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Forest

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BLACK HILLS NATIONAL FOREST



Beaver dam and food cache on Castle Creek – Vicinity of McIntosh Fen and 1874 Custer Expedition Campsite.

FY 2007 MONITORING AND EVALUATION REPORT

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Black Hills Forest Plan

Monitoring and Five-Year Evaluation Report

Fiscal Year 2007

(October 2006 through September 2007)

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 is also the second, five year evaluation of the Forest Plan 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.

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.

Five-Year Evaluation Findings:

Black Hills National Forest management activities, primarily prescribed burning, have met stated Clean Air Standards over the past decade. (Monitoring Item 1: Air Quality)

Data collected for the past 5 years indicated a period of years with lower than average precipitation for the Black Hills area. As a result, the soil conditions were generally dry in association with the below average precipitation patterns during the same period. Although one site had an increase in bulk density measurement compaction, over the past 5 years the measurements have been well below the 15% threshold and are consistent with the Forest Service Handbook. (Monitoring Item 2: Soil Productivity)

Range allotment soil bulk density sampling data has been collected for livestock use activities since 1998. Sampling results over the past 5 years have generally been consistent with the Forest Service Handbook

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regarding soil compaction on range allotments. Two allotments sampled documented soil bulk density levels at or above the Region 2 Soil Quality Standard average for increase in bulk density threshold levels. Plans are being made to address these specific situations. Based on the limited number of exclosures, the monitoring design can generally be expected to change at some date in the future. (Monitoring Item 2: Soil Productivity)

The level of sampling that has been documented for soils revegetation generally indicates that such practices as full implementation of Forest Plan Standards and Guidelines and project specifications based on implementation such as Watershed Conservation Practices (WCP) and Best Management Practices (BMP) for silviculture have been successful at meeting the Regions Soil Quality Standards (Monitoring Item 3: Soils Revegetation)

Monitoring over the past 5 years has indicated that the effect of timber harvest has had limited negative impacts on watersheds and/or streams at the sites that were monitored. While the BMPs and WCPs are generally being implemented on road systems and are generally effective, review of the audit information evaluated indicate that road drainage needs more focus. There were some areas with documented drainage issues such as ruts, rills and gullies on roads and/or a need for more effective road drainage features (such as crossings, drainage dips, etc) or surface hardening (such as gravel application) that need to be incorporated on some roads. (Monitoring Item 4: Watershed Health)

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. 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 5: Water Quantity)

No Forest-wide data on riparian resource condition was collected in FY 2007. The best available information on existing riparian condition and trend was presented in the Final Environmental Impact Statement (USDA Forest Service 2005b) prepared for the Phase II Forest Plan Amendment. Specific projects that have restored or enhanced riparian habitat are reported in Monitoring Item 7. Climatic conditions, specifically the past eight or nine years of ongoing drought, have had a negative influence on riparian condition and trend due to the lack of water. (Monitoring Item 6: Riparian Condition and Trend)

During the past 5 years, 255 acres of riparian habitat restoration or enhancement has been completed. Although still somewhat short of the 500 acres for Forest Plan Objective 214, a significant increase in acres was done over the past 5 years (2003 to 2007), in comparison to the prior 5 years (1998 to 2002) when less than 20 acres were restored. (Monitoring Item 7: Riparian/Wetlands - Habitat Restoration)

Forest database stand mapping is more accurate today than in the mid-1990s for the 1997 forest plan, which accounts for the decline in objectives for vegetation species composition. There was a slight increase (284 acres) in aspen acres in 2007, but about a five percent decline compared to 1997. No funds or targets have been provided for the treatment of mountain mahogany stands. For the ten-year period, grassland and meadow acreages have changed but it is due to inconsistencies in what cover types have been queried in the vegetation database. To insure more consistent reporting, the covertypes representing grassland and meadow habitats will follow the cover types defined in the Phase II Amendment Final Environmental Impact Statement. (Monitoring Item 8: Vegetation Species Composition)

The tracking of structural stages is a key resource attribute that measures the forest structure. An increase in structural stage 4A is a function of Forest emphasis on addressing the mountain pine beetle attack, visual sensitivity, and retention of larger sized trees. (Monitoring Item 9: Structural Stages)

No data on large trees is provided prior to 2005 because this is a new objective under the Phase II Amendment. The management areas have changed labels and boundaries from the 1995 database to today's forest plan scheme. Therefore, it is not possible to do a 5 year evaluation on large trees at this time. (Monitoring Item 10: Large Trees)

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Based on the information gathered for the Phase II Amendment and the addition of recent wildfires and insect tree mortality on the Forest, on an average, there are more than 3 snags per acre well dispersed across the Forest. (Monitoring Item 11: Snags)

A total of 18,351 acres of burned forest habitat was created and largely retained over the last 5 years; exceeding the 10,000 acre, 5 year objective. (Monitoring Item 12: Burned Forest Habitat)

The growth rate monitoring item is not addressed because the information source of Forest Inventory and Analysis has not been written and published by the Northern Research Station. (Monitoring Item 13: Growth Rate)

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 (as per Standard 2416) then stands are certified as regenerated. Stands are summarized annually by database query for a total number of acres certified for the Forest. The total acres certified as a stocked stand in fiscal year 2007 was 24,498 acres. Over the past five years the forest has consistently met the objective for acres certified annually. (Monitoring Item 14: Regeneration)

The Forest has offered a total of 656.2 mmbf of volume from suitable and available timberlands in the last decade, or an average of 65.62 mmbf. This is 78% of Objective 303 for the first decade (83 mmbf). The ASQ for Objective 303 in the Norbeck Wildlife Preserve is a decade total of 27 mmbf. The 12.7 mmbf resulting from the 2 sales in the Norbeck Wildlife Preserve was approximately 47% of the objective. (Monitoring Item 15: Timber Production)

Districts have been working toward collecting rangeland trend data. In the last few years the Forest has launched an effort in conjunction with the 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 direction of trends and as a result some trends can not yet be determined. However, the data collected and analyzed over the last five years indicate that most of the allotments show the trend was steady or moving towards the desired condition. (Monitoring Item 16: Rangeland Trend)

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. Over the past five years, the average actual grazing use on the forest was 120,887 AUMs, 94% of the projected Forest grazing capacity of 128,000. In fiscal year 2007, actual grazing use on the Forest was 126,186 AUMs, which is approximately 98 percent of the annual projected Forest grazing capacity.

Forage utilization on most allotments surveyed was within Forest Plan Standards. The use on some areas in some allotments did exceed proper allowable use guidelines; however these areas represent a small percentage of the overall utilization on the Forest and are corrected in a variety of ways (such as moving from pasture to pasture, leaving before off date, and reducing numbers on a temporary basis). The Forest continues to promote more permittee assistance in monitoring grazing allotments using the Wyoming Rangeland Monitoring Guide and Black Hills Range Guide. Assistance includes on the ground training with permittees so they can monitor themselves, and individual and group monitoring sessions with permittees. (Monitoring Item 17: Forage Utilization/Residual)

The past five years (2003-2007) were all drought years in the Black Hills. The level of monitoring conducted at most sites (presence/absence) is not rigorous enough to capture any perceptible changes that could be attributed to drought, and data for prior non-drought years is limited. For one species (*Platanthera orbiculata*), for which numbers of individuals are more closely tracked, there is not enough pre-drought data to draw any conclusions. Of the currently listed R2 sensitive plant species with established monitoring designs, sensitive plants have continued to be present at all of the monitoring sites visited over the past five years. At this time, the type and amount of data collected cannot support any conclusions about trends for any of the species.

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

The Forest is conserving habitat for sensitive wildlife species. More time and continued effort is needed to achieve the desired mix of ponderosa pine structural stages. Continued efforts are needed to improve riparian condition and increase the acres of aspen. Continued efforts to control pine encroachment into meadows and grasslands are needed to achieve the grassland acre objective. Additional surveys and monitoring are needed for Cooper's Rocky Mountain snail, finescale dace and lake chub. (Monitoring Item 18 - Sensitive Species - Wildlife)

The past five years (2003-2007) were all drought years in the Black Hills. The level of monitoring conducted at most sites (presence/absence) is not rigorous enough to capture any perceptible changes that could be attributed to drought, and since monitoring for plant Species of Local Concern (SOLC) was initiated in 2006 data for prior non-drought years is limited. From 2006 to 2007 plant SOLC have continued to persist at all occurrences that were visited in both years. At this time, the type and amount of data collected cannot support any conclusions about trends for any plant SOLC. (Monitoring Item 19: Emphasis Species – Species of Local Concern – Plants)

The Forest is conserving habitat for wildlife Species of Local Concern. Progress is still needed towards increasing the acres of Structural Stage 5 and very large tree component in management Areas 5.4 and 5.43 to improve habitat. More time and continued effort is needed to achieve the desired mix of ponderosa pine structural stages. (Monitoring Item 19: Species of Local Concern - Wildlife)

The bald eagle was delisted in FY 2007 and is now addressed under Monitoring Item 18b for Sensitive Species. (Monitoring Item 20: Emphasis Species – Threatened and Endangered Species)

The Forest is achieving Objective 238 for Management Indicator Species. Continued efforts are needed to maintain or enhance riparian and aspen habitat. Additional time and effort is needed to achieve the grassland acres identified in Objective 205. Continued monitoring is needed to determine long-term trends for most MIS. Continued monitoring of bird densities is important to determine if recent declines for brown creepers and golden-crowned kinglets are due to annual fluctuation or long-term trends. (Monitoring Item 21: Management Indicator Species)

Our inventory of noxious weeds on the Forest continues and, as our tracking methods improve, the total acres of noxious weeds on the Forest will be refined. For the past 5 years we have exceeded the 8000 acre treatment objective in the Forest Plan and continue to work on noxious weed prevention and treatment as funding is available. (Monitoring Item 22: Noxious Weeds)

Mountain pine beetle (MPB) infestations continue to spread (along with those of other insects), and is at epidemic levels across many areas of the forest, particularly the central Hills and Harney Peak. Both tree mortality and acres affected will continue to increase. Silvicultural treatment of stands to reduce density is the only long term solution to reducing the overall impact of mountain pine beetle. However, the Forest's ability to reduce insect risk is limited by funding, the time it takes to set up a timber sale or other treatment project, legal considerations (NEPA process), and contract length. It is likely that we are only about mid-point in the cycle of this current outbreak, and so higher levels of beetle mortality are likely to continue into the coming few years. The current risk situation is one of elevated risk over the coming year and beetle infestations will continue to be present and expand into almost any of the pine that is near infestations. (Monitoring Item 23: Population, Tree Mortality and Hazard)

Gypsy moth has not been a problem on the Forest. Continued monitoring of this introduced pest is warranted. (Monitoring Item 24: Exotics)

Fire hazard has remained unchanged since 1995. Fuel treatments have reduced fire hazard, but increasing tree density continues to increase fire hazard. Analysis of fire hazard will continue to improve and in 2008 will be

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focused on targeted management areas and separated within and outside the wildland-urban interface (WUI) when counties complete their community wildfire protection plans. (Monitoring Item 25: Fire Hazard)

The Forest has been successful at aggressively treating fuels over the past five years to thin trees, convert some pine types to hardwood, and treat ground fuels. These treatments must continue to stay ahead of increasing fire hazard as 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 26: Fuel Treatment)

Since the Plan was revised in 1997, most of the significant fires in the Black Hills had a complex of intermingled private lands, most with homes and other structures, and a mix of high to very high fire hazard with high to extreme fire danger ratings. These fires included West Hell Canyon (2001), Little Elk (2002), Grizzly Gulch (2002), Battle Creek (2003), Old Hill City Road (2005), Camp Five (2005), Ricco (2005), East Ridge (2006), Boxelder (2007) and Alabaugh (2007). Remarkably, few structures were burned in these fires. However, with shifts in wind direction and/or weather, the results could have been far more devastating in terms of private property damage.

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, has been actively involved in development of Community Wildfire Protection Plans, and provide mutual support for fire suppression activities. (Monitoring Item 27: Fire Prevention and Suppression)

Monitoring Item 28: Fire Non-emergency Watershed Condition did not exist as a monitoring item until the Phase II Amendment to the Black Hills National Forest Land and Resource Management Plan became effective (March 2, 2006). At this time, the only area within a post-fire interim BAER process for ongoing emergency watershed condition is the Alabaugh Fire that occurred in 2007.

Decreasing or flat budgets and steeply escalating equipment and fuel costs have limited the ability to meet objectives. Maintenance and reconstruction is being accomplished through a combination of force account work, contracts, cooperators and timber program work. Deferred maintenance on roads is increasing. Construction of new roads is adequate to fully support the timber program and provide recreational access to the Forest, and the projected objectives for new road construction may exceed Forest needs. (Monitoring Item 34: Access – Road Mileage)

Sharp declines in budget have made accomplishing trail goals unattainable. Elimination of TRTR "10 percent" funds has severely impacted ability to fund trail work and construction. No funds are available for trail construction, and funds are severely limited for trail maintenance. Emphasis on travel management in 2007, with associated funding from trail funds, has further decreased funding available to implement trail program goals. Condition of trails is steadily declining as maintenance is unable to keep up with use. (Monitoring Item 36: Trail Opportunities)

CRAIG BOBZIEN
Forest Supervisor

Date

Monitoring Item 1: Air Quality

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

Monitoring:

The Forest experienced no violations of the Clean Air Act in 2007. There was one air quality complaint from an individual; however that complaint was not attributed to Forest Service projects (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.

Burning 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/ancl2.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 in mitigating all potential air-quality-impacting activities.

Evaluation:

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

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 (USDA Forest Service 2004) and again in 2006 (USDA Forest Service 2007). 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). Any Forest watershed or soil reports that addressed soil bulk density since the 2006 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. The 2007 soil bulk density information has been combined here to provide an updated source of information.

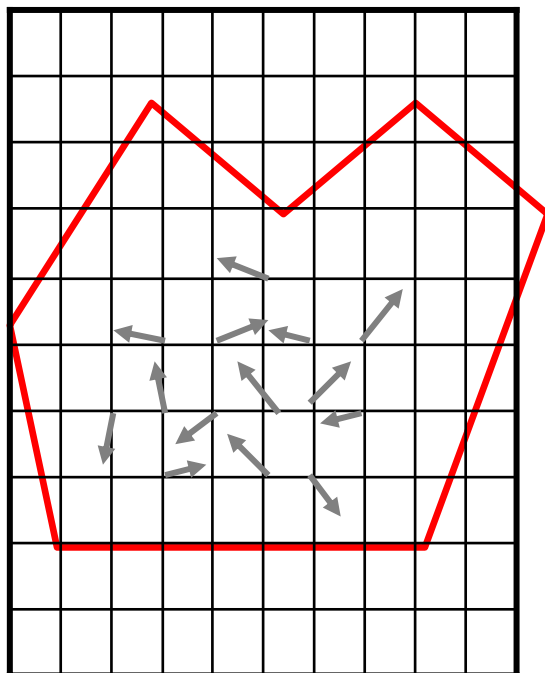
Background and General Soil Bulk Density Sampling Design Description:

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 the monitoring design through partnership 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 generally 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 Black Hills National Forest administered lands: timber harvesting and livestock use. In addition, sites with characteristics indicating a greater likelihood of potentially becoming compacted were generally targeted initially for site selection (i.e. clay or loam soils, higher water holding capacity capability, minimal amounts of rock fragments, higher elevations that contribute to longer snow retention and therefore later seasonal moisture retention conditions, within the higher precipitation zones of the Forest). The 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. In addition to the target sampling described above, the Jasper Fire (occurred in 2000) offered opportunities for sampling within burned areas that were to be 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 management activities at specific locations, active measures are to be taken in accordance with the Black Hills National Forest Land and Resource Management Plan, as amended, along with various Forest Service Handbook direction to decrease those levels.

Example of Grid Placement with Random Transects for Collecting Samples



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



Preparing soil samples for bulk density calculations.

Timber Harvest Activity Sampling

Monitoring:

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

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

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to be shut down again on June 3, 2003 based on wet soil conditions. Inspection sheets documented that the area received more snow the week prior to June 10, 2003, likely contributing to some level of increased site moisture and timber sale activities were taking place on June 10, 2003.

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

Evaluation:

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

- 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 specifies that soil compaction is caused by the weight of vehicles and animals on the ground and soils compact when soil moisture exceeds the plastic limit. Consistent with the Handbook, there is evidence that soils in the Black Hills can compact when some level of timber harvest (or post sale activity) equipment activity occurs when some degree of moist to wet soil conditions exist.
- Also consistent with the same Forest Service Handbook R2 Amendment (2509.25-2600-2), the data generally collected during the below average precipitation years provides evidence that operating timber harvest equipment during dry soil moisture conditions can be expected to prevent or limit increases in soil bulk densities, or limit the likelihood for increases in soil bulk density effects.
- While uncertain that soil bulk density levels would decrease or decrease as fast on every soil within the Black Hills, there is evidence that conditions were such that within one geographic area, on at least one soil type, and to the depth sampled, that the mean soil bulk density decreased from levels above the threshold classified as “detrimental compaction” to levels below the threshold within the time period of one year. It is unknown what factors may have contributed to this level of decrease, but it may have been associated with soil moisture and temperature conditions that favored active freezing and thawing conditions at the site during that specific year, or that the flush of herbaceous growth (and the associated increased root activity) may have contributed to the decline in soil bulk density levels.

Timber Harvest Soil Bulk Density Sampling

Post Harvest Sample Year	Timber Harvest Units Sample Locations	Soil Sampled	Bulk Density Increase from Pre-harvest Sampling to Post-Harvest Sampling
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 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%
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
1998 - This was the initiation year of this soil bulk density sampling method (pre-harvest sampling occurred).			



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



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

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 climatic cycle with above average precipitation (see precipitation chart for Rapid City at the end of this report). The general bulk density calculated for the area from the data collected in 1998 was 15.5% greater in the grazed area as compared to the ungrazed enclosure. The site was re-sampled in 2006 based on questions

regarding potential changes in soil moisture conditions from year to year. Since below annual average precipitation levels had been documented for the general area of the Black Hills area since 2000, some questioned whether that may influence bulk densities of soils as compared to gathering data during the period of higher moisture climatic conditions, or if sampling would reveal that there would be little or no difference since livestock generally use the same areas in succeeding years. Therefore, the Wolff Range allotment was sampled again in 2006 to compare to bulk densities calculated for the site in 1998. The calculated change in bulk density was slightly lower (approx. 1%) in 2006 as compared to the 1998 results. However, no single factor can be associated with this limited approximate 1% change since there were other contributing factors that could have altered soil bulk density comparisons at this site, for example cattle had been in the enclosure for at least two weeks of the 2005 season and could have affected the “ungrazed” conditions for 2006 which may have increased the enclosure bulk densities. Gopher activity was prevalent both within and outside of the enclosure and may be contributing to bulk density level changes. Following the 2006 sampling year, cattle were again in the Wolff Allotment enclosure for approximately two weeks in 2007.

The Crows Nest/Upper Beaver Allotment was also sampled in 1998 during the climatic cycle period with above average precipitation. The general bulk density calculated for the area from the data collected in 1998 was approximately 18% greater in the grazed area as compared to the ungrazed enclosure. The site was re-sampled in 2007 for similar reasons as those above, to increase our understanding regarding if there are bulk density changes associated with various climatic cycles with potential for changes in soil moisture conditions, or if sampling would reveal that there would be little or no difference since livestock generally use the same pasture areas in succeeding years. In addition to sampling similarly to 1998, additional transects were sampled further to the east and west of the original sample site, within the same soil map unit, to gather more information on extent of increased bulk density levels compared to the enclosure. Data from the additional sampling also indicated average bulk density levels above the 15% threshold level.

A recent decision regarding management of the Wolff Allotment was completed in 2006 as part of the North Zone Range 05 Project (USDA Forest Service 2006a). The decision document and environmental analysis completed for that allotment can be referred to regarding actions to be taken to maintain or improve resource conditions as well as any specific allotment monitoring to take place, including those for the soil resources. Those documents and information on the planned actions to be taken can be obtained by contacting the Northern Hills District Ranger, Spearfish, South Dakota.

A decision regarding management of grazing activities within the Crows Nest/Upper Beaver Allotment was completed in the late 1990's. The District was notified of the 2007 sampling results during calendar year 2007 with the intent to allow time to identify adjustments to implement and meet Forest Plan standards and Forest Handbook direction for the area for the 2008 grazing season. The District Ranger is preparing a plan to address this situation.

Soil bulk density sampling occurred within two other range allotments located in the southern Black Hills in 2007. Both of those sample sites are located in areas that generally receive less annual precipitation and are at lower elevations (4,300' and 4,680' elevations) than the Crows Nest/Upper Beaver Allotment. The change in average soil bulk density within enclosures compared to the adjacent grazed area at those locations indicated that soil bulk density conditions were well within those specified in the Region 2 Soil Quality Standards.

Evaluation:

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

- 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 specifies that soil compaction is caused by the weight of vehicles and animals on the ground and soils compact when soil moisture exceeds the plastic limit. Consistent with the Handbook, there is evidence that soils in the Black Hills can compact when some

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level of livestock use activity occurs when some degree of moist to wet soil conditions exist.

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

The use of the current monitoring protocol design is becoming limited for assessing soil bulk density in grazed areas of the Black Hills National Forest. Livestock enclosures are not located on every range allotment, or within every pasture within those allotments. Further limiting factors are that some of the existing enclosures are not appropriate for undisturbed reference conditions in that they are not of a large enough size, are located on a different soil than the primary grazed area of an allotment or are located within a different vegetation cover type than the primary grazed portion of the allotment. In addition, similar to that described above for the Wolff Allotment monitoring, another limiting factor is that cattle periodically continue to access and remain within various enclosures from which they are to be restricted from for extended periods of time (based on enclosure condition, gate access issues, limited inspection and maintenance, etc.) and the current design for comparing resource conditions, such as for soil bulk density levels is currently not an option within those allotments. Based on continued access and occupancy of cattle within the enclosure on the Wolff Allotment that enclosure is no longer considered suitable for Forest Plan monitoring for sampling and assessing soil bulk density conditions associated with livestock use.

There is the potential that some of the existing enclosures with similar soils to other allotments may serve as the reference ungrazed comparison of the soil condition (and has been used), however this is likely a limited option. If the Forest is interested in continuing to pursue monitoring as currently designed, conditions of existing enclosures will need to be changed or additional adequate enclosures (size large enough to serve as a representative sample area for ungrazed conditions, located within similar soil types and vegetation types, maintained to restrict cattle access, etc.) will need to be developed.

Range Allotment (Livestock Grazing Areas) Soil Bulk Density Sampling

Year Sampled	Range Sample Site	Soil sampled	Average Difference in Soil Bulk Density in Grazed Area Compared to Ungrazed Areas
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	Butche and Boneek loams	+5.2%

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	Elevation: 4,300'		
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%
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%*

- See information regarding bulk density percentages in section preceding the table.

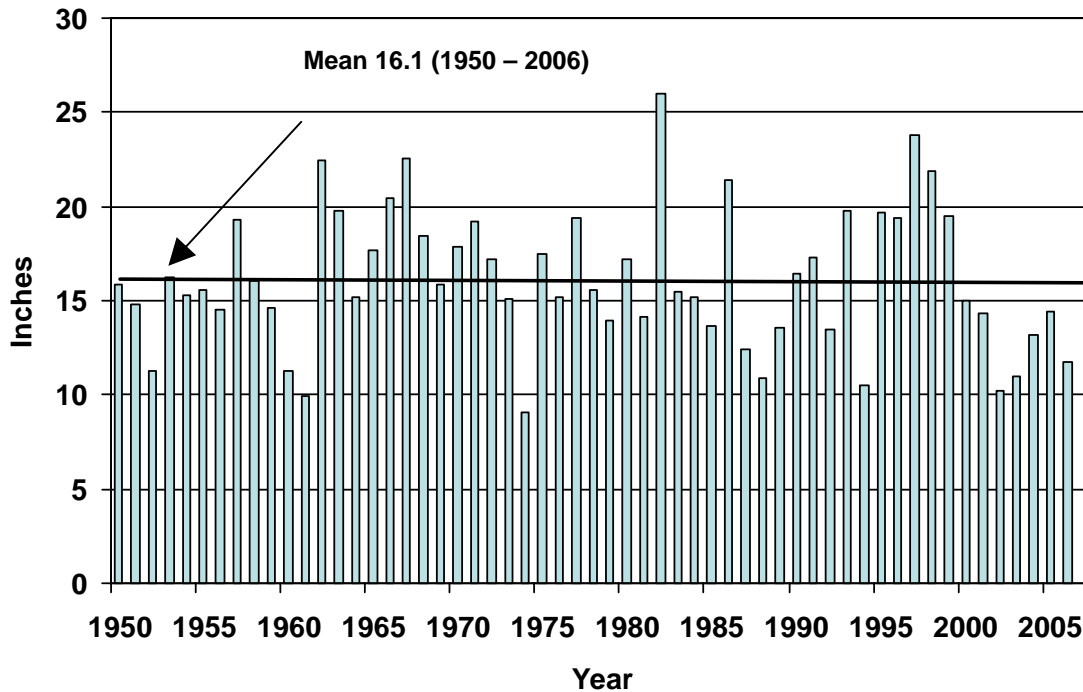
Soil bulk density sampling within the Wolff Range Allotment in 2006.



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



Annual precipitation for Rapid City, SD from 1950-2006



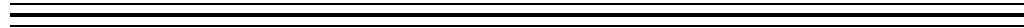
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Monitoring Item 3: Soils Revegetation

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 to 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 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).

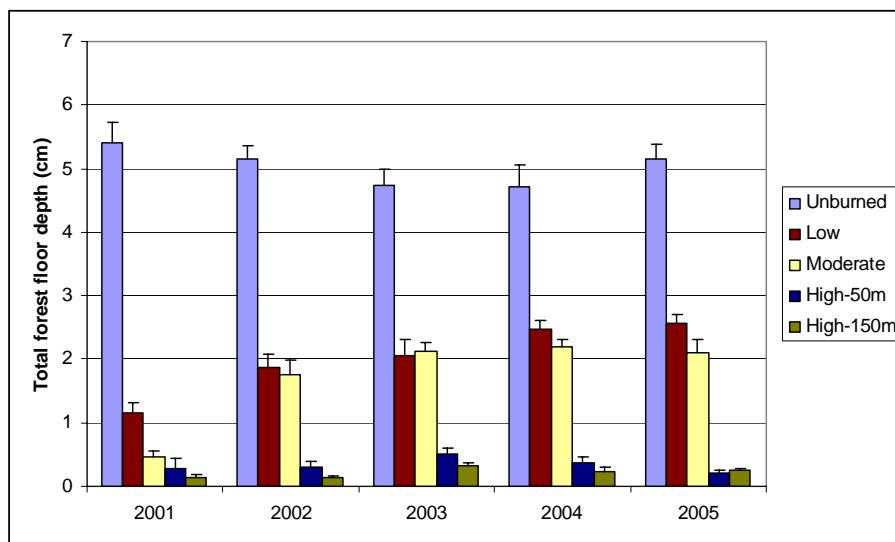
Evaluation:

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 generally expected to protect soil resources from excessive damage. 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 generally 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. 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 by contacting the various Districts. While vegetation management disturbances have generally been documented to retain ground cover or revegetate and redevelop 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 reestablish vegetation and effective ground cover (see tables below). 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.

Fire behavior	2001 (early season)	2002 (early season)	2003	2005
Unburned	39.7 (11.0)	40.3 (10.1)	52.9 (9.7)	40.2 (10.1)
Low	9.1 (2.2)	20.0 (3.5)	32.2 (7.7)	29.4 (4.8)
Moderate	5.1 (1.7)	14.2 (3.3)	34.9 (7.1)	37.3 (6.7)
High	3.0 (1.1)	13.5 (3.7)	40.8 (8.5)	37.8 (8.0)

Total plant cover (%) in ponderosa pine stands receiving no postfire silvicultural activities in the Jasper Fire area. (Keyser et al. 2006)

Total forest floor depth (litter + duff) (mean ± 1SE) in ponderosa pine stands receiving no postfire management one, two, three, four and five years post-fire in areas of different fire behavior in the Jasper Fire Area (Keyser et al. 2006).



Keyser Tara, Dr. Frederick Smith, and Dr. Leigh Lentile. 2006. Monitoring Fire Effects and Vegetation Recovery on the Jasper Fire, Black Hills National Forest, SD. Unpublished Final Report (In Service Agreement#0203-01-007). Colorado State University, Department of Forest, Rangeland, and Watershed Stewardship.

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 generally addresses Objective 104b and the Clean Water Act. While the reporting frequency for this monitoring item is to occur every 2-10 years, this monitoring item was reported on both in 2006 and 2007 in the Black Hills National Forest FY 2005 and 2006 Monitoring and Evaluation Reports (USDA Forest Service 2006; 2007). In 2007, the implementation and effectiveness monitoring for BMPs and WCPs occurred within sample areas of the following timber sales: Annabelle, Bear, Blackhawk, Bullock, Bunny, Cattle Salvage, Crooked, Doll, Dumbuk, Hat, Henderson, Hopkins, Lime Kiln, Limestone, Mallo, Martin, Maverick, Mercedes, Needles 2, Nest, Nichols, North Fork, Odakota, Painter, Redbank, Round Mountain, Soholt, Thumb and Uncle (USDA Forest Service 2008a, 2008b, 2007c).

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 and 2006 Monitoring and Evaluation Reports (USDA Forest Service 2007a; USDA Forest Service 2007b), the 2007 field season 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 2007c; USDA Forest Service 2008a; USDA Forest Service 2008b). The 2007 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.

While the Forest actively internally monitors BMP implementation and effectiveness, various personnel have also participated in Best Management Practices field audits that have cooperatively 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 generally implemented and generally effective, that road drainage needs greater focus from the standpoint of BMPs.

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 will have timber project planning, sale administration, watershed and engineering design personnel meet in January or February 2009 to adjust some of the project design criteria to improve road drainage.

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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.

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- a. Raise the water table to saturate historically inundated soils.
- b. Convert drier-site vegetation to native wet-meadow species.
- c. Reintroduce beaver into the drainage once suitable habitat is developed.
- d. Design management to maintain wet-meadow conditions.

Monitoring:

Projects to restore 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 table below shows projects that have contributed to riparian/wetland habitat restoration in FY 2007.

Project	District	Funding Source	Target
Bearlodge Campground enclosure	Bearlodge	NFWF	0.5 acres
Redwater Beaver Pond enclosure	Bearlodge	NFWF	0.5 acres
Redwater Allotment <i>Salix lucida</i> enclosure	Bearlodge	NFWF	0.5 mile
Pole Cabin <i>Carex</i> enclosure	Bearlodge	NFWF	0.5 mile
Castle Creek enclosure	Hell Canyon	NFWF	0.5 mile
McIntosh Fen Rehabilitation	Mystic	NFWF/NFVW	0.5 mile
Black Fox Wetland enclosure	Mystic	NFWF	30 acres
Castle-Creek Walk-in Fishery repair	Mystic	NFWF	0.5 mile
Long Draw stream channel stabilization	Mystic	NFVW	6 acres
North Boxelder Fen enclosure	Northern Hills	NFWF	0.5 mile/40 acres
Crago Flats <i>Salix</i> spp enclosure	Northern Hills	NFWF	15 acres
Silver Creek <i>Salix</i> spp enclosure	Northern Hills	NFWF/NFVW	0.5 mile/20 acres

The following table summarizes the acres of riparian habitat restored or enhanced from FY2003-2007. 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	TOTAL
Riparian acres restored	53	32	54.5	3	112	255

Evaluation:

Progress is being made in achieving Objective 214. Projects to restore McIntosh Fen or to protect the Black Fox fen/wetland complex achieved the most target acres, but the smaller spring/seep protection projects also provide biological diversity benefits not reflected in their small size.

During the past 5 years, 255 acres of riparian habitat restoration or enhancement has been completed. Although still somewhat short of the 500 acre objective for Forest Plan Objective 214, a significant increase in acres was done over the past 5 years (2003 to 2007), in comparison to the prior 5 years (1998 to 2002) when less than 20 acres were restored.

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.

Monitoring:

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 and 2007.

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

Evaluation:

There was a slight increase (284 acres) in aspen acres in 2007, but about a five percent decline compared to 1997. Forest database stand mapping is more accurate today than the mid-1990s for the 1997 forest plan, which accounts for the decline in acres since 1997. 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. Additional time is needed to meet Objective 201.

Objective 202: Conserve and manage existing mountain mahogany stands.

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

Monitoring:

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. 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.

Evaluation:

No funds or targets have been provided for the treatment of mountain mahogany stands.

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

Monitoring:

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 13,021 acres (see cover type chart). There are 7,965 acres of bur oak with stand age determination. Of the 7,965 acres, there are 1,456 acres of bur oak that is 100 years or older.

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

Monitoring:

The following are the acres by vegetation cover types for 2006 and 2007:

	2006	2007
Paper birch	3212	3436
Lodgepole pine	87	103
Limber pine	-0-	-0-
Douglas-fir	30	30

Evaluation:

Changes in acres are a result of more accurate mapping.

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.

Monitoring:

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 and 2007. Meadow acreage for the 1997 Forest Plan was not available.

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

Evaluation:

The Forest is approximately 19,000 acres short of the grassland objective. The Forest has 2,849 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. In 2007, cover types more representative of wet meadows were queried.

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

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Monitoring:

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 and 2007. 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, 1997 & 2005-2007				
Cover Type	1997	2005	2006	2007
Spruce	21,737	25,462	26,483	26,110

Evaluation:

The Forest is over 6,000 acres above or 30% greater than the objective of 20,000 acres of spruce.

Monitoring Item 9: Vegetative Diversity – Structural Stages

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

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

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

Monitoring:

The following are the percentages of structural stages in ponderosa pine as identified in the Phase II Amendment.

Structural Stage	% of MA
SS1 – grass-forb	5%
SS2 – shrub/seedling	5%
SS3A – sapling-pole	10%
SS3B – sapling-pole	15%
SS3C – sapling-pole	5%
SS4A – mature	25%
SS4B – mature	25%
SS4C – mature	5%
SS5 – old growth	5%

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Objective 201 for MA 3.7: 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.

Monitoring:

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

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

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%
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%
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%
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%

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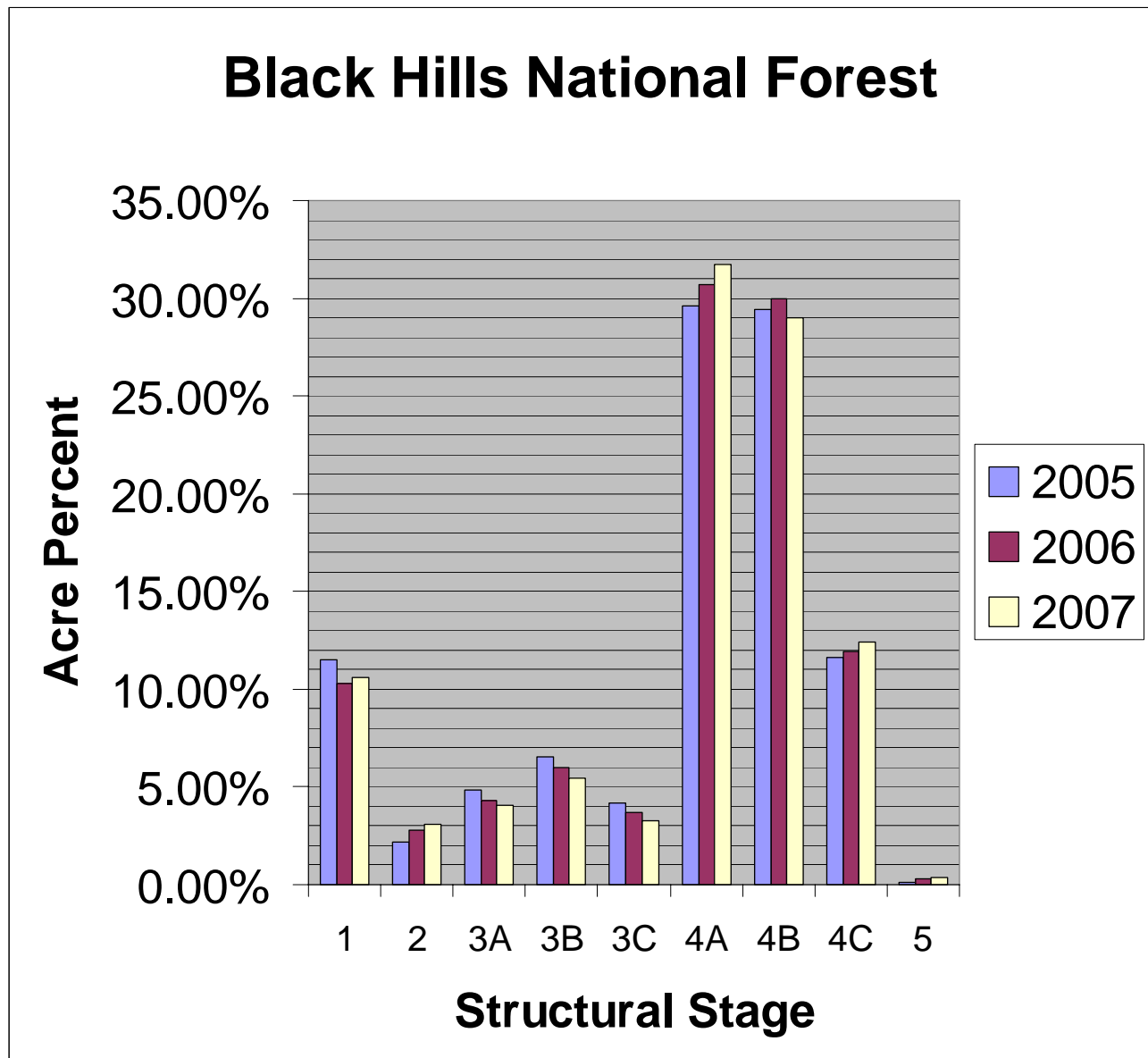
	acres >	2006	448	158	318	285	316	3014	4428	1390	52	10409
	percent >	2006	4.30%	1.50%	3.10%	2.70%	3.00%	28.96%	42.54%	13.35%	0.50%	100.00%
	acres >	2007	3,217	589	525	743	351	1,079	1,854	1,143	52	9,553
	percent >	2007	33.68%	6.17%	5.50%	7.78%	3.67%	11.29%	19.41%	11.96%	0.54%	100.00%
5.6	acres >	2005	132	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%
	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%
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%

While each management area is considered individually for the ponderosa pine cover type within the five management areas, there is generally too much structural stage 1, 4A, 4B and 4C, and not enough structural stage 2, 3A, 3B, 3C and 5. Structural stage 1 acres are attributable to the recent large wildfires. To achieve percents in some structural stage categories, the vegetative treatments may span decades to change to another structural stage category. For example, a 4A stand without an understory may take several decades to transition to a 4B stand. To achieve more structural stage 2 or 3A or 3B 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 most preferred harvest methods from the last forest planning analysis (USDA Forest Service 1996b Ch.II-36 Table II-6).

Evaluation:

The Forest is harvesting tree on about 18,000 acres per year or 2 percent of the suitable forestlands per year, 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 should implement more overstory removals. There is concern of changing the forest landscape where large trees are not seen in most forest stands. 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 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 and commercial thinning are significant contributors to the upward trend of structural stage 4A.



Monitoring Item 10: Vegetative Diversity – Large Trees

Objectives 203 for MA 4.1, Objective 204 for MA 5.1, Objective 206 for MA 5.4; Objective 204 for MA 5.43, and Objective 204 for MA 5.6: 10% of the structural stage 4 ponderosa pine acreage in the management area will have an average tree size of “very large”.

Monitoring:

The percent of very large trees in structural stage 4 by management area from 2005 to 2007 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.

Mgt. Area	Percentage of very large trees in S.S.H. (objective: 10%)		
	2005	2006	2007
4.1	18.3	17.6	17.5
5.1	11.1	11.6	11.8
5.4	8.7	8.0	9.5
5.43	6.5	3.4	5.5
5.6	26.8	25.9	29.1

Evaluation:

In FY 2007, Management Areas 5.4 and 5.43 were not meeting the objective. However, as for a trend for all 5 management areas there is very little change as a whole. The two large management areas of 5.1 and 5.4 indicate a slight increase in percent which equates to more acres of very large trees. 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.

Monitoring:

Number of snags per acre is an output for each forested stand on the forest where there is tree inventory data. Annually, approximately 5-10% of the Forest has field data collected. The table below displays the 2006 and 2007 data.

From the vegetation database, the average number of standing dead trees per acre for diameter class 9 inch plus diameter trees by management area on conifer sites with a height 25 feet or greater is 1.7 snags for year 2005. For 2006 the Forest average is 1.3 snags per acre. For year 2007 the Forest average is 3.6 snags per acre. Values highlighted in yellow indicate where the objective is not being met on a management area basis.

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

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

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.				
Management Area	2006		2007	
	# of Trees >9-inch dbh (Objective: 3)	% Trees >14-inch dbh (Objective 25%)	# of Trees >9-inch dbh (Objective: 3.6)	% Trees >14-inch dbh (Objective: 25%)
1.1A	1.6	37.5	3.0	43.3
2.2	2.2	45.5	4.4	43.2
3.1	1.6	31.2	7.3	32.9

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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.				
Management Area	2006		2007	
	# of Trees >9-inch dbh	% Trees >14-inch dbh	# of Trees >9-inch dbh	% Trees >14-inch dbh
3.31	0.4	25.0	1.4	14.3
3.32	2.4	29.2	5.8	29.3
3.7	1.4	28.6	4.9	32.7
4.1	1.2	25.0	3.6	27.8
4.2A	1.1	36.4	5.6	35.7
4.2B	2.7	22.2	5.1	11.8
5.1	1.2	25.0	3.7	21.6
5.1A	1.0	20.0	1.1	18.2
5.2A	2.6	26.9	4.2	28.6
5.3A	1.1	27.3	2.3	21.7
5.3B	5.7	33.3	14.2	34.5
5.4	1.5	20.0	3.1	22.6
5.43	1.5	20.0	2.2	31.8
5.4A	2.7	40.7	5.2	44.2
5.6	1.1	27.3	3.5	28.6
8.2	2.5	23.1	3.2	40.6
Total Average	1.3	28.6	3.6	29.7

The above vegetation database summary numbers do not have the on-the-ground inventory data of recent fires or large tree mortality areas due to insects. Hence, the large fires of Cicero Peak, Jasper, Elk Mountain II, Roger's Shack, Cement, Ricco, Battle Creek, Grizzly Gulch which have standing dead trees from fire and the Beaver Park, Deerfield and Bugtown areas which have standing dead trees from insect mortality do not contribute to the above standing dead trees per acre. However, 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 that are 9 inches in diameter or greater resulted in an estimate of 150 trees per acre. Therefore, 150 trees per acre times 175,127 acres of wildfire equals 26,269,050 trees forest-wide.

Due to snag fall down from wind, an estimate of 60% of the 26,269,050 trees remains standing. Last year (2006) an estimate of 70% (18,388,335) trees remaining was used. For year 2007, approximately 15,761,430 trees (26,269,050 x 60%) which is applied across the Forest of 1 million forested acres results in approximately 15.76 snags per acre from wildfire.

Tree mortality from insects since year 1996 - 2007 is estimated at 300,000 acres. Likewise, an estimate of 150 trees per acre times 300,000 acres results in 45 million snags times 70% fall down rate equals 13.5 million standing snags divided by one million forested acres results in 13.5 snags per acre. The

15.8 snags per acre estimate from wildfire and 13.5 snags per acre from insects is an average across the Forest. In reality, the snags are concentrated in the wildfire areas and the insect tree mortality areas.

Therefore, snag density across the Forest ranges from 0-150 snags per acre. Most snags break down and snap

off below 25 feet in height. The average tree height for Black Hills pine is 62 feet. Strong winds often break the standing snags from 15-25 feet in height.

Evaluation:

The addition of recent wildfires and insect tree mortality results in above 3 snags per acre, well dispersed across the Forest (Reference: Phase II Amendment I-8, Objective 211).

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.

Monitoring:

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 October 2005 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%)
2007	108	368	338 (92%)
Total	565	18,351 acres	18,073 (98%)

Evaluation:

A total of 18,351 acres of burned forest habitat was created and largely retained over the last 5 years, exceeding the 10,000 acre objective. Approximately 200 acres in the Red Point Salvage Sale and 30 acres in an existing sale within the Boxelder Fire 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 13: Growth Rate

Objective 303: Offer the allowable sale quantity (ASQ) of timber on suitable and available timber lands as identified in the Phase II Amendment in the next decade.

Monitoring and evaluation:

The growth rate monitoring item is not addressed because the information source of Forest Inventory and Analysis has not been written and published by the Northern Research Station.

Monitoring Item 14: Regeneration

Regeneration is not specifically referenced in the Forest Plan with an objective; however, it is addressed under Monitoring Item 14 in the Monitoring Implementation Guide.

Monitoring:

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 (as per Standard 2416) then stands are certified as regenerated. Stands are summarized annually by database query for a total number of acres certified for the Forest.

Evaluation:

The total acres certified as a stocked stand in fiscal year 2007 was 24,498 acres. Over the past five years the forest has consistently met the objective for acres certified annually.

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)	
Sawtimber	
Million Cubic Feet	181
(Million) Board Feet	838
Roundwood	
Million Cubic Feet	21
(Million) Board Feet	N/A
Total	
Million Cubic Feet	202
(Million) Board Feet	838

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)	
Sawtimber	
Million Cubic Feet	5.4
(Million) Board Feet	27.0
Roundwood	
Million Cubic Feet	1.0
(Million) Board Feet	N/A
Total	
Million Cubic Feet	6.4
(Million) Board Feet	27.0

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

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

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. As 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). Guideline 2402 limits timber offer in the decade beginning in fiscal year 2007 to less than 202 million cubic feet.

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).

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Monitoring:

Harvest acres from signed decisions (NEPA decisions)
is 48,821 acres.

1997 Forest Plan Objective 303

ASQ 181,000 ccf - Average Per Year (sawtimber)

Ten Year Summary

Year	Sold ccf	Cut ccf	Harvested Acres
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
2007	177,878	180,219	18,286
TOTAL	1,210,574	1,453,410	162,888
Average per Year	121,057	145,341	16,289

Evaluation:

The first decade average annual volume is 65.6 million board feet which is below the objective of 83.8 million board feet.

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. 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 25,488 ccf (16,385 ccf + 9,103 ccf).

Evaluation:

These 2 sales within the forest plan period (decade) total a volume of approximately 12.7 million board feet, less than the 27 million board feet for Objective 303. Future vegetation treatments are being analyzed in the ongoing Norbeck Wildlife Preserve analysis.

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).

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 many of these study sites are not documented well enough to find the location. In the last few years the Forest has launched an effort in conjunction with the 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 direction of trends.

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 one time; you can read any or all items depending on the monitoring question(s). 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_bulletins/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

Monitoring:

A portion of this trend data was collected, compared to historic data and then analyzed to show trend in species composition for Southeast Range EA. Starting in 2001 the District began collecting the following trend data using the Cover Frequency methodology. Below are the number of allotments established or reread by year.

Year	# of Allotments	Acres
2001	16	121,673 acres
2002	5	65,411 acres
2003	2	7,915 acres
2004	2	4,147 acres includes riparian study.
2005	1	700 acres is a riparian study.
2006	1	1,760 acres reread of 2004 riparian study.
2007	6	12,459 acres

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

Evaluation:

In the analysis conducted, the data showed that the trend was steady or moving towards desired condition.

Mystic Ranger District

Monitoring:

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

Trend data was collected in 2004 on 47,822 acres for 16 of 29 allotments. In 2005, another 78,085 acres of trend data was collected for 21 allotments. 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.

Evaluation:

No new transects were read in 2007. For 2008, PFC transects used to evaluate condition are planned for installation on eligible sites within seven of the eight allotments in the Mystic Hills Range Project. Additionally, the existing long term trend studies on these eight allotments are planned for evaluation.

Bearlodge Ranger District

Monitoring:

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.

Evaluation:

Proper Function Condition (PFC) was used to evaluate condition. 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. The 2 PFC transects in 2007 were both found to be Functional at Risk with no apparent trend.

Northern Hills Ranger District

Monitoring and Evaluation:

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

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5 allotments totaling 42,345 acres. In 2007, PFC was accomplished on 4 allotments totaling 17,751 acres.

Of the 4 transect run in 2007:

Rapid Creek was found to be Functional.

Ladyfinger was classified Functional at Risk.

Elk Creek was Functional at Risk but, only a very small portion of this site was on National Forest.

Bear Butte was classified as Functional at Risk because of an old head cut from an unknown cause.

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 2007, actual grazing use on the Forest was 126,186 AUMs. This is approximately 98 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
Livestock AUMs Grazed	122,971	118,919	120,405	115,955	126,186

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	284,280	304,387	81,675
Grazing Allotments Evaluated	24	29	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 an indicator of move times between and off the pastures; it is not to be used as a compliance tool. Forage utilization on most allotments

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surveyed was within Forest Plan Standards. The use on some areas in some allotments did exceed proper allowable use guidelines; however these areas represent a small percentage of the overall utilization on the Forest and are corrected in a variety of ways (such as moving from pasture to pasture, leaving before off date, and reducing numbers on a temporary basis).

Evaluation:

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 allotments 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.

The Forest continues to promote more permittee assistance in monitoring grazing allotments using the Wyoming Range Guide and Black Hills Range Guide. Assistance includes on the ground training with permittees so they can monitor themselves, and individual and group monitoring sessions with permittees.

Monitoring Item 18: 2007 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 R2 sensitive plant species and Black Hills National Forest plant species of local concern in the event that funding/personnel are not adequate to complete the full monitoring plan. Priorities are currently set every spring for the coming year. The strategy was invoked in 2007 due to constraints on availability of personnel resulting in limited survey of new locations of *Cypripedium parviflorum* (the species was assigned Low priority; see discussion in *Cypripideum parviflorum* section below) and *Viburnum opulus* var. *americanum* (the species was assigned Medium priority; see discussion in *Viburnum opulus* var. *americanum* section below). This working tool is expected to be updated on a periodic basis as new information becomes available and will be applied as needed in the future. See the 2008 Sensitive Plant Monitoring Guide for the monitoring questions and protocols that will be used in 2008.

The year 2007 was considered a drought year for the State of South Dakota. This information was obtained by accessing US Drought Monitor at www.drought.unl.edu/dm/monitor.html.

Noxious weed information is discussed for various species. For information regarding the treatment of weeds on the Black Hills National Forest please refer to the following: Black Hills National Forest Land and Resource Management Plan (1997) as amended by Phase II (2005), Black Hills National Forest Noxious Weed Management Plan (2003), and Monitoring Item 22.

Monitoring and Evaluation of Sensitive Species with Developed Protocol

Sensitive Species: *Carex alopecoidea* (foxtail sedge)



Left: Photo point inside enclosure at CAAL8-22 showing livestock impacts to habitat (enclosure built in 2007 per Forest Plan Standard 2505f to exclude livestock from all or parts of the 5 largest *Carex alopecoidea* occurrences; photo by Cheryl Mayer on October 24, 2007). Right: *Carex alopecoidea* plant with perigynia at CAAL8-22 site (photo by Beth Burkhart on July 19, 2007).

Carex alopecoidea was confirmed on Black Hills National Forest in 2000 and through intensive survey effort, approximately 31 occurrences were documented between 2001 and 2003. Based on the number of occurrences that have been located and the amount of suitable riparian habitat in the Black Hills and Bearlodge, more occurrences are still likely to be discovered.

Recent available data were used in developing a monitoring design for *Carex alopecoidea*. Occurrences for monitoring were primarily selected based on the following criteria: size (estimated number of individuals), geographic distribution of the occurrences, and location of occurrences in different drainages. The current monitoring design involves assessing the status of six core occurrences and a limited number of other occurrences on an annual basis. The monitoring is designed to address six questions: 1) is the species present?; 2) is there evidence of contraction or expansion of occurrences?; 3) are invasive plant species present in the site?; 4) are there effects of weed treatment activities on the occurrence?; 5) are there effects of restricting livestock grazing on all or portions of occurrences designated by Phase II amendment?; and 6) are occurrences in botanical areas (Dugout Gulch Botanical Area and Upper Sand Creek Botanical Area) grazed by livestock?

Species persistence concerns for *Carex alopecoidea* led to BHNF Standard 2505f directing implementation of additional measures to assure avoidance of livestock use on *Carex alopecoidea* by restricting livestock use of all or portions of 5 of the largest geographically spaced occurrences (site numbers: CAAL8-19, CAAL8-20, CAAL8-22, CAAL8-30, CAAL8-31). The monitoring program is not tasked with accomplishing livestock restriction (e.g. by fencing or other means) but will gather data on results when restrictions are accomplished. It is unknown if livestock grazing causes beneficial, neutral, or negative direct impacts to *C. alopecoidea* and what kind of indirect impacts to *C. alopecoidea* result from changes to habitat conditions caused by livestock grazing. Monitoring will provide data to begin answering these questions.

2007 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 endpoints with a GPS system annually. 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.

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

CAAL8-16 (Dugout Gulch Botanical Area): On July 13, 2007, plants were observed in the same areas and appeared to be at the same densities as in 2006. The extent of the occurrence was stable. However, a cut boundary fence was noted. Evidence of livestock grazing on *Carex alopecoidea* and other vegetation was observed. Trampling and grazing by livestock occurred along the stream as indicated by hummocking and bank shearing. [Note: permitted livestock have a travelway through the botanical area but are not supposed to graze in the botanical area.]

CAAL8-19 (Ladyfinger Gulch): On July 12, 2007, plants were observed in the same areas and appeared to be at the same densities as in 2006. The extent of the occurrence was stable. Bank shearing from livestock trampling was observed on streambanks and hummocking was observed in the water influence zone. An interdisciplinary group visiting the site the same day discussed options for an appropriate enclosure to meet Forest Plan Standard 2505f (see above). A design was not agreed upon but a small, temporary enclosure was constructed (approximately .13 acres) to exclude livestock from one concentration area. A long-term plan to meet Forest Plan Standard 2505f will be developed as part of the North Zone Range 08 Management Project that is currently underway. Range management plans for the part of the CAAL8-19 site outside the enclosure (when built) will also be included in the North Zone 08 Range Management Project. Management meeting Region 2 Watershed Conservation Practices Handbook management measures and design criteria will be protective of *Carex alopecoidea* plants and habitat.

CAAL8-20 (Pettigrew Gulch): On August 24, 2007, plants were observed in the same areas and appeared to be at the same densities as in 2006. The extent of the occurrence was stable. Herbaceous vegetation was grazed by livestock to less than 1/2 inch in areas; shrub vegetation (willow species) shows evidence of livestock grazing; and hummocking and bank-shearing from livestock hoof action were observed along the stream and in contributing seeps. The site was visited on July 12 by an interdisciplinary group to determine an appropriate enclosure design to meet Forest Plan Standard 2505f (see above). A design was agreed upon but the enclosure was not built in 2007 due to other district priorities. Range management plans for the CAAL8-20 site (the part of the site outside the enclosure, when built) will be included in the North Zone 08 Range Management Project. Management meeting Region 2 Watershed Conservation Practices Handbook management measures and design criteria will be protective of *Carex alopecoidea* plants and habitat.

CAAL8-22 (Pole Cabin Gulch): On July 19, 2007, plants were observed in the same areas and appeared to be at the same densities as in 2006. The extent of the occurrence was stable. *Carex alopecoidea* was present in all forks of the site. Herbaceous vegetation was grazed by livestock to less than 1 inch in areas; shrub vegetation (willows) shows evidence of livestock grazing; and hummocking and bank-shearing from livestock hoof action were observed along the stream and in contributing seeps. An interdisciplinary group visited the site on July 19, 2007 to determine an appropriate enclosure design to meet Forest Plan Standard 2505f (see above). A design was agreed upon and the enclosure constructed in late summer. On October 24, 2007, botanists visited the enclosure and initiated photo point monitoring. Additional monitoring will be designed and implemented in coming years to gain insight into livestock grazing effects on *C. alopecoidea* and its

habitat.

CAAL8-30 (Deer Creek): On August 17, 2007, plants were observed in the same areas and appeared to be at the same densities as in 2006. The extent of the occurrence was stable. Herbaceous vegetation was grazed by livestock to less than 1 inch in areas; shrub vegetation (willows) shows impacts from livestock grazing; and hummocking and bank-shearing from livestock hoof action were observed along the stream. Grazing had occurred on coarse-textured or poisonous plants that cattle usually avoid (e.g. water hemlock (*Cicuta maculata*), beaked sedge (*Carex utriculata*), and cattail (*Typha latifolia*). An interdisciplinary group visited the site in October 2006 and November 5, 2007 to determine an appropriate exclosure design to meet Forest Plan Standard 2505f (see above). A design was agreed upon but not built in 2007 due to other district priorities.

CAAL8-31 (Beaver Creek): On August 17, 2007, plants were observed in the same areas and appeared to be at the same densities as in 2006. The extent of the occurrence was stable. However, there was evidence of heavy water flow in Beaver Creek (e.g. new sediment bars and scoured banks). Livestock trampling of these new features was observed. An interdisciplinary group visited the site in October 2006 and on November 5, 2007, to determine an appropriate exclosure design to meet Forest Plan Standard 2505f (see above). A design was agreed upon but not built in 2007 due to other district priorities.

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

Planning/design has begun on constructing fenced exclosures at all five sites and one was completed in 2007 after the 2007 grazing season. Photo point monitoring was initiated at the CAAL8-22 exclosure in October 2007. Additional monitoring will be implemented in 2008. Forest-wide, management is moving toward meeting Forest Plan Standard 2505f (see above).

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

Carex alopecoidea plants in CAAL8-16 site in Dugout Gulch Botanical Area were grazed by livestock in 2007 (see summary in item 1 above). CAAL8-12 site in Upper Sand Creek Botanical Area was observed on September 27, 2007. *Carex alopecoidea* plants were grazed by livestock in 2007.

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

CAAL8-16 – High abundance of invasive species (including noxious weeds) in site and along drainage bottom – *Cynoglossum officinale* (houndstongue), *Cirsium arvense* (Canada thistle), *Cirsium vulgare* (bull thistle), *Arctium minus* (lesser burdock), *Rhamnus cathartica* (common buckthorn - listed as noxious/invasive in 5 states), and *Verbascum thapsus* (common mullein) all found within one ft of *C. alopecoidea*. While no evidence of weed treatment was observed in 2007, the beneficial effect of significant handpulling of weeds, especially *Arctium minus*, in 2006 is still observable.

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

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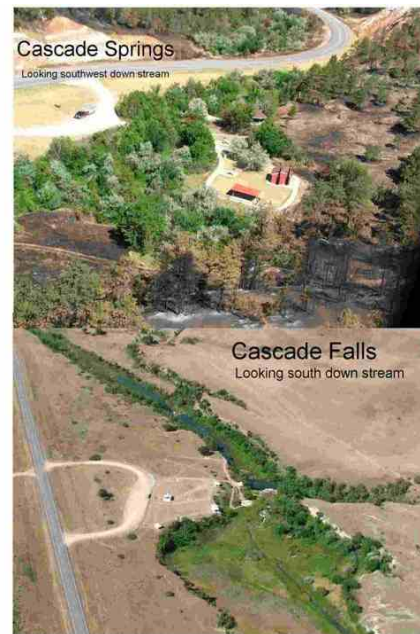
CAAL8-22 – *Carduus nutans*, *Cirsium arvense*, *Cirsium vulgare*, *Tanacetum vulgare* (common tansy), *Verbascum thapsus*, and *Artemisia absinthum* (absinth wormwood – designated noxious in North Dakota and Colorado) are all co-located with *Carex alopecoidea* in the same ecotype.

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

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

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

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



Left photo by Cheryl Mayer at *Epipactis gigantea* site EPGI-1 on July 2, 2007: orchid individual at right edge of photo is in healthy bloom while orchids in the center are brown and dried. Recent extended heat appeared to have caused the mortality. Right photos: the 10,300 acre Alabaugh Fire burned July 7-13, 2007 in areas immediately adjacent to Cascade Springs.

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

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

catastrophic disturbances in the area.

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. 2007 monitoring occurred before the fire (July 2). 2008 monitoring will begin evaluating effects of the fire.

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. Hell Canyon Ranger District is initiating 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)]. The project will start in 2008 with the collection of seeds for growing out at Bessey Nursery to provide local genetic, native plant restoration material.

As of 2001, the U. S. Geological Survey (USGS) gauging station at the southern end of J. H. Keith Cascade Springs Picnic Ground was discontinued. Permanent surface water transects were established in 2004 and data collected from annual readings in 2004, 2005, 2006, and 2007 (when the phenology of *Epipactis gigantea* was appropriate for monitoring). This protocol is not rigorous enough to determine cause and effect relationships relative to changes in water level and is only meant to document large changes in water levels in Cascade Creek. Recently, it has been learned that the USGS may reactivate the gauging station at the southern end of J.H. Keith Cascade Springs Picnic Ground in 2008 due to concerns on impacts to groundwater from the fire and current and expected future development in the southern Hills. Data from this gauging station will be incorporated into plant monitoring records when available.

The current monitoring design involves assessing the status of the Black Hills National Forest occurrence of *Epipactis gigantea* on an annual basis. The monitoring is designed to address six questions: 1) is the species present?; 2) is recreation or erosion resulting in losses of plants?; 3) are invasive plant species present in the site?; 4) are there any effects from weed treatment activities?; 5) is there evidence of change in the water table?; and 6) is there evidence of plant collection?

2007 Monitoring Design and Results Evaluation:

1. Monitor presence/absence of concentration areas of *Epipactis gigantea* on an annual basis. If a decline is observed, consult on a more rigorous design with the Rocky Mountain Research Station.

Cascade Springs and Cascade Falls were visited for monitoring on July 2, 2007. Recent extended heat caused uplands to appear quite dry. Vegetation of all types, including *Epipactis gigantea*, even a short distance from the creek seemed dry. Some *E. gigantea* plants (many with flowering heads) were totally brown and dead (some possible causes: water stress or disease). Overall, the site appeared stable relative to concentration areas mapped in previous years, although the density of *E. gigantea* plants seemed low and some small patches were missing where noted in previous years.

The Alabaugh Wildfire July 7 -13 burned 10,300 acres, including area adjacent to the Black Hills National Forest land at Cascade Springs. The Cascade Springs and Cascade Falls sites were not directly impacted. However, adjacent steep slopes were burned. A high precipitation event on August 3 caused sediment movement from surrounding burned hillsides into Cascade Creek and high flows, particularly at Cascade

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Falls. Erosion mats were placed on August 7 to limit additional runoff and sediment input to the creek. 2007 monitoring occurred on July 2, before the Alabaugh Fire. 2008 monitoring will begin evaluating effects of the fire. Preliminary conclusion from observational monitoring in late summer and fall at the sites is that this landscape is highly erosive and the plant species/communities present have adapted to occasional intense events. Long-term negative impacts from the fire are not expected but the site will continue to be monitored.

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

There is a nick point trail (observations indicate low use) that extends into an *Epipactis gigantea* patch at the uppermost headwater springs. Some trampling of orchids was observed in 2007. Recreation access through another nick point that was first documented during 2002 monitoring season has been limited by a fence that was constructed several years ago. In 2007, there was no evidence that the continuing recreational use on this nick point trail is extending into any *Epipactis gigantea* patches. A third nick point trail (first documented in 2000), continues to overgrow with shrubs and a tree was noted down on it in 2007. The trail leads to a cement platform below the nick point. Some trampling of orchids was observed in 2007. A very short nick point trail is defined near the gazebo (west of point RP6) and extends into a patch of *Epipactis gigantea*. Some trampling of orchids was observed in 2007.

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

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

On July 2, 2007, the two transects at Cascade Springs were read - water levels were documented at 0.5 m intervals. Transect No. 1 is the upstream transect; Transect No. 2 is downstream.

	2004 (July 2)	2005 (July 5)	2006 (July 14)	2007 (July 2)
Transect No. 1: Average stream depth (cm)	11.9	12.6	9.2	12.8
Transect No. 2: Average stream depth (cm)	21.5	27.6	25	22

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

In 2007, *Cirsium arvense* (Canada thistle) continues to be present along the stream, including individuals located in patches of *Epipactis gigantea*. *Cirsium vulgare* (bull thistle) is also intermingled with *E. gigantea*. *Elaeagnus angustifolia* (Russian olive) continues to be present at Cascade Springs. *Tamarix* spp. (salt cedar) was not present. Hell Canyon District staff spent one day at Cascade Springs handpulling weeds in 2007. In

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general, weed density continues to appear to be lower in the site than 2-3 years ago, likely due to consistent weed treatment efforts over a period of years. Hell Canyon District Botanist is leading a project to replace non-native tree species with natives. This project will take place over several years to avoid any drastic changes to the ecosystem (e.g. causing impacts to nesting birds, associated shade tolerant species, etc.). In 2008, seeds of native trees and shrubs will be collected from Cascade Springs area and sent to USFS Bessey Nursery in Nebraska for propagation. These materials for restoration will be developed and planted at Cascade Springs as non-native trees and shrubs are removed in future years.

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

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

No new erosion patches were observed in 2007 at any *Epipactis gigantea* concentration areas. The Alabaugh Wildfire (July 7-13, 2007) occurred after monitoring was accomplished on July 2, burning steep hillsides adjacent to Cascade Creek. A high precipitation event occurred August 3 that moved sediment into the creek. Erosion mats were placed in some areas to try and limit sediment input into Cascade Creek. Monitoring in 2008 will begin evaluating impacts of the fire at Cascade Springs and Cascade Falls. Preliminary conclusion from observational monitoring in late summer and fall at the sites is that this landscape is highly erosive and the plant species/communities present have adapted to occasional intense events. No long-term negative impacts from the fire are expected but the site will continue to be monitored.

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

There was no evidence of unauthorized collections of *Epipactis gigantea* at the time monitoring was completed in 2007.

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



(Photos by Beth Burkhart) Left: *Lycopodium complanatum* and *L. annotinum* plants at LYCO3-1/LYAN2-1 site on September 27, 2007. Right: New cattle trail in 2007 through LYCO3-8/LYAN2-4 site with plants and habitat trampled to bare ground - documented on September 24, 2007.

There are currently 8 known occurrences of *Lycopodium complanatum* on Black Hills National Forest. Prior to the 2004 monitoring season, there were four known occurrences of *Lycopodium complanatum* including

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one in an area burned by the Grizzly Gulch wildfire (2002). It is unknown what long-term effects the fire will have on the persistence of the species at this site so it is monitored annually. Two occurrences were discovered in 2004, 2 in 2005, and one in 2006 [Note: two adjacent sites were combined into one in 2005]. Three occurrences are located in an area with a significant amount of similar habitat (north-facing spruce (*Picea glauca*) slopes above small streams) that may reveal more occurrences when comprehensively searched.

The greatest risk identified to *Lycopodium complanatum* based on baseline data gathered from sites on Black Hills National Forest is the small number and limited size of occurrences. There are currently few apparent or ongoing risks to this boreal remnant species at known occurrences, but they are small enough that random events such as drought or fire could eradicate them. All of the more recently located occurrences are in active grazing allotments. There are risks to these occurrences from livestock trampling if new travel patterns develop and from invasive species in nearby surrounding areas.

The current monitoring design involves assessing the status of four core occurrences on an annual basis. The monitoring is designed to address five questions: 1) is the species present?; 2) is there evidence of contraction or expansion of the largest occurrence (LYCO3-1)?; 3) have invasive plant species invaded the site?; 4) are there any effects of weed treatment activities?; and 5) are there any impacts from livestock grazing (particularly, trails through sites)?

2007 Monitoring Design and Results Evaluation:

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

- LYCO3-1 (Sand Creek)
- LYCO3-4 (Grizzly Gulch/wildfire site)
- LYCO3-5 (Tillson Creek)
- LYCO3-8 (North Fork Rapid Creek)
- LYCO3-9 (Boundary Gulch/SD-WY state line)

Lycopodium complanatum was present at LYCO3-1 on September 27, 2007.

Lycopodium complanatum was present at LYCO3-4 on September 28, 2007.

Lycopodium complanatum was present at LYCO3-5 on September 24, 2007.

Lycopodium complanatum was present at LYCO3-8 on September 24, 2007. The site was severely negatively impacted in 2007 by livestock trailing directly through the site (resulting from new fence constructed on nearby private/Black Hills National Forest boundary). Northern Hills District range staff was notified about the situation.

Lycopodium complanatum was present at LYCO3-9 on July 13, 2007.

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

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

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

The monitoring protocol developed in 2005 by consultation with the Rocky Mountain Research Station to minimize damage to the LYCO3-1 site and increase repeatability of results was continued in 2007. The site appeared stable at all ten boundary markers and the extent of the site was stable. Consequently, according to the protocol, photographs/drawings were not retaken. There were a few new down trees near the site.

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

No noxious weeds were observed to occur within any of the *Lycopodium complanatum* sites in 2007.

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

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

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

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

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

No evidence was observed of weed treatment activity affecting any *Lycopodium complanatum* occurrences.

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

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

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

LYCO3-5 – Wildlife trails occur in and around some of the concentration areas. A few cowpies were observed in the vicinity of the occurrence but not in the site itself, indicating that livestock occasionally traverse the slope. LYCO3-5 is in an active grazing allotment upslope of a drainage bottom where livestock concentrate. While the spruce deadfall on the slope currently acts as an effective barrier, it is not a permanent barrier. The Northern Hills range program will monitor the LYCO3-5/LYAN2-3 occurrence for impacts from livestock grazing.

LYCO3-8 – The site is at the base of a slope where it meets the drainage bottom. In 2006, hummocking and bank-shearing from hoof action were observed in the adjacent riparian area. In 2007, severe impacts from livestock trailing through LYCO3-8 were observed including trampling of plants and habitat to bare ground.

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It appears that construction of a new fence on the private/Black Hills National Forest boundary to the east has changed livestock travel path so livestock follow the new fenceline and then walk through LYCO3-8 to reach the riparian area. This site is very small and fragile (moss cover 50-80%).

LYCO3-9 – No trails or other impacts from livestock grazing were observed in the site. The dense paper birch (*Betula papyrifera*)/hazelnut (*Corylus cornuta*) forest surrounding the site has discouraged access by livestock in the past. However, timber harvest in 2004 on the hillside adjacent to the site opened up skid trails that livestock now use, however, no increased impacts have been noted to date through monitoring.

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



Photos by Beth Burkhart. Left: 2007 typical condition of vegetative *Platanthera orbiculata* (one basal leaf) at site PLOR4-3 on August 16, 2007. Right: In 2007, the only *P. orbiculata* plants in reproductive status (pictured plant is in fruit) were observed in the Black Elk Wilderness - photo of plant at PLOR4-25 site on July 30, 2007.

Platanthera orbiculata is relatively secure in the Black Hills based on the large number of occurrences (greater than 30) that are distributed in three geographically separated regions on Black Hills National Forest, each within a different geological area: 1) Bearlodge Mountains, 2) northwestern Black Hills (contains the largest cluster of sites), and 3) Black Elk Wilderness. The species is present in patchy, scattered occurrences on shady, northwest to northeast facing slopes and draws in strong association with *Betula papyrifera* (paper birch)/ *Corylus cornuta* (hazelnut) and *Picea glauca* (white spruce) forests. The species persistence in the Black Hills is primarily limited by the small extent of cool, moist boreal habitat, although it appears to be secure on Black Hills National Forest at this time. Long-term droughts or dramatic climate changes characterized by drier and warmer conditions may present the greatest risk to *P. orbiculata* and its habitat.

Currently known occurrences are within active grazing allotments, with the exceptions of locations in the Black Elk Wilderness. Risks to most of the occurrences from this use are generally low because many of the sites are on steep slopes with dense shrub vegetation, both of which deter livestock. No ongoing recreational impacts have been documented at the Black Elk Wilderness occurrences, in spite of the close proximity of a hiking trail. Other potential future risk factors could include plant collection and invasion by noxious weeds.

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

The monitoring was designed to assess the status of the nine core occurrences on an annual basis. The monitoring addresses four questions: 1) is the species present?; 2) is there evidence of plant collecting?; 3) are noxious weeds and other invasive species established at the site?; and 4) are known occurrences in botanical areas (Bear/Beaver Gulches Botanical Area) grazed by livestock? Although the proposed monitoring focuses on the presence or absence of a given occurrence, a count of the number of individuals is made. If any of the core occurrences are not present when monitored, the reason will be documented if it can be determined and then randomly selected additional sites will be chosen to serve as core sites.

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

Monitoring occurred on the additional drought year monitoring sites in 2002, 2003, 2004, 2005, 2006, and 2007 because these years were considered drought years. Declines were documented in 2002, and declines in numbers occurred to a much greater extent in 2003, with plant numbers dropping to less than 10 aboveground individuals on a number of sites. Numbers of plants found in 2007 were similar to numbers in 2003, 2004, 2005, and 2006 (see table below). It is not known at this time how it may be determined whether absence is a result of dormancy or mortality.

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

The monitoring was designed to assess the status of the nine core occurrences on an annual basis. The monitoring addresses four questions: 1) is the species present?; 2) is there evidence of plant collecting?; 3) are noxious weeds and other invasive species established at the site?; and 4) are known occurrences in botanical areas (Bear/Beaver Gulches Botanical Area) grazed by livestock?

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1. Annually monitor presence/absence of known site locations in the Bearlodge Mountains: site numbers PLOR4-1, PLOR4-2 and PLOR4-3. If any of the core monitoring sites is not present (refer to

discussion above regarding climatic ties), document reason if it can be determined (i.e. drought, fire, noxious weeds).

Platanthera orbiculata was present at all three sites in 2007.

PLOR4-1: There was no evidence of livestock accessing the site.

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

Platanthera orbiculata was present at all three sites in 2007.

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 is not present (refer to discussion above regarding climatic ties), document reason if it can be determined (i.e. drought, fire, noxious weeds).

Platanthera orbiculata was present at all three sites in 2007.

PLOR4-19: There are indistinct trails and occasional cowpies in the site but no evidence of regular access of livestock to the site.

Hardwood restoration activities occurred at PLOR4-6 in 2004 [conifers were felled, skidded, and removed down the hillside on skid trails; mechanized equipment traversed a large proportion of the hillside, also removing paper birch (tree), beaked hazelnut (shrub), and herbaceous cover]. Only 2 *Platanthera orbiculata* individuals (vegetative) were observed in the treated area in 2005. In 2006, no *P. orbiculata* plants were observed in the treated area. In 2007, 2 vegetative individuals were found in a paper birch “island” of lower disturbance in the treated area. Monitoring results to date suggest that the hardwood restoration/treatment activities implemented were not beneficial to *P. orbiculata*. The canopy of the treated area is much more open, there is a large amount of ground disturbance, and there is a large amount of slash scattered over the ground. Continued monitoring is needed.

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

The year 2007 was classified as a drought year in western South Dakota and northeastern Wyoming (see General Information at beginning of this monitoring report). *Platanthera orbiculata* was present at the additional drought monitoring sites: PLOR4-21 and PLOR4-22. PLOR4-4 site was not monitored in 2007.

Individuals were counted at 11 sites. Relative to 2000 data, 2007 counts were lower on eight sites and higher on three sites. See table below for monitoring data summary.

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For seven of the eight sites with declining numbers, there was no evidence of physical disturbances that could have affected the number of individuals. At site PLOR4-6, canopy and soil disturbances associated with hardwood restoration activities occurred in 2004 and has likely affected the number of individuals observed.

At PLOR4-21, more evidence of livestock trailing through the site on the lower part of the slope was observed than in previous years. Livestock trails were noted cutting up and down the bank below the slope. The Northern Hills range program has been notified of the concern and possible adaptive management (e.g. livestock could be discouraged from trailing on the slope by blocking cutbank access with a few felled ponderosa pine trees).

Platanthera orbiculata counts at core monitoring sites during varying climatic conditions

Monitoring Years →	2000	2003	2004	2005	2006	2007
<i>Platanthera orbiculata</i> Site Numbers:	(Coming off a series of higher precipitation years)	(Drought year)	(Drought year)	(Drought year)	(Drought year)	(Drought year)
PLOR4-1 (Bearlodge RD)	44 (2001)	6	9	7	7	6
PLOR4-2 (Bearlodge RD)	37	11	15	19	17	11
PLOR4-3 (Bearlodge RD)	51	1	2	2	2	7
PLOR4-6 (Northern Hills RD)	26	5	9 (treatment occurred)	7 (5 in untreated area)	4 (all in untreated area)	7 (5 in untreated area)
PLOR4-12 (Northern Hills RD)	37	7	8	3	4	3
PLOR4-19 (Northern Hills RD)	78	86	92	93	131	130
PLOR4-23 (Hell Canyon RD)	8	16	29	27	32	6 (short search)
PLOR4-24 (Hell Canyon RD)	6	6	9	16	17	3
PLOR4-25 (Hell Canyon RD)	4	10	13	12	14	10
PLOR4-4* (Northern Hills RD)	14	1	3	5	6	not visited
PLOR4-21* (Northern Hills RD)	40	8	9	5	12	10
PLOR4-22* (Northern Hills RD)	1	1	3	3	3	3

*Additional sites monitored in drought years

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

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PLOR4-4 was not monitored in 2007.

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

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

PLOR4-2: No noxious weeds in the site.

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

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

PLOR4-12: No noxious weeds in the site.

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

PLOR4-23: No noxious weeds in the site.

PLOR4-24: No noxious weeds in the site.

PLOR4-25: No noxious weeds in the site.

PLOR4-4: Not monitored in 2007.

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

PLOR4-22: No noxious weeds in the site.

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

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



Left photo by Ken Marchand in November 2007: Aerial photo of McIntosh Fen [*Salix candida* site SACA4-1]. The area in center that looks like stitching is where metal plates were installed to slow water flow out of the fen through old drainage ditch. Right photo by Cheryl Mayer on August 15, 2007: *Salix candida* leaf with significant cover by willow rust (*Melampsora epita*).

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

Species assessments for *Salix candida* were completed in 2003 (Black Hills NF) and 2006 (Forest Service Region 2). Baseline data were collected for *Salix candida* in 2002 and 2003. Monitoring data were collected for *S. candida* from 2004 to 2007. As an obligate wetland species, the primary risk to *Salix candida*'s persistence and reproductive success is any lowering of the water table where it occurs, whether natural or human-induced. Noxious weeds or insect infestations have been identified as potential risks for this species. *Cirsium arvense* (Canada thistle) currently occurs within McIntosh Fen Botanical Area. Although high soil moisture levels in the fen itself appear to exclude *C. arvense* from the wettest part of *S. candida* habitat, *C. arvense* and *S. candida* occur within a foot of each other in drier *S. candida* locations. *Lythrum salicaria* (purple loosestrife) is not known to occur at McIntosh Fen, or anywhere close by, but is very aggressive and has the potential to out compete riparian natives, including *S. candida*. Insect infestations (willow borer) have been documented, in *S. candida* as well as other *Salix* species in McIntosh Fen and elsewhere in the Black Hills. Fishing occurs along Castle Creek (near the fen) in the McIntosh Fen Botanical Area, and a designated snowmobile trail crosses the Botanical Area but does not extend into either of the two subpopulations of the *S. candida* occurrence. No impacts have been documented to *S. candida* from either activity to date. Although minimal impacts have been documented from wildlife use and no impacts from livestock grazing (since designation of McIntosh Fen Botanical Area), both could be potential risks at the site.

Monitoring staff requested R2 Forest Health scientists to make a health assessment of willows at McIntosh Fen relative to insects and disease. The site was visited August 15, 2007. Observations were:

- 1) the most damaging agent was the poplar and willow borer (*Cryptorhynchus lapathi*). Branch/stem mortality was observed on all species of willow present, including *Salix candida* and *S. serissima*.
- 2) willow leaf rust (*Melampsora epita*) is present and affecting many individuals. In most cases, the rust was not significantly affecting the willow. However, a few willows were being significantly stressed (having 60% or more of their leaf surfaces affected).
- 3) other minor diseases and insect damage were observed.

Final management considerations in the assessment report included that weevil, rust, and other diseases and insects were not causing widespread damage to willows at McIntosh Fen. 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 willow 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.

Permanent water transects were placed in 2004 and data collected from a one-time reading each in 2004, 2005, 2006, and 2007 when the phenology of *Salix candida* is appropriate for monitoring. This protocol is not rigorous enough to determine cause and effect relationships relative to changes in water level. It is only meant to coarsely document changes in water level at McIntosh Fen. When piezometers are established, data generated on water levels will be incorporated into plant monitoring records.

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

Salix candida, *S. serissima*, and other willows propagated from material collected at McIntosh Fen were planted in 2007 by Mystic District personnel at a location on Heely Creek (about 5 miles from McIntosh Fen). The transplanted population is considered an experiment to see if propagation and transplant of *S. candida* and *S. serissima* are feasible. Altering natural distribution of native plant species is not a simple choice even when concerned about potential loss of species in the Black Hills (e.g. *Salix candida* is known from only one occurrence, *S. serissima* from 4 occurrences, *S. lucida* ssp. *caudata* from 2 occurrences) because patterns in natural distribution of species without mobility are valuable reflections of ecosystem change through time. The Heely Creek planting will be monitored by forest-wide as well as district programs. Plants will be protected from livestock grazing to meet BHNF Standard 2505e (see above) through use of a temporary fence for two to three years. After three years, if the *S. candida* and/or *S. serissima* occurrences have established, a permanent fence will be installed.

The current monitoring design involves assessing the status of the Black Hills National Forest occurrence on an annual basis. The monitoring is designed to address six questions: 1) is the species present?; 2) is there contraction or expansion occurring?; 3) are hydrological changes occurring?; 4) are invasive plant species present?; 5) are there any effects from weed treatment activities?; and 6) is any livestock grazing occurring on *S. candida* in McIntosh Fen Botanical Area?

2007 Monitoring Design and Results Evaluation:

- 1. On an annual basis at McIntosh Fen, GPS new endpoints of the occurrence if site size has changed. Revisit markers placed in 2005 around perimeter of the largest dense patches of *Salix candida*.**
 - **Collect data on the five nearby plants to each marker that were tagged in 2005 and note whether they are reproductive or vegetative.**
 - **Assess the condition of these plants and document the number of plants at each location that is observed to be affected by some agent (e.g. rust, willow borer, wildlife grazing, livestock grazing, etc.). Specify the agent that is observed. Document observations regarding whether *S. candida* occurrence at McIntosh Fen Botanical Area is grazed by livestock.**

There was no expansion or contraction of the SACA4-1 site at McIntosh Fen detected in 2006 when the site was monitored on June 6, 2007.

The twelve large plastic stakes installed at McIntosh Fen in 2005 (ten at the southern subpopulation and two at the northern subpopulation) were revisited on June 6, 2007. Five individuals tagged near each stake were relocated. Plants were in good flowering condition for identifying male vs. female plants. Notes were taken on 58 *Salix candida* plants: 36 female and 22 male individuals. The most striking observation was that 16 tags were found on dead branches that had to be moved to live branches (11 tags were moved from dead to

live branches in 2006). 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 (~28% plants with new dead branches) confirms monitoring observations that willow borer is having an impact on *Salix* species at McIntosh Fen. [Evidence of willow borer activity was noted on the bases of most dead branches observed.] A few *S. candida* individuals were observed that had been browsed by wildlife. Little rust was observed on *S. candida* in June 2006, however, more plants were observed impacted by rust at the time of Forest Health assessment on August 15, 2007.

Final management considerations from the assessment completed by Region 2 Forest Health scientists in 2007 on McIntosh Fen include that weevil, rust, and other diseases and insects were not causing widespread damage to willows at McIntosh Fen. 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 (botanist, hydrologist, and wildlife biologist) are working on a project at McIntosh Fen in consultation with Dr. David Cooper, Colorado State University, to improve site hydrology. In 2007, metal plates were installed on one old drainage ditch to slow water flow out of the fen. Piezometers will be installed in 2008 to track groundwater level changes and additional plates installed on other old drainage ditches.

There was no evidence of livestock grazing on *Salix candida* at the occurrence and no evidence that livestock had entered the fenced McIntosh Fen Botanical Area. 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 depth point water measurement transects at McIntosh Fen described under the monitoring design for *Salix serissima*. Transects should be read when *S. candida* is in good phenological stage for monitoring.

The permanent water transects at McIntosh Fen were read on June 6, 2007. General observation was that the fen area looked comparable to previous years.

In 2007 at the southern subpopulation of McIntosh Fen, there were five points with measurable aboveground water and six points documented with trace for water – out of a total of 125 depth point measurements collected along a transect length of 109 m. In 2006, there were five point with measurable aboveground water and eleven points with trace for water. In 2005, there were five points with measurable aboveground water and five points documented with trace for water. In 2004, nine points had measurable aboveground water.

In 2007, at the northern subpopulation at McIntosh Fen, four points had measurable aboveground water and three points had trace water – out of a total of 62 depth point measurements collected along a transect of 61 m. In 2006, four points had measurable aboveground water and four points had trace water. In 2005, nine points had measurable aboveground water and four points were documented with trace water. In 2004, three points had measurable aboveground. Part of the northern transect intersects a depression feature (most likely man-made) that was holding water in 2007 and 2005; the feature was dry in 2006 and 2004).

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

SACA4-1 McIntosh Fen site – *Cirsium arvense* (Canada thistle) is present in the same ecotype as *Salix candida*, within one foot of plants. It occurs in slightly drier areas where *S. candida* is at the edge of suitable

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habitat. Mystic Ranger District has treated *C. arvensis* in the uplands of McIntosh Fen in previous years, but not in 2006 or 2007. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

Sensitive Species: *Salix serissima* (*autumn willow*)



Left photo by Cheryl Mayer at McIntosh Fen *Salix serissima* site SASE2-1 on August 15, 2007: willow borer larva in base of *S. serissima* branch. Right photo by Beth Burkhart at Middle Boxelder *S. serissima* site SAS2-2 on June 21, 2007: healthy leaves and catkins were produced in spring 2007 but on some *S. serissima* plants they browned and died before maturity due to willow borer activity.

There are currently 4 known occurrences of *Salix serissima* on Black Hills National Forest. Until 2002, a single occurrence of *S. serissima* was known to occur at McIntosh Fen Botanical Area. A second occurrence was discovered in 2002 within a fenced enclosure along Middle Boxelder Creek. In 2004, botanical survey for range management discovered two new occurrences of *S. serissima* – near Nahant and on Silver Creek. Both sites were visited and baseline data collected in 2005.

Because *Salix serissima* is an obligate wetland species, the primary risk to its persistence and reproductive success is any lowering of the water table where it occurs, whether it is natural or human-induced. Noxious weeds and fungal infections or insect infestations have been identified as concerns for this species. *Cirsium arvensis* (Canada thistle) currently occurs within the McIntosh Fen Botanical Area. Although high soil moisture levels in the fen itself appear to exclude *C. arvensis* from the wettest part of *S. serissima* habitat, *C. arvensis* and *S. serissima* occur within a foot of each other in drier *S. serissima* locations. *Lythrum salicaria* (purple loosestrife) is not known to occur at any of the sites, or anywhere close by, but is very aggressive and has the potential to out compete native riparian species, including *S. serissima*. A fungal infection was noted on the leaves of *S. serissima* at McIntosh Fen in 2001 through 2007 and willow borer has been documented at both McIntosh Fen and Middle Boxelder Creek occurrences. A willow defoliator beetle was observed at Middle Boxelder Creek occurrence in 2006. Fishing occurs along Castle Creek (near the fen) in the McIntosh Fen Botanical Area. A designated snowmobile trail crosses the Botanical Area but does not extend into the *S. serissima* occurrence. At this time, no impacts have been documented to *S. serissima* from either activity.

Wildlife use and cattle use are a potential risk at all *S. serissima* sites. The enclosure at Middle Boxelder Creek site was expanded in 2007, but livestock accessed the enclosure for 2 weeks in September/October 2007. Areas at the spring source were trampled to bare ground and livestock trampled and grazed *S. serissima* individuals. Cattle accessed *S. serissima* in the enclosure at Middle Box Elder Creek in 2005 and negatively impacted *S. serissima* and its habitat, but the fence was repaired and cattle excluded in 2006. District records

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indicate that livestock have accessed Middle Boxelder enclosure at least every other year since it was built in the late 1990's. Cattle had not been restricted from Silver Creek fen until an enclosure was built in 2007. Monitoring in 2005 and 2006 documented livestock access to *S. serissima* at Silver Creek with negative impacts to *S. serissima* and its habitat. The enclosure built in 2007 successfully restricted livestock at Silver Creek site in 2007. The occurrence near Nahant is in a low area bounded by a paved road and a steep rocky outcrop. There is no evidence of recent or current livestock use of the low area and it appears the occurrence location is restricted from livestock by physical boundaries.

Species persistence concerns for willow emphasis species on Black Hills NF (*Salix candida*, *S. serissima*, and *S. lucida* ssp. *caudata*) led to BHNF Standard 2505 e directing that no authorized utilization will be allowed by domestic livestock on known occurrences of these species. Adaptive management by the Black Hills National Forest range program will follow through with fencing, monitoring, and actions so management meets Standard 2505e in the Middle Boxelder (SASE2-2) and Silver Creek (SASE2-4) occurrences of *S. serissima*.

Monitoring staff requested R2 Forest Health scientists to make a health assessment of willows at McIntosh Fen relative to insects and disease. The site was visited August 15, 2007. Conclusions reported on previous pages (*salix candida*).

Two permanent water transects were established at McIntosh Fen and one transect at Middle Boxelder site in 2004. Data is collected when *S. candida* is in good phenology for monitoring (*S. serissima* is generally at best phenology for monitoring in mid June to mid July). This protocol is not rigorous enough to determine cause and effect relationships relative to changes in water level. It is only meant to coarsely document surface water level. When piezometers are established in McIntosh Fen, data generated on water levels will be incorporated into plant monitoring records.

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

Salix candida, *S. serissima*, and other willows propagated from material collected at McIntosh Fen were planted in 2007 by Mystic District personnel at a location on Heely Creek (about 5 miles from McIntosh Fen). The transplanted population is considered an experiment to see if propagation and transplant of *S. candida* and *S. serissima* are feasible. Altering natural distribution of native plant species is not a simple choice even when concerned about potential loss of species in the Black Hills (e.g. *Salix candida* is known from only one occurrence, *S. serissima* from 4 occurrences, *S. lucida* ssp. *caudata* from 2 occurrences) because patterns in natural distribution of species without mobility are valuable reflections of ecosystem change through time. The Heely Creek planting will be monitored by forest-wide as well as district programs. Plants will be protected from livestock grazing to meet BHNF Standard 2505e (see above) through use of a temporary fence for two to three years. After three years, if the *S. candida* and/or *S. serissima* occurrences have established, a permanent fence will be installed.

Monitoring for *Salix serissima* was designed to address four questions at each occurrence: 1) is the species present?; 2) is occurrence contraction or expansion occurring?; 3) are hydrological changes occurring?; and 4) have invasive plant species or other disturbance agents impacted the site?

2007 Monitoring Design and Results Evaluation:

1. At McIntosh Fen, GPS new endpoints of subpopulations if site size has changed. Revisit the ten stakes placed in 2005 around the perimeter of the largest dense patches of *Salix serissima* at both subpopulations. Assess the condition of the two to six plants chosen and tagged in the vicinity of each stake; document the number of plants at each location that is observed to be affected by some agent

(e.g. rust, willow borer, livestock grazing, wildlife grazing, etc.). Specify the agent that is observed. Document observations regarding whether *S. serissima* occurrence at McIntosh Fen Botanical Area is grazed by livestock.

There was no expansion or contraction of the SASE2-1 site at McIntosh Fen detected in 2007.

The ten large plastic stakes installed at McIntosh Fen in 2005 (at the southern subpopulation) were revisited on June 6, 2007. The two to six *Salix serissima* individuals tagged near each stake were relocated. Plants were in good flowering condition for identifying male vs. female plants (male plants appeared to be near maximum of flowering activity). Notes were taken on 50 *Salix serissima* plants in 2007: 17 female, 10 male, and 23 vegetative individuals. Three tags were found on dead branches of plants and moved to live branches (2005 protocol states that tags will be placed on live branches). Evidence of willow borer was noted at the bases of most dead branches. There were also other qualitative observations of willow borer impacts to plants. In 2006, three tags were found on dead branches of plants and had to be moved to live branches. The data (~6% plants with new dead branches each year) appears to confirm monitoring observations that willow borer is having an impact on *Salix* species at McIntosh Fen. 74% of plants were observed to have some rust.

Final management considerations from assessment by Region 2 Forest Health scientists at McIntosh Fen completed August 15, 2007 include that weevil, rust, and other diseases and insects were not causing widespread damage to willows at McIntosh Fen. 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 (botanist, hydrologist, and wildlife biologist) are working on a project at McIntosh Fen in consultation with Dr. David Cooper, Colorado State University, to improve site hydrology. In 2007, metal plates were installed on one old drainage ditch to slow water flow out of the fen. Piezometers will be installed in 2008 to track groundwater level changes and additional plates installed on other old drainage ditches.

There was no evidence of livestock grazing on *Salix serissima* 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. At Middle Boxelder Creek, Nahant, and Silver Creek, GPS new endpoints if *Salix serissima* site boundaries have changed. Count individuals during the blooming period (documenting total number of individuals and total number of reproductive individuals). Document the number of plants observed to be affected by some agent (e.g. rust, willow borer, livestock grazing, wildlife grazing, etc.). If the number of individuals declines by more than 10% at the Middle Boxelder Creek occurrence, consult on monitoring design with the Rocky Mountain Research Station.

The Middle Boxelder site (SASE2-2) was visited June 21, 2007. The site boundaries have not changed but the site does not appear healthy – mainly due to overall dry site condition and many *Salix* species individuals affected by willow borer. Thirteen *S. serissima* individuals were observed (4 female, 4 male, and 5 vegetative). Willow borer activity was noted in the site. In 2006, twelve *S. serissima* plants were found. In 2005, fourteen *S. serissima* plants were found. The variability in plant numbers is caused by most of the plants occurring in an area where there is a thick tangle of multiple *Salix* species with many plants about the same height.

The Middle Boxelder enclosure was expanded in 2007 to include more of the spring source area. However, livestock accessed the enclosure in September/October 2007 for 2 weeks before BHNFB botanists reported

their presence. Northern Hills range staff arranged for the permittee to remove the livestock and the fence was repaired by district personnel. The area around the spring was trampled to bare ground and *Salix serissima* and other willows were trampled and grazed. Livestock also accessed the site in 2005; no livestock were observed in the site in 2006. Forest Plan Standard 2505 e directing no utilization of *S. serissima* by domestic livestock is not yet being met on a consistent basis at this site.

The Nahant site (SASE2-3) was visited June 13, 2007. The two male plants documented in 2005 and 2006 were observed in 2007 (catkins present and at full maturity). There is some evidence of willow borer on the *S. serissima* individuals as well as other *Salix* species individuals. No rust was observed. No livestock were observed in the site but 3 cowpies from this year were found.

The Silver Creek site (SASE2-4) was visited June 21, 2007. The six individuals documented in 2005 and 2006 (5 females, 1 male) were observed in 2007. Evidence of willow borer was observed on *Salix serissima* individuals as well as other *Salix* species individuals. Both large *S. serissima* plants (one male and one female) had many dead branches. There are wildlife trails in the site (identified as a fen in 2006 during consultation with Dr. David Cooper of Colorado State University). The site was not fenced at this time but livestock had not yet been in the surrounding pasture. Monitoring staff and Northern Hills District range staff visited the site on July 12, 2007 to determine an appropriate enclosure. New fence was constructed to tie into existing fence before livestock were turned into the pasture so there were no impacts to *S. serissima* in Silver

Creek Fen in 2007 (site was visited again October 10, 2007). Forest-wide and district monitoring will be required to ensure fence integrity so Forest Plan Standard 2505e (see above) will be consistently met at this site.

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

The permanent water transects at McIntosh Fen were read on June 6, 2007. General observation was that the fen area looked comparable to previous years.

In 2007 at the southern subpopulation of McIntosh Fen, there were five points with measurable aboveground water and six points documented with trace for water – out of a total of 125 depth point measurements collected along a transect length of 109 m. In 2006, there were five point with measurable aboveground water and eleven points with trace for water. In 2005, there were five points with measurable aboveground water and five points documented with trace for water. In 2004, nine points had measurable aboveground water.

In 2007, at the northern subpopulation at McIntosh Fen, four points had measurable aboveground water and three points had trace water – out of a total of 62 depth point measurements collected along a transect of 61 m. In 2006, four points had measurable aboveground water and four points had trace water. In 2005, nine points had measurable aboveground water and four points were documented with trace water. In 2004, three points had measurable aboveground. Part of the northern transect intersects a depression feature (most likely man-made) that was holding water in 2007 and 2005; the feature was dry in 2006 and 2004).

On June 21, 2007 the permanent water transect at Middle Fork Boxelder Creek site was read. Six points had measurable aboveground water out of a total of 38 depth point measurements collected along a transect of 19.55m. In 2006, five points had measurable water; in 2005, five points had measurable water; and in 2004, four points had measurable water – collected along the same transect of 19.55 m.

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

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

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

Nahant site (SASE2-3) – *Leucanthemum vulgare* (ox-eye daisy) is thick above the drainage bottom (approximately 10 m from *S. serissima* plants). *Linaria vulgaris* is found further away from *S. serissima* plants, scattered below the road. No effects of weed treatment have been observed to date.

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

No evidence was observed of weed treatment activity affecting any *Salix serissima* occurrences except SASE2-1 where weeds have been treated in the uplands around McIntosh Fen (this has reduced weed seed introduced into McIntosh Fen).

Sensitive Species: *Sanguinaria canadensis* (bloodroot)



Photos by Cheryl Mayer: left – vegetative *Sanguinaria canadensis* shaded by downed log at site SACA13-9 on May 18, 2007; right – large fruit of *S. canadensis* at site SACA13-9 in 2007.

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Sanguinaria canadensis, occurring in the northern/northeastern Black Hills, is one of the most abundant R2 sensitive plant species on Black Hills National Forest. There were 22 known occurrences of *S. canadensis* on Black Hills National Forest lands at the time that a Black Hills NF species assessment was written (Hornbeck et al. 2003). *Sanguinaria canadensis* occurs in hardwood forests, shrub thickets and floodplain habitats. The species is considered secure on the forest at this time. Persistence of *S. canadensis* on Black Hills National Forest is not currently considered at risk from livestock grazing because nine sites are currently not grazed and one site is not accessible to livestock. Timber harvest is generally not deemed a persistence risk to *S. canadensis* because occurrences are currently being avoided or mitigated, or vegetative treatments may be designed to benefit the species. Collection (or illegal *S. canadensis* harvest) is not currently an issue in the Black Hills.

Black Hills National Forest's approach for monitoring *Sanguinaria canadensis* to answer questions on species persistence involved selecting core occurrences using four criteria: size (estimated number of individuals), geographic distribution of the occurrence, potential risk from livestock grazing, and community type. The largest estimated number of individuals observed at a given site was a primary factor used in delineating potential core occurrences. Eight core occurrences were selected. Of these, 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.

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

Core monitoring sites designated as key (populations over 1,000 individuals) for *Sanguinaria canadensis*:

1. *S. canadensis* site SACA13-1 (False Bottom site)
2. *S. canadensis* site SACA13-2 (Lost Gulch/Pillar Peak Allotment site)
3. *S. canadensis* site SACA13-3 (Meadow Creek site)
4. *S. canadensis* site SACA13-14 (Park Creek site)

Remainder of core monitoring sites for *Sanguinaria canadensis*:

5. SACA13-4 (Deadman Gulch – south site)
6. SACA13-5 (Deadman Gulch – central site)
7. SACA13-9 (North Deadman Gulch tributary site)
8. SACA13-10 (Boulder Canyon site)

2007 Monitoring Design and Results Evaluation:

1. Annually monitor presence/absence of the 4 core sites considered key because of large population size. If relocated, collect data (5-page form). If the occurrence boundary has changed, gather GPS data at the endpoints if the site is large (over ½ acre) or collect GPS points if the site is less than ½ acre.

Sanguinaria canadensis was present at all four core monitoring sites considered key due to large population size in 2007 (SACA13-1, SACA13-2, SACA13-3, SACA13-14). Occurrence extent at all these sites was comparable to previous years (i.e., no new endpoints were GPSd).

Meadow/hardwood enhancement activity occurred at SACA13-14 a few weeks before the site was monitored

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in May 2006. While dropping conifers (spruce and pine) in *S. canadensis* sites may improve habitat by reducing permanent shade, trees were dropped directly on *S. canadensis* plants/populations. Monitoring on May 18, 2007 documented that some *S. canadensis* plants were negatively impacted by the management activity in 2006, but population overall is healthy. Some *S. canadensis* plants were observed coming up through the conifer slash.

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

2007 was a drought year. Core sites SACA13-4, SACA13-5, SACA13-9 and SACA13-10 were monitored during 2007 (in addition to the four core sites considered key due to large population size [see Item 1 above]) and were present at extents comparable to previous years.

3. Document any noxious weeds or invasive species at the core monitoring 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 are occupying the same ecological type. Use this information to develop a weed strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

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

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

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

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

No evidence was observed of weed treatment activity affecting any *Sanguinaria canadensis* occurrences. Noxious weeds are a growing concern in the key *S. canadensis* sites. Black Hills National Forest plant monitoring personnel are working on developing a strategy with prioritization for weed treatment in all R2 sensitive and SOLC plant occurrences. Monitoring the success of weed treatment as well as possible impacts to the health/vigor of *S. canadensis* sites will be critical to successfully developing effective treatments that conserve *S. canadensis* while reducing weed populations/sources.

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

There was no evidence of collection at any of the four core monitoring sites designated as key in 2007.

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



Photos by Cheryl Mayer at *Viola selkirkii* site VISE2-13 on June 5, 2007. Left: erosion channel in loose granitic soil in site. Right: handpulling weeds in the site (*Cirsium arvense*, *Cirsium vulgare*, *Verbascum thapsus*).

Thirteen occurrences of *Viola selkirkii* are known to occur in four distinct watersheds in the Black Hills National Forest, within the Black Elk Wilderness and Norbeck Wildlife Preserve. Additional occurrences are known from Custer State Park and Mt. Rushmore National Memorial in the Black Hills. A *V. selkirkii* occurrence was confirmed in 2004 in the Upper Pine Creek Research Natural Area and it was noted that part of the occurrence was inside the Elkhorn Mountain Fire area. The occurrence was revisited in 2005, 2006, and 2007 to observe impacts from the fire. Because additional potential habitat is believed to occur in relatively remote areas of the Black Elk Wilderness, there may be additional occurrences of *V. selkirkii* yet to be discovered and documented.

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

The current protocol design includes annual monitoring of the VISE2-2 occurrence in the Norbeck Wildlife Preserve. VISE2-2 site was selected because it is one of the three largest occurrences of *Viola selkirkii* on Black Hills National Forest lands, it is relatively accessible, and it has the largest combination of potential risks from hikers, elk, random events (i.e. wildfire, flooding), and invasive plant species (includes noxious weeds). Annual monitoring of the VISE2-11 occurrence is included in the protocol because of the combination of potential risks associated with powerline activities and human trampling disturbances. Although no weeds were observed at VISE2-11 site, there is potential for increase in invasive plant species. Further, because these are two of the lowest elevation sites, it is likely that any declines associated with drought conditions would occur here before occurring at higher elevations. VISE2-1 and VISE2-11 are used as triggers for determining if additional occurrences should be monitored. The decision for additional monitoring is based on whether there is an absence of one or more of the four largest sub-occurrences (there are nine distinct sub-occurrences) at the VISE2-2 site, or the absence of one of the two sub-occurrences at the VISE2-11 site.

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The current monitoring design involves assessing the status of three of the largest occurrences on an annual basis. The monitoring is designed to address four questions: 1) is the species present?; 2) are invasive plant species present in the site?; 3) has treatment of invasive plant species affected the occurrence?; and 4) has a flood or fire event affected an occurrence?

2007 Monitoring Design and Results Evaluation:

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

Monitoring of *Viola selkirkii* at site VISE2-2, occurred on May 23, 2007. The four largest sub-occurrences were present.

Monitoring of *Viola selkirkii* at site VISE2-11 (Sunday Gulch) occurred on June 14, 2007. Both sub-occurrences were present as well as individuals and patches between the sub-occurrences, extending into Custer State Park. The site extends along a power line. Trees have been trimmed under the powerline and some of the spruce areas thinned for fuels reduction. Much of the resulting slash was piled in 2004-2005, including some in the drainage bottom in mossy areas under spruce. Some of the piles were within a few feet of *V. selkirkii* patches and some were covering *V. selkirkii* plants. Monitoring staff expressed concern to Hell Canyon District staff in June and revisited the site in September to scatter two slash piles that were right next to/on *V. selkirkii* patches. Slash piles in the area were not burned by monitoring time in 2007.

All Black Hills NF *Viola selkirkii* occurrences will be revisited in 2008.

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

In the VISE2-2 site, *Cirsium arvense* (Canada thistle; SD and WY noxious weed) was observed to occur in small patches approximately 10 ft from *Viola selkirkii* individuals (based on identification of weed material left from last year). Other invasive plant species observed occurring in the same ecotype were *Cirsium vulgare* (bull thistle; within 5 ft of *V. selkirkii* plants) and *Caragana arborescens* (Caragana; adult plants scattered throughout the drainage; new plants becoming established). The Caragana was reported to Hell Canyon Ranger District staff in 2004 and treatment is on their list of projects, but it didn't appear in 2007 that any work had been accomplished.

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

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

- a) *Cirsium arvense* (Canada thistle). A few *C. arvense* were found on the edge of the burned area, some intermingled with *V. selkirkii* individuals. *Cirsium arvense* occurs upslope from the large *V. selkirkii* patches, so there is high potential for the species to spread down-drainage into the site. Observers spent time handpulling all the small *C. arvense* plants that could be spotted in 2005, 2006, and 2007. It appears the weed pulling is effective based on the low number of remnant adult plants but the seed source from adjacent fire area is huge.
- b) *Verbascum thapsus* (common mullein). Several plants were observed approximately 20 ft from *Viola selkirkii* plants. Time was also spent handpulling *Verbascum thapsus* in 2007. Dense patches of *V. thapsus* were observed in the fire area, which provide a ready seed source to the occurrence site.
- c) *Cirsium vulgare* (bull thistle). A few rosettes were found in the occurrence area, approximately 20 ft from *V. selkirkii* plants. *Cirsium vulgare* plants were handpulled in 2005, 2006, and 2007.

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

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

Site VISE2-13 (which was partially burned in the Elkhorn Mountain Fire of October 9, 2003) was revisited and observed on June 5, 2007. *Viola selkirkii* is very dense in areas. It does not appear that the site was adversely affected by the direct effects of the fire. In 2005, it was observed that most plants occurred out of the actual burned area although several plants were seen coming up in burned ground (> 50 plants). In 2006 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. No abnormal flooding was apparent, but the nature of the site (e.g., loose granitic soil, lots of gullies for runoff) appears conducive to a possible flooding event. Several invasive plant species (discussed above) were found in the same ecotype as *V. selkirkii*. Their density in the site appears to be an indirect effect of the disturbance caused by the fire – a result of the massive seed source produced by the frequent patches of these species in the surrounding burned area.

No other occurrences were known to be affected by a flood or fire event prior to the monitoring period. No flood or fire disturbances were observed at any of the *V. selkirkii* sites monitored in 2007.

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

In general, as identified in the monitoring designs, the main focus for the 2007 monitoring season was to attempt to relocate a number of previously reported locations of the following species and to find new locations. Plans included gathering baseline data and assessing risks at occurrences that were relocated/discovered.

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



Left photo by Cissie Buckert: *Botrychium campestre* with mature spores at BOCA5-9 site on June 7, 2007. Right photo by Cheryl Mayer: *Botrychium campestre* at BOCA5-8 on June 14, 2007

There are currently 7 known occurrences of *Botrychium campestre* on Black Hills National Forest. *Botrychium campestre* was confirmed in March 2006 (through genetic analysis by Dr. Don Farrar, Iowa State University) to occur on the Black Hills National Forest at two locations (one in previously known *B. lineare* site BOLI7-1 on the Bearlodge Ranger District in Wyoming and one at new location on Hell Canyon Ranger District in South Dakota). Two locations were also found and confirmed by Dr. Farrar in 2005 at Wind Cave National Park (one location with *B. lineare* as well as *B. campestre*). Baseline data were gathered at these sites in 2005. Four new occurrences were discovered by Dr. Farrar and Black Hills NF staff in 2006 (one in the Bearlodge Mountains of Bearlodge Ranger District; one adjacent to Mystic District on private land on the eastern flank of the Black Hills; and two on Hell Canyon Ranger District, one estimated to have approximately 1,000 individuals and including both *B. campestre* and *B. lineare*). Two new occurrences were discovered by Black Hills NF staff in 2007 (one on Hell Canyon Ranger District and one on Bearlodge Ranger District). As with other *Botrychium* species, dry conditions are expected to limit the emergence of aboveground stems and individuals may not emerge during a succession of dry or drought years.

2007 Monitoring Design and Results Evaluation:

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

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All *Botrychium campestre* occurrences on Black Hills National Forest were not revisited in 2007 (BOCA5-5 and BOCA5-7 were not revisited). It was determined that the time available for survey was better spent searching suitable habitat for new occurrences and revisiting only a subset of the known sites.

BOCA5-1 – Revisited May 28, 2007. Extent of site and population number determined to be comparable to 2006. No changes in disturbance regime were observed.

BOCA5-6 – Revisited May 29, 2007. Some thinning piles had been burned on the slope since 2006 but none directly on known concentration areas of *Botrychium campestre* and *B. lineare*. A large track vehicle had been driven over parts of the slope. There did not appear to be any major impacts to *B. campestre/B. lineare* from this activity. In 2007, a large crew of 20 people allowed for survey of a much larger area than that searched in 2006. By the end of the survey, more than 300 flags were used to mark individuals or groups of individuals. Dr. Farrar collected 55 specimens from numerous concentration areas to further his research on *Botrychium campestre* and *B. lineare*. One result of his genetic analysis of this material was support of his taxonomic research hypothesis that these species may best be regarded as varieties of a species rather than separate species. Dr. Farrar will be publishing his results and taxonomic conclusions in the coming years. The area in and around BOCA5-6 site was prescribed burned in November 2007. One major concentration area of *B. campestre* and *B. lineare* was excluded from burning but all other areas were burned. Dr. Farrar was consulted about the impacts of fire to *B. campestre/B. lineare* before the fire plan was finalized. His suggestion was that these species evolved in grassland with fire as a natural dynamic and that fire, especially fire in the fall after spore release, should not be detrimental to the occurrence. He has observed *Botrychium* spp. populations in other parts of the country undergo a great flush of growth after wildfire. Dr. Farrar will be returning to the Black Hills in May 2008 to observe the results of fire at the BOCA5-6 site.

BOLI7-1 – Revisited June 26, 2007. Extent of site and population number determined to be comparable to 2006. No changes in disturbance regime were observed.

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

BOCA5-8 – Site discovered on June 14, 2007 (*Botrychium campestre* confirmed by genetic analysis). The site is a northeast-facing lower slope with western snowberry (*Symphoricarpos occidentalis*) shrub cover and a good diversity of native forb species. The occurrence is in an active livestock grazing allotment.

BOCA5-9 – Site discovered on June 7, 2007 (*Botrychium campestre* confirmed by genetic analysis). The site is dry with little bluestem (*Schizachyrium scoparium*) and blue grama (*Bouteloua gracilis*) and a dense litter layer. There is also good diversity of native forb species. The only use of the site currently is recreation.

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

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

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

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

BOCA5-8: *Cynoglossum officinale* (houndstongue) observed approximately 3 m from *Botrychium campestre* plants in same ecological type.

BOCA5-9: No noxious weeds noted.

BOLI7-1: *Cynoglossum officinale* (houndstongue) and *Tanacetum vulgare* (common tansy) were observed to be occasional in the same ecological type as *Botrychium campestre*.

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

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



Photos by Cheryl Mayer of site BOLI7-2. Right: old logging road on July 28, 2005 where *Botrychium lineare* plants were discovered in May 2005; road was used for fire suppression activities in July 2005. Left: revegetation on old logging road on June 19, 2007 – no *B. lineare* plants were located in 2006 or 2007 but Dr. Don Farrar (Iowa State University) suggests the occurrence may still be recovering belowground; monitoring of the site will continue.

There are currently 5 known occurrences of *Botrychium lineare* on Black Hills National Forest. *Botrychium lineare* was determined in December 2003 to occur on the Black Hills National Forest at a single location in the Bearlodge Ranger District in Wyoming. Three locations were found in 2005 – one in Bearlodge Ranger District (Wyoming), one in Hell Canyon Ranger District (South Dakota), and one in Wind Cave National Park (South Dakota). One location was found in 2006 – on Hell Canyon Ranger District (South Dakota). One location was found in 2007 – on Mystic District (South Dakota) (Note: all identifications have been confirmed by genetic analysis by Dr. Don Farrar, Iowa State University).

Baseline data were gathered at sites in 2003, 2004, 2005, 2006, and 2007. As with other *Botrychium* species, dry conditions are expected to limit the emergence of aboveground stems and individuals may not emerge during a succession of dry or drought years.

2007 Monitoring Design and Results Evaluation:

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

BOLI7-1 – Revisited June 26, 2007. Extent of site and population number determined to be comparable to 2005. No changes in disturbance regime were observed.

BOLI7-2 – Revisited June 19, 2007. The occurrence was drastically changed by firefighting, rehab, and follow-up engineering activities related to the Cement Fire in late July 2005 (occurrence discovered in May 2005). The old roadbed was bladed to bare ground and there was vehicle traffic on the road for several months before it was closed off again. The slopes adjacent to the roadbed were burned. Pin flags marking *Botrychium lineare* individuals survived the disturbances but no plants were found in 2006 or 2007. There was significant cover of herbaceous species on the roadbed in 2007. However, the species composition is quite different than before the fire activity (currently more early colonizing and weed species). Dr. Farrar suggests that *B. lineare* may be in recovery mode. Compaction may have broken mycorrhizal fungi connections that could take several years to reestablish. Dr. Farrar suggests checking the site for several years to see if the occurrence is persisting or not.

BOCA5-1: Revisited May 28, 2007. Extent of site and population number determined to be comparable to 2005. *Botrychium campestre* and *B. lineare* both present. No changes in disturbance regime were observed.

BOCA5-6 – Revisited May 29, 2007. Some thinning piles had been burned on the slope since 2006 but none directly on known concentration areas of *Botrychium campestre* and *B. lineare*. A large track vehicle had been driven over parts of the slope. There did not appear to be any major impacts to *B. campestre/B. lineare* from this activity. In 2007, a large crew of 20 people allowed for survey of a much larger area than that searched in 2006. By the end of the survey, more than 300 flags were used to mark individuals or groups of individuals. Dr. Farrar collected 55 specimens from numerous concentration areas to further his research on *Botrychium campestre* and *B. lineare*. One result of his genetic analysis of this material was support of his taxonomic research hypothesis that these species may best be regarded as varieties of a species rather than separate species. Dr. Farrar will be publishing his results and taxonomic conclusions in the coming years. The area in and around BOCA5-6 site was prescribed burned in November 2007. One major concentration area of *B. campestre* and *B. lineare* was excluded from burning but all other areas were burned. Dr. Farrar was consulted about the impacts of fire to *B. campestre/B. lineare* before the fire plan was finalized. His suggestion was that these species evolved in grassland with fire as a natural dynamic and that fire, especially fire in the fall after spore release, should not be detrimental to the occurrence. He has observed *Botrychium* spp. populations in other parts of the country undergo a great flush of growth after wildfire. Dr. Farrar will be returning to the Black Hills in May 2008 to observe the results of fire at the BOCA5-6 site.

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

BOLI7-3 – The site was discovered on July 11, 2007 (*Botrychium lineare* confirmed by genetic analysis). The site is adjacent to a small perennial stream in a drainage bottom. Western snowberry (*Symphoricarpos occidentalis*) occurs in scattered patches and herbaceous cover is thick. The site is in an active livestock allotment.

Potential risks to *Botrychium lineare* and *B. campestre* at known locations on Black Hills National Forest, as determined through discussion with Dr. Farrar, could include succession of the sites to later vegetative

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successional stages, changes to the hydrology of the sites, noxious weed invasion, or alterations from the small amounts of low level disturbances currently existing at the sites.

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

BOLI7-1: *Cynoglossum officinale* (houndstongue) and *Tanacetum vulgare* (common tansy) were observed to be occasional in the same ecological type as *Botrychium lineare*.

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

BOLI7-3: *Cirsium arvense* (Canada thistle) and *Carduus nutans* (musk thistle) present within 100 m of *Botrychium lineare*.

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

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

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

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



Left photo by Cheryl Mayer on June 12, 2007: habitat at *Cypripedium parviflorum* site CYPA19-27. Right photo by Susan Corey on June 8, 2007 in Dugout Gulch Botanical Area (CYPA19-21): *Cypripedium parviflorum* plant in bloom.

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

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Cypripedium parviflorum is found on 3 of the 4 ranger districts of the Black Hills National Forest (Bearlodge, Mystic, and Northern Hills) and occurrences are located in 20 different 6th level watersheds. An estimate of the total number of individuals on the Forest is about 4,000.

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

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

2007 Monitoring Design and Results Evaluation:

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

In balancing monitoring workload, we invoked the 2007 Prioritization Strategy to determine that survey/monitoring of other species were of higher priority than documenting 5 new occurrences of *Cypripedium parviflorum*. (From 2007 Prioritization Strategy: “Given the number of low priority indicators, the number of known sites, the widely dispersed geographical distribution, the discovery of additional occurrences in 2004, 2005, and 2006, the likelihood the species is under reported from remote areas, the fact that it has not been targeted for survey until the recent last few years, and the low levels of risk, this species was placed into the *Low* priority category for monitoring.”)

In 2007, two *Cypripedium parviflorum* sites were visited. Baseline data were collected at one previously reported site in 2007 and one site was revisited in Dugout Gulch Botanical Area (baseline data collected in 2005). Twenty-five occurrences were discovered during botanical surveys to support timber project planning and will be available for baseline data collection in 2008.

The occurrence documented on Iron Creek at CYPA19-27 that was visited June 12, 2007 included 6 individuals. However, GIS points from Forest files indicate more plants were found upstream in 2003 in areas not surveyed in 2007. The only risk observed was invasive plant species (see Item 4 below).

See Item 3 below for description of revisit to CYPA19-21 occurrence in 2007 in Dugout Gulch Botanical Area.

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

There was no evidence of collection of *Cypripedium parviflorum* individuals at either site observed in 2007.

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

CYPA19-21 in Dugout Gulch Botanical Area was documented with baseline data collection in 2005. It was noted in 2005 that the occurrence was not in preferred habitat for livestock but at risk because it is accessible and in the drainage bottom. [Note: permitted livestock have a travelway through the botanical area but are not supposed to graze in the botanical area.] In 2006, the occurrence was revisited and greater than expected impacts to the CYPA19-21 occurrence were observed for the authorized travelway use by permitted livestock. *Cypripedium parviflorum* plants had been trampled and cropped by livestock moving in and out of the stream

bottom. Occurrence condition was reported to Bearlodge District range management staff. On July 13, 2007, the occurrence was revisited and impacts from livestock were not observed directly on *Cypripedium parviflorum* plants but were observed on suitable habitat (and *Carex alopecoidea* plants) in the botanical area. Livestock impacts are greater than expected for authorized travelway use by permitted livestock through the botanical area to and from an allotment. A cut boundary fence was observed and reported on July 13, 2007.

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

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

CYPA19-27 – *Tanacetum vulgare* (common tansy) within 5 ft of *Cypripedium parviflorum* plants.

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

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



Photos by Cheryl Mayer. Left: *Viburnum opulus* var. *americanum* plant at VIOPA2-6 on Pettigrew Creek on August 24, 2007. Right: Browsed twigs of *Viburnum opulus* var. *americanum* by livestock and elk at VIOPA2-29 at Boeson Spring on October 16, 2007.

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

surveys, there are times when it would likely not be noticed in high density thickets. Many thickets are so dense they are basically impenetrable; it is likely that the numbers of individuals reported at occurrences is a conservative number.

2007 Monitoring Design and Results Evaluation:

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

In balancing monitoring workload, we invoked the 2007 Prioritization Strategy to determine that survey/monitoring of other species were of higher priority than documenting 5 new occurrences of *Viburnum opulus* var. *americanum*. [From 2007 Prioritization Strategy: “The mix of ...high and low indicators, along with the higher number of sites but relatively small population sizes, led to assigning this species a *Medium* priority category for gathering baseline monitoring data.”]

In 2007, data were collected at 2 *Viburnum opulus* var. *americanum* sites. Baseline data were collected at one previously reported site in 2007 and one site was revisited to gather information for range allotment planning (baseline data was collected in 2003).

The occurrence documented at Boeson Spring at VIOPA2-29 that was visited October 16, 2007 includes 5 plants. Livestock grazing occurred at the site in 2007 – cowpies were observed in the site. Hummocking, trampling, and streambank alteration from livestock occurred this year. Light to moderate browsing was observed on this year’s leaders of *Viburnum opulus* var. *americanum* (20-30%). Evidence of elk use was also observed in the area (tracks, scat, wallow). It is unknown if browsing was by livestock, elk, or both. The allotment this occurrence is in (Pettigrew Allotment) will be examined in the North Zone Range 08 Environmental Assessment (EA). Management and monitoring of the wetland area and the *Viburnum opulus* var. *americanum* occurrence will be determined in the North Zone Range 08 EA.

The occurrence at VIOPA2-6 was revisited on August 24, 2007 and 4 plants observed adjacent to Pettigrew Creek. Hummocking, trampling, and streambank alteration from livestock occurred this year. Livestock trails and cowpies were observed. Browsing on stems of *Viburnum opulus* var. *americanum* was observed – since evidence of elk or other wildlife was not observed, it is concluded that the browsing was by livestock. There was evidence of some insect predation on leaves. The allotment this occurrence is in (Pettigrew Allotment) will be examined in the North Zone Range 08 Environmental Assessment. Management and monitoring of the riparian area and the *Viburnum opulus* var. *americanum* occurrence will be determined in the North Zone Range 08 EA.

Noxious weeds were documented in both sites. See Item 2 for more information.

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

VIOPA2-6 – *Cynoglossum officinale* (houndstongue), *Cirsium arvense* (Canada thistle), *Cirsium vulgare* (bull thistle), and *Trifolium* sp. (non-native clover species) are all present in the same ecotype.

VIOPA2-27 – *Cynoglossum officinale* within 1 m of *Viburnum opulus* var. *americanum* and scattered occasionally in the same ecotype. *Cirsium arvense* found scattered slightly up-drainage in same ecotype.

No evidence was observed of weed treatment activity affecting any *Viburnum opulus* var. *americanum*

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

5 Year Monitoring Summary (2003-2007) for R2 Sensitive Plant Species

In October 1999 (WO Appeal Decision - October 12, 1999), the Washington Office directed the Forest to “determine whether a need exists to monitor habitat and/or populations of sensitive species within the affected area of proposed projects, and display the rationale for this determination.” In 2000 it was decided that baseline data to support more quantitative monitoring designs needed to be gathered at sensitive plant sites on the Forest. Since 2000 the development of monitoring protocols for sensitive plant species has progressed. After consulting initial baseline data, forest GIS info, expert advice, species assessments and additional data, species specific monitoring protocols were developed. As more is learned about these species and the monitoring methods, protocols can change to utilize more efficient or effective techniques or to better answer the monitoring questions for each species. Baseline data is still being collected for species that do not yet have monitoring protocols (*Botrychium campestre*, *Botrychium lineare*, *Cypripedium parviflorum* and *Viburnum opulus* var. *americanum*). These are species that do not yet have adequate information to determine an appropriate monitoring protocol including species that were added to the R2 sensitive species list recently, and species that were recently discovered (or re-discovered) on the Forest. Over the past 5 years, changes to the R2 sensitive species list have taken place; some species that were monitored in previous years are no longer monitored and some new species have been added.

The past five years (2003-2007) were all drought years in the Black Hills. The level of monitoring conducted at most sites (presence/absence) is not rigorous enough to capture any perceptible changes that could be attributed to drought, and data for prior non-drought years is limited. For one species (*Platanthera orbiculata*), for which numbers of individuals are more closely tracked, there is not enough pre-drought data to draw any conclusions.

In at least one site, data forms show weed density to be much lower at Cascade Springs (R2 sensitive *Epipactis gigantea* site) than 5 years ago, likely due to consistent weed treatment effort over the last several years. Continued hand-pulling efforts are taking place at sites where this is a feasible option. Forest Plan Guideline 4303 places high priority on controlling noxious weeds in R2 and SOLC plant occurrences and botanical areas. However, noxious weeds have been documented and continue to persist at many sites. Therefore a weed treatment strategy with prioritization is currently being developed for R2 sensitive and SOLC plant species.

In 2005 the Phase II amendment to the Forest Plan added Standard 2505f, which requires livestock use to be restricted in all or portions of five *Carex alopecoidea* sites (CAAL8-19, CAAL8-20, CAAL8-22, CAAL8-30 and CAAL8-31). Planning/design has begun on constructing fenced exclosures at all five sites and one (CAAL8-22, Pole Cabin Gulch) was completed in 2007. Photo point monitoring was initiated at the CAAL8-22 exclosure in October 2007, and additional monitoring will take place in 2008. A temporary exclosure was constructed to exclude livestock from one small concentration area of site CAAL8-19 in Ladyfinger Gulch. In the three remaining sites, fenced exclosures have been designed but not yet constructed. Forest-wide management is moving toward but not yet meeting Forest Plan Standard 2505f.

Monitoring data has been collected for R2 sensitive plant occurrences in Botanical Areas. While several sites have no recorded occurrence of grazing livestock, three sites over the past five years have had documented impacts from livestock use. One of these three sites (CAAL8-16 in Dugout Gulch Botanical Area) has had repeated documented impacts annually from 2004 to 2007.

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Of the currently listed R2 sensitive plant species with established monitoring designs, sensitive plants have continued to be present at all of the monitoring sites visited over the past five years. At this time, the type and amount of data collected cannot support any conclusions about trends for any of the species.

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)



Photos by Cissie Buckert. Left: placing erosion mat at Cascade Springs (site ADCA-1) on August 7, 2007 (after Alabaugh Fire July 7-13, 2007) to slow sediment input from burned slopes adjacent to Cascade Creek. Right : *Adiantum capillus-veneris* site at Cascade Falls (site ADCA-2) on August 7, 2007 – covered with sediment from high stream flows after heavy precipitation event following Alabaugh Fire.

The Forest Service administers developed picnic grounds at two ends of the only known *Adiantum capillus-veneris* occurrence located within the Black Hills. The majority of the central portion of the occurrence is located along Cascade Creek on the Whitney Preserve managed by The Nature Conservancy. 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 in response 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 or increasing, 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. 2007 monitoring occurred before the fire (July 2). 2008 monitoring will begin capturing effects of the fire.

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 *Adiantum capillus-veneris* and its habitat on Black Hills National Forest. *Cirsium arvense* (Canada thistle) is a SD state-

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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. Hell Canyon Ranger District is initiating 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)]. The project will start in 2008 with the collection of seeds for growing out at Bessey Nursery to provide local genetic, native plant restoration material.

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, and 2007 to coarsely document changes in water level in Cascade Creek. In 2008, USGS may reactivate the gauging station at the southern end of J.H. Keith Cascade Springs Picnic Ground (discontinued in 2001) due to concerns on impacts to groundwater from the fire and from current and expected increasing future development in the southern Hills. Data from this gauging station will be incorporated into plant monitoring records when available.

Adiantum capillus-veneris had been included on the R2 sensitive species list until 2003, therefore, baseline data and a monitoring design are available. The current monitoring design involves assessing the status of the two ends of the Cascade Creek occurrence that are located on lands administered by the Black Hills National Forest. The monitoring is designed to address the following questions: 1) is the species present?; 2) is recreation or erosion resulting in loss of patches?; 3) are invasive species present in the sites?; 4) has treatment of invasive plant species affected the occurrence?; 5) is there evidence of changes in the water table?; and 6) is there evidence of plant collection?

2007 Monitoring Design and Results Evaluation:

1. Monitor presence/absence of *Adiantum capillus-veneris* patches along stream transects on an annual basis. If the number of patches decline, consult on a more rigorous design with the Rocky Mountain Research Station.

Cascade Springs (ADCA-1) and Cascade Falls (ADCA-2) were visited for monitoring on July 2, 2007. In general, Cascade Springs and Cascade Falls appeared comparable in condition to recent years. The sites appeared stable relative to concentration areas of *Adiantum capillus-veneris* mapped in previous years – that is, areas were found as mapped for majority of concentration areas.

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

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

A very short nick point trail is defined near the gazebo and extends into a patch of *Epipactis gigantea* and *Adiantum capillus-veneris*. Some trampling of the fern and orchids was observed in 2007.

At Cascade Falls, there are patches of *Adiantum capillus-veneris* on the rocks that create the falls, which people climb on/over to swim below the falls. These patches have been persisting and were present in 2007.

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

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

On July 2, 2007, the two transects at Cascade Springs were read - water levels were documented at 0.5 m intervals. Transect No. 1 is the upstream transect; Transect No. 2 is downstream.

	2004 (July 2)	2005 (July 5)	2006 (July 14)	2007 (July 2)
Transect No. 1: Average stream depth (cm)	11.9	12.6	9.2	12.8
Transect No. 2: Average stream depth (cm)	21.5	27.6	25	22

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

In 2007, *Cirsium arvense* (Canada thistle) continues to be present along the stream, including individuals located adjacent to *Adiantum capillus-veneris*. *Cirsium vulgare* (bull thistle) is also intermingled. *Elaeagnus angustifolia* (Russian olive) continues to be present at Cascade Springs. *Tamarix* spp. (salt cedar) was not present. Hell Canyon District staff spent one day at Cascade Springs handpulling weeds in 2007. In general, weed density appear to be much less in the site than 2-3 years ago, likely due to consistent weed treatment efforts over the last several years. Hell Canyon District Botanist is leading a project to replace non-native tree species with natives. This project will take place over several years to avoid any drastic changes to the ecosystem (e.g. causing impacts to nesting birds, associated shade tolerant species, etc.). In 2008, seeds of native trees and shrubs will be collected from Cascade Springs area and sent to USFS Bessey Nursery in Nebraska for propagation. These materials for restoration will be developed and planted at Cascade Springs as non-native trees and shrubs are removed in future years.

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

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

No new erosion patches were observed in 2007 at any *Adiantum capillus-veneris* concentration areas. Past documented erosion patches (erosion observed to be associated with stream movement dynamics) continue to be present. The Alabaugh Wildfire (July 7-13, 2007) occurred after monitoring was accomplished on July 2, burning steep hillsides adjacent to Cascade Creek. A high precipitation event occurred August 3 that moved sediment into the creek. Erosion mats were placed in some areas to try to limit sediment input into Cascade Creek. Monitoring in 2008 will collect information on impacts of the fire at Cascade Springs and Cascade Falls. Preliminary conclusion from observational monitoring in late summer and fall at the sites is that this landscape is highly erosive and the plant species/communities present have adapted to occasional intense

events. Long-term negative impacts from the fire are not expected but the site will continue to be monitored.

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

There was no evidence of unauthorized collections of *Adiantum capillus-veneris* at the time monitoring was completed in 2007.

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



Photo by Cheryl Mayer at *Botrychium multifidum* site BOMU-8 on August 16, 2007.

There are currently 8 known occurrences of *Botrychium multifidum* on Black Hills National Forest. The species was removed from the R2 sensitive species list in 2007. At that time, it was added to the Black Hills NF plant species of local concern list. The majority of *B. multifidum* occurrences on the Black Hills National Forest were discovered in 2003. Before 2006, there were seven known occurrences, all of which were located in the Norbeck Wildlife Preserve and Black Elk Wilderness. There are similar associated habitat conditions elsewhere in the Black Elk Wilderness/Norbeck Wildlife Preserve (note: Black Elk Wilderness is entirely within the Norbeck Preserve but not all Norbeck Preserve is in the Black Elk Wilderness), and probably within Custer State Park and Mount Rushmore National Memorial; therefore, it is likely that additional occurrences are located in the general area. In 2006, an occurrence was discovered in the Bearlodge area of the Black Hills. The habitat conditions at this site (sandstone substrate, intermittent drainage, paperbirch/hazelnut forest) are very different from those at the other 7 sites in the Black Hills central core area (granite substrate, permanent streams, alluvial spruce forest). It is likely that additional occurrences will be found based on a revised search image including a broader habitat range and this is reflected in the monitoring design.

The current monitoring design, developed when *Botrychium multifidum* was an R2 sensitive species, involves assessing the status of five Black Hills National Forest occurrences on an annual basis and all occurrences every 5 years. The monitoring is designed to address four questions: 1) are there other occurrences?; 2) is the species present and is there evidence of contraction or expansion in the aboveground portion of known

occurrences?; 3) are invasive plant species present in the site?; and 4) are there any effects from weed treatment activities?

2007 Monitoring Design and Results Evaluation:

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

In 2007, one attempt was made to relocate an unverified *Botrychium multifidum* report from Butcher Gulch. No *Botrychium multifidum* individuals were located. [This occurrence was also looked for in 2004, 2005, and 2006.]

2. Annually check presence/absence and count individuals at five monitoring sites (BOMU-1, BOMU-4, BOMU-5, BOMU-7, BOMU-8). These include one site that is close to heavy trail traffic areas.

BOMU-1 (Lost Cabin Creek) – Located in the Black Elk Wilderness. 127 individuals were counted on October 2, 2007 (215 individuals counted in September 2006; 383 counted in September 2005; 35 counted in June 2004; and 65 counted in June 2003). Individuals were found in all high concentration areas searched in 2005/2006. [Note: *Botrychium* species are known for high variability in aboveground expression between years.] There was lower percentage of reproductive plants (compared to high point in 2006) - 10 plants with sporophores were counted. The site appeared stable from 2006 to 2007. There were no impacts from trail traffic on trail adjacent to site.

BOMU-4 (Iron Creek) – Located in the Black Elk Wilderness. 6 individuals were counted on September 25, 2007 (15 individuals in 2006, 25 individuals in 2005). A large spruce tree fallen across the site in 2006 continues to dominate the site. Plants were smaller and fewer had reproductive structures than in 2006. It is possible that the large expenditure of energy in 2006 to produce large individuals resulted in low aboveground production in 2007. The site appeared stable from 2006 to 2007.

BOMU-5 (Iron Creek Tributary) – Located in the Black Elk Wilderness. 16 individuals were counted on September 25, 2007 (18 counted in 2006, 11 counted in 2005). The site appeared stable from 2006 to 2007.

BOMU-7 (Upper Iron Creek) – Located in the Black Elk Wilderness. 19 individuals were counted on September 20, 2007 (17 individuals in 2006, 14 individuals in 2005). Subpopulation A was located in 2003 but not found in 2004, 2005, 2006, or 2007. Plants are mainly found in concentration areas noted from previous years. However, new plants are found scattered along the creek supporting the hypothesis that all the riparian area along the creek is suitable habitat. The site appeared stable from 2006 to 2007.

BOMU-8 (Little Beaver/Bearlodge) – Located in the Bearlodge Mountains. 10 individuals were counted on August 17, 2007 (7 individuals in 2006). The steep, narrow drainage where the occurrence is located appeared to have sustained heavy water flow between 2006 and 2007 monitoring visits (Bearlodge Mountains experienced heavy spring rains in some areas in 2007). New sediment bars were created and some scouring of the drainage bottom to bare ground was observed. The disturbance did not appear to affect the *Botrychium multifidum* individuals, which are located off the drainage bottom on a mossy boulder and a berm.

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

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

4. Document any noxious weeds or invasive species. Document if the invaders are co-located with *Botrychium multifidum* or what distance they are located from occurrences if they occupy the same

ecological type. Use this information to develop a weed treatment strategy with prioritization for all R2 sensitive and SOLC plant species. Document if any weed treatment activity has affected occurrences.

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

BOMU-4 (Iron Creek) – *Cirsium arvense* found in same ecotype within 5 m of *Botrychium multifidum* plants. *Cirsium vulgare* (bull thistle) found in same ecotype within 2 m of *B. multifidum* plants. *Phleum pratense* (timothy) co-located with *B. multifidum* and scattered in the floodplain area.

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

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

BOMU-8 (Little Beaver/Bearlodge) – No weeds were observed within the site, but *Cirsium vulgare* and *Phleum pratense* are found down the drainage where the drainage widens out (within 300m).

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

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



Photo by Cheryl Mayer at *Carex bella* site CABE3-2 in Black Elk Wilderness on July 5, 2007 highlighting *Carex bella* reproductive status (inflorescence with perigynia).

Three *Carex bella* occurrences located on lands administered by the Black Hills National Forest are all located within a single square mile section at the highest elevations of the Forest, with all reported locations occurring within Pennington County, South Dakota on the Hell Canyon Ranger District. These occurrences are located near Harney Peak, Nelson Creek and Lost Cabin Creek within the Black Elk Wilderness Area.

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

The current monitoring design involves assessing the status of the three known occurrences on an annual basis. The monitoring is designed to address four questions: 1) is the species present?; 2) are there other occurrences?; 3) are invasive plant species present in the site?; 4) has treatment of invasive plant species affected the occurrence?; and 5) has a flood or fire event affected an occurrence?

2007 Monitoring Design and Results Evaluation:

1. Revisit the three *Carex bella* locations in the Black Elk Wilderness and collect inventory information when the plant is most identifiable (primarily during the flowering or fruiting period). Search for additional occurrences in adjacent areas. Assess risks to the species at new sites.

The three known occurrences were visited on July 5, 2007: CABE3-1, CABE3-2, CABE3-3. The occurrences appeared stable from 2006. *Carex bella* appears to be relatively secure from most potential risks due to its location in the Black Elk Wilderness. However, it is possible a single, high-intensity, localized event could result in the loss of all occurrences because the sites are located within a limited geographic area. Risks

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include drought, increased activity associated with recreational rock climbing and hikers, browsing by non-native mountain goats (*Oreamnos americanus*), invasion by noxious weeds or other invasive species, and efforts to control them. In addition, fire suppression efforts might be a risk at some sites.

2. Document any noxious weeds or invasive plant species. Document if weeds are co-located with *Carex bella* 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 noxious weeds or invasive species were observed in any *Carex bella* site. *Bromus inermis* (smooth brome) was observed above the CABE3-1 site but in a slightly different ecotype. No evidence was observed of weed treatment activity affecting any *Carex bella* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

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



Right: Photo by Cheryl Mayer at *Eleocharis rostellata* site ELRO2-2 at Cascade Falls on June 28, 2007. *Eleocharis rostellata* is dense in the foreground and to the right of the stream. **Left:** Aerial photo from BAER reconnaissance after Alabaugh Fire July 7-13 (Cascade Falls/ELRO2-2 at bottom).

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

Eleocharis rostellata is an obligate wetland species 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 current monitoring design involves assessing the status of the two ends of the Cascade Creek occurrence that are located on lands administered by the Black Hills National Forest. The monitoring is designed to address the following questions: 1) is the species present?; 2) is recreation or erosion resulting in loss of plant concentration areas?; 3) are invasive species present?; 4) has treatment of invasive plant species affected the occurrence?; 5) is there evidence of changes in the water table?; and 6) is there evidence of plant collection?

2007 Monitoring Design and Results Evaluation:

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.

Cascade Springs (ELRO2-1) was visited on July 2, 2007 and Cascade Falls (ELRO2-2) was visited on June 28, 2006. Relative to *Eleocharis rostellata*, Cascade Springs and Cascade Falls appeared comparable in condition to 2006. Parts of the sites seemed dry due to recent extended heat, but since *E. rostellata* is found in saturated areas in the floodplain, it did not seem to be affected as much as other species in more upland locations (*E. rostellata* was observed in great abundance along streambanks and in other saturated areas).

The Alabaugh Wildfire July 7 -13, 2007 burned 10,300 acres, including area adjacent to the Black Hills National Forest land at Cascade Springs. The Cascade Springs and Cascade Falls sites were not directly impacted. However, adjacent steep slopes were burned. A high precipitation event on August 3 caused sediment movement from surrounding burned hillsides into Cascade Creek and high flows, particularly at Cascade Falls. Erosion mats were placed on August 7 to limit additional runoff and sediment input to the creek. 2007 monitoring occurred on July 2, before the Alabaugh Fire. 2008 monitoring will begin evaluating effects of the fire. Preliminary conclusion from observational monitoring in late summer and fall at the sites is that this landscape has been highly erosive for a long time and the plant species/communities present have adapted to occasional intense events. Long-term negative impacts from the fire are not expected but the site will continue to be monitored.

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

Eleocharis rostellata grows along streambanks and nearly or completely saturated areas in the floodplain. It is less likely to be impacted by recreation nick trails than the other species of concern at Cascade Springs and Cascade Falls (*Epipactis gigantea* and *Adiantum capillus-veneris*) 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.

Some trampling of *Eleocharis rostellata* was observed in 2008 on a nick trail at the downstream point of land in Cascade Springs/J.H. Keith Park where two streams from different spring sources converge. No *E. rostellata* patches have disappeared in areas where nick point trails extend into them.

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.

On July 2, 2007, the two transects at Cascade Springs were read - water levels were documented at 0.5 m intervals. Transect No. 1 is the upstream transect; Transect No. 2 is downstream.

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	2004 (July 2)	2005 (July 5)	2006 (July 14)	2007 (July 2)
Transect No. 1: Average stream depth (cm)	11.9	12.6	9.2	12.8
Transect No. 2: Average stream depth (cm)	21.5	27.6	25	22

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 2007, *Cirsium arvense* (Canada thistle) continues to be present along the stream, including individuals located adjacent to *Eleocharis elliptica*. *Cirsium vulgare* (bull thistle) is also intermingled. The SD noxious weed *Sonchus arvensis* (field sow thistle) was documented in 2007 for the first time at Cascade Falls ELRO2-2. *Elaeagnus angustifolia* (Russian olive) continues to be present at Cascade Springs. *Tamarix* spp. (salt cedar) was not present. Hell Canyon District staff spent one day at Cascade Springs handpulling weeds in 2007. In general, weed density appear to be much less in the site than 2-3 years ago, likely due to consistent weed treatment efforts over the last several years. Hell Canyon District Botanist is leading a project to replace non-native tree species with natives. This project will take place over several years to avoid any drastic changes to the ecosystem (e.g. causing impacts to nesting birds, associated shade tolerant species, etc.). In 2008, seeds of native trees and shrubs will be collected from Cascade Springs area and sent to USFS Bessey Nursery in Nebraska for propagation. These materials for restoration will be developed and planted at Cascade Springs as non-native trees and shrubs are removed in future years.

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

No new erosion patches were observed in 2007 at any *Eleocharis rostellata* concentration areas. Past documented erosion patches (erosion observed to be associated with stream movement dynamics) continue to be present. The Alabaugh Wildfire (July 7-13, 2007) occurred after monitoring was accomplished on July 2, burning steep hillsides adjacent to Cascade Creek. A high precipitation event occurred August 3 that moved sediment into the creek. Erosion mats were placed in some areas to try and limit sediment input into Cascade Creek. Monitoring in 2008 will capture impacts of the fire at Cascade Springs and Cascade Falls. Preliminary conclusion from observational monitoring in late summer and fall at the sites is that this landscape has been highly erosive for a long time and the plant species/communities present have adapted to occasional intense events. Long-term negative impacts from the fire are not expected but the site will continue to be monitored.

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

No evidence of collection was observed in 2007.

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



Photo by Cheryl Mayer of *Gentiana affinis* co-located with *Cirsium arvense* (Canada thistle) at GEAF-10 site on Rapid Creek on August 7, 2007.

Less than 10 *Gentiana affinis* occurrences had been reported on Black Hills National Forest prior to 2006, primarily in limestone areas on the Mystic and Northern Hills District. Seven occurrences were documented in 2006 and 24 occurrences located in 2007, 22 of those through botanical surveys to support timber project planning. Locations are found at elevations from approximately 4,960 to 6,620 feet on the Hell Canyon, Mystic, and Northern Hills Districts. *Gentiana affinis* flowers from July through September and produces seeds in capsules from September through October. It is considered a facultative upland species in South Dakota and eastern Wyoming, meaning that it can occur in wetland habitats but typically occurs in upland areas. In the Black Hills, this gentian is reported to occur in moist (not saturated) areas in open conditions (no tree canopy), sometimes near wet meadows, fens, and stream margins in limestone areas.

2007 Monitoring Design and Results Evaluation:

1. Continue relocating previously reported occurrences and search for new locations of *Gentiana affinis* on Black Hills National Forest when the species is most identifiable (primarily during the flowering period). 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 5 sites in 2007. Assess risks to the species at documented sites.

In 2007, two new occurrences of *Gentiana affinis* were fully documented according to Black Hills NF plant monitoring protocols (although one may be determined through additional survey to be part of a large metapopulation along Rapid Creek). 22 new occurrences were discovered in 2007 through botanical survey to support timber project planning with a total estimate of approximately 7,000 – 20,000 stems (including 2 sites with 1,000 - 10,000 stems). 13 occurrences including the two largest are located on Hell Canyon District; 9 occurrences are located on Mystic District. These 22 occurrences are not yet fully documented (with 5-page data forms, photographs, and vouchers) and risks to the occurrences not yet evaluated.

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.

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

GEAF-8: *Cirsium arvense* (Canada thistle) co-located and within 1 ft of plants. *Carduus nutans* (musk thistle) co-located within 10 ft. *Cirsium vulgare* in patches. *Cynoglossum officinale* (houndstongue) scattered in the area. *Phleum pratense* and *Bromus inermis* present in the area.

GEAF-10: *Leucanthemum vulgare* co-located with *Gentiana affinis* and scattered. *Cirsium arvense* co-located and occasional. *Verbascum thapsus* found on the edge of the ecotype approximately 3 m from *G. affinis*.

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

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



Photos by Cheryl Mayer: Left: *Listera convallarioides* at LICO5-3 site discovered on August 6, 2007. Right: Trampling impacts by livestock in *L. convallarioides* habitat in Englewood Springs Botanical Area on August 13, 2007.

In the Black Hills, *Listera convallarioides* was first discovered in 1970 at Englewood Springs and a second site located in 1994 along West Strawberry Creek. Both were thought to occur on land administered by the Black Hills National Forest but recent use of technical mapping equipment (Global Positioning System) revealed that the plants at West Strawberry Creek location are on land administered by the Bureau of Land Management and adjacent Black Hills National Forest land. Two new occurrences were discovered in 2007 on the Northern Hills District during botanical survey to support range and timber project planning. All 4

known occurrences on Black Hills National Forest are restricted to a 20 square mile area in the northern Black Hills in Lawrence County, south of Lead, SD.

The Englewood Springs occurrence is within the Englewood Springs Botanical Area. This occurrence has been visited multiple times over the years, with greater than 1,000 individuals estimated to occur at the site. In 2007, *Listera convallarioides* individuals were located for the first time in the lower slope/drainage bottom of the botanical area. Plants and habitat have been impacted by livestock. A change from current management to

meet Forest Plan Standard 3.1-2503 (Restrict access of domestic livestock to protect R2 sensitive and SOLC plant occurrences in designated botanical areas) is being determined through range planning for the Upper Elk Creek allotment in the North Zone Range 08 Project which is currently underway. The elevation range of known sites is from 5,120 to 6,080 feet. *Listera convallarioides* individuals are located in saturated soil conditions adjacent to wet springs, and under tree canopies composed mostly of *Picea glauca* (white spruce).

2007 Monitoring Design and Results Evaluation:

1. Revisit the two known *Listera convallarioides* occurrences on Black Hills National Forest documented in 2006 and assess risks at the sites.

Listera convallarioides occurrence LICO5-2 (Englewood Springs) was visited on August 7, 2007 and occurrence LICO5-1 (Strawberry Creek) was visited on August 13, 2007. LICO5-1 was in comparable condition to that observed in 2006. At LICO5-2, a larger area of the Englewood Springs Botanical Area was searched than in previous years and *L. convallarioides* plants were discovered along the stream in the low gradient area west of the steep slope with the springs. There is no fence between Englewood Springs Botanical Area and the surrounding Upper Elk Creek allotment. It had been thought that fencing would not be needed since livestock have not been known to access *L. convallarioides* plants on the steep hillside. It was discovered that livestock are accessing *L. convallarioides* plants in the low gradient area and trampling plants and riparian habitat. District personnel are developing solutions.

One new occurrence discovered in 2007 consists of about 20 plants. The timing and intensity of livestock use in the site is unknown. This site is in the Upper Elk Creek allotment (North Zone Range 08 Project).

The second occurrence discovered in 2007 consists of about 250 plants. Risks to this site will be evaluated in 2008.

2. 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.

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

LICO5-2: *Cirsium arvense* and *Cynoglossum officinale* (houndstongue) co-located with *L. convallarioides*. BBNF plant monitoring and district personnel hand-pulled weeds for 2 hours in 2007 (also hand-pulled weeds in 2005 and 2006).

LICO5-3: *Cirsium arvense* thick in the drainage bottom and scattered in area co-located with *Listera convallarioides*. *Cirsium vulgare* (bull thistle) occasional in same ecotype less than 2 m from *L. convallarioides* plants. *Linaria vulgaris* and *Cynoglossum officinale* frequent in drainage bottom. *Phleum pratense* occurs in the bottom and is found scattered less than 4 m from *L. convallarioides*.

LICO5-4: Status of noxious weeds and invasive plant species will be evaluated in 2008.

Weed treatment activity (handpulling) in the LICO5-2 site in 2005, 2006, and 2007 appears to have lowered the percent cover of weed species slightly. No evidence was observed of weed treatment activity affecting any other *Listera convallarioides* occurrences. A weed treatment strategy with prioritization is currently being developed for all R2 sensitive and SOLC plant species.

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



Photo by Beth Burkhart of *Lycopodium annotinum* at site LYAN2-5 on October 24, 2007.

At the time a recent assessment was prepared (2003) for this species, only two occurrences were included in the Black Hills National Forest plant database. Since that time, additional new occurrences have been discovered and additional information has become available. Some of the reported occurrences are located very close to each other and once baseline data are gathered, locations may be combined into fewer larger occurrences composed of sub-components. There are currently 5 known occurrences of *Lycopodium annotinum* on Black Hills National Forest, including one documented in 2007.

Lycopodium annotinum is circumboreal and widely distributed in boreal habitats of North America. Elsewhere within its range, *L. annotinum* also occurs in swampy or moist coniferous forests, mountain forests, and exposed grassy or rocky sites. Currently, little is known about the basic ecology of this species on Black Hills National Forest. Known occurrences of *L. annotinum* are associated with high moisture microhabitat conditions within remnant boreal *Picea glauca* (white spruce) and *Betula papyrifera* (paper birch)/*Corylus cornuta* (beaked hazelnut) communities. These sites are sheltered microsites that are considerably cooler and moister than surrounding areas and are likely associated with isolated frost pockets. The currently known sites on lands administered by Black Hills National Forest are located at elevations from 5,100 feet to approximately 6,300 feet.

2007 Monitoring Design and Results Evaluation:

1. Revisit 4 known sites (LYAN2-1, LYAN2-2, LYAN2-3, LYAN2-4) and inventory; search for new occurrences 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.

All 4 known sites (LYAN2-1, LYAN2-2, LYAN2-3, LYAN2-4) were visited in 2007. One new occurrences of *Lycopodium annotinum* was discovered in 2007 and fully documented according to BHNF plant monitoring protocol. One occurrence is in the Upper Sand Creek Botanical Area. In three of the occurrences, *L. annotinum* is co-located with *L. complanatum* (R2 sensitive plant species). Occurrence size varies from 20 x 30 ft to smaller scattered patches (Note: *Lycopodium* species have a clonal growth form so it is not possible to estimate individuals).

Occurrences LYAN2-1, LYAN2-2, and LYAN2-3 all appeared stable relative to conditions observed in 2006.

Site LyAN2-4 was affected in 2007 by livestock trailing directly through the site (resulting from new fence constructed on nearby private/Black Hills National Forest boundary). Livestock impacts to the riparian area (hummocking, trampled and cropped vegetation) adjacent to the LYAN2-4 site were noted in 2006. In 2007, livestock traveled along the new fence through the LYAN2-4 site to get to the riparian area. *Lycopodium annotinum* and *L. complanatum* plants and fragile mossy habitat were trampled by livestock to bare ground in places.

A new occurrence LYAN2-5 was discovered in 2007. It has an overstory dominated by aspen and is located on a slope with patches of different kinds of mosses. *Lycopodium annotinum* covers a small area of about 1 x 3 m. Grazing occurs in Pole Cabin Gulch bottom below the site (see *Carex alopecoidea* CAAL8-22 occurrence notes). A few cowpies were seen on the slope in the same ecotype as *L. annotinum* but no trampling or damage to plants from livestock was evident. There were orange timber project boundary marks noted on *Pinus ponderosa* above the occurrence, but age of marking is unknown.

The persistence of *Lycopodium annotinum* in the Black Hills is at risk due to both the small number and small size of occurrences, which makes the species vulnerable to random events (such as from high intensity fire events) and invasion by noxious weeds and invasive plant species or weed treatment. Some sites could be affected by livestock, particularly trailing.

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.

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

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

LYAN2-3: No noxious weeds in the site.

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

LYAN2-5: *Cynoglossum officinale* occasional on the hillside in the same ecotype but not close to *Lycopodium annotinum*.

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

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



Photo by Cheryl Mayer of *Oxyria digyna* at site OXDI3-2 on July 5, 2007.

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

2007 Monitoring Design and Results Evaluation:

1. Revisit the 3 documented sites (OXDI3-1, OXDI3-2, OXDI3-3) and inventory. Search for additional occurrences in adjacent areas. Assess risks to the species at new sites.

Occurrences OXDI3-1 and OXDI3-2 were visited on July 5, 2007. OXDI3-3 was visited on August 9, 2007. All occurrences were present and appeared in comparable size and condition as in 2006. Sites appeared stable relative to 2006.

In the Black Elk Wilderness, *Oxyria digyna* is relatively secure from risks associated with a variety of activities (roads, timber harvest activities, livestock use). Ongoing risks may include disturbance by hikers and climbers, and trampling and browsing from mountain goats (*Oreamnos americanus*) or browsing by elk (*Cervus elaphus*). In addition, invasion by noxious weeds and invasive plant species, weed treatment, and fire suppression efforts are risks. No impacts from any of these risk factors (except light grazing by mountain goats at OXDI3-2) were observed at occurrences in 2007.

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.

OXDI3-1: No noxious weeds in the site.

OXDI3-2: No noxious weeds in the site.

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OXDI3-3: No noxious weeds in the site.

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

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



Photo Cheryl Mayer at PESA5-5 in Black Fox Botanical Area on May 25, 2007 - plants in flower before basal leaves mature.

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

A variety of associated conditions have been recorded for this boreal species in the Black Hills. Sites are characterized by open to partial tree canopies and range in elevation from 5,120 to 6,600 feet. Individuals are associated with dry to mesic to wet meadows and gentle slope areas along streams with saturated soils. *Picea glauca* (white spruce) is the tree species documented at several sites (with very low canopy conditions); however, *Populus tremuloides* (aspen) and *Pinus ponderosa* (ponderosa pine) are also documented. A variety of *Salix* (willow) species are documented at a majority of reported locations.

2007 Monitoring Design and Results Evaluation:

1. Continue relocating previously reported occurrences and search for new locations of *Petasites sagittatus* on Black Hills National Forest when the species is most identifiable (flowers are easy to observe but leaves are also large and easily identified throughout the summer) 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 5 sites in 2007. Assess risks to the species at documented sites.

Three occurrences of *Petasites sagittatus* were visited in 2007. One was a revisit to the occurrence in Black Fox Botanical Area and two were new sites fully documented according to BHNF plant monitoring protocol.

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One new site was discovered during botanical survey to support timber project planning and will be fully documented in 2008.

PESA5-5: located in Black Fox Botanical Area. Livestock grazing impacts (trampling of habitat) were observed at the occurrence on a second visit to the site October 19, 2007. Management does not yet meet BBNF Standard 3.1-2503 (Restrict access of domestic livestock to protect R2 sensitive and SOLC plant occurrences in designated botanical areas.)

PESA5-6: located in the Norbeck Preserve, so risks from management activities (such as livestock grazing) are limited.

PESA5-7: located in an active grazing allotment and cowpies were observed in the drainage bottom. It is also located as close as 2 m to an adjacent road.

Population estimates at the sites:

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

PESA5-6: 500 to 1,000 plants

PESA5-7: 500 to 1,000 plants

Since this species is a facultative wetland species, the primary risk to its persistence and reproductive success is any lowering of the water table or altered hydrology where it occurs, whether natural or human-induced. Noxious weeds and other invasive species, effects associated with intensive livestock use, recreational impacts (potentially associated with the adjacent Black Fox Campground - Off Road Vehicle use) and climatic change (drought stress) are also risks.

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.

PESA5-5: *Cirsium arvense* (Canada thistle) co-located and intermingled. *Cirsium vulgare* (bull thistle) and *Cynoglossum officinale* (houndstongue) occasional in same ecotype.

PESA5-6: *Cirsium arvense* touching PESA5 plants, but not abundant in the site.

PESA5-7: fairly large patch of *Cirsium arvense* close to plants in one area. *Verbascum thapsus* (mullein), *Melilotus officinale* (sweet clover), and *Bromus inermis* (smooth brome) all growing along road adjacent to the occurrence.

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

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



Photo by Cheryl Mayer of *Polystichum lonchitis* with sori containing spores visible on the back side of frond at site POLO4-10, taken October 24, 2007.

Black Hills National Forest has information on 20 records for this species on Black Hills National Forest. Reported sites are located in the northern Black Hills and Bearlodge Mountains (Lawrence County, SD and Crook County, WY).

A circumboreal and subalpine forest fern, *Polystichum lonchitis* is commonly associated with *Picea glauca* (white spruce), *Betula papyrifera* (paper birch), and *Corylus cornuta* (beaked hazel). In the Black Hills, *P. lonchitis* is associated with moist, shaded, north facing slopes in forested ravines and gulches on limestone substrates at elevations from 4,280 to 6,040 feet. Some occurrences consist of one or few individuals; others have dozens to greater than 50 individuals; and the largest occurrence in Griggs and Higgins Gulches is estimated to have greater than a hundred individuals. Nine sites were located in 2002 and 2003. A number of older reports lack information regarding abundance and total size estimates. Approximately 35 percent of the reported locations are distributed within three Black Hills National Forest designated Botanical Areas.

2007 Monitoring Design and Results Evaluation:

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 (fronds are identifiable in spring, summer, and fall) 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 5 sites in 2007. Assess risks to the species at documented sites.

Two occurrences of *Polystichum lonchitis* were fully documented in 2007 according to BHNF plant monitoring protocol and two occurrences were discovered during botanical survey to support timber project planning and will be documented in 2008.

Population estimates at the documented sites:

POLO4-9: 80 - 100 plants

POLO4-10: 2 plants

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Risk assessment:

POLO4-9 – Plants were found on mossy benches under beaked hazelnut (*Corylus cornuta*). Site is not easily accessible due to steep, wet slopes in the area and thick vegetation. No evidence of livestock or any recreational use of the area.

POLO4-10 – Plants on slope in paper birch/hazelnut community above heavily grazed drainage bottom in Pole Cabin Gulch (see notes on *Carex alopecoidea* site CAAL8-22). Plants trail across the slope. One plant is located on the edge of a livestock trail.

Polystichum lonchitis in the Black Hills is limited by the small extent of cool, moist boreal habitat. As with other boreal remnant species, long-term drought or dramatic climate changes characterized by drier and warmer conditions may present the greatest risk to *Polystichum lonchitis* and its habitat. Other risks are associated with the potential for Off Road Vehicle impacts, livestock trampling, water developments, and activities associated with road construction. Noxious weeds and invasive species are a risk to occurrences and wildfire and suppression activities can also be considered a risk to occurrences. Collectors may desire the species so, depending on the level of interest, collection could present a risk. Potential for impact from livestock trampling was observed at one occurrence in 2007.

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.

POLO4-9: No weeds found in the site or the area.

POLO4-10: *Cynoglossum officinale* (houndstongue) approximately 5 m from plants. Not many weeds in the site, but *C. officinale* and *Cirsium arvense* abundant in the drainage below the slope.

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

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



Photo by Cheryl Mayer of *Salix lucida* ssp. *caudata* leaves and insect damage at site SALU-3 in Spearfish Canyon on July 6, 2007.

This species (but a different subspecies – ssp. *lucida*) was historically documented (1913) from the Black Hills but has never been relocated. *Salix lucida* ssp. *caudata* was thought not to exist in the Black Hills until an individual was located along a small tributary of Iron Creek in 1993. Since that time, three additional occurrences were discovered (2002 and 2003). Two occurrences were located in the Bearlodge Mountains north of Sundance, Wyoming. The other two occurrences were located within the central granitic core area of the Black Hills, northeast of Custer, South Dakota. Dr. Robert Dorn, *Salix* species expert, visited the Black Hills in June 2006 and visited known sites with Black Hills NF botanists. The two occurrences in the central granitic core were identified to be comprised of *Salix* species other than *S. lucida* ssp. *caudata*. One occurrence in the Bearlodge was visited and confirmed (a single male plant). The other Bearlodge occurrence was not relocated, but the voucher specimen was confirmed by Dr. Dorn [there were many small *Salix* sp. shrubs at the location but they were browsed too heavily to positively identify]. Lastly, Dr. Dorn shared a new location for *S. lucida* ssp. *caudata* that he had recently found in Spearfish Canyon (2 plants: one female and one male). In summary, as of the end of field season in 2006, there are two confirmed occurrences of *S. lucida* ssp. *caudata* on Black Hills NF and one occurrence with a confirmed voucher that has not been relocated yet. Additional habitat along Spearfish Creek was searched in 2007 but no plants were found. The second Bearlodge occurrence was also searched for in 2007 and not relocated.

Salix lucida ssp. *caudata* is commonly associated with streambanks, shores, wet meadows, and seeps and is a facultative wetland species. It is at the easternmost extent of its range in the Black Hills of South Dakota. The occurrences in the Bearlodge Mountains (Crook County, Wyoming) are located at some of the lower elevations (4,200 and 4,800 feet) of the Black Hills National Forest. The occurrence in the Northern Hills District in Spearfish Canyon is located at 5,000 ft.

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

Salix species are preferred forage by livestock and big game. Concern for emphasis *Salix* species on Black Hills NF led to BHNF Standard 2505 e directing no utilization of emphasis willow (*Salix*) species (including

S. candida, *S. serissima*, and *S. lucida* ssp. *caudata*) by domestic livestock. A temporary cage was erected around the Bearlodge occurrence/plant in 2005 to restrict livestock from grazing. A beaver, however, entered the cage in spring 2005 and chewed off several stems. The stems were retrieved and sent to USFS Bessey Nursery for propagation. In spring 2006, the nursery had propagated 36 plants. The Bearlodge District Ranger decided to plant some of the rooted stock at the known occurrence and some at a location approximately three miles away in an enclosure around a spring/old beaver pond. The individual at the original site and 5 plantings were protected from grazing/browsing by an enclosure built in 2007 (the plantings also had wire cages around them). Live plants were observed in all cages in August 2007.

Salix lucida ssp. *caudata* has not been recorded previously from the location 3 miles from the original plant. There are biogeographical concerns with planting an uncommon species in locations where it has not been previously known but this project was undertaken as an experiment. The planted location was visited in August 2007. 29 cages around planted willows (inside livestock enclosure) were observed with 19 cages containing live *S. lucida* ssp. *caudata* plants.

2007 Monitoring Design and Results Evaluation:

1. 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.

Suitable habitat along Spearfish Creek was surveyed on July 6, 2007. No new *Salix lucida* ssp. *caudata* individuals were located. There is still much suitable habitat to be surveyed.

2. Relocate the second Bearlodge site for *Salix lucida* ssp. *caudata* that was not found in 2006 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 baseline data on the pilot planting site for *S. lucida* ssp. *caudata* on Bearlodge. Assess risks to new sites.

The location of the second Bearlodge occurrence was searched in October 2007. No *Salix lucida* ssp. *caudata* was found.

3. Document observations regarding if *Salix lucida* ssp. *caudata* plants are grazed by livestock.

Plants at SALU-3 along Spearfish Creek are not accessible to livestock.

In 2007, an enclosure was built at the occurrence at SALU-2 in the Bearlodge to restrict livestock; no evidence of livestock was observed in the enclosure in August.

Salix lucida ssp. *caudata* individuals at the experimental planted site are in an enclosure and there was no evidence of livestock inside the enclosure in August.

Management at all *Salix lucida* ssp. *caudata* occurrences is 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*).

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.

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SALU-2: *Cirsium arvense* (Canada thistle) scattered throughout the drainage. *Cynoglossum officinale* (houndstongue) within 10 m of plant; *Carduus nutans* (musk thistle) 50 m from *Salix lucida* ssp. *caudata* plant.

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

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

5 Year Monitoring Summary (2003-2007) for Plant SOLC

Species of Local Concern (SOLC) are defined as plant, fish or wildlife species (including subspecies or varieties) that do not meet the criteria for sensitive status. These could include species with declining trends in only a portion of Region 2, or those that are important components of diversity in a local area. The list of plant SOLC appears in the 2005 Black Hills National Forest Land and Resource Management Plan Phase II Amendment Final EIS. 2006 was the first year plant SOLC were added to the forest-wide plant monitoring program.

The main focus for plant SOLC is to relocate previously reported occurrences in combination with searching suitable habitat for new sites. Baseline data is being gathered and risks assessed, with a goal of eventually designing and implementing a monitoring protocol for each species. Occurrences for species that baseline data has already been collected at all known sites (*Adiantum capillus-veneris*, *Botrychium multifidum*, *Carex bella*, *Eleocharis rostellata*, *Listera convallarioides*, *Oxyria digyna*, *Salix lucida* ssp. *caudata*), are being revisited in addition to searching suitable habitat for potential new sites. Each of these species has relatively few total known occurrences on the forest (ranging from one to eight).

The past five years (2003-2007) were all drought years in the Black Hills. The level of monitoring conducted at most sites (presence/absence) is not rigorous enough to capture any perceptible changes that could be attributed to drought, and since monitoring for plant SOLC was initiated in 2006 data for prior non-drought years is limited.

In at least one site, data forms show weed density to be much lower at Cascade Springs (SOLC *Adiantum capillus-veneris* and *Eleocharis rostellata* site) than 5 years ago, likely due to consistent weed treatment effort over the last several years. Continued hand-pulling efforts are taking place at sites where this is a feasible option. Forest Plan Guideline 4303 places high priority on controlling noxious weeds in R2 and SOLC plant occurrences and botanical areas. However, noxious weeds have been documented from several plant SOLC occurrences. Therefore, a weed treatment strategy with prioritization is currently being developed for R2 sensitive and SOLC plant species.

Monitoring data has been collected for plant SOLC occurrences in Botanical Areas. While some sites have no recorded impacts from livestock, two sites over the past five years have had documented impacts from livestock use (LICO5-2 in Englewood Springs Botanical Area and PESA5-5 in Blackfox Botanical Area). Forest Plan Standard 3.1-2503 requires that access of domestic livestock be restricted to protect the R2 sensitive and species of local concern plant occurrences in designated botanical areas.

From 2006 to 2007 plant SOLC have continued to persist at all occurrences that were visited in both years. At this time, the type and amount of data collected cannot support any conclusions about trends for any plant SOLC at this time.

Monitoring Item 18: 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

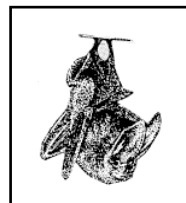


The American marten monitoring protocol focuses on the amount of preferred habitat. In the Black Hills, marten are highly associated with white spruce forests, and this is considered preferred habitat.

Amount of Preferred Habitat: As disclosed in Monitoring Item 8, the spruce cover type was 26,110 acres of the Forest. This is 30 % 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 2007, nine mines were evaluated for bat habitat. The May Mine Complex (Hell Canyon District) and the Centennial Trail shaft (Mystic District) were gated. The table below shows the number of bat passage devices installed in caves and mines across the Forest. The Forest continues to install devices to protect sensitive bats.

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

Disturbance: Eight mines, caves and/or bat passage devices were monitored for signs of vandalism, incompatible uses, and non-compliance with established closure dates. A user-created trail was noted at the Hutchins Mine addit (Bearlodge District). This incompatible use was reported to the permittee. All four sites (Bad Luck Cave, Red Deer Mine, D&R Mine and White Elephant Mine) evaluated on the Hell Canyon District were okay. Three sites were evaluated on the Northern Hills District. Two sites had disturbance (Runkle) or vandalism (Davenport) that was observed and fixed in FY 2007. The third site (Erskin) was okay.

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Some evaluations occurred on the Mystic District by non-Forest Service personnel without Forest Service funding. Subsequently, this data was not accessible by the Forest.

Snags: Monitoring Item 11 displays that in FY 2007, there were 3.6 snags per acre >9" dbh and greater than 25 feet tall across conifer forested portions of the Forest. This is an increase from 1.3 and 1.7 snags per acre in FY 2005 and FY 2006, respectively. The percent of snags greater than 14 inches dbh was 25%. This was an increase from 23% in FY 2006. Both the number of snags and the percent greater than 14 inches dbh meet or exceed 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. There are currently 11 known prairie dog colonies on the Forest, covering more than 400 acres of NFS land. Total acreage of the colonies is larger when adjacent private lands are considered. Additional colonies have been identified over time. This is in part due to increased survey effort, but also reflects prairie dog expansion during the past few years due to favorable conditions resulting from the ongoing drought. Three colonies (Clifton, Norbeck and Pleasant Valley) were newly discovered in 2005. Two of these probably existed (undiscovered) prior to 2005. The third (Clifton) was a brand new colony that did not exist when field work was conducted after the Red Point Fire burned the area in 2003. An additional colony in the Pass Creek area was identified in 2006, though it was existing prior to 2005. Also noteworthy was that one colony (Bennett) was newly re-occupied in 2005 after having no prairie dogs present since the town was discovered in 2002. No prairie dog towns on Black Hills National Forest were poisoned from 2003-2007. The Forest is meeting Objective 237.

Prairie Dogs	2002	2003	2005	2007
# of towns	6	5	10	11
acres	246	264	400	Not surveyed

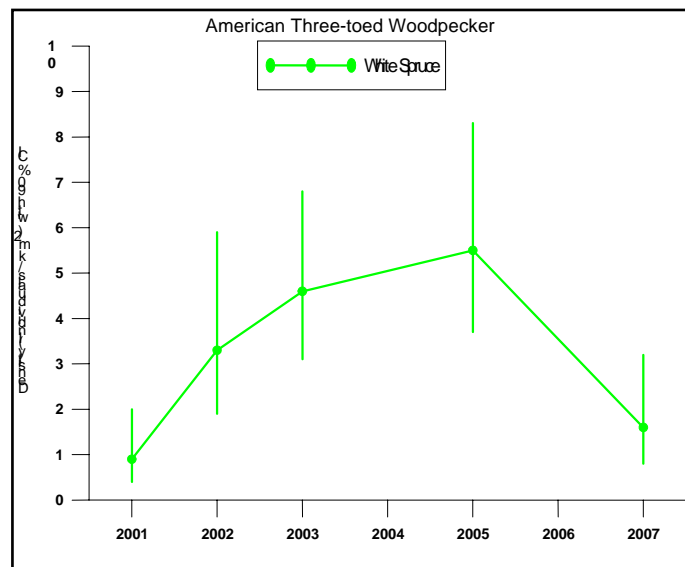
Birds -- American Three-toed Woodpecker



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 sampled in 2007, as well as in 2001, 2002, 2003 and 2005.

Estimated woodpecker densities have ranged from 0.9 to 5.5 birds/km² (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 26,110 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 2007, 49 goshawk territories were monitored by Forest biologists. Of these, 18 (37%) 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.

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Goshawk Territories Monitored & Occupied, 2000-2007							
	2000	2001	2002	2003	2005	2006	2007
Territories Monitored	42	46	84	74	56	34	49
Territories Occupied	12	9	20	25	23	9	18
% of Territories Occupied	29%	20%	24%	34%	41%	26%	37%

The SDGFP has funded goshawk monitoring on the Black Hills from 2003 to 2007 (Knowles and Knowles 2007). In 2007, seven of those territories produced a total of 12 young. During the five years of surveys, 24 active nest territories with goshawk nests in 49 trees were documented. Forty-two nesting attempts were monitored and 33% failed prior to the fledging of young. Nest failure occurred throughout the nesting period. Human activity or predation by great-horned owls or red-tailed hawks accounted for 6 nest failures, but there was no obvious cause for the majority (9) of failures.

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. Protective measures were undertaken in coordination with the U.S. Fish and Wildlife Service to reduce human disturbance at the nest site, but the nest was later abandoned. An earlier unsuccessful nesting attempt was reported about a ¼ mile outside the Forest boundary on Stockade Reservoir in Custer State Park in 2004 (USDA Forest Service 2005b). In both cases, neither the contents of the nest nor the reason for the failed attempt are known.

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.

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

The bald eagle was removed from the federal endangered species list in August 2007. It is designated as a Region 2 sensitive species for the next five years to evaluate its status. The delisting of this species and the recent nesting attempts in the Black Hills imply that this species population trend nationally and locally is increasing. 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, 2001-2007							
Species	2001	2002	2003	2004	2005	2006	2007
Burrowing Owl	0	0	0	1	0	7	0
Flammulated Owl	0	1	0	0	0	0	0
Lewis's Woodpecker	3	4	9	4	8	7	9
Loggerhead Shrike	1	0	0	0	0	0	0
Long-billed Curlew	0	0	0	0	0	8	0
Northern Harrier	1	0	0	0	0	1	0
Peregrine Falcon	0	0	0	0	0	0	0
Yellow-billed Cuckoo	0	0	0	0	0	0	0

In addition to the MBBH program, seven burrowing owls were observed on the Forest in 2006. Two adults and three chicks were observed at two nests. These are the first nesting burrowing owls documented on the Forest for quite some time.

Of the species listed above, the Lewis's woodpecker is the most frequently detected. In 2007, nine individuals were observed, of which five were detected in burned habitat (Jasper Fire Area). This habitat is where most of the detections have occurred over the years (Giroir et al. 2007). This is consistent with reports from other literature that this species prefers older burns (Anderson 2003). The Jasper Burn occurred in 2000.

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. Grassland habitat was not monitored in 2007.

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 2007. For some species this may be due in part because their preferred habitats were not sampled in 2007. 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.

Given the continued or new occurrences of burrowing owls, Lewis's Woodpeckers, and long-billed curlews, it appears the Forest is conserving habitat for these species and meeting Objective 221.

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 2007. 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, progress 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 45,843 acres on

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the Forest. This is an increase of 229 acres from the previous year, but a 2,381 acre ($\approx 5\%$) decline for the ten-year period. 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

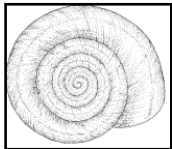


The leopard frog monitoring protocol calls for determining continued persistence at a rotating sample of 8 known occupied habitats (index sites) annually. The protocol was not funded in 2007 and has not been for the past five years.

Projects implemented in 2007 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 2007.

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 (Frest 1991), 1992 (Frest 1993), 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.

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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 2007. The Wyoming Game and Fish Department did sample Hemler Reservoir in the summer 2007, but no fish were collected. Finescale dace are typically abundant in Hemler Reservoir, a privately owned pond on the Forest. 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). Abundance is affected by ecological conditions such as drought and the presence of standing water habitat. This species' distribution and abundance will likely be improved by management efforts that enhance or create standing water habitat, such as beaver ponds, within the stream network. A focused inventory on the Bearlodge Ranger District would provide useful information on this species' current distribution on the Forest.

Lake Chub

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

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

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

*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, but it is certainly greater than when the reservoir was chemically renovated in 1982 to reduce the white sucker population (Isaak et al. 2003). Lake chub numbers declined substantially in 2000 and continue to remain low (SDGFP 2006). 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. Isaak et al. (2003) recommended a standardized, non-lethal method to sample lake chub with some initial overlap with gillnet sampling to calibrate the new methodology. Boat electrofishing and/or beach seining were two methods suggested.

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 2007, nine mines were evaluated for bat habitat. The May Mine Complex (Hell Canyon District) and the Centennial Trail shaft (Mystic District) were gated.

Disturbance: Eight mines, caves and/or bat passage devices were monitored for signs of vandalism, incompatible uses, and non-compliance with established closure dates. A user-created trail was noted at the Hutchins Mine addit (Bearlodge District). This incompatible use was reported to the permittee. All four sites (Bad Luck Cave, Red Deer Mine, D&R Mine and White Elephant Mine) evaluated on the Hell Canyon District were okay. Three sites were evaluated on the Northern Hills District. Two sites had disturbance (Runkle) or vandalism (Davenport) that was observed and fixed in FY 2007. The third site (Erskin) was okay. Some evaluations occurred on the Mystic District by non-Forest Service personnel. No Forest Service funding was provided, subsequently this data was not available to the Forest.

Snags: Monitoring Item 11 displays that in FY 2007, there were 3.6 snags per acre >9” dbh and greater than 25 feet tall across conifer forested portions of the Forest. This is an increase from 1.3 and 1.7 snags per acre in

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FY 2005 and FY 2006, respectively. The percent of snags greater than 14 inches dbh was 25%. This was an increase from 23% in FY 2006.

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 2007. 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, progress 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 Covertypes: As disclosed in Monitoring Item 8, the spruce cover type was 26,110 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 adjacent table shows the acres of Structural Stage 5 Forest-wide. Structural stage 5 has increased over the past three 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, 1997-2007				
	1997	2005	2006	2007
Structural Stage 5	22,409	2,677	3,445	4,494

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 (17.5%, 11.8% and 29.6%, respectively) and below the objective for Management Areas 5.4 and 5.43 (9.5% and 5.5%, respectively). Management Area 5.4 comprises 34.4% of the structural stage 4 acres within these Management Areas. Management Area 5.43 is only 0.6% of the total structural stage 4 acres in these management areas. See Monitoring Item 9 for more detailed information on vegetative diversity by structural stages.

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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 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. The recent bighorn sheep die-off from pneumonia in Custer State Park has not occurred on the Forest.

Black Hills Bighorn Sheep Population Estimates, 2000-2007				
2000	2004	2005	2006	2007
175-200	270	300	350	350

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, 2000-2007				
2000	2004	2005	2006	2007
140-180	125	90	70	60

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. Nesting attempts in Spearfish Creek have remained fairly stable. Nesting success has

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increased, but additional monitoring is needed to determine long-term trends. Nesting attempts and success have declined in Whitewood Creek. The cause of this decline is unknown. Additional monitoring will determine the long-term trend.

American Dipper Nest Monitoring Results, 2003-2007					
Stream	2003	2004	2005	2006	2007
Spearfish Creek					
Nesting Attempts	26	39	42	36	44
Successful nests	n/a	15	24	21	26
Nesting Success	n/a	39%	57%	58%	59%
Whitewood Creek					
Nesting Attempts	8	13	7	3	6
Successful nests	n/a	9	5	1	2
Nesting Success	n/a	69%	71%	33%	33%
Source: Lovett 2007 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). No observations were made in 2007. This species is more likely to be detected on transects in riparian habitat which was not surveyed in 2007. The vegetative composition of these habitats has not been analyzed, but it is suspected that bur oak, green ash, aspen, and other hardwoods are important, as is a dense understory of shrubs such as ninebark, chokecherry, hawthorn, and currants.

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.

Coopers Hawk: The Cooper's Hawk appears to be distributed through most of the Black Hills and Bearlodge Mountains, though it is fairly uncommon. The MBBH program has recorded the species in all of the major habitat types, with no obvious affinity for any one. Other Forest records show a majority of observations in the central Hills, but this may be an artifact of data entry patterns into the corporate database. Giroir et al. (2007) observed three individuals in 2007, one each in burned, shrubland and white spruce 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. The highest number of observations occurred in 2007. Five were in burned habitat and one was in pine-juniper shrubland (Giroir et al. 2007). This species has not been detected along transects in aspen or montane riparian habitat. Monitoring Item 9 discusses the Forest's progress towards the structural stage objectives for

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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 2007 (Giroir et al. 2007). None were recorded in 2006 (Hutton et al. 2007), but forested habitats were not monitored. 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
Black-and-white Warbler	5	7	2	3	6	7	0
Broad-winged Hawk	3	6	0	24	19	3	2
Cooper's Hawk	10	4	3	9	9	2	3
Northern Saw-whet Owl	1	0	0	1	0	0	0
Pygmy Nuthatch	3	2	0	1	4	3	6
Sharp-shinned hawk	2	4	3	6	3	0	1
Source: MBBH data (Giroir et al. 2007)							

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 2007. 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 2007. 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

The bald eagle was delisted in FY 2007. Please see the discussion for this species under Monitoring Item 18b – Sensitive Species (Wildlife).

In July 2007, the National Park Service reintroduced the black-footed ferret into Wind Cave National Park after a thirty year absence. Limited potential ferret habitat, e.g. one 13-acre prairie dog town, currently occurs on the Forest adjacent to Wind Cave National Park. Ferret monitoring on the Forest would only be needed if a specific management action is proposed that would adversely affect ferrets, such as poisoning prairie dogs on National Forest System lands adjacent to Wind Cave National Park.

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., Objectives 103, 104, 215, Standards 1201, 1203, 1205, Guideline 1115).

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 associated with 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. Surveys were done via helicopter.

Forty 6th-level watersheds were sampled to determine the abundance of beaver. A total of thirty-one food

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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 FY 2007 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:

Additional time is needed to determine the trend in beaver abundance and distribution based on the food cache protocol. Subjectively, the long-term population trend of beaver has increased in the Black Hills since heavy trapping has been moderated by harvest regulations, but it is less than its potential. 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 long-term trend in beaver habitat is one of decline. The reduction in beaver activity that occurred from heavy trapping likely caused a lowering of water tables and a subsequent loss of willows and other riparian vegetation (Parrish et al. 1996). This, in conjunction with other factors, has reduced the quality and quantity of riparian willow habitat in the Black Hills following European settlement. The amount of aspen and other hardwoods on the Forest has also declined (USDA Forest Service 2005b). The implementation of Forest Plan standards and guidelines, Regional watershed conservation practices and best management practices likely maintains existing riparian habitat consistent with Objective 238a, but probably at a level less than its full capability. According to Monitoring Item 7, progress is being made to restore 500 acres of riparian shrub communities (Objective 214) and to enhance streams. 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). Current aquatic/riparian habitat conditions have been exacerbated by the eighth or ninth year of ongoing drought.

In time, the food cache monitoring protocol will provide a direct measure of the beaver population trend Forest-wide. The aspen/willow monitoring may provide supplemental long-term trend information. This data only needs to be calculated on a 5 or 10 year frequency rather than annually.

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 2006 (Sandrini 2007). 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 2007). This Unit includes lands outside the boundary of the Black Hills National Forest.

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Estimated Deer Population in South Dakota and Wyoming Black Hills, 2000-2007								
	2000	2001	2002	2003	2004	2005	2006	2007
SD White-tails	29,000	30,000	35,000	40,000	46,000	50,000	54,000	50,000
SD Mule Deer	12,000	10,000	11,000	10,000	12,000	14,000	14,000	12,000
SD Total Deer	41,000	40,000	46,000	50,000	58,000	64,000	68,000	62,000
WY White-tails	n/a	n/a	39,274	45,437	42,997	42,018	42,196	n/a

The Arc Habitat Suitability Index (ArcHSI) model was not run for FY 2007. 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). 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 2007, RMBO sampled seven habitats: aspen, burned, late-successional pine, pine north, pine south, shrubland and spruce. Additional results are found in Giroir et al. (2007). This was the seventh 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.

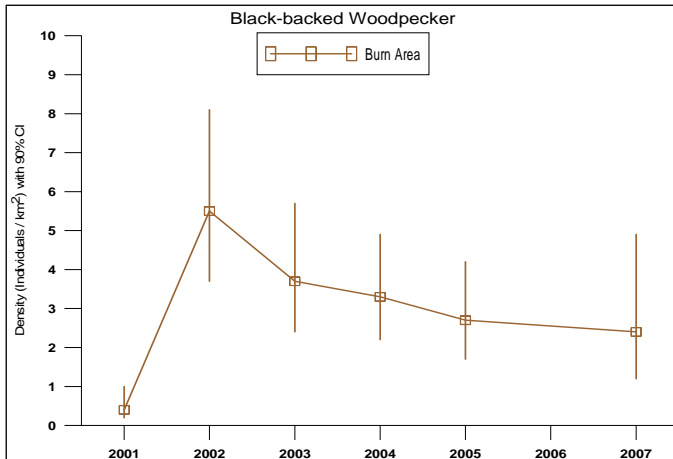
Non-Game Birds -- Black-backed Woodpecker

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.

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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, the transects are not well-distributed across the Forest. Black-backed woodpecker relative densities (birds/km²) were at their highest in 2002 and have declined thereafter (Blakesly et al. 2008). Burned habitat was not sampled in 2006.

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 km² 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 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 km² were estimated to occur in MBBH's late successional habitat.

Acres of Preferred Habitat – Burned Areas: According to Monitoring Item 12, a total of 18,351 acres of burned forest habitat was created and largely retained over the last five years. This total does not include any relatively large (>1,000 acres), contiguous blocks of insect-killed trees which has also created habitat. Adequate non-salvaged, post-fire timber stands currently exist to provide foraging/nesting habitat for the black-backed woodpecker consistent with 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. The overall trend of the Forest is still for an increasing beetle infestation. This translates into a short-term favorable habitat condition for the woodpecker.

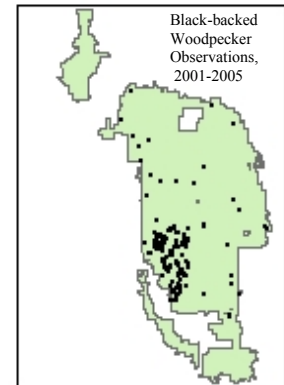
Acres of Preferred Habitat – Dense Mature and Late Successional Stands: Forest Plan Objectives 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204 guide the Forest to provide 5% of the pine in structural stage 4C and 5% of the pine in structural stage 5 in these management areas, partly to ensure habitat 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 adjacent table shows the acres of structural stages 4C and 5 Forest-wide. Structural stages 4C and 5 increased from 2006 to 2007 and also for the ten-year evaluation period.

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

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 adjacent map, which was generated from MBBH data, does not show occurrences in the Bearlodge Mountains; however, other Forest records confirm the species' presence there as well (Stefanich 2006).



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).

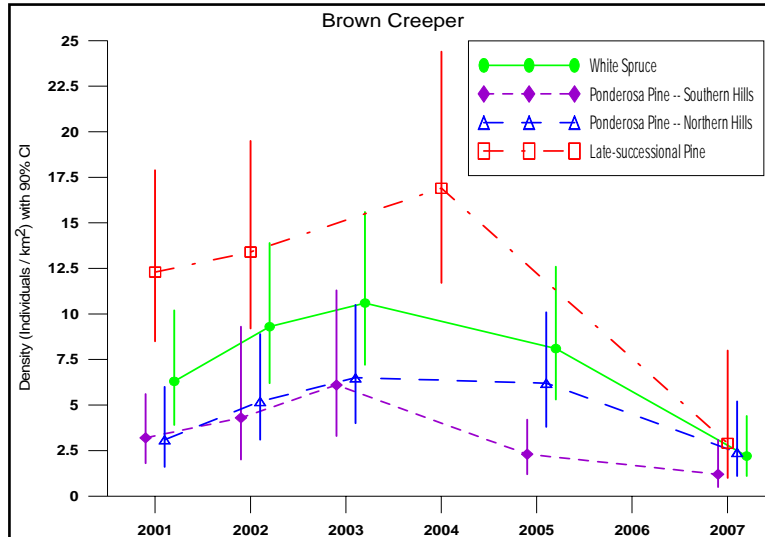
Non-Game Birds -- Brown Creeper

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 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.

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



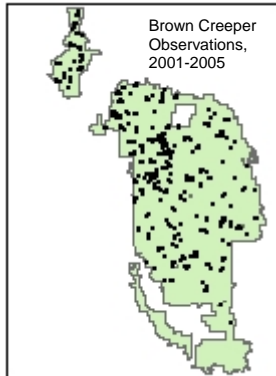
Acres of Preferred Brown Creeper Habitat, 1997-2007				
	1997	2005	2006	2007
White Spruce	21,737	25,462	26,483	26,110
Structural Stages 4C & 5	137, 207	134, 129	137, 978	146, 833
TOTAL	158,944	159,591	164,461	172,943

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, 2005-2007.		
2005	2006	2007
7,800	10,631	8,051

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, though short-term activities to meet the structural stage 4C objective may be affecting the Forest's ability to provide very large trees in structural stage 4C. Continued effort and additional time is needed to increase the acres of structural stage 5.



Non-Game Birds -- Golden-crowned Kinglet

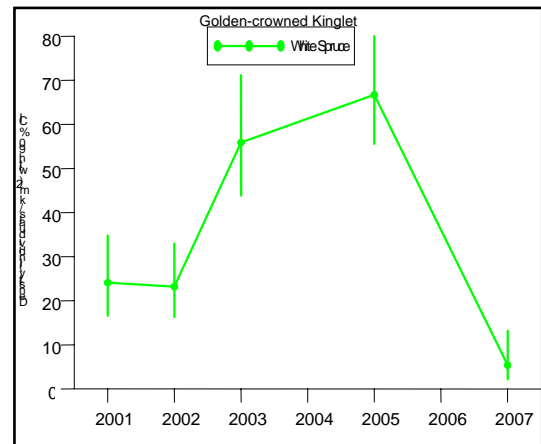
Monitoring:

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 was monitored in 2007 in the MBBH program. Kinglet densities (birds/km²) 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:

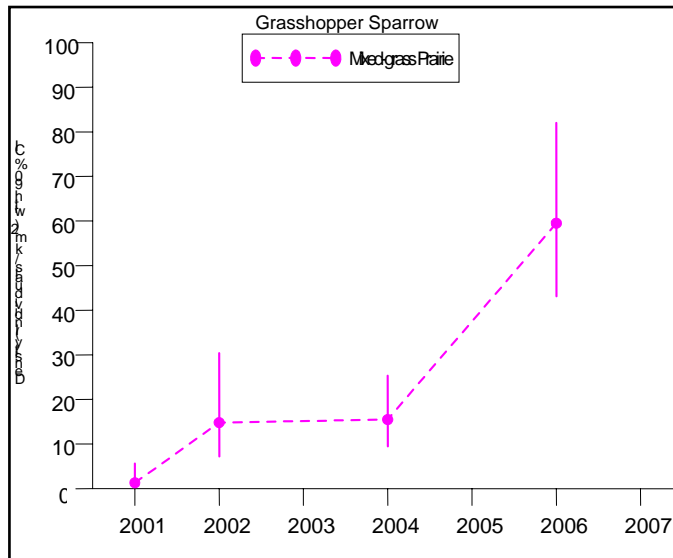


Relative Densities in Preferred Habitats: In the Black Hills, the grasshopper sparrow is highly associated with mixed-grass prairie. This is the basis for its MIS status. Mixed-grass prairie was not monitored in 2007 in the MBBH program. Density estimates have continued to increase since first monitored 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

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expanded sampling may also explain some of the change (Panjabi 2004).

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.

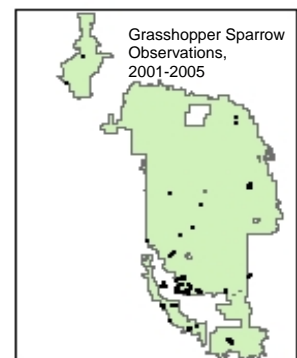


Evaluation:

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:

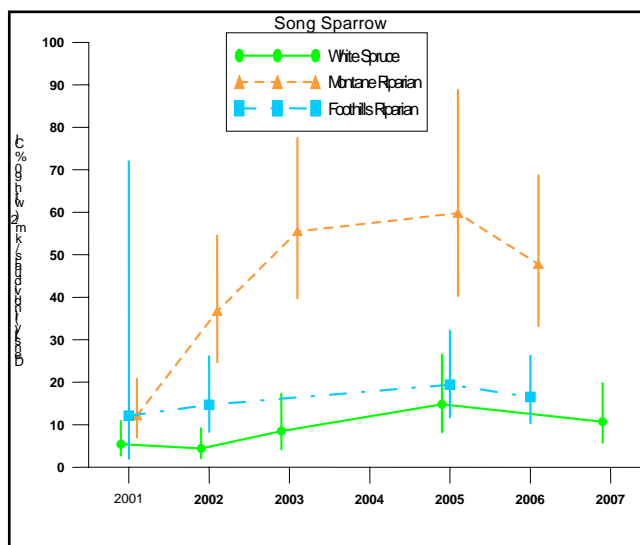
Relative Densities in Preferred Habitats: In the Black Hills, the song sparrow is strongly associated with riparian habitats. This is the basis for its MIS status. Neither the foothills nor montane riparian habitats were monitored in 2007 as part of the MBBH program.

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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.

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. White spruce was the only other habitat where detections were frequent enough to calculate relative densities.

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 2007. 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.

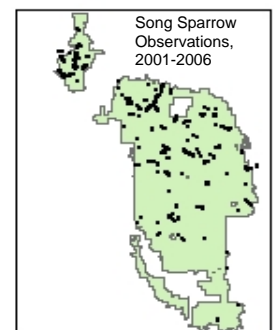


Evaluation:

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 (see map).

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

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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 BBNF 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 45,843 acres on the Forest. This is an increase of 229 acres from the previous year, but a 2,381 acre ($\approx 5\%$) decline for the ten-year period. 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 2007. The University of Wyoming completed a monitoring protocol (Dauwalter et al. 2008) for this species on the Black Hills through an Agreement with the Rocky Mountain Regional Office. Opportunities to sample most, if not all the sites identified in the protocol

may exist in FY 2008 due to the cooperative efforts of the South Dakota Department of Game, Fish and Parks and the Wyoming Game and Fish Department.

Evaluation:

The Forest-wide population trend for mountain sucker is one of decline when comparing present occurrence to past distribution from surveys in the early 1960s and mid-1980s. Quantitative population trend data for the

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mountain sucker was presented in the Forest Plan Phase II Amendment Final Environmental Impact Statement (USDA Forest Service 2005b).

The quality and quantity of mountain sucker habitat is also one of long-term decline. Mountain sucker numbers and distribution are affected by the eighth or ninth year of ongoing drought, which reduces or eliminates stream habitat. Reoccupancy of this habitat may be limited due to a number of instream barriers that prohibit the movement of mountain suckers when more favorable stream flows return. Interaction with non-native fish species may also have reduced the number and/or distribution of mountain suckers over time. The 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 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:

1. R2 sensitive and species of local concern occurrences of snails and plants.
2. Research Natural Areas.
3. Botanical Areas.
4. New invaders.
5. New areas of infestation.
6. Spreading or expanding infestations.
7. Existing infestations.

Monitoring:

Objective 231 discusses treatment of at least 8000 acres per year. The Forest has been above that level since 2003 and plans to continue at a higher level as funding is available.

Year of Treatment	Acres Treated
2002	7,515
2003	14,700
2004	15,744
2005	13,882
2006	15,685
2007	11,649

Infestation acreage is difficult to measure; however our inventory methods and tracking continue to improve. The Weed Environmental Assessment signed in January 2003 has an estimate of approximately 82,000 acres. Our current estimate is closer to 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 management 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 March 19, 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 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/>

Monitoring Item 23: INSECTS AND DISEASES - Population, Tree Mortality and Hazard

Objective 10-07: Where outbreaks of mountain pine beetle could present risks to management objectives for ponderosa pine, reduce acreage of ponderosa-pine stands that are in medium or high risk for infestation.

Objective 10-08: Using analyses of insect-and-disease occurrences, prioritize suppression strategies to meet management objectives and minimize value loss of tree vegetation affected by outbreaks of insect-and-disease pests.

Sub-Item: Population, Mountain pine beetle and Ips

Monitoring:

Evaluations of mountain pine beetle were conducted for the Upper Spring Creek and Norbeck areas in the Black Hills. These evaluations consisted of a multi stage sampling based on aerial surveys, ground surveys, and in the case of Norbeck, analysis of aerial photography to estimate mountain pine beetle infestations and how they are changing. Based on the ground surveys, beetle-caused mortality is increasing at a high level in these areas. There will be some removal of infested trees in a small part of the Upper Spring Creek area prior to treatment of the entire project area. The Black Elk Wilderness, which is part of the Norbeck area, is the fastest growing beetle epidemic on the forest at this time. Currently, there are large areas of almost complete mortality caused by mountain pine beetle and beetle 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. 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 should 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

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on beetle susceptibility of uneven aged ponderosa pine stands in the Black Hills. This study concluded that, much as is the case with even aged stands, stand density is the driving factor in which uneven aged stands are most susceptible. 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, and one of them may be effective for two seasons. These insecticides are effective for treating individual, high value trees but are not practical for widespread use.

The level of tree mortality caused by *Ips* beetles has continued to decline, but still remains at above average levels. This is especially true in urban interface areas around the edge of the forest, where most of the recent *Ips* mortality is concentrated. There is increased *Ips* activity in piles left from logging operations and small handpiles created during fuels work, however, to date we have not seen these populations spill out and infest any significant part of the 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.

Findings in a study of fire and subsequent tree mortality and insect infestations indicates that the most effective measures for predicting ponderosa pine mortality for up to 3 years post-fire are crown scorch and crown consumption. Adding DBH and *Ips* attack increased the accuracy of the predictions (Sieg et al. 2006).

Wood Borers

Wood boring insects (beetles in the families Cerambycidae and Buprestidae) are still present in numbers that are above average in burned areas and in mountain pine beetle killed trees.

Boring insects play a large role in lumber quality. Since these insects actually bore into the wood of a tree as opposed to just living under the bark as do bark beetles, they cause serious degradation of lumber after they have attacked a tree. Over the past few years trees have died and become infested with borers so rapidly that in some cases, the trees did not hold lumber value for more than two to three months after they were killed.

Evaluation:

The mountain pine beetle is at epidemic levels across many areas on the forest, particularly the central Hills. At this time, this is still a ever growing 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

Monitoring:

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

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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.

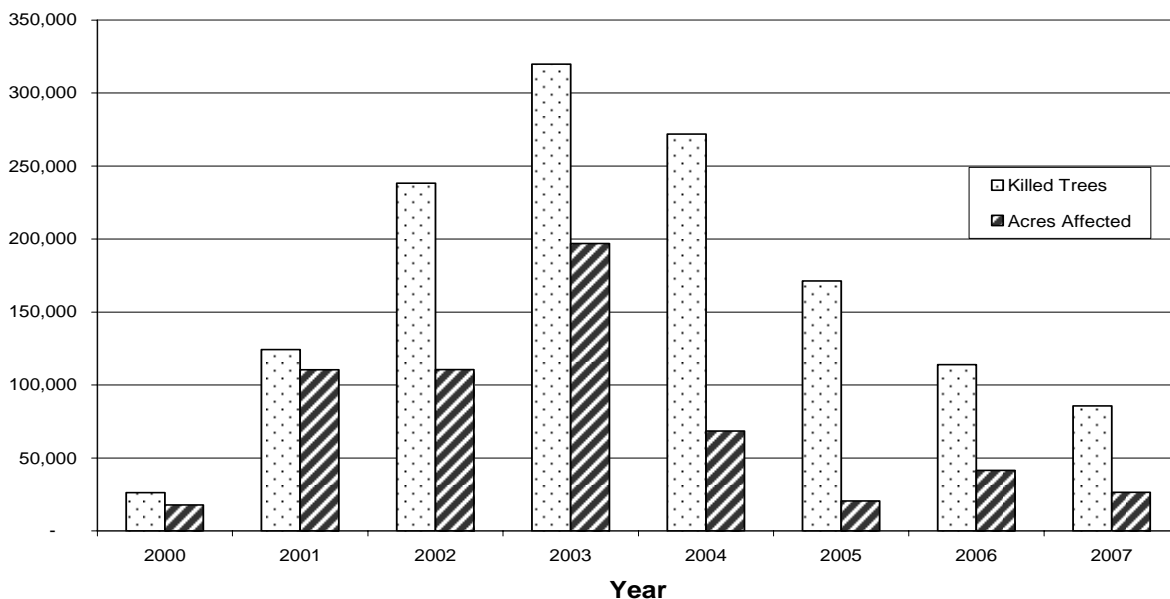
Health of Paper Birch in the Black Hills

In 2007 we sampled a number of paper birch stands in the Black Hills to provide information on their overall condition. All of the data has not been analyzed, but generally, stands are in good condition. Over 85% of the trees sampled were alive and had relatively high crown health ratings. *Armillaria* root disease was found in all stands, but beyond that there were no other insects and diseases causing widespread damage. *Armillaria*, however, was only a problem in a few of the stands. Animal browsing was the most commonly noted problem with seedlings and saplings.

Sub-Item: Tree Mortality

Monitoring:

Mortality of ponderosa pine caused by mountain pine beetle in the Black Hills of South Dakota and Wyoming from 2000 to 2007 as estimated by overview aerial detection surveys



The above graph shows the estimated number of trees killed and acres affected based on aerial surveys for the past 8 years. There is an appearance that mortality has declined in recent years, however, that may be due to a number of factors, including removal of large numbers of green infested trees prior to beetle flight and differences in timing and mapping techniques employed by different mappers. The overall trend on the forest is certainly still for an increasing tree mortality due to mountain pine beetle.

Evaluation:

The mountain pine beetle outbreak we have been experiencing the past few years continues 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 beetle mortality are likely to continue into the coming few years.

Sub-Item: Hazard

Monitoring:

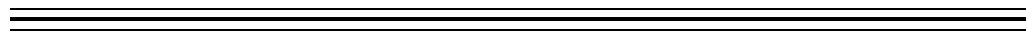
The R2 FSVEG database was used to rate the overall hazard of the forest. These ratings are based on structural stages and how susceptible they are to beetle attack. In this system all ponderosa pine stands are rated. Stands that are structural stage 1 and 2 and 3A are considered low susceptibility. Stands that are stage 3B and 4A are rated as medium susceptibility. Stands in stages 3C, 4B and 4C are rated as high. Based on that data, 174,871 acres or 17% were rated as low hazard, 355,071 acres or 34% were rated as medium hazard and 510,004 acres or 49% were rated as high hazard to mountain pine beetle.

The most problematic of the categories is those stands that are in the medium range. The range is fairly narrow and where the cutoff should be between low and medium and medium and high is a changing number. In the future, breaking the rating down to just low and high and splitting the medium between them may make more sense. As more data is collected on the rating categories, what is considered as low and high may also change in the future. Also, although a large part of the forest is rated as high, this does not necessarily take into consideration areas that have recently been treated or areas where there has been high levels of mortality, either of which would lower the hazard rating to beetles.

Finally, one should note that generally hazard is based solely on stand conditions, with no inference of beetle pressure or activity in the area. During times, such as now, when there are outbreak beetle populations in any number of areas throughout the Black Hills, almost any stand over 60 basal area can be susceptible to beetle mortality. To get a true risk factor, the stand conditions (as noted in hazard ratings above) and the beetle conditions both need to be considered.

Evaluation:

Based on the above information, 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

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

Detection surveys for the gypsy moth were continued at recreation and administrative sites on the Forest in 2007. 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

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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 affect nearby native ash stands and community forests.

Gypsy moth has not been a problem on the Forest. The need for continued monitoring of this introduced pest is warranted.

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.

Monitoring:

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

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 unchanged since 1995. Fuel treatments have reduced fire hazard, but increasing tree density continues to increase fire hazard. Analysis of fire hazard will continue to improve and in 2008 will be focused on targeted management areas and separated within and outside the wildland-urban interface (WUI) when counties complete their community wildfire protection plans.

Monitoring Item 26: Fuel Treatment

Objective 10-04: Reduce or otherwise treat fuels commensurate with risks (fire occurrence), hazard (fuel flammability), and land and resource values common to the area, using the criteria in Forest-wide Guideline 4110.

Monitoring:

In FY07 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.

Core Fuel Treatment:

The Forest accomplished fuel-treatment-related activities funded by appropriated **WFHF** funds on a total of

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19,766 acres of the National Forest in FY2007. Included in this work were activities as listed below:

CATEGORY	MECHANICAL (acres)	PRESCRIBED FIRE (acres)	TOTAL (acres)
WUI	11,229	2,607	13,836 (70%)
NON-WUI	4,813	1,097	5,910 (30%)
GRAND TOTAL	16,042	3,724	19,766 (100%)

(Source: Database of Record, FACTS, 10/25/2007).

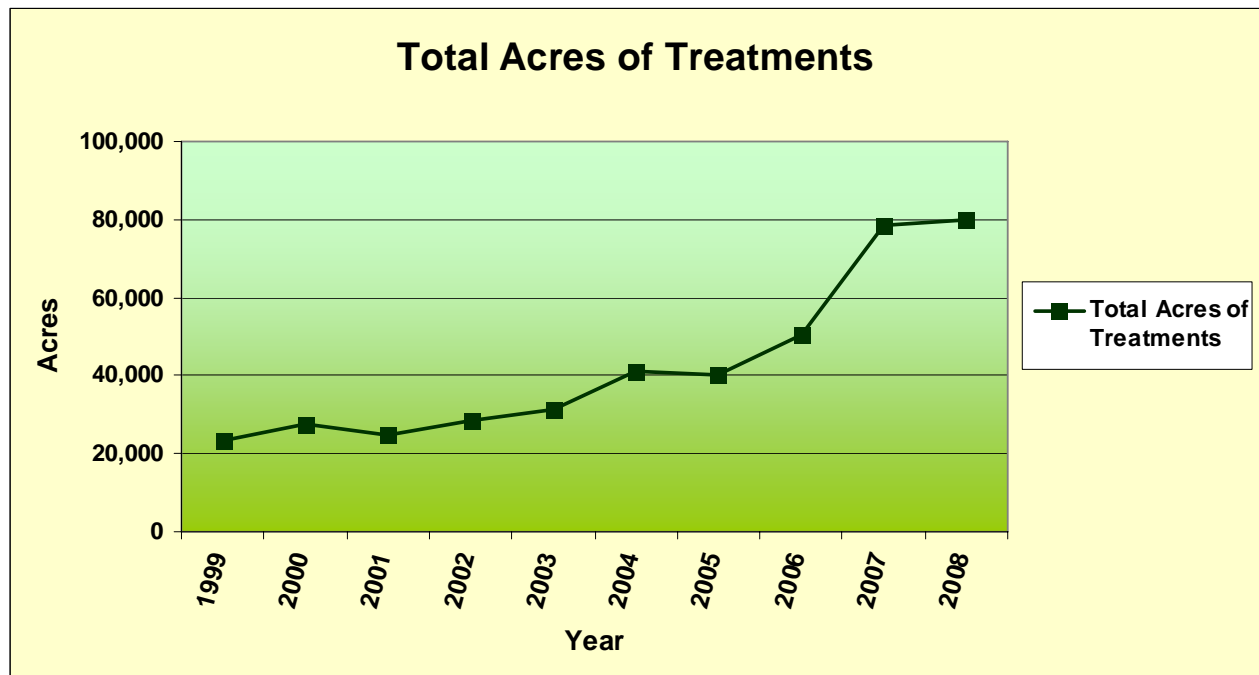
Integrated Fuel Treatment:

Fire hazard was reduced via fuel reduction on 33,985 acres done through tree thinning, timber harvest, forest health, and wildlife and range management projects. An additional 21,543 acres of slash treatment was accomplished through timber sale and service contractors.

Total (unified) Fuel Treatment: 19,766 (core) + 33,985 (integrated) = 53,751 acres (+ 21,543 purchaser requirements) = 75,294

Evaluation:

The Forest has been successful at aggressively treating fuels over the past five years to thin trees, convert some pine types to hardwood, and treat ground fuels. These treatments must continue to stay ahead of increasing fire hazard as 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.



(Note: FY 2007 USFS changed national business rules for reporting.)

Monitoring Item 27: Fire Prevention and Suppression

Objective 10-06: Develop fuel management and protection strategies for intermixed land ownerships in partnership with private, state, and other federal agencies.

Monitoring:

Status of fire management agreements with partner agencies: All cooperator agreements and annual operating plans were reviewed and signed as required in 2007.

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 2007.

Involvement in (SDIFC) meetings and other interagency activities: The Forest is a member of the South Dakota Interagency Fire Council SDIFC and an ad hoc member of the Black Hills Fire Advisory Board (BHFAB). Both of these organizations provide interagency coordination of prevention, pre-suppression, and suppression activities in the Black Hills and surrounding areas. The Forest has representation at all meetings and participates in and provides representation to various committees and task groups of these two active organizations.

All other information, related to efficiency of operation in the fire management arena through interagency cooperation and prevention activities: The Forest completed reviews of various fire incidents during the course of the 2007 fire season in compliance with findings and abatement requirements of the Thirty-Mile incident.

Evaluation:

Based on the information above, 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 2007.

Objective 10-05: Manage wildfires using the appropriate response based on management area emphasis, existing values, risk of ignition, and fuel hazards within a given area.

Monitoring:

All wildfires on the Black Hills National Forest in 2007 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 7,907 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	83	86
Human	25	282
TOTAL	108	368

The 2007 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 76% of the total acres burned resulting from statistical fires in 2007 where the result of a single fire that consumed 263 acres of NFS lands. Approximately 98% of these acres were forested. Approximately 76% of all statistical fires occurring in 2007 where lightning caused with the remaining 24% being human caused.

Evaluation:

The most significant wildfire occurring on the Black Hills in 2007 was the Alabaugh Fire under State of South Dakota jurisdiction. NFS lands included only 1,000 acres, but 35 structure were burned on private lands, 1 resident fatality and 2 firefighters injured in a burnover. This incident reinforced that drought induced extreme fire behavior and residential development in a grass-forest intermix without adequate vegetation treatment and fire resistant building materials combined to make a very costly fire. In a subjective evaluation of fires since the Plan was revised in 1997 it is observed that most of the significant fires in the Black Hills had a complex of intermingled private lands, most with homes and other structures, and a mix of high to very high fire hazard with high to extreme fire danger ratings. These fires included West Hell Canyon (2001), Little Elk (2002), Grizzly Gulch (2002), Battle Creek (2003), Old Hill City Road (2005), Camp Five (2005), Ricco (2005), East Ridge (2006), Boxelder (2007) and Alabaugh (2007). Remarkably few structures were burned in these fires, but with shifts in wind direction or weather the results could have been far more devastating in terms of private property damage. It is recommended interagency partners continue to work on ways to encourage private landowners to use “firewise” development standards and to more aggressively treat fuels in the wildland urban interface.

Monitoring Item 28: Fire – Non-emergency Watershed Condition

Objective 11-01: Achieve a non-emergency watershed condition as soon as possible after an event but generally no later than 3 to 5 years.

This monitoring item is relatively new in that it did not exist as a monitoring item until the Phase II Amendment to the Black Hills National Forest Land and Resource Management Plan became effective (March 2, 2006). The evaluation and annual monitoring of whether post-fire conditions exhibit emergency watershed conditions and the process to take action for achieving a non emergency watershed condition follows direction included in Forest Service Handbook 2509.13 -- Burned Area Emergency Rehabilitation Handbook (USDA Forest Service 1995). At this time, the only area within a post-fire interim BAER process for ongoing emergency watershed condition Monitoring Item 28: Fire -- Non- Emergency Watershed Condition evaluation by the Black Hills National Forest is the Alabaugh Fire that occurred in 2007.

Monitoring Item 29: Scenery – Scenic Integrity

Objective 401: Review all existing projects and areas that do not meet the adopted Scenic Integrity Objective (SIO) specified for each management area, and set priorities for rehabilitation.

Objective 402: Provide natural appearing landscapes with diverse scenery and enhance opportunities to enjoy attractive settings. Maintain Scenic Integrity Objectives.

Monitoring and Evaluation:

No monitoring occurred related to this item in FY2007. Limited Forest Plan monitoring funding was devoted to more critical monitoring items.

Monitoring Item 30: Heritage Resources

Objective 403: Improve the management of heritage resources and integrate them with recreation and education while providing for compliance with all applicable laws and regulations.

- a. Increase numbers and types of heritage resource interpretive sites and opportunities. Provide five projects per year during the plan period.
- b. Conduct six heritage resource stabilization and rehabilitation projects per year during the plan period.
- c. Nominate eligible sites (approximately five per year in the plan period) to the National Register of Historic places.
- d. Inventory 50,000 acres each year in the plan period for heritage resource sites.

Objective 404: Conduct three research projects each year to support heritage resource management.

Objective 405: Manage all heritage sites listed in the National Register of Historic Places in consultation with the State Historical Preservation Officer (SHPO) and the President's Advisory Council on Historic Preservation (ACHP).

Objective 406: Provide opportunities for the public to participate in heritage management activities, including the monitoring, excavation, and protection of archeological sites.

Monitoring and Evaluation:

No monitoring occurred related to this item in FY2007. However, the Forest maintains a strong relationship with the South Dakota and Wyoming State Historic Preservation Officers (SHPO), the Advisory Council on Historic Preservation, and the Tribal Historic Preservation Officers (THPO) on listed and eligible properties. The Forest also successfully participated in a Passport in Time project.

Monitoring Item 32: Recreation Opportunities

Objective 407: Provide the following Recreation Opportunity Spectrum (ROS)

Recreation Opportunity Spectrum (ROS) (Thousands of Acres)	
Primitive	11
Semi-Primitive Non-Motorized	18
Semi-Primitive Motorized	12
Roaded Natural	1107
Roaded Natural Non-Motorized	95
Rural	1

Objective 408: Manage recreation use to stay within the capacity for the ROS class

ROS Class	Capacity Range Recreation Visitor Days (RVDs/Acre)		
	Low	Moderate	High
Primitive	0.25	0.5	0.75
Semi-Primitive Non-Motorized	1.00	2.0	3.00
Semi-Primitive Motorized	1.50	3.0	4.50
Roaded Natural Non-Motorized	1.50	3.0	4.50
Roaded Natural	3.00	6.0	9.00
Rural	<<<< Design Capacity >>>>		

Monitoring and Evaluation

Recreation Activity: Recreation Opportunities across the Forest

The 1997 Forest Plan, Phase II amendment identifies objectives for capacities of the ROS classes expressed in recreation visitor days (RVDs). No monitoring data or techniques concerning this data were conducted in FY2007 to determine the degree to which the Forest is meeting this objective. Recreation opportunity spectrum capacity objectives by ROS class have not been monitored.

General anecdotal evidence of how well the Forest is meeting these objectives may be evident through monitoring of developed recreation use, dispersed recreation activities, and trail counter data from wilderness use.

Developed Recreation Discussion

The backlog of deferred maintenance needs for our developed sites continues to be a major concern related to meeting Forest Plan standards for maintaining developed recreation sites. Operation and maintenance funding from appropriated dollars has been historically insufficient to meet the needs. The Forest makes use of service partners wherever possible, such as our campground concessionaire. Forest-wide, our fee sites are paying for day-to-day operation through the concession permit. Special-use fees paid to the Forest from the concessionaire are re-invested into our developed sites through the Granger-Thye fee offset program. In 2007, this fee system enabled the Forest to re-invest approximately \$50,000 in permit fees back into our developed sites. The Black Hills National Forest Visitor Information Center overlooking scenic Pactola Lake and satellite visitor information stations at our district offices provided significant developed and dispersed recreation information for the visiting public. During 2007, the Forest compiled information on recreation site annual and deferred maintenance for use in continued preparation of an action plan for the Recreation Facility Analysis. Public involvement was initiated in 2007.

The success of the Forest’s developed recreation management program could be considered an indication the Forest is meeting Forest Plan objectives in providing urban and roaded natural recreation opportunities within the capacity objective.

Dispersed Recreation Discussion

The Black Hills National Forest continues to be a leader in providing dispersed recreation as evidenced by the following opportunities: Mickelson and Centennial National Recreation Trails, snowmobiling, cross-country skiing, ATV and ORV routes, an established network of Forest roads and hiking trails, the Peter Norbeck Scenic Byway, a multitude of fishing opportunities at National Forest lakes, and some of the best elk and deer

hunting in South Dakota and Wyoming.

The Black Hills National Forest is well roaded with over 6,000 miles of federal, state, county and Forest Service roads serving approximately 1.2 million acres of National Forest land. Restrictions on motorized use have been established in areas where resource damage is occurring due to increased ORV/ATV use.

The dispersed recreation opportunities discussed here provide background information that the Forest is providing a wide range of ROS classes but with emphasis on roaded recreation opportunities, both roaded natural and/or semi-primitive motorized. How the Forest is doing in meeting the overall Forest Plan ROS objectives cannot be determined using the monitoring data currently gathered.

Monitoring Item 33: Recreation Use, Trends, and Demographics

Objective 413: Provide interpretation, information and environmental education as an important part of outdoor recreation. Use "Tread Lightly", "Leave No Trace" and other techniques.

Objective 417: Coordinate trail development with the State Comprehensive Outdoor Recreation Plan (SCORP). Develop trail facilities in cooperation with other agencies and partners.

Objective 419: Provide for the annual designation and management of 350 miles of snowmobile trail by the States of Wyoming and South Dakota. Annual changes to the trail system should be limited.

Monitoring and Evaluation:

Objective 413

The Forest's information and environmental education efforts are monitored through the number of products offered. Recreation funding (NFRW) provided a target of 15 interpretation and environmental education products to standard.

The Moon Walk program, spearheaded by the Mystic Ranger District, presented six programs during the spring, summer, and fall across the Forest with participation by all districts. The visitor information center, located along Highway 385, was open five days a week from the middle of May to the end of September. This facility provided information, education, and interpretation exhibits, including "Tread Lightly" messages and literature, and averages over 60,000 visitors each year. The Dakota Digital Network reaches more than 30 classrooms annually on a wide range of subjects like fire, weeds, and fire prevention.

Through its visitor information station at Pactola Lake, moon walks, wilderness education, and interpretive portal signs throughout the forest along with other information and education efforts, the Forest continues to meet this Forest Plan objective. The Forest's partnership with the Black Hills Parks and Forest Association also provided staffing assistance at the visitor center, publications and interpretive products at forest outlets, and supplemental funding for an interpretive exhibit at Mount Roosevelt historical site.

Objective 417

The Forest provided its share of management of the Centennial Trail, a designated National Recreation Trail (NRT) jointly managed by Custer State Park, Black Hills National Forest, Bureau of Land Management, and the National Park Service. Trail work included annual trail maintenance and trail reconstruction efforts on the trail portions located on National Forest System lands. The Forest supported the Game, Fish, and Parks Mickelson Trail rail trail by providing engineering expertise for bridge inspections.

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The Forest is meeting this Forest Plan objective through its cooperative management of the Mickelson Trail and the Centennial Trail.

Objective 419

The Forest continued its participation in a Memorandum of Understanding (MOU) with the Wyoming and South Dakota Snowmobile Trail programs with snowmobile trails located, signed, managed, and groomed on the Bearlodge Ranger District by the State of Wyoming and on the Northern Hills, Mystic, and Hell Canyon Ranger Districts in South Dakota. The Forest issued its annual winter travel management special order, which provides for snowmobile and cross-country ski trails on the Forest.

This Forest Plan objective is being met through the Forest's fulfillment of its responsibilities outlined in its MOUs with the Wyoming and South Dakota snowmobile programs.

Monitoring Item 34: Access - Road Mileage

Objective 309: Provide the following changes to the National Forest System roads in support of long-term sustainable production of commodities.

Road Construction	280 miles/decade
Road Reconstruction	870 miles/decade
Road Obliteration	140 miles/decade
Two-track Obliteration	270 miles/decade

Objective 420: Manage travel corridors for federal, state and county roads.

- a. Meet a scenic integrity objective of high.
- b. Provide recreation facilities, trailheads, trail crossings and other road corridor components to meet demand.
- c. Include opportunities for pedestrians and bicycle ways.
- d. Use cooperative opportunities for development of outdoor facilities, such as provided for in the Intermodal Surface Transportation Efficiency Act (ISTEA) as an integral part of corridor planning.

Objective 421: Provide the following road system:

Roads (By End of the First Decade)		
Suitable for Public Use		4,700 miles
Passenger Car	1,200 miles	
High Clearance Vehicles	3,500 miles	
Roads Closed to Vehicles		500 miles
TOTAL		5,200 miles

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Monitoring and Evaluation:

The following is the status of National Forest System (NFS) roads between FY2003 and FY2007:

	FY03 Miles	FY04 Miles	FY05 Miles	FY06 Miles	FY07 Miles
NFS Maintenance Levels 1,2,3,4,5	5,449.0	5,443.0	5503.1	5478.9	
NFS Miles Constructed	9.0	8.5	4.7	4.2	10.1
NFS Miles Reconstructed	87.0	102.0	27.1	19.9	57.1
NFS Miles Under Forest Service Jurisdiction	4,839.0	4,910.1	4951.2	4961.5	4927.0
NFS Miles Under Local Government Jurisdiction	610.0	538.9	527.0	531.1	532.8
NFS Miles Obliterated	3.7	0.0	28.6	25.0	0.3
NFS Miles Open Year Long, Seasonally For Low Clearance Vehicles	715.0	673.5	675.6	680.0	679.7
NFS Miles Open Year Long, Seasonally Which Are Accessible To High Clearance Vehicles Only	3158.0	3,129.0	3086.9	3036.0	3052.9

	1997 Revised Forest Plan (Miles/decade)	Accomplished FY2003 (Miles)	Accomplished FY2004 (Miles)	Accomplished FY2005 (Miles)	Accomplished FY2006 (Miles)	Accomplished FY2007 (Miles)
Road Construction	280	9.0	8.5	4.7	4.2	10.1
Road Reconstruction	870	87.0	48.8	27.1	19.9	57.1
Road Obliteration	140	3.7	0	28.6	25.0	0
Two-track Obliteration	270	9.0	10.0	70.8	58.0	Data not available

Forest Plan Activities (Miles)	Accomplished FY2003-FY2007	Percent of Annual Compliance FY2003 – FY2007
Road Construction	7.3 miles/yr	26%
Road Reconstruction	48.0 miles/yr	55%
Road Obliteration	11.5 miles/yr	82%
Two-track Obliteration	24.5 miles/yr (through 2006)	Current data not available, 91% based on 2002-2006
	Current Inventory	
Suitable for Public Use	3,716 miles	
Passenger Car	980 miles	
High Clearance Vehicles	3,036 miles	
Roads Closed To Vehicles	1,213 miles	

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Number of miles of road reported varies per year, more than indicated by construction and obliteration miles would account for. This is due to database corrections made as more accurate information is entered, replacing less reliable data. Mileage for the Roads Accomplishment Report (RAR) is deemed the most reliable source of data. Some previous monitoring was based upon individual data base queries, so RAR data shown on this report may not agree with previous reports.

Decreasing or flat budgets and steeply escalating equipment and fuel costs have limited the Forest ability to meet our objectives. Maintenance and reconstruction is being accomplished through a combination of force account work, contracts, cooperators and timber program work. Deferred maintenance on roads is increasing.

Construction of new roads is adequate to fully support the timber program and provide recreational access to the Forest, and the projected goals for new road construction may exceed Forest needs.

Monitoring Item 35: Access - Off-Road Vehicle Access

Objective 422: Provide the following off-road travel opportunities:

Category	Percentage of Forest
All Motorized Travel Allowed Yearlong	59.1%
Seasonal Restrictions Apply	22.8%
Seasonal Restrictions - No Off-road Travel	3.2%
Backcountry Motorized Recreation on Designated Trails	1.0%
Only OHV Travel Prohibited	11.4%
Motorized Travel Prohibited Except Snowmobiles	1.2%
All Motorized Travel Prohibited	1.3%

Monitoring and Evaluation:

Travel Management Planning is in process on the Forest. A Draft Environmental Impact Statement (DEIS) will be released in 2009 and a Motor Vehicle Use Map is expected to be released in 2010.

Monitoring Item 36: Access - Trail Opportunities

Objective 416: Maintain and construct trails as displayed in the following table:

Non-motorized Trails (1996)	293 miles
Motorized Trails (1996)	14 miles
Non-motorized Trail Construction	204 miles
Motorized Trail Construction or Conversion from Road to Motorized Trail	15 miles
Total Forest Trail System	526 miles
Reconstruction	100 miles

Objective 418: Enhance the trail system to disperse use away from the Black Elk Wilderness.

Monitoring and Evaluation:

1997 Revised Forest Plan		FY2003	FY2004	FY2005	FY2006	FY2007
Existing Trail Inventory:						
Non-motorized Trails (1996)	293 miles	332.8	332.8	332.8	309.2	309.2
Motorized Trails (1996)	14 miles	13.7	13.7	13.7	13.7	13.7
New Trail Construction:						
Non-motorized Trail Construction	204 miles ¹	0.0	0.0	0.0	7.0	0.0
Motorized Trail Construction or Conversion from Road to Motorized Trail	15 miles ¹	0.0	0.0	0.0	0.0	0.0
Total Forest Trail System	526 miles ²	346.5	346.5	346.5	322.9	322.9
Reconstruction	100 miles ¹	10.2	11.4	1.6	2.9	3.0

¹Per decade

²Total Miles at End of Decade

Forest Plan Objective	Percent Compliance FY2003 – FY2007
Non-motorized Trail Construction	¹ 0%
Motorized Trail Construction or Conversion from Road to Motorized Trail	² 0%
Reconstruction	³ 58.2%

Figures are based on the following goals by the end of the first decade:

¹ increase of 20.4 miles per year

² increase of 1.5 miles per year

³ increase of 10 miles per year

Sharp declines in budget have made accomplishing trail goals unattainable. Elimination of TRTR "10 percent" funds has severely impacted ability to fund trail work and construction. No funds are available for trail construction, and funds are severely limited for trail maintenance. Emphasis on travel management in 2007, with associated funding from trail funds, has further decreased funding available to implement trail program goals. Condition of trails is steadily declining as maintenance is unable to keep up with use.

Monitoring Item 37: Access - Right-Of-Way Acquisition

Objective 503: Acquire approximately 25 rights-of-way each year to improve Forest access.

Monitoring:

Type	FY2001			FY2002		
	Cases	Miles	Acres	Cases	Miles	Acres
Acquired	12	6.2	24.6	3	4.2	10.6
FLPMA*	~	~	~	~	~	~
Forest Road Easements Conveyed	4	3.5	14.1	1	.09	.69
Private Road Easements Conveyed	3	6.7	26.7	17	6.06	25.8
FRTA** Easements ¹	0	0	0	0	0	0

Type	FY2003			FY2004		
	Cases	Miles	Acres	Cases	Miles	Acres
Acquired	2	2.9	11.8	3	1.05	437
FLPMA*	~	~	~	~	~	~
Forest Road Easements Conveyed	6	2.5	20.8	7	13.8	57.51
Private Road Easements Conveyed	14	1.9	15.37	14	5.0	20.82
FRTA** Easements ¹	2	0.3	2.52	1	0.18	0.75

Type	FY2005			FY2006		
	Cases	Miles	Acres	Cases	Miles	Acres
Acquired	2	.38	3.04	1	.06	0.47
FLPMA*	~	~	~	~	~	~
Forest Road Easements Conveyed	8	2.91	23.36	1	0.24	1.87
Private Road Easements Conveyed	5	1.85	10.02	3	0.52	4.18
FRTA** Easements ¹	1	1.51	12.1	1	0.33	2.66

Type	FY2007		
	Cases	Miles	Acres
Acquired	1	.05	.01
FLPMA*	~	~	~
Forest Road Easements Conveyed	2	4.8	14.68
Private Road Easements Conveyed	9	2.69	21.44
FRTA** Easements ¹	~	~	~

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*FLPMA - Forest Land Policy Management Act *

*FRTA - Forest Road and Trail Act

¹Previously under special use permit that was converted to easements in 1998

Monitoring Item 38: Land Adjustment

Objective 501: Conduct approximately 500 to 1000 acres of land exchange each year over the decade, such as through purchase, exchange or donation, whenever lands meet land-adjustment criteria in Guidelines 8101 through 8104.

Objective 502: Provide timely response to landowner requests for access across the National Forest.

Objective 504: Actively seek local government and tribal government input and support for those exchanges that substantially change the balance of federal and private lands.

Objective 505: Work with conservation groups, state agencies and others to develop and implement cost-effective land and resource protection measures such as conservation easements, etc.

Monitoring:

Land Acquired Through Acquisition

	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007
Land Adjustment Completed	Acres	Acres	Acres	Acres	Acres	Acres
Land Acquired through Purchase	259	966	282	69	0	480
Land Acquired through Exchange	330	433	0	0	320	0
Land Acquired through Donation	0	80	0	0	0	0
Total Acquired	589	1,479	0	69	320	480
LESS:	~	~	~	~	~	~
Land Conveyed Out	176	475	11	0	5	7.89
NET CHANGE	+413	+1,004	+271	+69	+315	+472.11

Land Being Acquired Through Acquisition

	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007
Land Adjustment Being Processed	Acres	Acres	Acres	Acres	Acres	Acres
Land Acquiring through Purchase	1,156	280	0	2,434	280	0
Land Acquiring through Exchange	473	1,020	900	678	0	0
Land Acquiring through Donation	80	0	0	0	0	0
Total Acquiring	1,709	1,300	900	3,112	280	0
LESS:	~	~	~	~	~	~
Land Conveying Out	504	1,070	1,376	850	0	0
NET CHANGE	+1,205	+230	-476	+2,262	+280	0

Evaluation:

The Forest has continued to foster communication with several conservation groups and state agencies with the objective of completing land adjustments and exchanges for everyone's benefit. The Forest is a member of the Black Hills Conservation Initiative, which is a partnership of private landowners, communities, state and federal agencies, and other conservation groups, to protect wildlife habitat and open space. The Forest has stressed land exchanges and purchases over conservation easements as the means to benefit the public. These exchanges can be time consuming (sometimes as long as three to ten years), but the outcome of a more efficient and manageable land pattern is worth the time and effort expended.

Landowner requests for access across the National Forest are increasing. The Forest has also been delegated the authority to sign the permits authorizing this use. Budgetary concerns and changes in the Lands staff have slowed the processing of special use applications. New staff is in place and being trained at the end of the fiscal year. The Forest has implemented cost recovery for all new special use applications.

The Forest actively seeks input and support from local and tribal governments with respect to land exchanges. The local and tribal governments are notified early in the exchange process and asked if they have any concerns or recommendations regarding the exchange proposal. Any concerns or recommendations related are considered and evaluated throughout the exchange process. The governments are again notified during the NEPA phase of the project and again at the time of a decision being made.

Monitoring Item 39: Economic Efficiency

Objective 601: Strive to reduce net costs of both market and non-market programs.

Objective 602: Maintain the ability to respond to budget reductions by keeping overhead and fixed costs, including salaries, at less than 70 percent of the Forest budget.

Report not available; available Forest Plan Monitoring funding was devoted to more critical monitoring items.

List of Preparers

Item Number	Monitoring Item	Preparers
Introduction	What This Document Is	Edward Fischer
	Forest Plan Amendments	Edward Fischer
1	Air Quality	Todd Pechota
2	Soil Productivity	Deanna Reyher
3	Soils Revegetation	Deanna Reyher
4	Watershed Health	Deanna Reyher
6	Riparian – Condition and Trend	Steve Hirtzel
7	Riparian Wetlands	Steve Hirtzel
8	Vegetative Diversity – Vegetation Species Composition	Blaine Cook
9	Vegetative Diversity – Structural Stages	Blaine Cook
10	Vegetative Diversity – Large Trees	Blaine Cook
11	Vegetative Diversity and Snag Retention	Blaine Cook
12	Vegetative Diversity – Burned Forest Habitat	Blaine Cook
14	Regeneration	Blaine Cook
15	Timber Production	Blaine Cook
16	Rangeland Trend	Craig Beckner
17	Forage Utilization	Craig Beckner
18a	Sensitive Species (Plants)	Beth Burkhart
18b	Sensitive Species (Wildlife)	Steve Hirtzel
19	Species of Local Concern	Steve Hirtzel
20	Threatened and Endangered Species	Steve Hirtzel
21	Management Indicator Species	Steve Hirtzel
22	Noxious Weeds	Craig Beckner
23	Insect and Disease – Population, Damage, Trend, and Hazard	Blaine Cook
24	Exotics	Blaine Cook
25	Fire Hazard	Todd Pechota
26	Fuel Treatment	Todd Pechota
27	Fire Prevention and Suppression	Todd Pechota
28	Fire – Non-emergency Watershed Condition	Deanna Reyher
29	Scenery – Scenic Integrity	Steve Keegan
30	Heritage Resources	Donita Carlson
32	Recreation Opportunities	Craig Kjar
33	Recreation Use, Trend, and Demographics	Craig Kjar
34	Access - Road Mileage	Craig Kjar

Item Number	Monitoring Item	Preparers
35	Access - Off-Road Vehicle Access	Craig Kjar
36	Access - Trail Opportunities	Craig Kjar
37	Access - Right-of-Way Acquisition	Craig Kjar
38	Land Adjustment	Craig Kjar
39	Economic Efficiency	Claire Huking
	Compiling and Editing	Claire Huking

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