changed. In 2008, 14 *S. serissima* individuals were observed (five female, two male, and seven

vegetative). In 2007, 13 *S. serissima* plants were found, 12 in 2006 and 14 in 2005. The variation in population numbers is probably due to human error as most of the individuals occur in a dense carr with other *Salix* species. Evidence of previous years' willow borer activity was noted, but no newly dead branches or willow borer larvae were observed this year. At the time of 2008 monitoring, no impacts by livestock on the site was observed. Damage to the exclosure fence from recent flooding and associated debris was reported to Northern Hills District personnel (in 2007 damage to the fence allowed livestock to access the exclosure where they trampled and browsed *S. serissima* plants and habitat). Moderate to heavy wildlife browsing was also observed on *S. serissima* plants at this site in 2008.

The Nahant site (SASE2-3) was visited July 7, 2008. The two male plants originally documented were observed in 2008. These individuals were free of rust and willow borer larvae. Livestock were not observed in the site, but evidence of recent high water at the site (debris in branches) was observed. The plants showed no evidence to new willow borer activity; however, past damage was still evident.

The Silver Creek site (SASE2-4) was visited July 7, 2008. The six individuals (five females, one male) documented in 2005, 2006, and 2007 were again observed in 2008. Evidence of willow borer was observed on most *Salix serissima* individuals. Recent high water in the site was evident (matted vegetation, debris). Overall, the wetland appeared healthy and comparable to previous years; however the *S. serissima* individuals were not as vigorous this year. Many *S. serissima* plants had a high percentage of dead branches, damage from willow borers, and stress from being browsed. All willows and bog birch on the north side of the site had experienced heavy grazing by livestock in the past, but livestock have since been restricted from the site. The exclosure fence constructed in 2007 was intact and no livestock had accessed the site in 2008. Monitoring revealed that the site continues to be browsed by wildlife.

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

Two permanent water transects were installed at McIntosh Fen in 2004 and data has been collected from a one-time reading each in 2004, 2005, 2006, 2007, and 2008 when the phenology of *Salix candida* is appropriate for monitoring. A similar transect was installed in 2004 at Middle Fork Boxelder Creek (*Salix serissima* site SACA2-2) and has also been read annually. This protocol is not rigorous enough to determine cause and affect relationships relative to changes in water level. It is only meant to coarsely document changes in water levels. When available, data generated on water levels from the recently installed piezometers at McIntosh Fen (discussed above under *Salix candida*) will also be incorporated into plant monitoring records.

A summary of the data (2004-2008) from the three water transects (McIntosh Fen – North, McIntosh Fen – South, and Middle Fork Boxelder Creek) are presented in the tables below.

McIntosh Fen – South Water Transect Data Summary (Transect Length = 109 m)				
Year	**# of Positive Measurements**	**# of "Trace" Measurements**	**# of "Zero" Measurements**	**Total # of Measurements**
2004	7	4	115	126
2005	7	5	114	126
2006	6	4	116	126
2007	5	6	115	126
2008	13	41	72	126

McIntosh Fen – North Water Transect Data Summary (Transect Length = 61 m)				
Year	**# of Positive Measurements**	**# of "Trace" Measurements**	**# of "Zero" Measurements**	**Total # of Measurements**
2004	3	0	59	62
2005	9	4	49	62
2006	2	1	59	62
2007	5	3	54	62
2008	13	3	46	62

Middle Fork Boxelder Creek (*S. serissima* site SASE2-2) – Water Transect Data Summary (Transect Length = 19.5 m)				
Year	**# of Positive Measurements**	**# of "Trace" Measurements**	**# of "Zero" Measurements**	**Total # of Measurements**
2004	5	0	35	40
2005	3	0	37	40
2006	5	8	27	40
2007	6	9	25	40
2008	17	15	8	40

Most notable from the data presented above is the increase in the number of "positive" and "trace" measurements recorded in 2008 (and decrease in "zero" readings) as compared to the previous four years. Unlike the past several years, 2008 was not designated as a drought year in the Black Hills. www.drought.unl.edu/dm/monitor.html General observations at McIntosh Fen were that the site area had considerably more surface water than the past several years. This is likely due to the higher precipitation levels in 2008, however at the southern subpopulation it may also be attributed to the 2007 fen restoration work discussed earlier.

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

   In 2008, there was no evidence of weed treatment negatively affecting any *S. serissima* occurrences.

   McIntosh Fen (site SACA4-1) – *Cirsium arvense* (Canada thistle) is present in the same ecotype and co-located with *S. serissima* in some areas. It occurs in slightly drier areas where *S. serissima* is at the edge of suitable habitat. Mystic Ranger District has treated *C. arvense* in the uplands of McIntosh Fen in previous years. District weed personnel report a high level of success with biological control releases of stem miner weevil (*Ceutorhynchus litura*) in 2007. No additional weed treatment took place in 2008. *Bromus inermis* (smooth brome) is abundant in drier upland areas adjacent to the site and is occasionally co-located with *S. serissima* on the margins of the site.

   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 three meters). *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 meters from *S. serissima* plants). *Linaria vulgaris* is found further away from *S. serissima* plants, scattered below the road.

   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 large, high density patches downstream of the site on private land.

Sensitive Species: *Sanguinaria canadensis* (bloodroot)

Sanguinaria canadensis occurs in moist forests from Nova Scotia to Florida and west to Manitoba and Kansas. In the Black Hills it occupies floodplains, forested terraces, drainage bottoms, and north-facing footslopes in open, rich hardwood plant communities. There are approximately 22 known occurrences of *S. canadensis* on the Black Hills National Forest. The currently known range in the Black Hills is limited to the northeast portion of the Black Hills (Northern Hills Ranger District), from the east side of Spearfish Canyon to west of Tilford. Black Hills occurrences range in elevation from 3,940 to 5,000 ft.

The eight core *S. canadensis* occurrences were selected 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. Of these eight core occurrences, four were designated as

key because they contain over 1,000 individuals and are deemed critical to maintaining the metapopulation of *S. canadensis* on the Black Hills National Forest. According to the current protocol, the four key occurrences are to be monitored annually and the additional four remaining core occurrences are to be monitored during drought years.

2008 Monitoring Design and Results Evaluation:

1. **Annually monitor presence/absence of the four core monitoring sites considered key due to large population size (SACA13-1, SACA13-2, SACA13-3, SACA13-14). If occurrence extent has changed from the previous year, gather GPS data at the endpoints if the site is long (e.g. some sites are ½ mi to 1 ½ mi long in drainages) or collect GPS points around the entire occurrence if the site is small (less than ½ acre).**

   S. canadensis was present at sites SACA13-1, SACA13-2, SACA13-3 and SACA13-14 in 2008. See table below for site assessments.

2. **During a drought year, monitor presence/absence of all eight core sites. (The four key sites listed in item 1 above and sites SACA13-4, SACA13-5, SACA13-9 and SACA13-10.) If any core sites are absent, select another known site to monitor presence/absence.**

   S. canadensis was present at sites SACA13-4, SACA13-5, SACA13-9 and SACA13-10 in 2008. See table below for site assessments.

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

   See table below. In 2008 there was no evidence of weed treatment adversely affecting any *S. canadensis* occurrences.

4. **Document any evidence of *Sanguinaria canadensis* collection at the four core monitoring sites considered key due to large population size.**

   No evidence of collection was observed at any of the *S. canadensis* sites in 2008.

Site ID # (Location Ranger Dist.)	***Sanguinaria canadensis* (bloodroot)**
SACA13-1 (False Bottom – Northern Hills)	• **Date Monitored:** 5/21/2008 • **Site Assessment:** *S. canadensis* was present in the site and was similar in extent to 2007. Site appears stable and healthy. Plants extend onto private land. No evidence of grazing was observed. Site was observed at peak flowering which is later phenologically than

	previous years (visit on 5/16/2007 reported that the population was finished flowering). Some faint game trails pass through the large carr of *S. canadensis* at the south end of the site. No evidenced of collection was observed. • **Weeds:** *Tanacetum vulgare* (common tansy) and *Hypericum perforatum* (St. Johnswort) were abundant in the drainage bottom and were observed occasionally on the benches where *S. canadensis* occurs. *Cynoglossum officinale* was scattered throughout the site and was co-located with *S. canadensis*. *Verbascum thapsus* was scattered in the same ecotype within less than a meter of *S. canadensis* individuals. *Bromus inermis* was the dominant species in some open areas along drainage, but was less prominent in shady areas (where *S. canadensis* thrives).
SACA13-2 (Lost Gulch – Northern Hills)	• **Date Monitored:** 6/17/2008 • **Site Assessment:** *S. canadensis* was present in the site and was similar in extent to 2007. Site appears stable and healthy. • **Weeds:** *Cynoglossum officinale* and *Cirsium arvense* were scattered occasionally in the site, sometimes co-located with *S. canadensis*. *Tanacetum vulgare* and *Linaria dalmatica* occurred along the road. *Bromus inermis* was co-located with *S. candida*, and was more concentrated at the south end of the site among aspen. *Cirsium vulgare* occurred occasionally throughout drainage with a few plants found in same ecotype. *Verbascum thapsus* occurred occasionally in same ecotype and was also scattered along road. *Centaurea maculosa* was noted in 2004, but not observed this year. *Arctium minus* occurred occasionally in creek bottom.
ACA13-3 (Meadow Creek – Northern Hills)	• **Date Monitored:** 5/16/2008 • **Site Assessment:** *S. canadensis* was present in the site and was similar in extent to 2007. The site appears stable and healthy. Monitoring revealed evidence of light livestock utilization adjacent to the site. At the time the site was visited, the water in the creek was running fairly high and showed evidence of higher flow earlier (matted grass/vegetation). • **Weeds:** Weeds are still dense in the area used to access a recent timber sale. *Tanacetum vulgare* was abundant in and along the drainage bottom, but also extends onto the bench where *S. canadensis* occurs and is often co-located with *S. canadensis*. *Cynoglossum officinale* was scattered throughout the site, often next to *S. canadensis* *Cirsium vulgare* was not observed in 2008, but reported in 2007 as scattered occasionally in bottom and in same ecotype as *S. canadensis*. *Verbascum thapsus* was abundant in the drainage bottom and occurred occasionally in same ecotype (within four meters of *S. canadensis*). *Hyoscamus niger* (black henbane) occurs along the margins of a disturbed area associated with recent logging activity. Last year's seed heads were observed approximately ten meters from *S. canadensis*. *Linaria vulgaris* was observed in a small population on the margin of a

	disturbed area associated with recent logging activity. The population is approximately ten meters from *S. candida*.
SACA13-4 (Deadman Gulch & side drainage – Northern Hills)	• **Date Monitored:** 5/16/2008 • **Site Assessment:** *S. canadensis* was present in the site; however the population is estimated to be smaller this year. The cause of the decrease in population size is unknown. Monitoring may have been conducted too early in the season and plants were still emerging. • **Weeds:** *Cynoglossum officinale* and *Verbascum thapsus* were scattered in the same ecotype. *Tanacetum vulgare* was common in Deadman Gulch bottom but was not found in the same ecotype as *S. canadensis*. *Bromus inermis* was observed in Deadman Gulch bottom on benches.
SACA13-5 (Deadman Gulch side drainage – Northern Hills)	• **Date Monitored:** 5/16/2008 • **Site Assessment:** *S. canadensis* was present in the site – similar in extent to 2007. Site appears stable and healthy overall. No evidence of livestock use. • **Weeds:** Weeds were infrequent in the site itself, but *Cynoglossum officinale, Tanacetum vulgare, Verbascum thapsus*, and *Cirsium sp.* were abundant upstream, less than 200 meters above the site. *Cynoglossum officinale* was observed scattered, but infrequent in the site.
SACA13-9 (Deadman Gulch – Northern Hills)	• **Date Monitored:** 5/16/2008 • **Site Assessment:** *S. canadensis* was present in the site and was similar in extent to 2007. The site appears stable and healthy, but phenologically earlier than previous years. High water earlier this year was evident in scattered piles of needles and debris. Monitoring did not reveal evidence of livestock accessing the site. • **Weeds:** Weeds were most abundant at west end of the site, in area of logging slash. *Cynoglossum officinale* intermingled with *S. canadensis* in the slash. *Cirsium arvense* and *Cirsium vulgare* were scattered on benches along drainage in same ecotype.
SACA13-10 (Boulder Canyon – Northern Hills)	• **Date Monitored:** 5/19/2008 • **Site Assessment:** *S. canadensis* was present in the site and was similar in extent to 2007. The site appears stable and healthy, but phenologically earlier than last year (site was visited 5/9 and was already past flowering). • **Weeds:** *Tanacetum vulgare* was dense in the creek bed, but also scattered frequently in the same ecotype as *S. canadensis*, often within one meter of individuals. *Bromus inermis* occurs on the bench mostly in more open areas where *S. canadensis* is less frequent, but occasionally collocated where *S. canadensis* occurs in the open *Cynoglossum officinale* was scattered in the site and co-located with *S. canadensis* plants. *Verbascum thapsus* occurred occasionally in the same ecotype as *S. canadensis*. Other weeds known to occur in the area include *Cirsium arvense* (observed in 2006 approximately 50 meters from *S. canadensis*) and *Dipsacus fullonum* (Fuller's teasel) (upstream on private land along Bear Butte Creek).

SACA13-14 (Park Creek – Northern Hills)	• **Date Monitored:** 5/19/2008 • **Site Assessment:** *S. canadensis* was present in the site and was similar in extent to 2007. The site appears stable and healthy. Livestock use (2007 season) was evident in the site area (manure, faint trails, streambank alteration, hummocking, and trampling). • **Weeds:** *Cynoglossum officinale* was observed frequently in same ecotype and within one meter of *S. canadensis*. *Cirsium vulgare* and *Cirsium arvense* were scattered in the same ecotype. *Verbascum thapsus* was observed in drier areas along road. *Bromus inermis* was common along the road, but was not observed in the site. *Centaurea biebersteinii* was not observed this year, but found near road in previous years. Botany personnel should stay aware of this population to ensure the area is treated if necessary.

Sensitive Species: *Viola selkirkii* (Selkirk's violet; great-spurred violet)

Viola selkirkii is a circumboreal herbaceous species, and rangewide it is locally abundant in specialized microsites in coniferous and deciduous forests. There are about thirteen known occurrences on Black Hills National Forest lands with additional occurrences documented from Custer State Park and Mt. Rushmore National Monument. Black Hills occurrences are restricted to a concentrated area (ca. 36 square miles) of the central core on igneous or metamorphic bedrock. Microhabitats are often moist, cold air drainages, in shaded to open areas, and often in the vicinity of granitic rock outcrops. White spruce is usually the dominant overstory with a variable understory. All currently known occurrences on Forest Service lands are located within the Black Elk Wilderness and/or the Norbeck Wildlife Preserve. Black Hills occurrences range in elevation from 5,240 to 7,000 ft.

On Black Hills National Forest, *Viola selkirkii* is relatively secure from most potential risks, with the possible 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. Some 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 current protocol design includes annual monitoring of sites VISE2-2 ("Violet Valley") and VISE2-11 (Sunday Gulch). These sites were selected because they have a relatively large number of plants, they have greater combined potential risks than other sites, and they are two of the lowest elevation sites. It is likely that any declines associated with drought conditions would occur here before occurring at higher elevations. VISE2-1 and VISE2-11 are used as triggers for determining if additional occurrences should be monitored.

2008 Monitoring Design and Results Evaluation:

1. **On an annual basis, monitor presence/absence of the four largest sub-occurrences at site number VISE2-2 ("Violet Valley"), and site number VISE2-11 (Sunday Gulch). If one or more of the four largest sub-occurrences at "Violet Valley" or the Sunday Gulch occurrence is 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 occurrences are being affected in the same way.

The four largest sub-occurrences of site VISE2-2 and site VISE2-11 were present in 2008. See table below.

2. **Monitor all known *Viola selkirkii* occurrences at least every five years (last done in 2003). Visit all sites for monitoring in 2008.**

   All known *V. selkirkii* occurrences on Black Hills National Forest lands were monitored in 2008. *V. selkirkii* was present at all sites.

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

   See table below. In 2008 there was no evidence of weed treatment adversely affecting any *V. selkirkii* occurrences.

4. **On any currently known *Viola selkirkii* site that is affected by a flood or fire event, monitor for presence/absence. Monitor presence/absence of VISE2-13 (Pine Creek Natural Area/Elkhorn Mountain 2003 Fire area).**

   V. selkirkii was present at site VISE2-13 in 2008. See table below for the site assessment.

   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 2008.

Site ID # (Location – Ranger Dist.)	***Viola selkirkii* (Selkirk's violet; great-spurred violet)**
VISE2-1 (Needles – Hell Canyon)	• **Date Monitored:** 6/13/2008 • **Site Assessment:** *V. selkirkii* was present in the site (1001-10,000 plants observed). Recent spruce downfall and scouring from high water events were observed in the site, but it is stable and healthy. Large patches of *V. selkirkii* were present with many individuals in bloom. • **Weeds:** *Cirsium arvense* (Canada thistle) was widely scattered throughout the site and was often co-located with *V. selkirkii*.
VISE2-2 ("Violet Valley" – Hell Canyon)	• **Date Monitored:** 6/13/2008 • **Site Assessment:** *V. selkirkii* was present in the site (1001-10,000 plants observed), including all four of the largest sub-occurrences. The site appears stable and healthy. • **Weeds:** *Cirsium arvense* was scattered in the drainage in same ecotype and

	occasionally co-located with *V. selkirkii.* *Cirsium vulgare* (bull thistle) was occasionally observed in the same ecotype and within a meter of *V. selkirkii* *Caragana arborescens* (Siberian peashrub) was observed in the site in previous years, but was not observed in 2008. This could be attributed to delayed phenology and survey for *C. arborescens* should be included in next year's monitoring protocol for this site.
VISE2-3 (Elkhorn Mtn – Hell Canyon)	• **Date Monitored:** 6/4/2008 • **Site Assessment:** *V. selkirkii* was present in the site (1,001-10,000 plants observed). Site extent increased from last monitoring visit (2004). A few plants were observed with insect damage, but the site appears stable and healthy. Site occurs in the Black Elk Wilderness. • **Weeds:** One *Verbascum thapsus* (common mullein) plant was observed in the same ecotype, but not in the vicinity of *V. selkirkii*.
VISE2-4 (Harney Peak- Hell Canyon)	• **Date Monitored:** 6/20/2008 • **Site Assessment:** *V. selkirkii* was present in the site (501-1,000 plants observed). The site extent had expanded from the last monitoring visit (2004). The site appears stable and healthy. Monitoring revealed light recreational use (hikers, prayer flags, plastic bottles, trash, and historic debris from nearby lookout tower construction. *V. selkirkii* co-occurs with *Oxyria digyna* and *Carex bella* (sites OXDI3-2 and CABE3-3). The site is located in the Black Elk Wilderness. • **Weeds:** No weeds were observed in the site.
VISE2-5 (Harney Peak – Hell Canyon)	• **Date Monitored:** 8/18/2008 **Site Assessment:** *V. selkirkii* was present in the site (501-1,000 plants observed). The site extent is comparable to the last monitoring visit (2003). The site appears stable and healthy. The site is located in the Black Elk Wilderness. • **Weeds:** No weeds were observed in the site.
VISE2-6 (Pine Creek – Hell Canyon)	• **Date Monitored:** 6/13/2008 • **Site Assessment:** *V. selkirkii* was present in the site (1,001-10,000 plants observed). The site extent is comparable to the last monitoring visit (2003). The site occurs in the Upper Pine Creek Research Natural Area and the Black Elk Wilderness. The site covers a large and complex area along Pine Creek and the high, rocky ridges above it. Light recreational hiker use occurs within the vicinity with a worn trail evident in places along creek. Some *V. selkirkii* plants are likely impacted by hikers, but overall impacts and risks low because of the large extent of the site. The site appears stable and healthy. • **Weeds:** One *Verbascum thapsus* (common mullein) plant was observed in the site. It was pulled during the course of the monitoring visit.
VISE2-7 (midway to Harney Peak – Hell	• **Date Monitored:** 6/9/2008 **Site Assessment:** *V. selkirkii* was present in the site (1,001-10,000 plants observed). The extent of the site expanded from the last monitoring visit in 2003 (additional GPS points taken). The site appears stable and healthy, with

Canyon)	no disturbances observed. The site occurs in the Black Elk Wilderness. • **Weeds:** No weeds were observed in the site.
VISE2-8 (Nelson Creek – Hell Canyon)	• **Date Monitored:** 6/9/2008 • **Site Assessment:** *V. selkirkii* was present in the site (1,001-10,000 plants observed). The extent of the site was comparable to last monitoring visit (2003). The site is located in a remote area with no observed disturbances. *V. selkirkii* was dense in some areas. The site occurs in the Black Elk Wilderness. • **Weeds:** No weeds were observed in the site.
VISE2-9 (Lost Cabin Creek – Hell Canyon)	• **Date Monitored:** 6/20/2008 • **Site Assessment:** *V. selkirkii* was present in the site (1,001-10,000 plants observed). The extent of the site expanded from last monitoring visit (2003). Additional plants were found in a gully above the original site location. The site appears stable and healthy. Some of the site is close to established hiking trail (Trail #2), but no disturbance from hikers was observed. The site occurs in the Black Elk Wilderness. • **Weeds:** No weeds were observed in the site.
VISE2-10 (Harney Peak – Hell Canyon)	• **Date Monitored:** 6/20/2008 • **Site Assessment:** *V. selkirkii* was present in the site (501-1,000 plants observed). The extent of the population was comparable to the last monitoring visit (2003). The site appears stable and healthy. The site is located in a remote area with very little recreational use. This steep rocky drainage receives heavy run-off in large precipitation events, but no detrimental effects of flooding were observed. *V. selkirkii* co-occurs with *Oxyria digyna* (site OXDI3-4). The site occurs in the Black Elk Wilderness. • **Weeds:** No weeds were observed in the site.
VISE2-11 (Sunday Gulch – Hell Canyon)	• **Date Monitored:** 6/3/2008 • **Site Assessment:** *V. selkirkii* was present in the site (about 1000 plants observed). The extent of the population was comparable to the last monitoring visit (2007). Site appears stable and healthy. Portions of the site are adjacent to power lines and FS summer cabins. Slash piles from recent power line right-of-way thinning had been burned since the last site visit (*V. selkirkii* was observed next to burned area). Any individuals that were present in the burned area may have been lost, but could possibly return in subsequent years. Signs of recent high water were evident in the matted vegetation surrounding the site. • **Weeds:** *Cirsium vulgare* (bull thistle) was scattered infrequently along the drainage in the same ecotype as *V. selkirkii* and within ten feet of plants. *Bromus inermis* (smooth brome) was occasionally co-located with *V. selkirkii* on mossy, grassy benches.

VISE2-12 (Upper Pine Creek RNA – Hell Canyon)	• **Date Monitored:** 6/13/2008 • **Site Assessment:** *V. selkirkii* was present in the site (1,001-10,000 plants observed). The population extended slightly from the last monitoring visit (2004). The site is complex and includes the area surrounding a creek and springs as well as gullies between rock outcrops. The site receives light use by mountain goats. The site is adjacent to a hiking trail that receives light use, but hiker access to the site is infrequent. The loose and coarse soil is derived from decomposed granite. Some areas of erosion and bare soil are evident in gullies, but the site appears stable and healthy. The site is in the Upper Pine Creek Research Natural Area and the Black Elk Wilderness. • **Weeds:** No weeds were observed in the site.
VISE2-13 (Upper Pine Creek RNA/ Elkhorn Fire – Hell Canyon)	• **Date Monitored:** 6/13/2008 • **Site Assessment:** *V. selkirkii* was present in the site (1,001-10,000 plants observed). The extent of the site was comparable to the last monitoring visit (2007). **T**his site was partially burned in the Elkhorn Fire (October 9, 2003) and has been visited annually since 2004 (item #4 of the monitoring protocol). Most *V. selkirkii* individuals were originally found outside of the burned area, although about 50 plants were observed growing in charred ground (in 2004 and 2005). No adverse effects to the site from the fire were observed. Potential future adverse effects include flooding and/or increased runoff and competition from invasive plant species. In 2006 and 2007, it was difficult to tell burned ground from unburned ground because new pine needle litter had covered up the bare ground and charcoal. In 2008 the small dry drainage within the site had been scoured and eroded from rain events, but no negative effects to *V. selkirkii* from flooding were observed, The site is in the Upper Pine Creek Research Natural Area and the Black Elk Wilderness. • **Weeds:** The overall density of weeds co-located with *V. selkirkii* is relatively low; however, some of the more severely burned areas in the vicinity of site VISE2-13 are weedy. *Verbascum thapsus* (common mullein) and *Cirsium arvense* (Canada thistle) are dense in areas and *Cirsium vulgare* (bull thistle) was patchy. Hand-pulling of weeds in the site has taken place during annual monitoring from 2004 to 2008. *Cirsium arvense* was scattered in the same ecotype and was occasionally co-located with *V. selkirkii*. *Cirsium vulgare* occurred occasionally in same ecotype as *V. selkirkii*. *Verbascum thapsus* was occasional in same ecotype, within five feet of *V. selkirkii*.

Monitoring and Evaluation of Sensitive Species in Preparation for Protocol Development: Collecting Baseline Data

In general, as identified in the monitoring design, the main focus for the 2008 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 or newly discovered.

Sensitive Species: *Botrychium campestre* (prairie moonwort; Iowa moonwort)

Botrychium campestre ranges from the Great Lakes, across Iowa and Nebraska to eastern Colorado and northward to Alberta and Saskatchewan. Rangewide the species occurs primarily on well-drained soils in non-forested habitats, occasionally under shrubs in or at the margins of these habitats. Eleven occurrences are known on Black Hills National Forest lands (on the Bearlodge, Mystic and Hell Canyon Ranger Districts). All occurrences have been confirmed by genetic analysis by Dr. Don Farrar of Iowa State University. Additional sites exist on private land and at Wind Cave National Park. Seven of the eleven occurrences have had baseline monitoring data collected. The additional four occurrences were discovered in 2008 during botanical surveys for district projects. *B. campestre* is extremely inconspicuous. Rangewide, it is considered a grassland species associated with sandy grassland habitats in prairies, dunes, railroad sidings, and fields over limestone. Black Hills sites occur on substrates with at least some component of limestone and are primarily in open grassland habitats usually with high forb diversity and sometimes with a high percentage of bare and rocky soils. Little bluestem (*Schizachyrium scoparium*) and western snowberry (*Symphoricarpos occidentalis*) occur at a majority of sites. Black Hills occurrences range in elevation from 3,870 to 5,640 ft.

2008 Monitoring Design:

1. **Revisit as many of the known *Botrychium campestre* occurrences on Black Hills National Forest (BOCA5-1, BOCA5-5, BOCA5-6, BOCA5-7, BOCA5-8, BOCA5-9, BOLI7-1) as possible annually. Document any new disturbances or changed levels of pre-existing disturbances.**

   Five *B. campestre* (BOCA5-1, BOCA5-6, BOCA5-8, BOCA5-9, BOLI7-1) sites were re-visited in 2008. See table below for site assessments.

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

   Baseline data were collected at site BOCA5-9 in 2008. This site was originally found in 2007 and is listed above in item 1.

   Four additional occurrences were discovered in 2008 during botanical surveys for district projects. Species identification for these sites was not confirmed until February of 2009. Collection of baseline data for these sites will be considered in the 2009 monitoring design.

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

See table below. In 2008 there was no evidence of weed treatment adversely affecting any *B. campestre* occurrences.

Site ID # (Location – Ranger Dist.)	***Botrychium campestre* (prairie moonwort; Iowa moonwort)**
BOCA5-1 (Boles Canyon – Hell Canyon)	• **Date Monitored:** 5/26/2008 • **Site Assessment:** *B. campestre* was present in the site (11-50 plants), but not as abundant as previous years. Fewer individuals observed could be attributed to monitoring phenologically early (all plants under ½" tall) and plants may still be emerging. *Botrychium lineare* has also been confirmed (by genetic analysis) at this site. This site is addressed again below under the discussion for *B. lineare*. Brown tips (thought to be frost damage) were observed on some *B. campestre* plants. The site is near the Forest Service property boundary. A portion of the site is on private property. No changes in disturbance regime were observed. • **Weeds:** *Bromus inermis* abundant along the roadside and co-located with *B. campestre* but is less abundant on the uphill side of the road.
BOCA5-6 (Witch Spring – Hell Canyon)	• **Date Monitored:** 5/27/2008 • **Site Assessment:** *B. campestre* was present in the site and the population extent was expanded from 2007. Several new concentration areas were located later in the season (6/10/2008) during project surveys. The site is large (greater than ½ square mile) and plants are widely distributed in the vicinity. Population estimated at 1,000-2000 plants. Several *Botrychium lineare* individuals have also been confirmed (by genetic analysis) here, and this site is addressed again below under the discussion for *B. lineare*. A large part of the site was prescribed burned in November 2007. Many *B. campestre*/*B. lineare* individuals were observed emerging through the charred litter. • **Weeds:** No weeds were observed in the site.
BOCA5-8 (Fish Canyon – Bearlodge)	• **Date Monitored:** 5/30/2008 • **Site Assessment:** *B. campestre* was present in the site (four plants found) and the population extent and number of plants increased slightly from 2007. No changes in disturbance regime were observed. • **Weeds:** *Cynoglossum officinale* was scattered upslope in same ecotype about three meters from *B. campestre*. *Bromus inermis* occurred in the same ecotype as *B. campestre*, within one meter of roadside plants.

BOCA5-9 (South of Hot Springs – Hell Canyon)	• **Date Monitored:** 5/27/2008 • **Site Assessment:** *B. campestre* was present in the site (51-100 plants). This site was discovered in 2007, therefore this was the first SO Monitoring visit to this site. Two main concentration areas of *B. campestre* were found. Site history provided by C. Englebert indicated that this isolated tract had been grazed under a Special Use Permit for a long period of time, likely under season-long regime, until these permits were no longer used to manage grazing. The tract has not been grazed since that time (~10 years) and is not currently grazed. No changes in disturbance regime were observed. • **Weeds:** *Poa pratense* was common in the site and was co-located with *B. campestre.* *Bromus tectorum* was patchy, but found in the same ecotype.
BOLI7-1 (Upper Dugout Gulch – Bearlodge)	• **Date Monitored:** 7/14/2008 • **Site Assessment:** *B. campestre* was not observed in the site in 2008. Monitoring may have been too late in season to observe plants. Livestock was observed in the site at time of survey. Recent livestock trailing on an old roadbed where plants occur (freshly matted vegetation, shearing on mossy trail edges, fresh manure) was noted. Disturbance from livestock increased from previous monitoring visits. • **Weeds:** *Cynoglossum officinale* and *Tanacetum vulgare* were observed occasionally in the site.

Sensitive Species: *Botrychium lineare* (narrowleaf grapefern; slender moonwort)

Botrychium lineare is historically known from California and Utah and currently from Colorado to Washington, Montana, Alaska, and the Yukon Territory. Western populations of the species occur primarily on limestone substrates in a variety of habitats including heavily forested sites, grassy meadows, fen-like seeps, and gravelly roadsides. Seven occurrences are known from Black Hills National Forest lands (on the Bearlodge, Mystic, and Hell Canyon Ranger Districts). All occurrences have been confirmed by genetic analysis by Dr. Don Farrar of Iowa State University. Five of the seven known occurrences had baseline data collected during previous monitoring visits. The additional two occurrences were discovered in 2008 during botanical surveys for district projects. All sites occur in open conditions on substrates with some component of limestone. Rangewide, this species has often been documented in areas of road disturbances and other human and natural disturbances. Black Hills occurrences range in elevation from 4,200 (in Wind Cave national Park) to 6,160 ft.

2008 Monitoring Design:

1. **Revisit as many of the known *Botrychium lineare* occurrences on Black Hills National Forest (BOLI7-1, BOLI7-2, BOLI7-3, BOCA5-1, BOCA5-6) as possible annually. Document any new disturbances or changed levels of pre-existing disturbances.**

   All five of the known *B. lineare* sites were visited in 2008. See table below for site assessments

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

   Two new occurrences were discovered in 2008 during botanical surveys for district projects. Species identification for these sites was not confirmed until February of 2009. Collection of baseline data for

these sites will be considered in the 2009 monitoring design.

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

   See table below. In 2008 there was no evidence of weed treatment adversely affecting any *B. lineare* occurrences.

Site ID # (Location – Ranger Dist.)	***Botrychium lineare* (narrowleaf grapefern; slender moonwort)**
BOCA5-1 (Boles Canyon – Hell Canyon)	• **Date Monitored:** 5/26/2008 • **Site Assessment:** *B. lineare* was present in the site (11-50 plants), but was not as abundant as previous years. Monitoring occurred early in phenology (all plants under ½" tall) for this species and plants may have been still been below ground. *Botrychium campestre* has also been confirmed (by genetic analysis) at this site. This site is also addressed under the discussion for *B. campestre*. Brown tips (thought to be frost damage) were observed on some *B. lineare* plants. Site is near Forest Service property boundary. A portion of the site is on private property. No changes in disturbance regime were observed. • **Weeds:** *Bromus inermis* is abundant (dominant) along roadside and co-located with *B. lineare* but decreasing in density on the uphill side of road.
BOCA5-6 (Witch Spring – Hell Canyon)	• **Date Monitored:** 5/27/2008 • **Site Assessment:** *B. lineare* was present in the site and similar in extent to 2007, with additional concentration areas. Population estimated at 1,000-2,000 plants. *Botrychium campestre* has also been confirmed (by genetic analysis) here, and this site was addressed in the discussion for *B. campestre*. A majority of the site was prescribed burned in November 2007. Many *B. campestre*/*B. lineare* individuals were observed emerging through the charred litter. • **Weeds:** No weeds were observed in the site.
BOLI7-1 (Upper Dugout Gulch – Bearlodge)	• **Date Monitored:** 7/14/2008 • **Site Assessment:** *B. lineare* was <u>not</u> observed in the site in 2008. Monitoring may have been too late in season to observe plants. Livestock was in the site at time of survey. Recent livestock trailing on an old roadbed where plants occur (freshly matted vegetation, shearing on mossy trail edges, fresh manure) was observed. Disturbance from livestock increased compared to previous monitoring visits. • **Weeds:** *Cynoglossum officinale* and *Tanacetum vulgare* were observed occasionally in the site.

BOLI7-2 (Williams Gulch – Bearlodge)	• **Date Monitored:** 5/28/2008 • **Site Assessment:** *B. lineare* was not observed in the site in 2008. In July 2005, the Cement Fire burned the slope adjacent to the site. The road where plants occurred was severely disturbed in fire suppression and rehabilitation activities (bladed to bare ground) and *B. lineare* has not been observed at the site since its initial discovery in 2005 (site visited in 2006, 2007, and 2008). Dr. Farrar suggests that *B. lineare* may be recovering below the soil surface. Compaction may have broken mycorrhizal fungi connections that could take several years to reestablish. Dr. Farrar suggests monitoring the site for several years to see if the plants produce above ground parts. • **Weeds:** *Bromus tectorum* was discovered in a small patch approximately three meters from the site. *Cynoglossum officinale* occurs frequently on the roadbed with *B. lineare*. *Carduus nutans* was observed frequently on the lower slope, along main road, but not in same ecotype. *Verbascum thapsus* and *Thlaspi arvense* (field pennycress) were observed scattered along road.
BOLI7-3 (Hughes Draw – Mystic)	• **Date Monitored:** 5/28/2008 • **Site Assessment:** *B. lineare* was present in the site (three *B. lineare* individuals were visually identified but were not genetically confirmed in 2008). No livestock evidence was observed at the time of the 2008 monitoring visit. • **Weeds:** *Cirsium arvense*, *Carduus nutans* were observed in the area within 100 meters of *B. lineare*.

Sensitive Species: *Cypripedium parviflorum* (lesser yellow lady's slipper)

Cypripedium parviflorum is primarily circumboreal in distribution and rangewide is generally found in shady deciduous and mixed woodlands near streams, shrublands, swamps, bogs, and wet forests. Habitat in the Black Hills includes stream banks under both spruce and deciduous overstories, moist cliffs (usually north-facing), and moist areas/seeps under white spruce (*Picea glauca*) or mixed conifer forest. Black Hills occurrences range in elevation from 3,500 to 6,500 ft. An estimated 4,000 individuals exist in at least 50 distinct occurrences on three of the four Black Hills National Forest ranger districts (Bearlodge, Mystic, and Northern Hills) across 20 different sixth level watersheds.

2008 Monitoring Design:

1. **Relocate as many geographically spaced occurrences as possible of 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 M.A. 3.1 Botanical Areas. Assess risks to those occurrences.**

   Two previously reported sites (CYPA19-22, CYPA19-28) were visited and baseline data collected in 2008. Additionally, one site that already had baseline data collected (CYPA19-21) was revisited. See table below for site assessment.

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

   No evidence of collection was observed at any of the sites.

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

   No *C. parviflorum* occurrences in botanical areas were visited in 2008. Site CYPA19-21 (located just outside the Dugout Gulch Botanical Area) had evidence of livestock access to the site in 2008. See table below for details.

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

   See table below. In 2008 there was no evidence of adverse effects from weed treatment on any *C. parviflorum* occurrences.

Site ID # (Location – Ranger Dist.)	***Cypripedium parviflorum* (lesser yellow lady's slipper)**
CYPA19-21 (Dugout Gulch – Bearlodge)	• **Date Monitored:** 8/26/2008 • **Site Assessment:** *C. parviflorum* was present in the site (11-50 plants observed). Monitoring revealed some livestock trampling in the immediate area and a few *C. parviflorum* plants had been cropped, most likely by cows. Fresh manure was observed in the drainage. This site is adjacent to the Dugout Gulch Botanical Area. Some leaves were slightly tattered and browning possibly attributable to hail damage. No evidence of collection was observed. • **Weeds:** *Cynoglossum officinale* was abundant in the drainage bottom and co-located with *C. parviflorum*. *Arctium minus* was observed in same ecotype approximately five meters from *C. parviflorum*.
CYPA19-22 (S. Fork Castle Creek – Mystic)	• **Date Monitored:** 7/29/2008 • **Site Assessment:** *C. parviflorum* was present in the site (11-50 plants observed), with no evidence of disturbance or collection. • **Weeds:** *Cirsium arvense* was observed scattered occasionally in same ecotype as *C. parviflorum*.
CYPA19-28 (Spearfish Creek – Northern	• **Date Monitored:** 7/15/2008 • **Site Assessment:** *C. parviflorum* was present in the site (501-1000 plants observed). Plants appeared healthy. The majority of individuals were found in a previously disturbed area along a historic aqueduct. A few plants had tattered leaves and a couple had tops

Hills)	browsed, but damage was minor. No evidence of collection was observed. • **Weeds:** Very few weeds were observed in the site. One *Cynoglossum officinale* was observed in the same ecotype and was subsequently pulled.

Sensitive Species: *Viburnum opulus* var. *americanum* (American cranberrybush; highbush cranberry)

Viburnum opulus var. *americanum* is widely distributed across north central North America. In the Black Hills it occurs at mid-elevations in wet, shaded habitats along streams, springs, and canyon bottoms. There are more than 30 occurrences of *Viburnum opulus* var. *americanum* reported on the Black Hills National Forest (on the Northern Hills and Bearlodge Ranger Districts). Most documented Black Hills occurrences are in drainage bottoms or low slopes with moist soil conditions with partial shading. Currently known sites are primarily associated with paper birch/ironwood (*Betula papyrifera /Ostrya virginiana*) and paper birch/hazelnut (*Corylus cornuta)* communities, with or without white spruce (*Picea glauca*) or quaking aspen (*Populus tremuloides*). A few sites are in ponderosa pine/oak (*Pinus ponderosa/Quercus macrocarpa*). Paper birch is present at almost all currently known sites. Black Hills occurrences range in elevation from 3,800 to 5,700 ft.

2008 Monitoring Design:

1. **Relocate as many geographically spaced occurrences as possible 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 or fruiting period) and gather baseline data. Try to include reported occurrences MA. 3.1 Botanical Area. Assess risks to those sites.**

   Two new sites (VIOPA2-30, VIOPA2-31) were found and baseline data collected. Additionally one site that already had baseline data collected (VIOPA-6) was revisited. See table below for site assessments.

2. **Document any noxious weeds or invasive plant 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 update a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.**

   See table below. In 2008 there was no evidence of weed treatment adversely affecting any *Viburnum opulus var. americanum* occurrences.

Site ID # (Location – Ranger Dist.)	***Viburnum opulus* var. *americanum* (American cranberrybush; highbush cranberry)**
VIOPA2-6 (Pettigrew Gulch – Northern	• **Date Monitored:** 8/20/2008 • **Site Assessment:** *V. opulus* var. *americanum* was present in the site (one clump observed). Some minor insect damage had occurred on foliage. There was also slight yellowing on a few leaves. Recent livestock trailing and hummocking had occurred in the drainage

Hills)	directly adjacent to the plant (within 0.5 meter). The plant appeared vigorous and overall healthy, but 40 to 50% of the current year's leaders had been browsed. • **Weeds:** No weeds found in direct vicinity of *V. opulus* var. *americanum* plant. *Cirsium arvense, Carduus nutans, Cirsium vulgare, Cynoglossum officinale*, and *Verbascum thapsus* were found in the drainage in the same ecotype.
VIOPA2-30 (Griggs Gulch – Northern Hills)	• **Date Monitored:** 9/30/2008 • **Site Assessment:** *V. opulus* var. *americanum* was present in the site (one clump observed). Plant appeared healthy, but with some leaves were shriveled (~5% of leaves) with some minor insect damage (less than five percent of leaves). *V. opulus* var. *americanum* was co-located with SOLC *Polystichum lonchitis* (site POLO4-12). • **Weeds:** No weeds were observed in the site; however *Cynoglossum officinale* and *Cirsium arvense* were observed occasionally in the drainage in same ecotype.
VIOPA2-31 (south of Cranberry Spring – Bearlodge)	• **Date Monitored:** 10/3/2008 • **Site Assessment**: *V. opulus* var. *americanum* was present in the site (three clumps observed). Minor insect damage was observed (holes in some leaves). This drainage is adjacent to a road and the road is the drainage bottom in some areas. *V. opulus* var. *americanum* occurs directly in the drainage bottom and is within two meters of the road. Livestock use in the drainage adjacent to *V. opulus* var. *americanum*. Trailing and some light browsing on *V. opulus* var. *americanum* plants were observed. Light wildlife use was also noted in the drainage. • **Weeds:** *Cynoglossum officinale* occurred frequently in the same ecotype and co-located with *V. opulus* var. *americanum.* *Cirsium vulgare* occurred occasionally in the same ecotype. *Phleum pratense* occurred in the adjacent road and was also scattered along the drainage bottom in vicinity of *V. opulus* var. *americanum.*

Black Hills National Forest Plant Species of Local Concern (SOLC)

In general, the main focus for plant SOLC in 2007 was to relocate previously reported occurrences 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.

Species of Local Concern: *Adiantum capillus-veneris* (southern maidenhair fern)

Adiantum capillus-veneris occurs primarily in tropical and warm temperate regions of the world. In North America, it is mainly distributed across the southern third of the U.S. with disjunct northern occurrences (such as the Black Hills) restricted to moist, calcareous substrates closely associated with warm or hot springs. The single documented Black Hills occurrence is associated with warm springs at Cascade Creek (elevation 3,150-3,450 ft.) in the southwestern Black Hills (Fall River County, South Dakota). Plants at Cascade Creek are found in moist to saturated areas on the streambank and in depressions and old channels on the adjacent floodplain. No other warm springs are known on Forest Service administered land in the Black Hills.

Developed picnic grounds are located at two ends of the *Adiantum capillus-veneris* occurrence located within the Black Hills. The majority of the occurrence is located along Cascade Creek on the Whitney Preserve managed by The Nature Conservancy. Data since 2000 documents an 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 due to several years of higher than average moisture in the Black Hills (NOAA 1996-2001), as well as conservation activities taking place in the Cascade Creek valley. The population appears to be stable, but there is insufficient data to demonstrate a trend at the present time.

The Alabaugh Wildfire of July 7-13, 2007 burned approximately 10,300 acres, including areas immediately adjacent to Black Hills National Forest land along Cascade Creek. Monitoring in 2008 documented the effects of the fire. No *A. capillus-veneris* plants or associated riparian vegetation were burned during the Alabaugh Fire, but slopes adjacent to the site were burned. Several high precipitation events after the fire resulted in increased sediment and ash input into the creek. Since this landscape is naturally highly erosive, the plant species/communities present have adapted to occasional intense disturbance events. Long-term negative impacts are not expected but the site will continue to be monitored.

Ongoing recreational use, noxious and invasive plant species presence, and treatment of associated vegetation with herbicide are considered the greatest ongoing risks to *A. capillus-veneris* and its habitat on Black Hills National Forest. *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. In 2008 Hell Canyon Ranger District initiated a restoration program that will gradually replace non-native tree and shrub species with native shrubs [e.g. *Fraxinus pennsylvanica* (green ash), *Acer negundo* (boxelder), *Ulmus americana* (elm)].

2008 Monitoring Design:

1. **Monitor presence/absence of *Adiantum capillus-veneris* along Cascade Creek (ADCA-1, ADCA-2) on an annual basis. If the extent of concentration areas changes from one year to the next, consult on a more rigorous design with the Rocky Mountain Research Station.**

   A. capillus-veneris was present at a majority of the concentration areas along Cascade Creek (sites ADCA-1 and ADCA-2). However, some concentration areas were not found in 2008. Consultation with RMRS will take place in 2009 to determine if any changes should be made to the monitoring protocol for the 2009 season. See table below for site assessments.

2. **Document the number of recreational nick point trails that extend into concentration areas of *Adiantum capillus-veneris*.**

   At Cascade Springs (ADCA-1) several previously noted recreation nick points were still present in 2008 – no significant new use/trails noted. No new nick trails were observed at Cascade Falls (ADCA-2) this year, and trails noted on both sides of the creek in previous years had been obliterated/washed-out from the flooding.

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

   The two water transects were read on July 28, 2008. For water transect data, see monitoring item number three under *Epipactis gigantea*.

4. **Document any noxious weeds and the following invasive species of concern: *Elaeagnus angustifolia* (Russian olive) and *Tamarix* sp. (salt cedar). Document if weeds are co-located with *Adiantum capillus-veneris* or what distance weeds are located from concentration areas if weeds are occupying the same ecological type. Use this information to update a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected the occurrences.**

   Weed abundance appeared to decrease as a result of annual weed pulling at the site. *Cirsium arvense* and *Cirsium vulgare* were observed occasionally among *A. capillus-veneris* plants. The SD noxious weed *Sonchus arvensis* (field sow thistle) was documented in 2007 for the first time at Cascade Falls, but was not observed in 2008. *Elaeagnus angustifolia* (Russian olive) was present at Cascade Springs, while *Tamarix* spp. (salt cedar) was not.

   In 2008 there was no evidence of weed treatment negatively affecting any *A. capillus-veneris* occurrences.

5. **Document erosion patches occurring at any concentration area of *Adiantum capillus-veneris*.**

   There was evidence of new erosion and scouring of streambanks from recent high water events. Scouring disturbed areas of suitable habitat, but *A. capillus-veneris* persists along the stream. Sediment and debris accumulated in new areas as a result of flooding.

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

   No evidence of collection was observed at any of the *A. capillus-veneris* sites in 2008.

Species of Local Concern: *Botrychium multifidum* (leathery grapefern)

Botrychium multifidum is nearly circumboreal in distribution, being found across North America, Europe and northwest Asia. Rangewide, it grows in moist, open or shaded areas, including old pastures, meadows, woodland margins, riverbanks and bottom lands. There are eight known occurrences on Black Hills National Forest lands. Seven of the eight occurrences are located on the Hell Canyon Ranger District in a concentrated area (ca. 16 square miles) of the central core on igneous or metamorphic bedrock, within the Black Elk Wilderness and/or Norbeck Wildlife Preserve. A single site is known from the Bear Lodge Mountains (WY) in a steep narrow drainage with *Betula papyrifera* (paper birch) and *Corylus cornuta* (hazelnut) community on sandstone. Most known locations are in mossy, mesic sites dominated by *Picea glauca* (white spruce) or mixed *Picea glauca-Pinus ponderosa* (spruce-pine) woodlands along small, perennial streams. Plants occur in open to shady areas, often in or near old stream channels where water is no longer flowing on a permanent basis. Black Hills occurrences range in elevation from 4,620 to 6,450 ft.

2008 Monitoring Design:

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

   No new occurrences were discovered in 2008.

2. **Annually check presence/absence and count individuals at the five annual monitoring sites (BOMU-1, BOMU-4, BOMU-5, BOMU-7, BOMU-8).**

   B. multifidum was present at the five annual monitoring sites (BOMU-1, BOMU-4, BOMU-5, BOMU-7, BOMU-8) in 2008

3. **Every five years, re-inventory all locations within the same year (completed in 2004; next in 2009).**

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

   In 2008 there was evidence of weed treatment in two *B. multifidum* sites (BOMU-1, BOMU-7), with possible direct effects in one site (BOMU-7, See following table).

Site ID # (Location – Ranger Dist.)	***Botrychium multifidum* (leathery grapefern)**
BOMU-1 (Lost Cabin Creek)	• **Date Monitored:** 9/15/2008 • **Site Assessment:** *B. multifidum* was present in the site (114 plants observed). Individuals were relocated in all high concentration areas identified previously, but there were fewer individuals present in these areas than past monitoring visits report. Two small, new concentration areas were found, one slightly west of the original concentration area and one slightly to the east expanding the area of the site. Additional GPS points were obtained. The site appears healthy and stable. The site occurs in Black Elk Wilderness. • **Weeds:** *Cirsium arvense* was present and reported scattered in the site area in the same ecotype. Weed Treatment: *Cirsium arvense* plants observed at the site had been treated (blue dye and withered thistles were observed in the site area within a few meters of *B. multifidum* plants). Spraying does not appear to have had a negative effect on *B. multifidum*; however, botany personnel realize the need for better coordination with District weed personnel regarding this site.
BOMU-4 (Iron Creek)	• **Date Monitored:** 8/27/2008 • **Site Assessment:** *B. multifidum* was present in the site (20 plants observed). Trail #89 (Centennial Trail) is near the site. A faint trail (used by both people and wildlife) was observed along the creek adjacent to the *B. multifidum* site. Several high water events through the spring and summer caused scouring and sediment deposition in the area where the population is located. All of the plants that were located this year were found in an area that was obviously

	scoured. Spruce down fall was observed in the area. Site occurs in Black Elk Wilderness. • **Weeds:** *Cirsium arvense* occurs in the same ecotype and *B. multifidum* (within five meters). *Cirsium vulgare* was observed in the same ecotype, within two meters of *B. multifidum*. *Phleum pratense* was co-located with *B. multifidum* as well as scattered on the floodplain nearby. Monitoring revealed no evidence of weed treatment in the site.
BOMU-5 (Iron Creek tributary)	• **Date Monitored:** 8/27/2008 • **Site Assessment:** *B. multifidum* was present in the site (12 plants observed). The site appeared stable with no new disturbances. The site occurs in the Black Elk Wilderness. • **Weeds:** *Cirsium vulgare* was observed occasionally along the drainage with a few plants in the same ecotype (within two meters) as *B. multifidum*. *Cirsium arvense* was not observed in the site, but was scattered consistently along the drainage. A dense patch approximately 10 meters from the site was noted. No evidence of weed treatment was observed in the site.
BOMU-7 (Upper Iron Creek)	• **Date Monitored:** 8/28/2008 • **Site Assessment:** *B. multifidum* was present in the site (25 plants observed). Two plants were observed with minor insect damage. Recent spruce deadfall was observed in the area. The site occurs in the Black Elk Wilderness. • **Weeds:** *Cirsium arvense* was common along the drainage, thick in areas, and sometimes co-located with *B. multifidum*. *Cirsium vulgare* was scattered occasionally in the drainage, in same ecotype, and as close as seven meters from *B. multifidum*. *Phleum pratense* was observed occasionally scattered in slightly drier areas and as close as 10 meters from *B. multifidum*. Weed Treatment: Blue dye and withered *C. arvense* plants from recent weed spraying activity were observed in the site. Dye was found on plants which touched a pin that marked the location of a *B. multifidum* plant. No *B. multifidum* was found at the pin this year. At this time, botany personnel are uncertain if weed spray or other factors are the caused the absence of above-ground parts. Sprayed *C. arvense* was observed as close as five inches from the pin marking a *B. multifidum* location. In other areas drips of blue dye from weed spray were found on pine needles touching *B. multifidum* individuals. It appears that *C. arvense* was targeted in the weed spraying effort and the general vegetation in the area was not broadly sprayed. Botany personnel realize the need for better coordination with District weed personnel.
BOMU-8 (Little Beaver – Bearlodge)	• **Date Monitored:** 8/7/2008 • **Site Assessment:** *B. multifidum* was present in the site (eight plants observed). Water was flowing in the drainage at the time of monitoring (water two to four feet across and up to nine inches deep) in contrast to 2007 when there was no flowing water observed, only scattered pools.

	Stream banks were scoured in some areas due to high water flows the past two seasons, but the site looks lush and healthy, with thick vegetation on banks near *B. multifidum* plants. There was no manure or livestock trailing observed in the site this year • **Weeds:** No weeds were observed in the site. *Cirsium vulgare* and *Phleum pratense* were found downstream from the site. No evidence of weed treatment was observed at this site.

Species of Local Concern: *Carex bella* (southwestern showy sedge)

The primary range of *Carex bella* is the southwest U.S. and Mexico. Rangewide this species typically inhabits streambanks, meadows and moist woods or open slopes, frequently above timberline. Black Hills occurrences (eight reported; three on Black Hills National Forest lands and five in Custer State Park) are known from high elevations of the central granitic core in cool, moist, shaded white spruce forests often with paper birch and usually associated with large granite rock outcrops. The three occurrences on Black Hills National Forest lands are in a one square mile area within the Black Elk Wilderness on the Hell Canyon Ranger District. Black Hills occurrences range in elevation from 6,600 to 7,100 ft.

2008 Monitoring Design:

1. **On an annual basis, monitor presence/absence of the three known occurrences (CABE3-1, CABE3-2, and CABE3-3). Document if any occurrence is affected by a flood or fire event.**

   The three sites (CABE3-1, CABE3-2, CABE3-3) were all was present in 2008. No known occurrences were affected by flood or fire in 2008. See table below for site assessments.

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

   No new occurrences were discovered in 2008.

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

   See table below. In 2008 there was no evidence of weed treatment adversely affecting any *C. bella* occurrences.

4. **On any currently known *Carex bella* site that is affected by a flood or fire event, monitor for presence/absence.**

   No known sites were affected by flood or fire in 2008.

Site ID # (Location – Ranger Dist.)	*Carex bella* (southwestern showy sedge)
CABE3-1 (S. of Nelson Creek)	• **Date Monitored:** 6/9/2008 • **Site Assessment:** *C. bella* was present in the site. Site and plants appear healthy and comparable in extent to 2007. *C. bella* is co-located with R2 sensitive species *Viola selkirkii* (site VISE2-7) and SOLC *Oxyria digyna* (site OXDI3-1) at this site. The site occurs in Black Elk Wilderness. • **Weeds:** No weeds were observed at this site. *Bromus inermis* was observed in slightly different ecotype.
CABE3-2 (Nelson Creek)	• **Date Monitored:** 6/9/2008 • **Site Assessment:** *C. bella* was present in the site. The site and the plants appear healthy, stable, and comparable in extent to 2007. *C. bella* is co-located with R2 sensitive species *Viola selkirkii* (site VISE2-8) at this site. The site appears wetter than previous years with some standing water in low areas. The site occurs in the Black Elk Wilderness. • **Weeds:** None in the site.
CABE3-3 (Harney Peak)	• **Date Monitored:** 6/20/2008 • **Site Assessment:** *C. bella* was present in the site. The site and the plants appear healthy, stable, and comparable in extent to 2007. *C. bella* is co-located with R2 sensitive species *Viola selkirkii* (site VISE2-4) and SOLC *Oxyria digyna* (site OXDI3-2) at this site. No new disturbances were observed in 2008 (same levels and type of disturbance as in 2007 (i.e. litter from Harney, prayer bundles, etc.)). The site occurs in the Black Elk Wilderness. • **Weeds:** No weeds were observed at this site.

Species of Local Concern: *Eleocharis rostellata* (beaked spikerush)

Rangewide, *Eleocharis rostellata* occurs in coastal salt marshes and inland saline, alkaline, or strongly calcareous wetland habitats (e.g., around hot springs). The single documented Black Hills occurrence is on calcareous substrates in the year-round flows of warm spring water of Cascade Creek in the southwestern Black Hills (Fall River County, South Dakota), at an elevation of 3,150 to 3,450 ft. It 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 with shallow roots that occurs in saturated to inundated conditions. 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.

The Alabaugh Wildfire of July 7-13, 2007 burned approximately 10,300 acres, including areas immediately adjacent to Black Hills National Forest land along Cascade Creek. In 2008, Black Hills National Forest began documenting effects of the fire on *E. rostellata*. The fire did not burn any *E. rostellata* individuals or associated

riparian vegetation, but slopes adjacent to the site were burned. Several high precipitation events occurred after the fire resulting in increased sediment and ash input into the creek. Since this landscape naturally erosive, the plant species and communities present have adapted to occasional intense disturbance. Long-term negative impacts are not expected but the site will continue to be monitored.

Ongoing recreational use, noxious and invasive plant species presence, and treatment of associated vegetation with herbicide are considered the greatest ongoing risks to *E. rostellata* and its habitat on Black Hills National Forest. *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. In 2008 Hell Canyon Ranger District initiated a restoration program that will gradually replace non-native tree and shrub species with native shrubs [e.g. *Fraxinus pennsylvanica* (green ash), *Acer negundo* (boxelder), *Ulmus americana* (elm)].

2008 Monitoring Design*:*

1. **Monitor presence/absence of *Eleocharis rostellata* along Cascade Creek on an annual basis. If the extent of concentration areas changes from one year to the next, consult on a more rigorous design with the Rocky Mountain Research Station.**

   Sites ELRO-1 (Cascade Springs) and ELRO-2 (Cascade Falls) were visited on July 28, 2008. *E. rostellata* was present at both area and comparable in extent to 2007. *E. rostellata* vegetation was matted from the high water flow in areas, but the site appeared healthy and stable.

2. **Document the number of recreational nick point trails that extend into concentration areas of *Eleocharis rostellata*.**

   Eleocharis rostellata grows along streambanks and in saturated areas in the floodplain. It is not likely to be heavily impacted by recreation nick trails because recreational users do not generally find it appealing to wade/walk through a wetland to get to the creek when there are easier access routes.

   At Cascade Springs (ELRO-1), several previously noted recreation nick points were present in 2008 with no new use or trails noted. No new trails were observed at Cascade Falls (ELRO-2) this year, and trails noted on both sides of the creek in previous years had been obliterated during the flooding.

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

   The two water transects were read on July 28, 2008. For water transect data, see monitoring item number three under *Epipactis gigantea* above.

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

In 2008 *Cirsium arvense* was found occasionally among *E. rostellata* plants. *Cirsium vulgare* was also noted in the same ecotype. Lower weed abundance at Cascade Springs has been observed since annual weed-pulling was initiated several years ago. The SD noxious weed *Sonchus arvensis* (field sow thistle) was documented in 2007 for the first time at Cascade Falls but was not observed in 2008. *Elaeagnus angustifolia* (Russian olive) was present at Cascade Springs, while *Tamarix* spp. (salt cedar) was not.

In 2008 there was no evidence of weed treatment negatively affecting any *E. rostellata* occurrences.

5. **Document erosion patches occurring at any concentration area of *Eleocharis rostellata.***

   There was evidence of new erosion and scouring on streambanks from recent high water events. However, soil and banks seem stable in area where *E. rostellata* is concentrated. The rhizomatous growth pattern of the species produces thick mats of vegetation that help to hold the soil in place. There is also new thick sediment/debris in areas.

6. **Document any verifiable unauthorized collections of *Eleocharis rostellata.***

   No evidence of collection was observed at any of the *E. rostellata* sites in 2008.

Species of Local Concern: *Gentiana affinis* (northern gentian)

Gentiana affinis is known from western North America. There are many Black Hills National Forest occurrences (Mystic, Hell Canyon and Northern Hills Ranger Districts) primarily from the central to western Black Hills in a wide range of habitats. *G. affinis* is considered a facultative upland species in South Dakota and eastern Wyoming. Black Hills occurrences have been documented in moist areas near stream margins, springs and fens, montane grasslands, vegetated drainages with cobbles and conifer dominated slopes and range in elevation from 4,960 to 6,620 ft.

2008 Monitoring Design*:*

1. **Continue relocating previously reported sites and search for new 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. Document at least five sites in 2008. Assess risks to the species at documented sites.**

   One previously reported site (GEAF-11, Mystic District) was visited on July 29, 2008 and baseline data collected.

2. **Document any noxious weeds or other invasive plant species. Document if weeds 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 update a weed strategy with**

prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

No weeds were observed in the site (GEAF-11). *C. arvense* (Canada thistle) was observed occasionally in the same ecotype.

In 2008 there was no evidence of weed treatment adversely affecting any *G. affinis* occurrences.

Species of Local Concern: *Listera convallarioides* (broadlipped twayblade)

Listera convallarioides occurs across northern North America and extends south only at high elevations. Rangewide it occurs on rich humus in open woods and boggy meadows and prefers cool soil. It is considered a facultative wetland species in South Dakota and eastern Wyoming and has a high tolerance for anaerobic conditions. There are four known occurrences on Black Hills National Forest lands with one site extending onto BLM land. Occurrences are restricted to a 20 square mile area in the northern Black Hills (Northern Hills Ranger District), south of Lead, SD. Elevations range from 5,120 to 6,080 feet. Individuals are growing in saturated soil conditions adjacent to creeks and springs, in white spruce (*Picea glauca*) dominated forests. One occurrence is in Englewood Springs Botanical Area.

2008 Monitoring Design:

1. **Annually monitor the three *Listera convallarioides* occurrences on Black Hills National Forest (in 2008, collect baseline data on one new site from 2007 not yet fully documented).**

   The three *Listera convallarioides* sites (LICO5-1, LICO5-2, LICO5-3) were revisited in 2008. The new site located in 2007 (LICO5-4) was also visited in 2008 and baseline data collected.

2. **Document whether the occurrence (LICO5-2) in Englewood Springs Botanical Area is accessed by livestock to assess the status of meeting Forest Plan Standard 3.1-2503 (Restrict access of domestic livestock use to protect the R2 sensitive and species of local concern plant occurrences in designated botanical areas).**

   Site LICO5-2 had been accessed by livestock in 2008. See table below.

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

   See table below. In 2008 there was no evidence of weed treatment adversely affecting any *L. convallarioides* occurrences.

Site ID # **(Location – Ranger District)**	***Listera convallarioides* (broadlipped twayblade)**
LICO5-1 (W. Strawberry Creek – Northern Hills)	• **Date Monitored:** 8/19/2008 • **Site Assessment:** *L. convallarioides* was present in the site. Plants appeared very healthy and several individuals had bloomed and were in fruit. Site extends onto BLM land. A few of the leaves have a small amount of insect damage this year. There is a well used game trail though population center. • **Weeds:** *Cirsium arvense* and *Leucanthemum vulgare* were co-located with *L. convallarioides.* *Tanacetum vulgare* was observed in the same saturated ecotype and within three meters of *L. convallarioides.* *Linaria vulgaris* was observed in the vicinity of the site, but in drier ecotype. *Verbascum thapsus* was thick on the slope below road but not in vicinity of *L. convallarioides.*
LICO5-2 (Englewood Springs – Northern Hills)	• **Date Monitored:** 7/21/2008 • **Site Assessment:** *L. convallarioides* was present in the site and comparable in extent to 2007. The entire site occurs in the Englewood Springs Botanical Area. Evidence of wildlife use in the area (deer and elk tracks and scat). • **Livestock Use (item 2 above):** Livestock have accessed and caused impacts (from direct trampling) to *L. convallarioides* plants and habitat, especially in new concentration area (discovered in 2007) west of FSR 228. Livestock trampling, trailing, streambank alteration and recent manure were observed in the riparian area/wetland west of FSR 228. Livestock hoof prints and trailing were also observed above the road (east of FSR 228) in the wetland where spring overflow crosses the road in culverts. This site is one of the annual monitoring sites for the North Zone Range 08 Project. Photopoint monitoring was established on 9/10/2008. See the North Zone Range 08 Environmental Assessment for full details of the monitoring plan. • **Weeds:** *Cirsium vulgare, Cynoglossum officinale,* and *Leucanthemum vulgare* were observed in the same ecotype, directly adjacent to *L. convallarioides*.
LICO5-3 (Bear Butte Creek – Northern Hills)	• **Date Monitored:** 7/21/2008 • **Site Assessment:** *L. convallarioides* was present in the site. The site expanded compared to 2007. Plants were found in moist to saturated areas adjacent to where springs come off lower slope. This site is in the Upper Elk Allotment but did not appear to have been grazed at the time of monitoring. This is also a monitoring site for the North Zone Range 08 Project. Some plants were found in the vicinity of spruce downfall. Faint game trails were observed near site. • **Weeds:** *Cirsium arvense* was thick in the drainage bottom and co-located with *L. convallarioides*. *Cirsium vulgare* was scattered occasionally in the same ecotype (less than two meters) as LICO5. *Phleum pratense* occurs in the drainage bottom and was scattered nearby (less

	than four meters) LICO5. *Linaria vulgaris* was scattered in the drainage bottom, not in vicinity of *L. convallarioides*. *Cynoglossum officinale* occurred frequently in the drainage bottom.
LICO5-4 (Elk Creek tributary – Northern Hills)	• **Date Monitored:** 7/18/2008 • **Site Assessment:** *L. convallarioides* was present in the site. Plants were very dense in areas. No livestock impacts to the site were observed, but livestock trampling and hummocking was evident in areas along the streambank north and south of the site. • **Weeds:** No weeds were observed in the site, but *Cirsium vulgare, Cynoglossum officinale, Carduus nutans,* and *Leucanthemum vulgare* were all present near the site.

Species of Local Concern: *Lycopodium annotinum* (stiff clubmoss)

Lycopodium annotinum is widely distributed in boreal habitats of North America. Elsewhere in its range, it occurs in swampy or moist coniferous forests, mountain forests, and exposed grassy or rocky sites. There are approximately ten known occurrences on Black Hills National Forest lands (Northern Hills, Bearlodge, and Mystic Ranger Districts). Sites occur primarily in the northern Black Hills and are associated with moist microhabitats within remnant boreal white spruce and paper birch/hazelnut communities. Three occurrences are co-located with *Lycopodium complanatum* [R2 sensitive species] and two are in the Upper Sand Creek Botanical Area. Black Hills occurrences range in elevation from 5,100 to 6,300 ft.

2008 Monitoring Design:

1. **Revisit the three sites (LYAN2-1, LYAN2-3, LYAN2-4) co-located with *Lycopodium annotinum*; search for new and previously reported sites 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 new sites.**

   The three sites (LYAN2-1, LYAN2-3, LYAN2-4) were revisited in 2008. Two previously reported sites (LYAN2-7, LYAN2-8) were located and baseline data collected. See table below for site assessments.

2. **Document any noxious weeds or invasive plant species. Document if weeds 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 update a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.**

   See table below. In 2008 there was no evidence of weed treatment adversely affecting any *L. complanatum* occurrences.

Site ID # (Location – Ranger Dist.)	*Lycopodium annotinum* (stiff clubmoss)
LYAN2-1 (Sand Creek – Bearlodge)	• **Date Monitored:** 9/17/2008 • **Site Assessment:** *L. annotinum* was present in the site and was comparable in extent to 2007. No disturbance to the site was observed. Grazing and ATV use was observed below the site, and was concentrated in the drainage bottoms. Monitoring revealed fresh erosion down-slope from the northern boundary of the site. • **Weeds:** No weeds were observed in the site. *Tanacetum vulgare, Cynoglossum officinale, Hypericum perforatum, Cirsium arvense* were abundant in drainage below the site.
LYAN2-3 (Tilson Creek Northern Hills)	• **Date Monitored:** 9/15/2008 • **Site Assessment:** *L. annotinum* was present in the site and was comparable in extent to 2007. Spruce blow-down was observed in the vicinity. Faint game trails and deer rubbed trees were noted in the site vicinity. No fresh sign of livestock traffic was observed in the site; however, the meadow and drainage bottom below the site had evidence of livestock use. • **Weeds:** No weeds were observed in the site, but *Phleum pretense* was observed occasionally on the hillside, in same ecotype.
LYAN2-4 (N Fork Rapid Creek tributary – Northern Hills)	• **Date Monitored:** 9/15/2008 • **Site Assessment:** *L. annotinum* was present in the site. Some *L. annotinum* plants may have been negatively impacted by livestock trailing through the site (see details below). There was new spruce downfall (natural) in the site vicinity that may have partially covered some plants with bark and debris. In 2007 impacts to the site from livestock trailing and trampling, thought to be related to a new private/FS boundary fence, were observed. In an attempt to restrict further access, trees were felled along the fence and in the site vicinity in 2008. This appears to have limited access, however, as of 2008 monitoring, there was still an opening in the brush where cows could access the site. Some trailing in this opening near the site appeared recent, but most appears to be from 2007. • **Weeds:** No weeds were observed in the site. *Verbascum thapsus, Cirsium vulgare, Leucanthemum vulgare,* and *Cynoglossum officinale* were scattered occasionally in the adjacent drainage bottom and along a nearby road.
LYAN2-7 (Timber Gulch Northern Hills)	• **Date Monitored:** 9/23/2008 • **Site Assessment:** *L. annotinum* was present in the site. Plants were green and healthy. The site is small, but plants locally very dense. • **Weeds:** No weeds were observed in the site.
LYAN2-8 (Ward Draw – Northern Hills)	• **Date Monitored:** 9/25/2008 • **Site Assessment:** *L. annotinum* was present in the site. *L. annotinum* plants appear healthy. • **Weeds:** No weeds were observed in the site. *Cynoglossum officinale* was found along the drainage bottom adjacent to the site.

Species of Local Concern: *Oxyria digyna* (alpine mountainsorrel)

Oxyria digyna is widely distributed in arctic and alpine regions of North America and across the western U.S. Associated habitats include rocky areas in mountains, especially near streams, and moist ground in alpine or subalpine areas. The three known occurrences on Black Hills National Forest lands are restricted to the central granitic core of the Black Hills, in a concise area (ca. two square miles) within the Black Elk Wilderness (Hell Canyon Ranger District). One additional occurrence is reported from Custer State Park. Plants occur on course-textured soils near steep, granite rock outcrops often in rocky gullies. Plants co-occur with *Carex bella* (SOLC) and/or *Viola selkirkii* (R2 sensitive species) at some sites. Black Hills occurrences range in elevation from 6,000 and 7,240 ft.

2008 Monitoring Design:

1. **Annually monitor the three documented sites (OXDI3-1, OXDI3-2, OXDI3-3). Search for additional occurrences in adjacent areas. Assess risks to the species at new sites.**

   The three documented sites (OXDI3-1, OXDI3-2, OXDI3-3) were revisited in 2008. One additional occurrence (OXDI3-4) was located and baseline data collected.

2. **Document any noxious weeds or invasive plant species. Document if weeds 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 update a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity affected occurrences.**

   See table below. In 2008 there was no evidence of weed treatment adversely affecting any *O. digyna* occurrences.

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

   No known *O. digyna* were affected by flood or fire in 2008.

Site ID # (Location – Ranger Dist.)	*Oxyria digyna* (alpine mountainsorrel)
OXDI3-1 (S. of Nelson Creek – Hell Canyon)	• **Date Monitored:** 6/9/2008 • **Site Assessment:** *O. digyna* was present in the site and was similar in extent to 2007. The site appears healthy and stable. *O. digyna* is co-located with R2 sensitive species *Viola selkirkii* (site VISE2-7) and SOLC *Carex bella* (site CABE3-1) at this site. The site occurs in the Black Elk Wilderness. • **Weeds:** No weeds were observed at this site.
OXDI3-2 (Harney Peak – Hell Canyon)	• **Date Monitored:** 6/20/2008 • **Site Assessment:** *O. digyna* was present in the site and was similar in extent to 2007. The site appears healthy and stable, but with some minor leaf damage (possibly from hail and heavy runoff). *O. digyna* is co-located with

	R2 sensitive species *Viola selkirkii* (site VISE2-4) and SOLC *Carex bella* (site CABE3-3) at this site. The site occurs in the Black Elk Wilderness. • **Weeds:** No weeds were observed at this site.
OXDI3-3 (Elkhorn Mtn – Hell Canyon)	• **Date Monitored:** 6/4/2008 • **Site Assessment:** *O. digyna* was present in the site and was similar in extent to 2007. This area does not get much use, only occasional off-trail hikers. The drainage in which the site occurs likely carries runoff in big rain events. Falling rock could threaten the site, but the area seems relatively stable. Mountain goat use of area is likely, but not evident at the time of monitoring. Some *O. digyna* leaves had a slight brown/tattered appearance that could be from recent heavy rain/hail events. • **Weeds:** No weeds were observed at this site.
OXDI3-4 (Harney Peak – Hell Canyon)	• **Date Monitored:** 6/20/2008 • **Site Assessment:** *O. digyna* was present in the site. This drainage carries a large amount of water during big rain events due to the sizeable surface area of exposed rock upslope. *O. digyna* plants occur directly in the runoff/scour zone. The site appears relatively stable. *O. digyna* co-occurs with R2 sensitive species *Viola selkirkii* (site VISE2-10) in this area. The area receives little to no recreational. • **Weeds:** No weeds were observed at this site.

Species of Local Concern: *Petasites sagittatus* (arrowleaf sweet coltsfoot)

Petasites sagittatus occurs in Alaska, across Canada and the northern United States from Washington to Michigan and south to Colorado and Utah. Rangewide, it is associated with cold, wet, marshy conditions and is a facultative wetland species. There are approximately 10 reported Black Hills National Forest sites (Mystic, Hell Canyon, and Northern Hills Ranger Districts). Black Hills occurrences are reported from moist to saturated wetland areas along drainages and seeps ranging from full sun to shady spruce forests often with birch or aspen. One occurrence is in the Black Fox Botanical Area. Black Hills occurrences range in elevation from 5,120-6,600 ft.

2008 Monitoring Design:

1. **Continue relocating previously reported locations and search for new locations of *Petasites sagittatus* 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 documented sites.**

   Baseline data was not collected on any new or previously reported sites in 2008. One site that already had baseline collected (PESA5-3) was visited in 2008. The site appeared healthy and stable and was similar in extent to the last monitoring visit (2006)

2. **Document any noxious weeds or invasive plant species. Document if weeds 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 update a weed strategy with prioritization for all**

R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

PESE5-3: Weeds were abundant in the site and adjacent habitat. *Cirsium arvense* and *Leucanthemum vulgare* occurred in dense patches, sometimes co-located with *P. sagittatus.* *Cirsium vulgare* and *Cynoglossum officinale* were observed in the same ecotype and were occasionally co-located with *P. sagittatus*. An occasional individual of *Verbascum thapsus* was found in the same ecotype. *Bromus inermis* and *Phleum pratense* are dominant in drier upland, but not in same ecotype.

In 2008 there was no evidence of weed treatment adversely affecting any *P. sagittatus* occurrences.

3. **Document whether the occurrence (PESA5-5) in Black Fox Botanical Area is accessed by livestock to assess the status of meeting Forest Plan Standard 3.1-2503 (Restrict access of domestic livestock use to protect the R2 sensitive and species of local concern plant occurrences in designated botanical areas).**

   In 2008 there were reports of livestock access to Black Fox Botanical Area and *P. sagittatus* site PESA5-5. However, detailed monitoring data was not collected at the site and observations of specific impacts to *P. sagittatus* individuals were not recorded.

Species of Local Concern: *Polystichum lonchitis* (northern hollyfern)

Polystichum lonchitis is a circumboreal, subalpine forest fern that occurs in rock crevices and at the base of boulders, mostly in boreal and subalpine coniferous forests or alpine regions. About twenty known occurrences are reported from Black Hills National Forest lands on the Northern Hills and Bearlodge Ranger Districts. *P. lonchitis* is disjunct in the Black Hills with the nearest occurrences in western Wyoming. Black Hills occurrences are associated with moist, often mossy, shaded to partially shaded, north-facing slopes, ravines, or gulches primarily on limestone substrates. Usually the overstory consists of *Betula papyrifera* (paper birch) and *Corylus cornuta* (hazelnut), sometimes with spruce (*Picea glauca*), ironwood (*Ostrya virginiana*), or aspen (*Populus tremuloides*) and often with diverse shrub and forb components. Black Hills occurrences range in elevation from 4,280 to 6,040 ft.

2008 Monitoring Design:

1. **Continue relocating previously reported locations and search for new locations of *Polystichum lonchitis* 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 documented sites.**

   Two previously reported locations of *P. lonchitis* were visited (POLO4-11, POLO4-12) in 2008. See table below for site assessments.

2. **Document any noxious weeds or invasive plant species. Document if weeds 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 update a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

See table below. In 2008 there was no evidence of weed treatment adversely affecting any *P. lonchitis* occurrences.

Site ID # (Location – Ranger Dist.)	***Polystichum lonchitis* (northern hollyfern)**
POLO4-11 (S. of cranberry Spring – Bearlodge)	• **Date Monitored:** 10/3/2008 • **Site Assessment:** *P. lonchitis* was present in the site. The site is more open (less understory vegetation) and easily accessible than most other *P. lonchitis* sites. This drainage is adjacent to a road, and the road is the drainage bottom in some areas. Several *P. lonchitis* individuals were found less than one meter from the edge of the road. Several *P. lonchitis* individuals were found within two meters of a livestock watering tank (located directly in the drainage bottom). Livestock trampling and hummocking has occurred in saturated areas throughout the drainage and directly adjacent to *P. lonchitis* plants (within one foot). Most plants are easily accessible to livestock, but some are protected by thick vegetation, slash, and topography. • **Weeds:** *Cynoglossum officinale* is frequent in the drainage and occasionally co-located with *P. lonchitis.* *Cirsium vulgare* is scattered through the drainage and occasionally co-located with *P. lonchitis.*
POLO4-12 (Griggs Gulch – Northern Hills)	• **Date Monitored:** 9/30/3008 • **Site Assessment:** *P. lonchitis* was present in the site. No use of the site was observed. A slump/landslide (likely from early season heavy rains) had occurred on the slope above the site. A few clumps of *P. lonchitis* are below the slide, in its path (within four meters). If future erosion occurs plants could be covered by fresh soil and debris, but plants are currently unharmed. The slide exposed bare soil that could support the establishment of noxious weeds. • **Weeds:** *Cynoglossum officinale* and *Phleum pratense* occurred occasionally in the same ecotype (within three meters) as *P. lonchitis* individuals. *Cirsium arvense* and *Cirsium vulgare* occur occasionally in the drainage bottom in the same ecotype, but not in the vicinity, as *P. lonchitis* individuals.

Species of Local Concern: *Salix lucida* ssp. *caudata* (shining willow)

Salix lucida ssp. *caudata* is widely distributed in the western and northern United States and Canada. Rangewide, it is commonly associated with streambanks, shores, wet meadows, and seeps, and is at its easternmost limit in South Dakota. It is considered a facultative wetland plant in South Dakota and eastern Wyoming. Two Black Hills National Forest occurrences were confirmed in 2006—one along a small creek in the

Bearlodge Mountains (Wyoming) at 4,800 ft (one original plant and five planted from cuttings), and the other on the bank of Spearfish Creek in the northern Black Hills (South Dakota) at 5,000 ft (two plants). A third location (Bearlodge, WY), documented by confirmed voucher, has not yet been relocated, and a fourth location (Bearlodge, WY) was planted from cuttings in 2007 (19 plants).

2008 Monitoring Design:

1. **Revisit the Spearfish Creek and N. Redwater sites (SALU-2, SALU-3) and complete the Black Hills National Forest Monitoring form. Survey Spearfish Creek for additional plants/occurrences 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 new sites.**

   Sites SALU-2 and SALU-3 were revisited. Additional habitat along Spearfish Creek was not surveyed in 2008.

2. **Attempt to relocate the second Bearlodge site for *Salix lucida* ssp. *caudata* that was not found in 2006 or 2007 and gather baseline data. Search for new locations in adjacent areas 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. Gather data on the experimental planting site for *S. lucida* ssp. *caudata* on Bearlodge. Assess risks to new sites.**

   The reported location of the historic Bearlodge Ranger District occurrence was searched in August 2008. No *Salix lucida* spp. *caudata* was found.

3. **Document observations regarding if *Salix lucida* ssp. *caudata* plants are grazed by livestock to assess the status of meeting Forest Plan standard 2505 e. No authorized utilization will be allowed by domestic livestock on known occurrences of willow emphasis species (e.g. *Salix candida*, *Salix serissima*, *Salix lucida*).**

   Salix species are preferred forage by livestock and big game. Concern for the persistence of emphasis *Salix* species (including *S. lucida* ssp. *caudata*) on Black Hills NF led to BHNF Standard 2505e.

   No *Salix lucida* ssp. *caudata* plants were observed to be grazed by livestock in 2008. Several plants had evidence of browsing in 2008, but since all plants are within maintained exclosures, browsing was most likely from wildlife.

4. **Document any noxious weeds or invasive plant species. Document if weeds 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 update a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.**

   See table below. In 2008 there was no evidence of weed treatment adversely affecting any *Salix lucida* ssp. *caudata* occurrences.

Site ID # (Location – Ranger Dist.)	***Salix lucida* ssp. *caudata* (shining willow)**
SALU-2 (N. Redwater tributary - Bearlodge)	• **Date Monitored:** 8/7/2008 • **Site Assessment:** *S. lucida* was present in the site. Site is comprised of six *S. lucida* individuals – one original and five additional plantings. Recent high water events have resulted in fresh sediment deposition around several of the *S. lucida* plants. Most of the original plant was lying flat and covered with sediment from recent high water events, but several new sucker shoots were emerging. The five planted individuals appear healthy but not extremely vigorous. Most *S. lucida* individuals at this site had some minor insect damage and varying degrees of yellowing and brown mottling of the leaves. Browsing of current year's growth on *S. lucida* ranged from 20-40% browsed (likely from wildlife, since all individuals are within a livestock exclosure). • **Livestock Use (Item 3 above):** The entire site is within livestock exclosures, and no livestock use within the exclosure was observed. • **Weeds:** *Carduus nutans* is located in the same ecotype and within four meters of *S. lucida* ssp. *caudata*. *Cirsium arvense* and *Cynoglossum officinale* were observed consistently along the drainage, in same ecotype as *S. lucida* ssp. *caudata*. It was dense in some patches. *Verbascum thapsus* occurred occasionally in the drainage. Weed Treatment: Some *C. nutans* in the site area were hand-pulled prior to the monitoring visit.
SALU-3 (Spearfish Canyon – Northern Hills)	• **Date Monitored:** 9/23/2008 • **Site Assessment:** *S. lucida* ssp. *caudata* was present in the site and was similar in extent as 2007. Two individuals were present. The plants were healthy and vigorous, but 5% of vegetation showed either insect damage or black spots on leaves. • **Livestock Use (Item 3 above):** No livestock use was observed. • **Weeds:** No weeds were observed in the site. *Cirsium arvense* was observed in the same ecotype. *Tanacetum vulgare* was observed approximately seven meters from *S. lucida* ssp. *caudata* on same side of creek. *Leucanthemum vulgare* was abundant on the opposite side of the creek. *Verbascum thapsus* was observed occasionally along the road, above the creek.
SALU-4 (Redwater Creek Exclosure – Bearlodge)	• **Date Monitored:** 8/8/2008 • **Site Assessment:** *S. lucida* ssp. *caudata* was present in the site. All *S. lucida* ssp. *caudata* in the site were planted from cuttings in 2007. A few game trails were observed inside the exclosure. Some browsing on *S. lucida* ssp. *caudata* by wildlife was evident but was not severe. Some very minor insect damage was observed on foliage.

	• **Livestock Use (Item 3 above):** The entire site is within a livestock exclosure and no livestock use was observed within the site. • **Weeds:** *Cirsium arvense* was dense at the east end of the exclosure, co-located with *S. lucida* ssp. *caudata*. *Carduus nutans* and *Cynoglossum officinale* were observed occasionally in the same ecotype as *S. lucida* ssp. *caudata*. *Cirsium vulgare* was scattered throughout the same ecotype, sometimes within two meters of *S. lucida* ssp. *caudata*. *Verbascum thapsus* was scattered in drier areas. *Phleum pratense* occurred consistently throughout the exclosure.

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 but are relevant habitat considerations for some sensitive species (including objectives related to landscape vegetative diversity (LVD) such as vegetation Objectives 201 and 239-LVD). Full evaluations of this last type of objectives are found under other monitoring items, but a summary may be provided below when appropriate. A summary of monitoring information and evaluation of that information presented for each sensitive species.

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 cover type was 25,724 acres of the Forest. This is 28 % greater than what is called for in Objective 239-LVD (20,000 acres). 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 (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. In 2008, one mine was evaluated for bat habitat. The table below shows the number of bat passage devices installed in caves and mines across the Forest in the past. One gate was installed in FY2008.

Number of Bat Passage Devices Installed in Caves and Mines					
	Prior to 2005	**2005**	**2006**	**2007**	**2008**
Caves	6	0	0	0	0
Mines	6	5	2	2	1

Disturbance: Eight mines, caves and/or bat passage devices were monitored for signs of vandalism, incompatible uses, and non-compliance with established closure dates. Garbage was noted around Erskin and Runkel Caves but the gate and entrance were in good condition. The caves were not entered to inspect the cave interior for damage. Davenport Cave gate is in good condition following repairs by the Paha Sapa Grotto. Aspen Sink, Igloo Cave and Back Luck cave gates were in good condition. Somebody wrote a note on the gate at Igloo Cave expressing their unhappiness that the cave was closed. The gate at Red Deer Mine will need some minor foam and dirt to repair a section that collapsed. This work is expected to be completed in FY2009. The gate at D&R Mine is in good shape but the miner changed the lock on the gate so Forest Service access is no longer allowed.

Snags: Monitoring Item 11 displays that in FY 2008, there were 3.6 snags per acre >9" dbh and greater than 25 feet tall across conifer forested portions of the Forest. This is the same as that reported in 2007. The percent of snags greater than 14 inches dbh was 24%. This was a decrease from 30% in FY 2007. The number of snags greater that 9 inches DBH exceeds Objective 211 and the percent greater than 14 inches dbh is slightly under (1%) Objective 211 (excluding large burned areas and mortality from insects).

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

Mammals – Black-tailed Prairie Dog

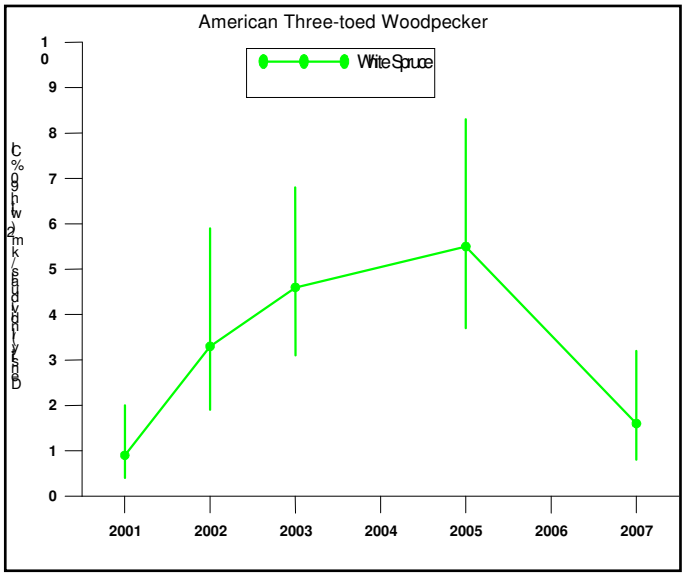
Objective 237 prompts the Forest to manage for 200-300 acres of prairie dog towns in at least 3 separate towns. This species was not monitored in FY 2008. The best available information is shown in the table below and indicates the Forest is meeting Objective 237.

Prairie	**2002**	**2003**	**2005**
# of towns	6	5	10
acres	246	264	400

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 the MBBH program. White spruce habitat was not monitored in 2008. White spruce habitat was sampled in 2007, as well as in 2001, 2002, 2003 and 2005. Estimated woodpecker densities have ranged from 0.9 to 5.5 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. Detections were too infrequent in these habitats to allow density estimates to be calculated.



Amount of Preferred Habitat: As disclosed in Monitoring Item 8, the spruce cover type was 25,724 acres of the Forest. This is greater than what is called for in Objective 239-LVD (20,000 acres). 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 (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. Monitoring Item 9 discusses the Forest's progress towards the structural stage objectives. Habitat diversity is being provided consistent with Objective 221, though it may take some time to achieve the desired amounts of some structural stages.

Territory 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 2008, 32 goshawk territories were monitored by Forest biologists. Of these, 13 (41%) were active. This territory occupancy rate 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 Monitored & Occupied, 2000-2008								
	2000	**2001**	**2002**	**2003**	**2005**	**2006**	**2007**	**2008**
Territories Monitored	42	46	84	74	56	34	49	32
Territories Occupied	12	9	20	25	23	9	18	13
% of Territories Occupied	29%	20%	24%	34%	41%	26%	37%	41%

The SDGFP has funded goshawk monitoring on the Black Hills from 2003 to 2008 (Knowles and Knowles 2008). During the 6 years of surveys, 26 active nest territories were studied. Forty-nine nesting attempts were monitored of which 31 fledged young (63% successful) (Knowles and Knowles 2008).

The Forest is conserving habitat for the northern goshawk, but additional time is needed to achieve the desired structural stage percentages.

Birds – Bald Eagle

Historically, bald eagles wintered in and migrated through the Black Hills. Eagles are frequently seen from October through March feeding on road-killed animals (carrion), perched near unfrozen lakes or streams, or soaring in the sky.

The first nesting attempt on the Forest was confirmed in FY 2007 at Deerfield Reservoir. This nest was monitored for the second year in FY 2008 and one eagle was fledged.

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 to 22 eagles were observed at the roost on four separate occasions between late December 2005 and late January 2006.

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.

The Forest is conserving habitat for the bald eagle consistent with Objective 221.

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 detection data collected through the MBBH program to track these species. See Monitoring Item 21 (Emphasis Species – MIS, Non-game Birds section) for more information on MBBH.

Rare Bird MBBH Observations, 2001-2008

Species	2001	2002	2003	2004	2005	2006	2007	2008
Burrowing Owl	0	0	0	1	0	7	0	0
Flammulated Owl	0	1	0	0	0	0	0	0
Lewis's Woodpecker	3	4	9	4	8	7	9	1
Loggerhead Shrike	1	0	0	0	0	0	0	0
Long-billed Curlew	0	0	0	0	0	8	0	3
Northern Harrier	1	0	0	0	0	1	0	0
Peregrine Falcon	0	0	0	0	0	0	0	0
Yellow-billed Cuckoo	0	0	0	0	0	0	0	0

Of the species listed above, the Lewis's woodpecker is the most frequently detected. As discussed in Monitoring Items 9 and 11, the snag objectives are being met and the structural stage objectives provide habitat diversity for forest dwelling species such as Lewis's woodpeckers.

Since the MBBH Program started in 2001, the first observations of long-billed curlew occurred in 2006. All observations occurred in grassland habitat in the Southern Black Hills.

None of the other rare sensitive birds (flammulated owl, northern harrier, loggerhead shrike, peregrine falcon, or yellow-billed cuckoo) were recorded on the Forest in 2008. Only the flammulated owl, loggerhead shrike and northern harrier have been detected and in very limited numbers in the recent history of the MBBH program.

The Forest is conserving habitat for these rare species, consistent with Objective 221, even though some species are absent or so rare that they are not detected.

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 or trend (Monitoring Item 6) was collected in FY 2008. The implementation of Forest Plan standards and guidelines, Regional watershed conservation practices and best management practices maintain riparian habitat Forest-wide, but probably at a level less than its full capability. Monitoring item 7 identifies projects to restore riparian and wetland habitat or to rehabilitate stream reaches. This data can be used to partially indicate trend of redbelly snake habitat. According to Monitoring Item 7, progess is being made to restore 500 acres of riparian shrub communities (Objective 214) and to enhance streams. These projects, though not directly targeted for the red-bellied snake, likely have a small positive influence on the habitat trend for this species.

According to Monitoring Item 8, stands dominated by aspen currently occupy approximately 45,111 acres on the Forest. This is a decrease of 732 acres from 2007, and about a seven percent decline since 1997. Aspen stands have been replaced by pine and spruce in many areas of the Forest, and likely 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 of aspen acres.

Overall, the Forest appears to be conserving habitat for the redbelly snake, but additional effort is needed to improve riparian condition and increase the acres of aspen.

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. This monitoring item was not funded in 2008. Four index sites were visited in the course of other duties. Leopard frogs were found at three of the four sites visited.

Projects implemented in 2008 that improved habitat conditions for leopard frogs by protecting stream or lake shorelines and upland vegetation are reported in Monitoring Item 7. These projects move the Forest towards achieving Forest Plan Objectives 213, 214, 215 and 221.

Forest Plan standards and guidelines, Regional watershed conservation practices and best management practices maintain riparian habitat condition. Small-scale riparian enhancement projects are likely to provide some positive incremental benefit to the leopard frog. Limited data suggest that the Forest is conserving habitat for the leopard frog.

Invertebrates – Cooper's Rocky Mountain Snail

The Cooper's Rocky Mountain snail (*Oreohelix strigosa cooperi*) monitoring protocol calls for monitoring 20% of all known (Frest and Johannes 2002) mountain snail sites annually and tracking newly discovered sites. The protocol was not funded in 2008.

In 2002, the Forest received the final report of the inventory and/or monitoring of 357 sites for land snails (Frest and Johannes 2002). Many of the sites had been surveyed in the early to mid 1990s, and some were re-visited in 1999 to help assess population changes. More than 100 new sites were inventoried for the first time. Cooper's Rocky Mountain snail was found at 102 sites, including 61 sites that contain a morph of *Oreohelix* that Frest and Johannes (2002) propose be split from the Cooper's Rocky Mountain snail into its own species. However, because this proposal has not been accepted through a peer review process, and current taxonomic research does not support splitting the species (Anderson et al. 2006), the Black Hills National Forest currently recognizes only the one species.

When comparing original survey data with data replicated in 1999, several noteworthy changes are revealed: (1) Cooper's snail was not resampled at five sites; (2) one site gained Cooper's snail; and (3) 42 sites surveyed for the first time in 1999 revealed Cooper's Rocky Mountain snail.
Eight of the Frest sites surveyed in either 1991, 1992, or 1999 (Frest and Johannes 2002) were monitored by district biologists in 2003. Of these eight sites, five were found to have live snails, two sites previously had live snails but only dead snails were found and one site lacked snails initially and no snails were found. Live Cooper's Rocky Mountain snails were found at six previously unsurveyed sites. These sites probably do not represent snail expansion areas but instead contribute to the Forest's inventory of known occupied sites. These details are reported in the FY2003 Monitoring Report available online at:
http://www.fs.fed.us/r2/blackhills/projects/planning/index.shtml.

In 2007, Frest sites #23 and #226 were monitored on the Northern Hills District. *Oreohelix* were present virtually everywhere on the known sites as well as at Roughlock Falls. Cooper's mountain snail was discovered at Black Fox Springs during field investigations for the Hop Creek project. The snails were discovered along the spring in a late successional stand.

In 2008, two known snail sites from Frest and Johannes (2002) were monitored. Site #119 was monitored while completing field review for the Pole Creek RX Burn. *Oreohelis strigosa cooperi* was found still occurring at the site. *Discus* spp. was also found bu was not identifies below the genus level. No treatment has occurred in the surrounding stand. Livestock use is heavy along road due to livestock water development., but the slope is too steep for livestock. Therefore the area is protected from trampling. Litter/duff is well developed and has lots of mosses. Spruce is the dominant species and site is very shaded. Other snails (live) noted but not identified to Genus level. Site #76 was also monitored. Dead (shells) and live snails found at the site include *Oreohelis strigosa cooperi* and *Discus* spp. which were both found by Frest and Johannes (2002). The site is protected from livestock around Ditch Creek Spring and due to steepness of slope. Probably the same site conditions exist as when surveyed by Frest and Johannes (2002). Frest and Johannes (2002) also reported *Vertigo paradoxa* at theis site. No *Vertigo* sp. found in the small quick dig through litter duff layer below the limestone rock. Dry to moist conditions were observed in the stand.

Two new snail sites were discovered in 2008. *Discus* spp, *Oreohelix strigosa cooperi*, and unidentified Succineids were found at both sites. One of the sites had been recently logged (past 5 years).

It appears the Forest is conserving snail habitat consistent with Objective 221 through the implementation of Standard 3103. Continued monitoring of known sites is needed. In particular, sites where the Cooper's Rocky Mountain snail was not resampled in 1999 should be revisited to verify species absence and additional inventory should be done to determine the distribution and abundance of this species.

Invertebrates – Regal Fritillary

The monitoring indicator for the regal fritillary is the amount of grassland habitat on the Forest. 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 acres are less than the objective, but that is to be expected given the limited amount of time this objective has been in place. The current acres of meadow exceeds the objective. 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 enhancing habitat for the regal fritillary through meadow and grassland restoration projects, but additional time will be needed to achieve the grassland acre objective. The meadow acreage is being achieved.

Sub-Item: **Fish – Finescale Dace and Lake Chub**

Finescale Dace

Monitoring of this species was not funded in FY 2008. 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 additional information on this species.

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 (Isaak et al. 2003). This species' distribution and abundance may be improved by management efforts that enhance or create standing water habitat, such as beaver ponds. A comprehensive inventory of the Bearlodge Ranger District would provide useful information on this species' current distribution.

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 collected by the South Dakota Department of Game, Fish and Parks on Deerfield Reservoir is shown in the table below.

Gillnet sampling	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
# caught	N/A	N/A	N/A	15	155	55	11	6	4	3	1	2	1	0	0
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	0	0

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

The lake chub population in Deerfield Reservoir is in a downward trend. Lake chub numbers declined substantially in 2000 and continue to remain low (SDGFP 2006). Aquatic habitat conditions in Deerfield Reservoir appear to be stable. The 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 2008). 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 speculative. The South Dakota Department of Game, Fish and Parks continued to remove white suckers from Deerfield Reservoir to reduce their population. This may have a positive effect on the lake chub if these two species are competing for resources. Other non-native predatory fish, such as yellow perch and rock bass, are fairly recent illegal introductions into the reservoir that may also be having a detrimental effect on lake chub 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. In 2008, one mine was evaluated for bat habitat. The table below shows the number of bat passage devices installed in caves and mines across the Forest in the past. One gate was installed in FY2008.

Disturbance: Eight mines, caves and/or bat passage devices were monitored for signs of vandalism, incompatible uses, and non-compliance with established closure dates. Garbage was noted around Erskin and Runkel Caves but the gate and entrance were in good condition. The caves were not

entered to inspect the cave interior for damage. Davenport Cave gate is in good condition following repairs by the Paha Sapa Grotto. Aspen Sink, Igloo Cave and Back Luck cave gates were in good condition. Somebody wrote a note on the gate at Igloo Cave expressing their unhappiness that the cave was closed. The gate at Red Deer Mine will need some minor foam and dirt to repair a section that collapsed. This work is expected to be completed in FY2009. The gate at D&R Mine is in good shape but the miner changed the lock on the gate so Forest Service access is no longer allowed.

Snags: Monitoring Item 11 displays that in FY 2008, there were 3.6 snags per acre >9" dbh and greater than 25 feet tall across conifer forested portions of the Forest. This is the same as that reported in 2007. The percent of snags greater than 14 inches dbh was 24%. This was a decrease from 30% in FY 2007.

The Forest is conserving and enhancing 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 FY 2008. The implementation of Forest Plan standards and guidelines, Regional watershed conservation practices and best management practices maintain riparian habitat Forest-wide, but probably at a level less than its full capability. Monitoring Item 7 identifies projects to restore riparian and wetland habitat or to rehabilitate stream reaches. This data can be used to partially indicate trend of meadow jumping mouse habitat. According to Monitoring Item 7, progess is being made to restore 500 acres of riparian shrub communities (Objective 214). These projects, though not directly targeted for the meadow jumping mouse, likely have a small positive influence on the habitat trend for this species.

Limited data suggest that the Forest is conserving habitat for the meadow jumping mouse.

Mammals – Northern Flying Squirrel

The monitoring indicator for the northern flying squirrel 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 4. These components tier directly to Monitoring Items 8, 9, and 10, respectively.

Acres of Spruce Covertype: As disclosed in Monitoring Item 8, the spruce cover type was 27,724 acres. This is greater than what is called for in Objective 239-LVD (20,000 acres). 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.

Acres of Structural Stage 5 Pine Stands: The table below shows the acres of Structural Stage 5 Forest-wide. Structural stage 5 has increased over the past four years, but has shown an 80% decline over the ten-year evaluation period. The long-term decline in acres is largely explained by more complete and more accurate data in the vegetation database following the Phase I Amendment in 2001.

Structural Stage 5 Forest-wide, 1997-2008					
	1997	**2005**	**2006**	**2007**	**2008**
Structural Stage 5	22,409	2,677	3,445	4,494	4,579

Acres of Structural Stage 4 Pine Stands with a Tree Size of Very Large: Forest Plan Objectives by management area (Management Area 4.1- Objective 203; 5.1-204; 5.4-206; 5.43-204; and 5.6-204) guide the Forest to provide 10% of the 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 the large tree objective for Management Areas 4.1, 5.1 and 5.6 and below the objective for Management Areas 5.4 and 5.43. Structural Stage 4 with a tree size of "very large" declined slightly in MA 5.4 and is only slightly below objective (9.1%). Management Area 5.43 represents 0.8 percent of the Forest. Subsequently, a large tree deficiency in this management area has a minor effect Forest-wide. See Monitoring Item 9 for more detailed information on vegetative diversity by structural stages.

The Forest is conserving habitat for the northern flying squirrel in regards to spruce habitat, but progress towards increasing the acres of structural stage 5 and the very large tree component in Management Areas 5.4 and 5.43 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 South Dakota Department of Game, Fish and Parks. Both species are classified as big game animals and are hunted through a limited permit system. The 2008 estimates were not available at the time of this report.

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). The estimate in 2000 was 175-200 animals (Smith 2001). The bighorn sheep population estimate for the Black Hills proper has increased from 2004-2006 (Huxoll 2005, 2006, 2007) and remained stable in 2007 at 350 (Huxell 2008). The Forest is conserving habitat for the bighorn sheep consistent with Objective 221 based on the upward trend in bighorn sheep numbers.

Black Hills Bighorn Sheep Population Estimates, 2000-2008					
2000	**2004**	**2005**	**2006**	**2007**	**2008**
175-200	270	300	350	350	n/a

Mountain goats are not native to the Black Hills, but were introduced in 1924 (Higgins et al. 2000). Population estimates for this species have declined over the past few years as summarized in the table below. Hunter harvest is closely regulated for this species, 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 Peak area. Optimal habitat may be limited for this species in the Black Hills.

Black Hills Mountain Goat Population Estimates, 2000-2008					
2000	**2004**	**2005**	**2006**	**2007**	**2008**
140-180	125	90	70	60	n/a

The cause of the mountain goat population decline is unknown. Possible causes include high predator (mountain lion) numbers, genetics (all descendants from a small number of goats in 1924), and/or loss of habitat. The Forest will continue to coordinate with the South Dakota Department of Game, Fish and Parks to determine if more specific habitat management actions are needed to conserve/enhance habitat for this species.

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 typically require specialized survey methods to effectively monitor. The Forest tracks all of these species except the American dipper through incidental observations collected through the MBBH program (see table at the end of this discussion). Monitoring Item 21 (Emphasis Species – MIS, Non-game Birds section) provides more detailed 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 South Dakota Department of Game, Fish and Parks monitors dippers on Spearfish and Whitewood creeks. Data on nesting attempts and nest success is shown in the following table. The number of successful nests was fairly stable on both Spearfish and Whitewood creeks in 2008, but the number of nesting attempts was lower which resulted in a higher nesting success than in the past several years. Additional monitoring will determine the long-term trend.

American Dipper Nest Monitoring Results, 2003-2007

Stream	2003	2004	2005	2006	2007	2008
Spearfish Creek						
Nesting Attempts	26	39	42	36	44	32
Successful nests	n/a	15	24	21	26	22
Nesting Success	n/a	39%	57%	58%	59%	69%
Whitewood Creek						
Nesting Attempts	8	13	7	3	6	4
Successful nests	n/a	9	5	1	2	2
Nesting Success	n/a	69%	71%	33%	33%	50%

Source: Lovett 2006, 2007, 2008 and SDGFP online: http://www.sdgfp.info/Wildlife/Diversity/dipper/index.htm

Black-and-White Warbler

This warbler is found mostly at lower elevations in the Black Hills 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). One observation in montane riparian habitat occurred in 2008. The vegetative composition of the habitats preferred by this species 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.

Progress is being made to achieve the desired condition for bur oak (Objective 201). Subsequently, habitat is being conserved for this species.

Broad-winged Hawk

This hawk occurs primarily in the northern Black Hills and Bearlodge Mountains although it has been observed Forest-wide. The highest number of detections occurred in 2004 in aspen habitat, though this species has been detected in most of the other habitats except shrubland and grassland. 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. Additional time and effort is needed to achieve the structural stage percentages.

Cooper's 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. White and Giroir (2008) observed individuals in all habitats sampled in 2008 with the exception of montane riparian habitat. 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. Additional time and effort is needed to achieve the structural stage percentages.

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. 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. Additional time and effort is needed to achieve the structural stage percentages.

Pygmy Nuthatch

The pygmy nuthatch is a rare but regular and widespread resident in the Black Hills. None were observed in 2008. The habitats sampled in 2008 are not favored by this species. 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. Additional time and effort is needed to achieve the structural stage percentages.

Sharp-shinned Hawk

The sharp-shinned hawk occurs throughout the Black Hills, but is perhaps the rarest of the three accipiters. Only one sharp-shinned hawk was observed in 2008 (White and Giroir 2008). 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. Additional time and effort is needed to achieve the structural stage percentages.

Species of Local Concern Bird Incidental Observations, 2001-2007								
Species	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Black-and-white Warbler	5	7	2	3	6	7	0	1
Broad-winged Hawk	3	6	0	24	19	3	2	5
Cooper's Hawk	10	4	3	9	9	2	3	5
Northern Saw-whet Owl	1	0	0	1	0	0	0	0
Pygmy Nuthatch	3	2	0	1	4	3	6	0
Sharp-shinned hawk	2	4	3	6	3	0	1	1
Source: MBBH data (Panjabe 2001, 2003, 2004, 2005, Hutton et al. 2007, Giroir et al. 2007, White and Giroir 2008)								

The MBBH program provides a means to loosely track the above species. More intensive and focused efforts involving call-response surveys to monitor raptors or night-time surveys to monitor the northern saw-whet owl would be needed to effectively monitor these species.

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 FY 2008. The implementation of Forest Plan standards and guidelines, Regional watershed conservation practices and best management practices maintain riparian habitat Forest-wide, but probably at a level less than its full capability. Monitoring Item 7 summarizes projects to restore riparian and wetland habitat or to rehabilitate stream reaches. This data can be used to partially indicate trend of butterfly habitat.

These projects have a small positive influence on the habitat trend for these butterflies to meet the intent of Objective 221.

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

The monitoring protocol for these species was not funded in 2008. Standard 3103 requires known SOLC snail colonies to be managed to retain favorable site conditions and to avoid/minimize the effects of land management activities to protect SOLC snails and their habitat. Subsequently, habitat is likely to be conserved for these species consistent with Objective 221.

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

Currently there are no federally threatened, endangered or proposed species or designated critical habitat on the Forest.

Monitoring Item 21: Emphasis Species – Management Indicator Species

Objective 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 36 CFR §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., Objective 103, 104, 215, Standards 1201, 1203, 1205, Guideline 115).

Nine species are designated as MIS on the Forest. They 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.

Mammals – Beaver

Monitoring:

Beaver use aquatic habitat with adjacent stands of willow, aspen or cottonwood. Beaver are absent from areas lacking permanent water and an adequate food supply. The beaver's strong influence on riparian and aquatic habitat was the basis for its selection as an MIS.

Beaver abundance and distribution were monitored from October 22-26, 2007 using the protocol developed by Beck and Staley (2005). This was the first time this protocol was used. The protocol is designed to detect a 5% annual decline in abundance over a nine year period and a 10% decline in distribution over a 12 year period. Food caches are the indicator of beaver abundance and distribution. Permanent waterbodies and the perennial stream network were surveyed via helicopter. Forty 6th-level watersheds were sampled to determine the abundance of beaver. A total of thirty-one food caches were detected in these watersheds. The average food cache density on the Forest was 0.0252 cache per kilometer (0.042 cache/mile) or about one cache for every 40 kilometers (24 miles)

of perennial stream. Abundance estimates are based on an estimated 1,294 kilometers (804 miles) of perennial stream within the sampled watersheds across all landownerships.

Twelve additional 6th-level watersheds were also sampled to determine the distribution of beaver on the forest. Food caches were observed in 5 of the 12 distribution watersheds sampled. Overall, 20 of the 52 watersheds (38%) surveyed had beaver food caches present.

For the habitat monitoring, the acreage of both aspen and willow cover types within 600 feet of perennial water was calculated using the Forest vegetation database. The aspen and willow acres were 2,574 and 317, respectively. The total aspen/willow acres were 2,890 acres. In FY 2005, only the acres of aspen stands within 600' of perennial water were calculated. The acreage was substantially higher (9,656 acres; see FY 2005 Monitoring and Evaluation Report) because the entire stand polygon was counted rather than just the stand acreage within 600 feet of perennial water.

Evaluation:

In time, the food cache monitoring protocol will provide a direct measure of the beaver population trend Forest-wide. The next food cache survey is scheduled for October 2010. The current distribution of beaver is reduced based on the number of inactive beaver sites that were observed, especially in headwater streams, where water and/or a suitable food supply is lacking.

The implementation of Forest Plan standards and guidelines, Regional watershed conservation practices and best management practices maintains existing riparian habitat consistent with Objective 238a, but likely at a level less than its historic capability. According to Monitoring Item 7, progess is being made to restore 500 acres of riparian shrub communities (Objective 214). These projects have a small positive influence on the habitat trend for the beaver. Additional time is needed to double the current acres of aspen (Objective 201).

Mammals – White-tailed Deer

White-tailed deer were selected as an MIS to evaluate forest conditions, including understory shrubs, needed to support this species. Forest Plan Objective 217 supports habitat management for 60,000 white-tailed and mule deer combined in South Dakota. This figure matches the South Dakota Department of Game, Fish and Park's population objective for the Black Hills (USDA Forest Service 1996b p. 349). South Dakota has released the 2007 population estimates (Huxell 2008), but the most current data for Wyoming is 2008 (Sandrini 2009). The South Dakota Black Hills white-tailed deer population peaked in 2006 and showed a slight decline in 2007. The combined SD deer populations are still above the state's objective. The white-tailed deer population in the Wyoming Black Hills Herd Unit #706 is above the Wyoming objective of 40,000 animals (Sandrini 2009). This Unit includes lands outside the boundary of the Black Hills National Forest.

Estimated Deer Population in South Dakota and Wyoming Black Hills, 2000-2007									
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
SD Whitetails	29,000	30,000	35,000	40,000	46,000	50,000	54,000	50,000	n/a
SD Mule Deer	12,000	10,000	11,000	10,000	12,000	14,000	14,000	12,000	n/a
SD Total Deer	41,000	40,000	46,000	50,000	58,000	64,000	68,000	62,000	n/a

	2000	2001	2002	2003	2004	2005	2006	2007	2008
WY Whitetails	n/a	n/a	39,274	45,437	42,997	42,018	42,196	44,125	43,044

The Arc Habitat Suitability Index (ArcHSI) model was not run for FY 2008. See the FY 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 is meeting the desired population objectives for South Dakota and Wyoming. 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 and Objective 238a based on the positive trend in the white-tailed deer population.

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; Giroir et al. 2007, White and Giroir 2008). 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 are 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).

In 2008, RMBO sampled five habitats: aspen, foothills riparian, montane riparian, mixed-grass prairie, and pine-juniper shrubland. Additional results are found in White and Giroir (2008). This was the eighth year of a long-term monitoring effort; continued monitoring is needed to detect long-term trends. The Forest is obtaining valuable 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.

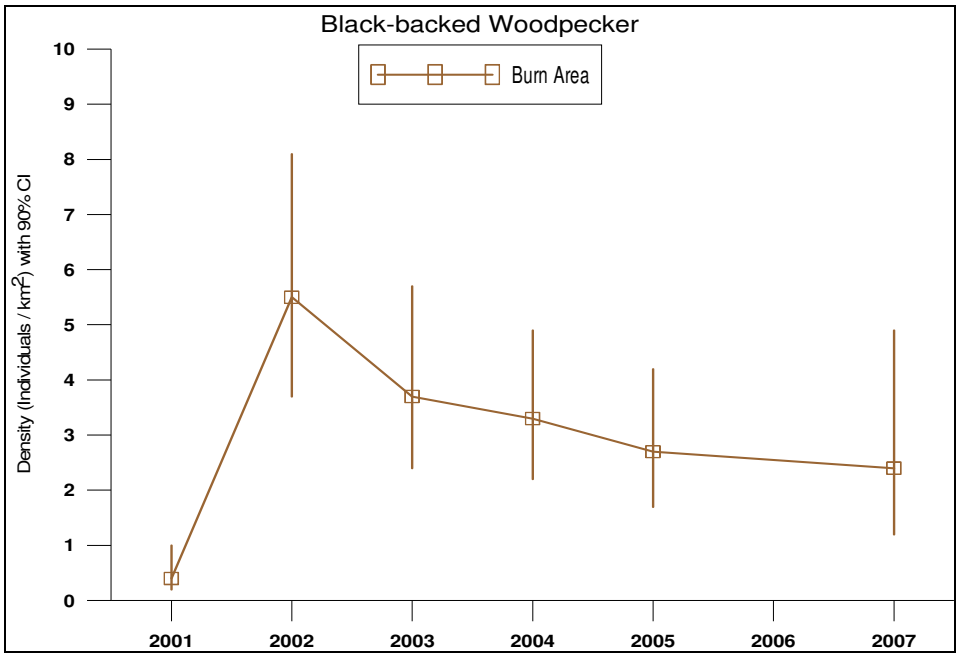
Non-Game Birds – Black-backed Woodpecker

Monitoring:

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 years), 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 habitat was not sampled in 2008. Burned habitats were monitored in 2007 and 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, transects are not well-distributed across the Forest. Black-backed woodpecker relative densities (birds/km^2) were at their highest in 2002 and have declined thereafter (Blakesley et al. 2008).



Source: Blakesley et al. 2008

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) measured 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.

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 habitat in the MBBH was not sampled in 2008. Late succession by the MBBH definition was monitored in 2001, 2002, 2004 and 2007. Of the years monitored, black-backed woodpecker observations were sufficient for density estimate calculations only in 2002 (Panjabi 2003). In that year, 1.3 birds per km^2 were estimated to occur in MBBH's late successional habitat.

Acres of Preferred Habitat – Burned Areas: According to Monitoring Item 12, a total of 7,740 acres of burned forest habitat was created and largely retained over the last five years. The acres of recently burned habitat are declining as fires move beyond five years since burn date. All but 30 acres (99.7%) has been retained as burned habitat to achieve Objective 11-03.

Acres of Preferred Habitat – Bark Beetle Infestations: As mentioned in Monitoring Item 23, the mountain pine beetle is at epidemic levels across many areas on the forest, particularly the central Hills and in Black Elk Wilderness. The overall condition on the Forest is still for a high beetle infestation. This translates into a short-term favorable habitat condition for the woodpecker.

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 provide 5% of the pine in structural stage 4C and 5% of the pine in structural stage 5 in these management areas, partly to ensure habitat for species like the woodpecker. Monitoring Item 9 displays structural stage data. All of the above management areas are meeting the desired percentage for structural stage 4C, but none of them are meeting the desired percentage of structural stage 5.

The table below shows the acres of structural stages 4C and 5 Forest-wide. Structural stages 4C and 5 combined has increased since 2006.

Structural Stages 4C and 5 Forest-wide, 1997-2008					
Structural Stage	**1997**	**2005**	**2006**	**2007**	**2008**
4C	114,798	135,694	134,533	142,339	149,151
5	22,409	2,677	3,445	4,494	4,579
TOTAL 4C & 5	**137,207**	**138,371**	**137,978**	**146,833**	**153,730**

Evaluation:

The black-backed woodpecker is distributed in low densities throughout most of the Black Hills. Where numerous wildfires have recently occurred, the species has been observed much more frequently and in higher densities.

The Forest-wide relative density for this species is probably higher than "normal" given the current habitat conditions. Black-backed woodpecker populations are 'eruptive" as reflected in their densities in burned habitat. This pattern of rapid colonization and subsequent decline is consistent with findings of other studies (Anderson 2003). This species' Forest-wide population trend is likely to decline in the future as vegetation management efforts to reduce the fire-hazard and insect-risk continue. Blakesly et al. (2008) projected it will take 25 years to detect a 3% annual decline for this species in burned habitats.

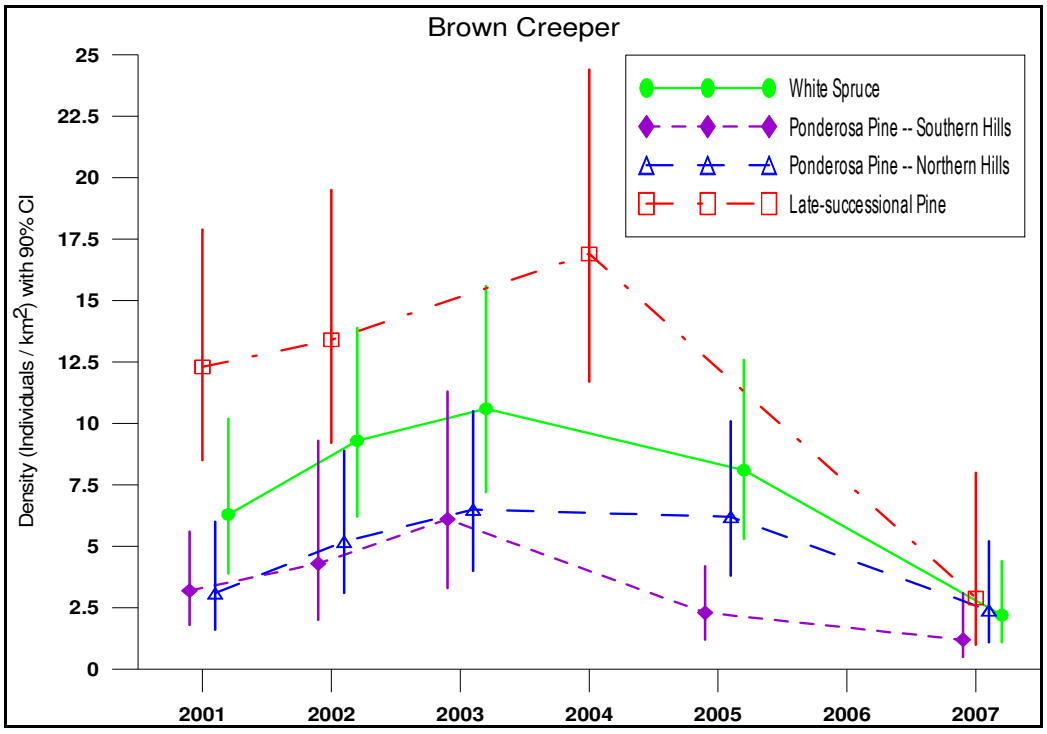
Overall, habitat for this species is being provided consistent with Objective 238b, Objective 221 and Objective 11.03. The "aging" of large burned areas, such as the Jasper Fire, into habitat less suitable for black-backed woodpeckers is likely being offset by the increasing acreage of insect-infested timber stands and the stable acreage of large diameter, older pine trees. Though additional time is needed to grow more of structural stage 5 (old growth).

Non-Game Birds – Brown Creeper

Monitoring:

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 2008 These habitats were monitored in 2007 (Giroir et al.

2007). See the chart below for annual density estimates for spruce, late successional pine, and pine north habitat types since 2001.



Source: Blakesley et al. 2008

Acres of Preferred Habitats: The table below summarizes habitat data from monitoring items 8 and 9 that represent preferred habitat for this species. Based on this information, brown creeper habitat appears to be increasing on the Forest.

Acres of Preferred Brown Creeper Habitat, 1997-2008					
	1997	**2005**	**2006**	**2007**	**2008**
White Spruce	21,737	25,462	26,483	26,110	25,724
Structural Stages 4C & 5	137, 207	134,129	137,978	146,833	153,730
TOTAL	**158,944**	**159,591**	**164,461**	**172,943**	**179,454**

Large trees with a closed canopy are also an important habitat component for brown creepers. The table below shows the amount of structural stage 4C Forest-wide with a tree size of very large. The acreage in 2007 was less than in 2006, but greater than in 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, 2005-2008.			
2005	**2006**	**2007**	**2008**
7,800	10,631	8,051	10,917

Evaluation:

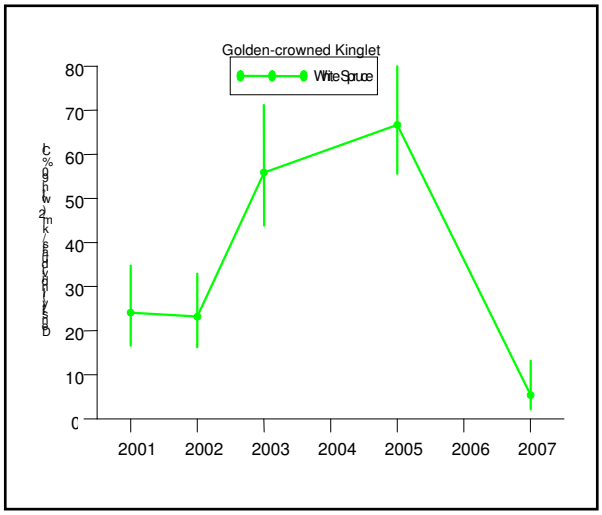
The MBBH data suggests the brown creeper is well distributed throughout the Black Hills (see map). Overall, the species occurs in fairly low densities across the Forest, but it is most abundant in late

successional pine forests and white spruce habitats.

Blakesly et al. (2008) projected it will take 25 years to detect a 3% annual decline for this species in pine-north, late successional and white spruce habitats and 30 years in pine-south habitat. In the short-term, relative densities declined for this species in 2007 compared to previous years.
The Forest-wide habitat is increasing based on the increase in preferred habitat defined by structural stages 4C and 5, though the acres of structural stage 4C with very large trees (>16" dbh) has decreased. 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. It appears that Objective 238a is being met, Continued effort and additional time is needed to increase the acres of structural stage 5.

Non-Game Birds – Golden-crowned Kinglet

Monitoring:



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 habitat was not sampled in 2008. Spruce was monitored in 2007 in the MBBH program. The chart at right shows kinglet densities since 2001 (Source: Blakesley et al. 2008). Kinglet densities (birds/km^2) were highest in 2005 and showed the lowest densities in 2007.

Acres of Preferred Habitat: The acres of white spruce habitat are displayed in Monitoring Item 8. Habitat for the golden-crowned kinglet has increased over the long-term and is exceeding the Forest-wide target of 20,000 acres (Objective 239).

Evaluation:

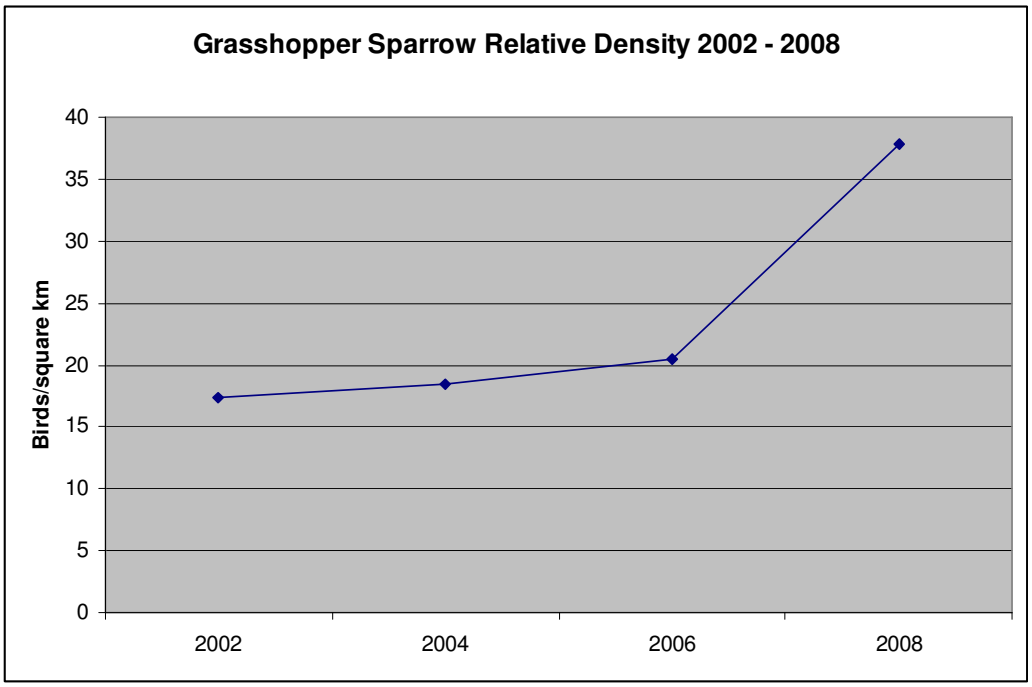
The MBBH data suggests the golden-crowned kinglet is distributed primarily in the northern half of the Black Hills, although it is also found in more localized areas of the southern Hills and Bearlodge Mountains as well. Blakesly et al. (2008) projected it will take 20 years to detect a 3% annual decline for this species in white spruce habitat. The Forest is meeting Objective 238a based on the acres of preferred habitat. In the short-term, the relative density in 2007 was the lowest since the MBBH program began in 2001; however the habitat continues to increase and exceed Objective 239.

Non-Game Birds – Grasshopper Sparrow

Monitoring:

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 in 2008 in the MBBH program. 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).



Source: White and Giroir 2008

Acres of Preferred Habitat: As disclosed in Monitoring Item 8, grassland cover types are currently short of the objective acres. Grassland acres have varied over time. This may be due to inconsistencies as to which cover types are queried from the vegetation database. The general perception is that grassland habitats have been declining due to pine encroachment. 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).

Blakesly et al. (2008) reported that the grasshopper sparrow was the only MIS for which density estimates could be obtained, but a 3% average annual decline could not be detected within 30 years. It may be necessary to add additional transects in mixed-grass prairie habitat in order to effectively monitor the grasshopper sparrow population.

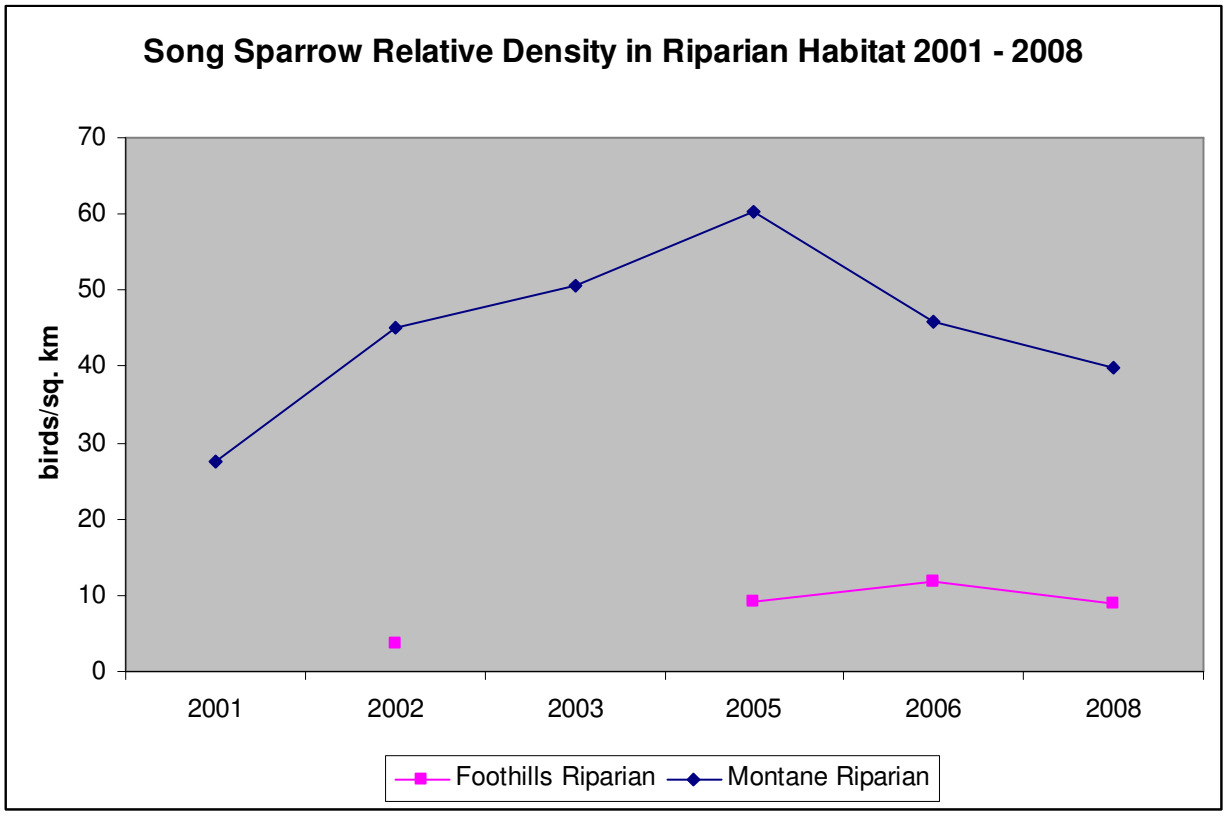
The Forest is largely maintaining grassland habitat consistent with Objective 238a, but additional time and effort is needed to achieve the grassland acres identified in Objective 205.

Non-Game Birds – Song Sparrow

Monitoring:

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. Neither the foothills nor montane riparian habitats were monitored in 2007 as part of the MBBH program.

Density data from recent years in which monitoring occurred is presented in the adjacent chart. Densities have been considerably higher in montane riparian than in foothills riparian.



Source: White and Giroir 2008

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.

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 FY 2008. However, Monitoring Item 7 may be used to partially indicate trend of song sparrow habitat. Progress is being made in achieving Objective 214. These projects may have a small positive influence on the habitat trend for song sparrows.

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.

Blakesly et al. (2008) predicted it will take 20 years and 35 years to detect a 3% average annual decline in montane and foothill riparian habitats, respectively. The MBBH program was designed to statistically detect population trends over a longer time period than it has been implemented. Riparian habitats have decreased in quantity and quality since the pre-European settlement era, indicating a long-term declining habitat trend (Parrish et al. 1996). Implementation of Forest Plan standards and guidelines, regional watershed conservation practices and best management practices maintain riparian habitat, but at less than its full potential. Small riparian protection projects that have improved riparian conditions in some areas contribute to habitat enhancement and achievement of Objective 238a.

GAME BIRDS:

Game Birds – Ruffed Grouse

Monitoring:

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 South Dakota Department of Game, Fish and Parks 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 South Dakota Department of Game, Fish and Parks and the Rocky Mountain Research Station to develop a new monitoring protocol for ruffed grouse (Hansen et al. 2008). Drumming count data was collected in April - May 2007 and September - October 2007. The probability of detecting ruffed grouse on the BHNF is largely influenced by date and wind speed. Low estimates of occupancy and detection probability from spring 2007 surveys imply large sample size requirements for future surveys. However, ruffed grouse sampling should be feasible if the date and wind speed are accounted for in future surveys.

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.

Trend in Condition of Preferred Habitat: According to Monitoring Item 8, stands dominated by aspen currently occupy approximately 45,111 acres on the Forest. There was a slight decrease (732 acres) in aspen acres in 2008, and about a seven percent decline compared to 1997. 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).

Evaluation:

The long-term habitat trend for ruffed grouse is one of decline given the reduction of aspen acreage compared to historic condition. It is likely that there has been an associated population decline in ruffed grouse. There has been a slight decline in aspen acres over the ten-year period and additional time and effort will be needed to meet Objective 238a. Development and implementation of a ruffed grouse monitoring protocol should allow for the detection of long-term population trend.

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:

Mountain sucker monitoring was not funded in FY 2008, but some sampling occurred due to the cooperative efforts of South Dakota and Wyoming. The Wyoming Game and Fish Department established two sampling sites on Beaver Creek, one upstream and one downstream of Cook Lake. The South Dakota Department of Game, Fish and Parks surveyed streams on the northern half of the Forest in 2008. The southern half of the Forest will be surveyed in 2009.

Evaluation:

The Forest-wide population trend for mountain sucker is one of decline when comparing past to present occurrence. Habitat conditions and negative interactions with non-native fish are likely causes. 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) and will be updated when both 2008 and 2009 data is available.

The long-term trend in aquatic habitat is variable and is influenced by a variety of factors. Increased rainfall and higher flows greatly improved stream conditions in 2008 compared to the previous 7-8 years of drought. Stream connectivity remains fragmented due to instream structures, such as dams and road culverts, which impede mountain sucker passage and likely prevents this species from reoccupying upstream habitat once suitable conditions have returned. The completion of riparian/aquatic habitat enhancement projects along with 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 and stream connectivity for the mountain sucker consistent with Objective 238d.

Monitoring Item 22: Noxious Weeds

Objective 230: Eradicate or limit spread (acres) of new introductions of non-native pests (insects, diseases, plants) to minimize ecosystem disruption.

Objective 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 2002-2008

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 is available.

Treatment Year	Acres Treated
2002	7,515
2003	14,700
2004	15,744
2005	13.882
2006	15,685
2007	11,649
2008	11,523

Infestation acreage is difficult to measure, and our inventory methods and tracking continue to improve. The Weed Environmental Assessment signed in January 2003 estimates approximately 82,000 acres with weeds. Our current estimate is closer to 180,000 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 several 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 second meeting was held on March19, 2008. 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).

The notes of the March 19, 2008 meeting are available on the Black Hills home page, within the "Invasive Species Action Plan" which is a three year action plan for needs in the Invasive Species Program. The web page is;
http://www.fs.fed.us/r2/blackhills/publications/

Currently we are considering moving this group under the newly formed South Dakota Invasive Species Management Association as an information sharing branch. See the web page at;
http://www.sisma-sd.org/

Monitoring Item 23: Insects and Diseases – Population, Tree Mortality, and Hazard

A: Population, Mountain pine beetle and Ips

Evaluations of mountain pine beetle were conducted for the Slate-Castle and Vestal areas and parts of the Norbeck area, particularly around Mt. Rushmore in the Black Hills. These evaluations consisted of a multi stage sampling based on aerial surveys and ground surveys to estimate mountain pine beetle infestations and how they are changing. Based on the ground surveys, beetle-caused mortality is increasing in these areas. The Black Elk Wilderness, which is part of the Norbeck area, is still the fastest growing beetle epidemic on the forest at this time. Currently, there are large areas of complete mortality caused by mountain pine beetle and beetle and levels are still growing exponentially. Large diameter trees are abundant in this area and are getting killed at a rapid pace,

also, stands of small diameter material (3-4 inch doghair stands) and more open grown trees which are typically not targeted by the beetle are also being killed. There have even been instances of spruce trees being attacked by mountain pine beetle as they ran out of their host trees. It is likely that much of the wilderness will be affected by mountain pine beetle before the epidemic is through. At the present time, the largest concern for mountain pine beetle remains in the central part of the Hills. There are, however, above average levels occurring elsewhere, particularly in the Northern Hills on the Limestone Plateau. These areas will be monitored closely in the coming year.

We continue to look at how beetles can be managed using silviculture. This past year we completed a study on beetle susceptibility of uneven aged ponderosa pine stands in the Black Hills (Negron et al 2008). This study concluded that, much as is the case with even aged stands, stand density is the largest factor in determining susceptibility to mountain pine beetle. It was also noted that in uneven aged stands, those with a higher proportion of mid to large diameter trees were more susceptible than those with smaller diameter trees.

Studies looking at alternative control measures, such as preventative sprays for high value trees, 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. These insecticides are effective for treating individual, high value trees but are not practical for widespread use. With the ongoing beetle outbreak, there has been a renewed interest in the potential of anti-aggregation pheromones (Verbenone) for protecting high value trees and stands from beetle attack. Verbenone has been used in Custer State Park for protection of their limber pine stand and has so far proven to be effective at keeping most of those trees alive in the middle of an ongoing outbreak. Verbenone is still very questionable as being effective for protecting ponderosa pine, as has been reported before.

The level of tree mortality caused by *Ips* beetles contiues to decline, but is still above average levels. Most of the decline has come from reduced numbers infesting recently wildfire and storm damaged areas. As areas of recent fire or storm damage have gone down, so has the *Ips* population. The one area where *Ips* activity has remained fairly high is in urban interface areas around the edge of the forest. There is increased *Ips* activity in piles left from logging operations and small handpiles created during fuels work, however, we have not seen these populations spill out and infest surrounding forest, instead, remaining in the piles. *Ips* populations are largely driven by drought conditions, particularly dry spring. As long as we have years of below average moisture, *Ips* will continue to occur at above average levels.

Evaluation:

The mountain pine beetle is at epidemic levels across many areas on the forest, particularly the central Hills. At this time, this is still an issue 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. Silvicultural treatment of stands to reduce density is the only long term solution to reducing the overall impact of mountain pine beetle.

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.

Health of Paper Birch in the Black Hills

In 2007 we sampled paper birch stands in the Black Hills to provide information on their overall condition. Overall, paper birch appears to be in good condition across most of the Black Hills. Generally, the stands that are the farthest south in the forest are showing the most decline largely because they are likely at the very edge of their range. There is not abundant regeneration of birch, however, there has really been no management of birch stands that would lead to such an occurrence. Most of the birch stands on the forest are reaching a mature state, so there may be increased levels of dieback in the coming years.

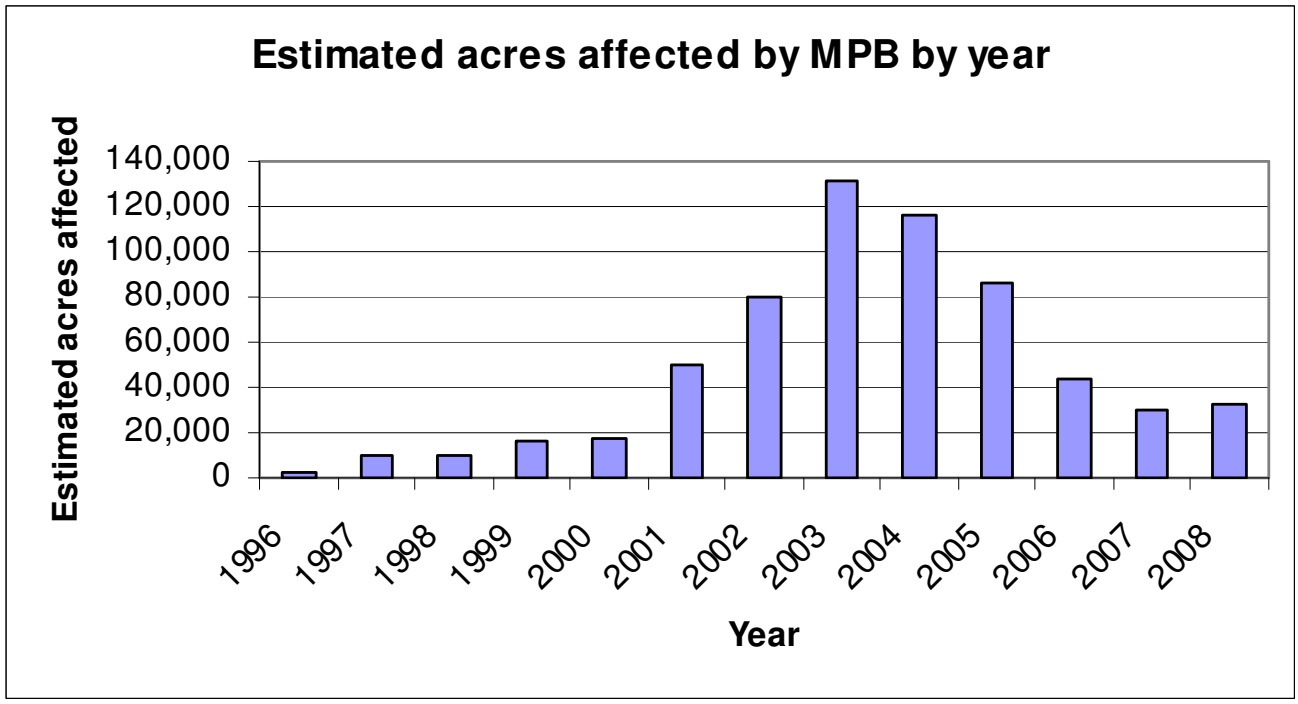
Over 90% of the birch trees sampled were alive and birch trees had an average crown health rating of about 85% which is relatively high. Armillaria root disease was found in all stands, but beyond that there were no other insects and diseases causing widespread damage. Regeneration of birch was fairly low. All the stands we surveyed were closed canopy forest stands, with little light getting to the ground and none had had any management or disturbance of the forest floor in recent times. Being very shade intolerant, one wouldn't expect too much regeneration of birch in these conditions. Animal browsing was the most commonly noted problem with seedlings and saplings.

Evaluation:

Overall, birch stands are currently in good health. They are, however, largely reaching a mature stage and have closed canopies that are limiting regeneration. Maintaining birch stands on the forest may require some management actions in the future.

B: Tree Mortality

Figure1. Estimated number of acres affected by mountain pine beetle from 1996 to 2008, based on aerial surveys over the entire Black Hills of South Dakota and Wyoming[2].



The above graph shows the estimated number of acres affected based on aerial surveys for the past 13 years. Cumulative area affected since 1996 totals 369,000 acres. 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. The overall trend on the forest is certainly still for an increasing beetle situation in parts of the forest and an overall above average amount of acres infested by beetles.

Evaluation:

The mountain pine beetle outbreak we have been experiencing the past few years contiues to move around and grow bigger in a number of areas. 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 the central Hills around Deerfield and Bear Mountain continue to suffer from 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

[2] Due to the nature of aerial surveys, this data will only provide rough estimates of location, intensity and the resulting trend information for any given agent. The data presented should only be used as an indicator of insect and disease activity, and should be validated on the ground for actual location and casual agent. Many of the most destructive diseases are not represented in this data because these agents are not detectable from aerial surveys.

beetle mortality are likely to continue into the coming few years.

C: 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[3]. In this system all ponderosa pine stands are rated. Structural stage 1 and 2 and 3A are considered low susceptibility; structural stages 3B and 4A are medium susceptibility, and SS 3C, 4B and 4C are high. The following table shows hazard class ratings by year.

Mountain Pine Beetle Hazard Class Ratings by Fiscal Year – Black Hills National Forest								
Rating class	2005		2006		2007		2008	
	Acres	%	Acres	%	Acres	%	Acres	%
Low	177,000	17	183,999	18	174,871	17	169,153	17
Medium	358,000	35	367,247	35	355,071	34	357,088	34
High	495,000	48	485,629	47	510,004	49	507,982	49
Total	1,030,000		1,036,875		1,039,946		1,036,223	

There has been little change in the last 4 years. We would expect to see some change as contracts over the last 5-6 years begin to be reflected in the vegetation data base.

Note that stand 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 mortlaity. 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: Insects and Disease – Exotics

Detection surveys for the gypsy moth were continued at recreation and administrative sites on the Forest in 2008. No moths were caught in recreation sites on the National Forest, however, we continue to catch moths in other nearby recreation areas. Since these are mostly 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. It is not known to occur in the Black Hills, and 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 certainly could be avenue for this insect to

[3] Black Hills National Forest Land and Resource Management Plan, October 2005, Phase II Final Environmental Impact Statement – Appendix pages B-13,14.

affect nearby native ash stands and community forests.

Monitoring Item 25: Fuel Hazard

Objective 10-01: Manage for 50 to 75 percent moderate-to-low fire hazard in the wildland-urban interface and reduce the fire hazard within proximity of structures to current NFPA standards except within specific management areas. Manage the remainder of the Forest for 50 percent moderate-to-low fire hazard except for specific management areas.

Fire Hazard Rating Acres

YEAR	LOW	MODERATE	LOW+MOD	HIGH/ VERY HIGH	HIGH/ VERY HIGH	TOTAL
BASELINE 1995	23,669	509,578	43%	696,524	57%	1,229,771
2006	108,365	421,218	43%	712,459	57%	1,242,042
2007	108,345	398,984	41%	734,783	59%	1,242,112
2008	104,874	437,737	43%	706,457	57%	1,249,068

Note: All cover types, structural stages and management areas. Difference in total acres may be due to land acquisitions, trades, and data refinement.

Evaluation:

Fire hazard has remained largely unchanged since 1995. Fuel treatments reduce fire hazard, but over time, increasing tree density moves areas previously rated as low to moderate up to high and very high ratings (roughly a 2% increase in areas rated as high/very high from the baseline of 1995). Analysis of fire hazard will continue.

Monitoring Item 26: Fuel Treatment

Monitoring:

In FY08, the Forest Service tracked fuel treatments in 2 broad categories: 1) "core" treatments that are funded by appropriated fuels reduction (WFHF) funds, and 2) "integrated" treatments that reduce fire hazard but are accomplished coincidental to other projects using other funding sources. The total is termed "unified" fuel treatment as a sum of all the treatments that reduce fire hazard.

Mechanical treatments are defined as a broad spectrum of treatment methods including, thinning, hand piling, machine piling, mastication, lop and scatter, and chipping. Prescribed fire treatments are defined as broadcast burning, machine pile burning, hand pile burning, jackpot burning, etc.

Treatments are categorized either within the wildland-urban interface (WUI) or outside of the WUI.

Core Fuel Treatment:

The Forest accomplished fuel-treatment-related activities funded by appropriated **WFHF** funds on a total of 12,901 acres of the National Forest in FY2008 (not including monitoring or weed spraying). Included in this work were activities as listed below:

Category	Mechanical (acres)	Prescribed Fire (acres)	Total (acres)
WUI	6498	2533	9,031 (70%)
Non-WUI	2785	1,085	3,870 (30%)
Total	9283	3618	12,901 (100%)

(Source: Database of Record, FACTS, 02/06/2009)

Integrated Fuel Treatment:

Fire hazard was reduced via integrated fuel reduction on 67,119 acres done through tree thinning, timber harvest, forest health, and wildlife and range management projects

Total (unified) Fuel Treatment:

19,766 (core) + 67,119 (integrated) = 80,020 Acres (Unified)

Evaluation:

Aggressive fuel treatments to thin trees, convert some pine types to hardwood, and treat ground fuels must continue to keep ahead of continuously increasing fire hazard as the seedlings establish and forested areas grow and become more dense. Treatments must include a combination of mechanical treatments to remove heavy forest fuels and thin trees followed by prescribed fire to remove smaller fuels and encourage fire resistance in trees. A secondary benefit is anticipated to include improved forage and vegetative diversity.

Monitoring Item 27a: Fire Prevention

Monitoring:

- Status of fire management agreements with partner agencies:

  All cooperator agreements and annual operating plans were reviewed and signed as required in 2008.

- 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 2008.

- 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.

Evaluation:

The Forest has extensively cooperated with private, state, and other federal agencies to develop joint fuel management and protection strategies for intermixed landownership in partnership with private, state, and other federal agencies and was actively involved in development of Community Wildfire Protection Plans during 2008.

Monitoring Item 27b: Fire Suppression

Monitoring:

All wildfires on the Black Hills National Forest in 2008 were suppressed through appropriate suppression responses in accordance with management area emphasis, existing values, and fuel hazards within the incident area. Total acres burned were 8,083 acres less than the 33 year average of 8,275 acres burned per year.

Confined: **All** Contained: **All** Controlled: **All**

Following is a summary of the number of fires and total burned acreage on National Forest System lands in 2007.

CAUSE	NUMBER OF FIRES	ACRES BURNED
Lightning	23	7
Human	19	185
TOTAL	42	192

The 2008 acres burned and number of starts was well below 33 year average of 135 statistical fires per year and 8,275 acres burned per year as listed in Page III-343 of the Phase II FEIS.

Approximately 87% of the total acres burned resulting from statistical fires in 2008 where the result of a single fire that consumed 168 acres of NFS lands. Approximately 70% of these acres were

forested. Approximately 55% of all statistical fires occurring in 2008 where lightning caused with the remaining 45% being human caused.

Evaluation:

The most significant wildlfire occuring on the Black Hills in 2008 was the human caused Freeland Well Fire under Black Hills National Forest jurisdiction. NFS lands included 168 acres. There were no structure burned and there were no injuries to firefighters or the public. The number of starts and corresponding low number of acres burned were near recorded, all time historic lows. This was the direct result of a wet five month period that began in early May and lasted through September.

Significant improvement in drought conditions that were prevelent since 2000 were experienced in 2008 and significant improvement in both live and dead fuel moistures occurred over the course of the summer.

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