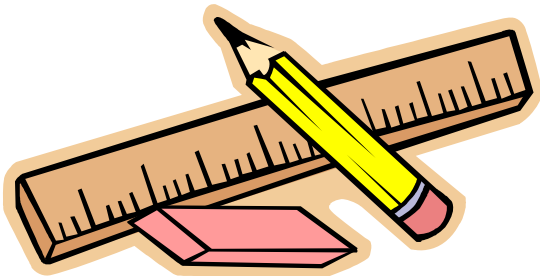
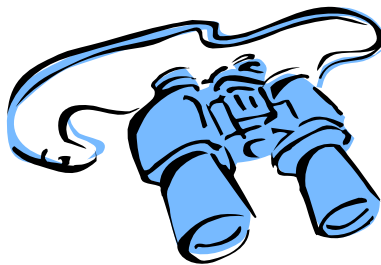


Sensitive Plant Species and Plant Species of Local Concern
Monitoring Implementation Guide
for the
Black Hills National Forest Land and Resource
Management Plan

May 2006

(Addendum to the October 2005 Guide)



Monitoring Item 18: Sensitive Plant Species
(Revised May 12, 2006; RMRS consultation occurred May 19, 2006)

Authority: Forest Plan

Indicators: Individual species monitoring. Population persistence.

Method of Data Collection: Field monitoring using the Black Hills National Forest Rare Plant Survey/Monitoring Form, Species Specific Monitoring Forms or Global Positioning System with Data Recording Capabilities.

Unit of Measure: Populations or occurrences (sites)

Sample Design: (Indicated by species below)

General: The monitoring described for each species is based on recent assessments prepared for a number of the species in 2002 through 2005, state heritage database information, survey and/or monitoring information for individual species, the number of currently known occurrences, the number of individuals at single occurrences, and recognition that numbers of individuals may largely be influenced by fluctuations in climatic conditions (i.e. several wet years in a row; several drought years) or changes in canopy closure. In addition, various invasive species and/or noxious weeds have potential to impact some of the occurrence sites. These influences, along with other disturbances that could impact portions of occurrences, served as factors driving the monitoring design for each of the species below. Abundance of occurrences (single occurrences versus multiple occurrences), how species occur geographically (i.e. multiple drainages) across the forest, species habitats (i.e. riparian habitats with flooding characteristics that can remove and/or result in re-colonization of species), and potential for risks that could affect the long-term persistence of the species were also used as factors in designing the monitoring. For species that are more widely distributed throughout the Black Hills, have a larger number of sites, and have many individuals per site, the monitoring design included the selection of key monitoring sites.

Consultation with the Rocky Mountain Research Station occurs on monitoring design for the plant species listed below. Monitoring data, along with additional new occurrence and site information, are used to annually reassess the adequacy of the monitoring design.

If monitoring indicates that occurrences are absent, severely degraded, or noxious weeds or other invasive plant species are present, active measures are to be taken in accordance with the Black Hills National Forest Land and Resource Management Plan (LRMP), along with any current amendments to the Black Hills National Forest LRMP.

There is new direction in Phase II Amendment to the Black Hills LRMP effective in March 2006 that relates specifically to persistence of R2 sensitive plant species and Black Hills National Forest species of local concern. These directions include:

Standard 2505. Allowable use and/or residual levels:

- 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*).

- f. Implement additional measures to assure avoidance of livestock use on *Carex alopecoidea*. Restrict livestock use of all or portions of 5 of the largest geographically spaced occurrences at site numbers: CAAL8-19, CAAL8-20, CAAL8-22, CAAL8-30, CAAL8-31.

Guideline 4303. Develop a noxious-weed management program that addressed the following components: awareness, prevention, inventory, planning, treatment, monitoring, reporting, and management objectives Control noxious weeds using the following priority order:

- a. R2 sensitive and species of local concern occurrences of snails and plants;
- b. Research natural areas;
- c. Botanical areas;
- d. New invaders;
- e. New areas of infestation;
- f. Spreading or expanding infestations;
- g. Existing infestations.

Standard 4304. Treat individual plants or groups of plants in areas where R2 sensitive or species of local concern plants occur. Use a treatment method that is the least risk to the species being protected.

Standard 4309. Monitor weed treatments used at R2 sensitive and species of local concern plant occurrences and re-treat as needed during the season.

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.

New monitoring questions have been added and protocols examined/revised to provide monitoring data will be able to document whether these actions support species persistence.

The presence of noxious weeds in R2 sensitive plant locations has emerged from Black Hills National Forest monitoring as an important issue to the persistence of some R2 sensitive species at some occurrences. With support from Phase II direction, monitoring botanists will analyze data collected in 2006 to develop a weed treatment strategy for R2 sensitive and SOLC plant species/sites to use in interacting with Black Hills National Forest weed managers to direct noxious weed treatment in and around R2 sensitive/SOLC occurrences in 2007. This plan does not prevent monitoring botanists from requesting weed treatment immediately if noxious weed species of particular concern/concentration are noted in 2006. However, a prioritization must be developed to best direct treatment efforts.

Phase II Amendment to the Black Hills LRMP directs that species designated by Black Hills National Forest as species of local concern (SOLC) are to be treated like R2 sensitive species in the planning and implementation of management activities. Black Hills National Forest designated ten plant SOLC in November 2005. These plant species are added to the 2006 monitoring guide for baseline data collection and assessment of risks, preliminary to developing species-specific monitoring protocols.

Site numbers are assigned to occurrences of the sensitive plants. Site numbers are composed of a nationally accepted species code (refer to the Natural Resources Conservation Service PLANTS Database) followed by a number. An example of a site number for a *Platanthera orbiculata* occurrence would be PLOR4-2.

Botrychium multifidum (leathery grapefern)

Botrychium multifidum was designated as a Region 2 sensitive species in December 2003. Five of the known occurrences were documented in 2003. There are seven currently known occurrences, all of which are located in the Black

Elk Wilderness/Norbeck Wildlife Preserve (note: Black Elk Wilderness is entirely within the Norbeck Preserve but some of the Norbeck Preserve is outside Black Elk Wilderness). Baseline data were collected at all seven locations in 2004.

Occurrences of this evergreen, boreal species are located in three watersheds on the Black Hills National Forest, at some of the higher elevations in the Black Hills (5,100 - 6,500 feet).

Occurrences are found in areas with mesic but not saturated soil conditions. Occurrences are documented in areas receiving periodic disturbances, such as on gravel bars and in old stream channels on substrates associated with the granitic core region. Some of the occurrences are not associated with perennial flowing water (but in sites that lend themselves to being affected by periodic flooding events). Varying levels of canopy cover are present at the sites with *Picea glauca* (white spruce) and *Populus tremuloides* (aspen) being the primary overstory components. Numbers of individuals documented at the sites in 2005 ranged from 11 to 383. The occurrence with 383 individuals in 2005 was documented to have 35 individuals 2004 and 65 in 2003. Dr. Don Farrar, Iowa State University, says this kind of variation in aboveground expression is not uncommon for *Botrychium* species. Additional similar habitat conditions occur in the Black Elk Wilderness and the Norbeck Wildlife Preserve, and additional occurrences are likely present on adjacent lands administered by Custer State Park and Mount Rushmore National Memorial.

Occurrences are primarily located the Black Elk Wilderness/Norbeck Preserve (86% of the locations), but one occurrence is found in Norbeck Wildlife Preserve outside Black Elk Wilderness (14% of the locations). Generally, there would be few risks associated with vegetation treatments or livestock grazing at any location. In addition, these plants grow in areas that are primarily located in the upper headwaters of bouldery, steep gradient watersheds that are generally resistant to alteration by various disturbance activities. *Cirsium arvense* (Canada thistle) was documented at three of the four occurrence locations monitored, so invasion by noxious weeds and other invasive plant species, along with treatment of those species, may be a risk to *Botrychium multifidum*. In addition, some of the occurrences are located near popular hiking trails and trampling or trail maintenance activities may present risks to those occurrences. Hell Canyon District trail maintenance personnel have been made aware of occurrence locations near trails so they can avoid or minimize impacts to occurrences. Other risks to the species may be associated with high intensity fire events (from the fire itself or suppression activities) or with flood events.

A monitoring strategy was proposed based on the major known risks to the occurrences of *Botrychium multifidum* and geographic distribution of known sites. The current revised monitoring design involves assessing the status of four Black Hills National Forest occurrences on an annual basis. The monitoring is designed to address four questions: 1) are there other occurrences in adjacent habitat?; 2) is the species present and is there evidence of contraction or expansion occurring within the aboveground portion of the occurrences?; 3) are invasive plant species present in the site?; and 4) are there any effects from weed treatment activities?

Four core sites were selected for annual monitoring: one located near a trail that has heavy foot traffic (site BOMU-1), sites BOMU-4 and BOMU-5, and site BOMU-7 which is located the farthest from the other sites.

2006 Monitoring Design:

1. Gather baseline data on any new occurrences that may be discovered in adjacent habitat. Assess risks to those sites.
2. Annually check presence/absence and count individuals at the four annual monitoring sites. These include one that is close to heavy trail traffic areas (site number BOMU-1), sites number BOMU-4 and BOMU-5), and site number BOMU-7, which is located farthest from the other sites.
3. Every five years, re-inventory all locations within the same year (completed in 2004; next in 2009).
4. Document any weeds designated as noxious by South Dakota or Wyoming or other invasive plant species. Document if the invaders are co-located with *Botrychium multifidum*, or at what distance they are located away from the occurrence site if they are occupying the same ecological type. Use this information to develop a weed treatment strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected occurrences.

Carex alopecoidea (foxtail sedge)

Because the identity of *Carex alopecoidea* and its occurrence on Black Hills National Forest was confirmed in 2000, baseline data were gathered on this species in 2001. An estimate of linear extent, numbers of population patches and other baseline data were gathered at 14 known sites. With the likelihood that more occurrences of this species would be identified in late August, and in consultation with the Rocky Mountain Research Station (January 2002), additional quick reconnaissance surveys were conducted in 2002 in similar habitat on the Bearlodge and Northern Hills Ranger Districts. Reconnaissance surveys resulted in 15 additional occurrences for *Carex alopecoidea* in the northwestern Black Hills and the Bearlodge Mountains. An additional limited number of quick reconnaissance surveys and project surveys in 2003 resulted in two additional reports. There were no reports of new occurrences in 2004 or 2005. A couple of reported locations were combined into a single occurrence and 31 occurrences of *Carex alopecoidea* were known to be located on the Forest as of the end of the 2004 season. Based on the number of occurrences that have been located in the preceding years Black Hills National Forest suspects that more occurrences are likely.

Based on the surveys for this species in the Black Hills, *Carex alopecoidea* is currently known to occur mainly along streams in two primary geographic locations (northwestern Black Hills and the main portion of the Bearlodge Mountains) between 4,100 and 6,400 feet elevation. The majority of currently known occurrences have been documented along the upper headwater areas of low gradient perennial streams. Associated conditions at many of the sites feature active or ancient beaver dams where flooding and disturbance have created wet to moist meadow habitats. Most individuals occur primarily in the transitional areas between saturated soil conditions and the adjacent mesic upland areas. Individuals at one of the lowest elevation occurrences occur within the saturated riparian zone. The majority of the sites are documented to have open conditions, with little to no overstory canopy present to block sunlight. Occasionally individuals are located scattered under *Salix* spp. (willows), *Crataegus chrysocarpa* (hawthorn), *Corylus cornuta* (hazelnut) or *Picea glauca* (spruce).

Within the two main geographic regions where *Carex alopecoidea* is found, the currently known occurrences are located within six distinct watersheds. Occurrences are located in eight active

grazing allotments with most of the individuals located where cattle are grazing or can access the plants. Although within active grazing allotments, two of the occurrences are located in areas that are supposed to be non-grazing areas within designated Botanical Areas (Sand Creek and Dugout Gulch). Weeds are documented at almost all occurrences, including *Cirsium arvense* (Canada thistle), *Cynoglossum officinale* (houndstongue), *Carduus nutans* (musk thistle), *Linaria vulgaris* (yellow toadflax), *Hypericum perforatum* (St. Johnswort) and *Tanacetum vulgare* (common tansy). A number of *Carex alopecoidea* occurrences are located in close proximity to roads.

Recent available data were used in developing monitoring guidelines for *Carex alopecoidea*. Occurrences for annual monitoring were primarily selected on the following criteria: size (estimated number of individuals), geographic distribution of the occurrence, if occurrences were located in different drainages, elevation ranges, and the presence and diversity of weeds. To incorporate geographic distribution, sites widely distributed from one another were selected over sites in close proximity to others. Based on these criteria, five occurrences were selected as core sites for monitoring. Sites selected include site numbers CAAL8-16, CAAL8-20, CAAL8-22, CAAL8-30 and CAAL8-31. In order to assess whether sites may contract, individual counts and endpoint documentation have been included for the core locations. In consultation with RMRS in 2006, it was determined that counting individuals at each site was not necessary; site size and extent will be documented by GPSing endpoints

Species persistence concerns for *Carex alopecoidea* led to the Phase II Amendment to the Black Hills LRMP (Standard 2505c) directing implementation of additional measures to assure avoidance of livestock use on *Carex alopecoidea* by restricting livestock use of all or portions of 5 of the largest geographically spaced occurrences at 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.

The current monitoring design involves assessing the status of five core 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?; and 6) are occurrences in botanical areas (Dugout Gulch Botanical Area and Upper Sand Creek Botanical Area) grazed by livestock?

2006 Monitoring Design:

1. Annually monitor presence/absence at sites CAAL8-16, CAAL8-20, CAAL8-22, CAAL8-30 and CAAL8-31. Document endpoints with a GPS system annually. If a contraction of the occurrence is noted, document the reason if it can be determined.
2. Document observations at CAAL8-19, CAAL8-20, CAAL8-22, CAAL8-30, and CAAL8-31 regarding effects of restricting livestock grazing on all or portions of these occurrences.
3. Document observations regarding whether *C. alopecoidea* sites in Dugout Gulch Botanical Area (CAAL8-16) and Upper Sand Creek Botanical Area (CAAL8-12) Botanical Area are grazed by livestock.
4. Document any weeds designated as noxious by South Dakota or Wyoming or other invasive plant species. Document if the weeds are co-located with *Carex alopecoidea*, or at what distance the weed species are located away from the occurrence site if they are

occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.

***Epipactis gigantea* (stream orchid; giant helleborine)**

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 or increasing, but there is insufficient data to demonstrate a trend at the present time.

The confinement of this species 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 would be expected to potentially help buffer against any catastrophic disturbances in the area.

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

Additional potential risks to the species could include alterations to the habitat by hydrologic or geologic modifications, or from erosion. Although no evidence of plant collection has been documented to date, it could also be a potential future risk to *Epipactis gigantea* along Cascade Creek, since the area has been identified as a botanical attraction in local tourist information and other publications.

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 patches?; 3) have invasive plant species invaded the site?; 4) are there any effects from weed treatment activities?; 5) is there evidence of changes in the water table?; and 6) is there evidence of plant collection?

Quantitative monitoring is problematic as some areas at Cascade Springs are inaccessible or involve high risk of damage to the plants from trampling or dislodging them on steep slopes. Also, because *Epipactis gigantea* reproduces clonally, it is not possible to determine the number

of individual plants. Baseline monitoring data were gathered in June 2000 and ongoing annual monitoring has been occurring. Monitoring includes verification of presence/absence of mapped patches along stream transects and recording any new patches. The current design includes documenting any changes on baseline map diagrams. Monitoring documents “nick points” or trails that extend into *Epipactis gigantea* patches. Monitoring also includes documenting stream bank erosion, weeds or other disturbances in or near *E. gigantea* patches at Cascade Springs. If the extent of the current year’s mapped patches is documented to decline by 10 percent or more relative to the year previous, consultation with ecologists, botanists and biometricians knowledgeable about the species is triggered, with the goal of developing a more rigorous monitoring strategy to determine if there truly has been a decline in the occurrence and what the reasons might be. Monitoring is most efficiently conducted during *Epipactis gigantea*’s flowering period in June.

As of 2001, the U. S. Geological Services (USGS) gauging station at the southern end of J. H. Keith Cascade Springs Picnic Ground is no longer being monitored by USGS. A water level monitoring system (use of a piezometer) had been considered for installation for 2002. However, it was determined that the methodology is not appropriate to this situation. In consultation with the Rocky Mountain Research Station in 2003, the monitoring design to measure water levels was revised and included permanently placing two water level measuring devices at two of the springs (one at each of two springs) in 2003, if possible. Because of heritage resource concerns, these two water measuring devices were not installed. Plans for the 2004 monitoring period included determining if permanent transects could be placed across the stream to measure water levels. Permanent transects were placed in 2004 and data collected in 2004 and 2005 to coarsely document presence/absence of water in Cascade Creek.

2006 Monitoring Design:

1. Monitor presence/absence of *Epipactis gigantea* patches along stream transects on an annual basis. If the number of patches decline by 10% or more, consult on a more rigorous design with the Rocky Mountain Research Station.
2. Recreation nick point: document the number of nick point trails that extend into *Epipactis gigantea* patches.
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.
4. Document any weeds designated as noxious by South Dakota and Wyoming and the following non-native invasive species of concern: *Elaeagnus angustifolia* (Russian olive), and *Tamarix* sp. (salt cedar). For each *Epipactis gigantea* patch, document if any weeds are co-located with the patch. Document the distance weed species are located away from specific patches if invasive species of concern are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.
5. Document erosion patches occurring at any *Epipactis gigantea* patch.
6. Document any verifiable unauthorized collections of *Epipactis gigantea*.

***Lycopodium complanatum* (groundcedar; trailing clubmoss)**

Four occurrences of *Lycopodium complanatum* were known from Black Hills National Forest prior to the 2004 monitoring season (site numbers: LYCO3-1, LYCO3-2, LYCO3-3 and LYCO3-4). Site numbers LYCO-3 and LYCO-4 were located in 2002. Site number LYCO-4 was located in an area burned by the Grizzly Gulch wildfire, and it is unknown what long-term effects the fire

may have on the persistence of the species at this site. Three *L. complanatum* occurrences were discovered in 2004 and baseline data were collected (LYCO3-5 (Tilson Creek west), LYCO3-6 (Tilson Creek east), and LYCO3-7 (Buskala Creek). In 2005, sites LYCO3-5 and LYCO3-6 were combined into a single site (LYCO3-5 with four subpopulations) in 2005 because the sites are only 200 m apart. A new location (LYCO3-8) was discovered in 2005 and baseline data were collected. The three most recently discovered occurrences are in active grazing allotments. These occurrences are also 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 original monitoring design for this species was developed based on baseline data gathered for the early known occurrences (site numbers LYCO3-1 and LYCO3-2). At that time, the greatest risk to the long term persistence of the species on the Black Hills National Forest was considered to be the small number and limited size of occurrences. There were no apparent or ongoing risks to the species, but what was known at that time indicated that locations of this boreal remnant species were small enough that random events, such as drought or fire, could eradicate an occurrence. Invasive plants were not considered to be an immediate risk to the species at either of those early known locations, but it was recognized that there was a potential for invasion because of the proximity of some invasive species in high abundance. Based on two locations and the potential for risks associated with warming and drying climatic changes to boreal remnant species, detection of early changes to the extent of the largest occurrence (LYCO3-1) was included in the original monitoring design. Presence/absence monitoring was designed for the smaller occurrence (LYCO3-2). Weed monitoring was also included for both locations. Following documentation of baseline data at the two occurrences discovered in 2002, presence/absence and the detection of weed invasion were added for sites LYCO3-3 and LYCO3-4.

During monitoring observations in 2004, concerns about the accuracy of the monitoring design and potential for damaging plants at the LYCO3-1 occurrence arose, and three new occurrences of *Lycopodium complanatum* were discovered on lands administered by Black Hills National Forest. It was determined that the monitoring needed to be revised to consider and reflect the new information. The monitoring protocol for *L. complanatum* was refined in consultation with the Rocky Mountain Research Station for the 2005 monitoring season.

The persistence of *Lycopodium complanatum* in the Black Hills is currently known to be contingent on conserving occurrences on public land. The monitoring design has been modified based on discovery of new occurrences, but also to keep site disturbance associated with monitoring to a minimum since that disturbance may present a risk to the species. A portion of the monitoring design continues to include gathering information to assess changes in the extent and condition of *L. complanatum* and its habitat, particularly in relation to invasive plant species and livestock grazing (i.e. trails through occurrences).

The number of currently known occurrences, geographic distribution and elevation, occurrence size, and an assessment of risks were primary components for modifying the design. A subset of the total occurrences has been selected as core sites and plans are to monitor them on an annual basis.

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)?

Core monitoring sites for *Lycopodium complanatum*:

1. LYCO3-1 (Sand Creek site) – This site is one of the largest *Lycopodium complanatum* occurrences and is the westernmost occurrence currently known on the Black Hills.
2. LYCO3-4 (Butcher Gulch site) – This site is expected to be at the greatest risk associated with weed invasion because of the fire disturbance (Grizzly Gulch wildfire). Approximately 50% of the known extent of the *Lycopodium complanatum* occurrence was burned over by the fire. In addition, since this site is one of the two lowest elevation (4,960 feet) sites for this boreal remnant species, the occurrence could be expected to serve as a barometer for any effects that may be associated with warmer and drier climatic conditions.
3. LYCO3-5 (Tilson Creek site which now includes LYCO3-6) – This occurrence is farthest from influences associated with roads or activities on private land. Down wood (associated with wind or snow impacts to spruce) is a significant component of the forest floor at this *Lycopodium complanatum* occurrence. This occurrence is located within an active grazing allotment, although little cattle use was noted on the 21 to 40% slopes where the occurrence is located and it was apparent that it would be difficult for cattle to negotiate through down spruce material to access the plants. In comparing associated site conditions to other sites, this occurrence would have the greatest potential for realizing any risks associated with grazing activities, particularly from cattle trails that might develop through the occurrences if new OHV trails or landscape changes from timber activity cause changes in cattle routes between forage areas, to water, to salt, etc.

Since changes in climatic conditions (periods that are warmer and drier) are considered a risk to this boreal remnant species, detecting changes in extent of the Sand Creek (LYCO3-1) occurrence is still relevant. Although the Butcher Gulch site may also be appropriate for this type of monitoring, it is unknown what long term effects the fire disturbance may have had, or may continue to have, that may not be related to a change in climatic conditions. Modifications were made to the design for detecting changes in extent of the Sand Creek occurrence, attempting to minimize monitoring disturbances at this location. Design currently includes assessing any contraction or expansion of the occurrence by placing permanent markers along the perimeter of the occurrence so that a baseline estimate of extent can be made in 2005. It is assumed that the permanent markers can be used for future assessments of any contraction or expansion that may occur at the Sand Creek occurrence.

The monitoring design has also been modified to include revisit (gathering data similar to baseline data gathered initially at the occurrences) of known Black Hills National Forest occurrences at least every five years, and to sample all known sites in the same year. This will be completed in 2009.

Lycopodium complanatum is evergreen and can be monitored at any time during the growing season (May to September). It is best observed in the spring or fall when overstory or other understory vegetative cover is low, but it is still possible to detect and identify any invasive plant species. However, in the spring, strobili are not present so it is not possible to make any observations on sexual reproductive activity.

2006 Monitoring Design:

1. Monitor the following *Lycopodium complanatum* sites for presence/absence on an annual basis: LYCO3-1, LYCO3-4, LYCO3-5.
2. Once every five years, revisit all seven known *Lycopodium complanatum* occurrences. All sites will be revisited in 2009.
3. Review the series of permanent markers placed at points along the boundary edges of the Sand Creek *Lycopodium complanatum* occurrence (site number LYCO3-1) in 2005. Determine if a contraction or expansion of the site has occurred and document with photographs and/or drawings if there has been a change. If there has been no observable change from 2005, document presence on the data sheet but do not retake documentation photographs/drawings. If there is no observable change in the occurrence in three years, retake photographs and/or drawings to document no change.
4. Document any weeds designated as noxious by South Dakota or Wyoming or other invasive plant species. Document if the weeds are co-located with *Lycopodium complanatum*, or at what distance the weed species is located away from the occurrence site if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.
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.

***Platanthera orbiculata* (lesser roundleaved orchid; large roundleaved orchid)**

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 administered land, 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 the forest at this time. Long-term droughts or dramatic climate changes characterized by drier and warmer conditions may present the greatest risk to the orchid and its habitat. Currently known occurrences are within active grazing allotments, with the exceptions of locations in the Black Elk Wilderness. Two known occurrences are located in Bear/Beaver Gulches Botanical Area. Risks to most of the occurrences from livestock are low because many of the sites are on steep slopes with dense shrub vegetation, both of which deter livestock. However, new OHV trails or timber activities could allow livestock to establish new trails through or adjacent to *P. orbiculata* occurrences that could result in trampling or browsing. Risks from other management activities (i.e. timber harvest) are generally low because known sites are subject to processes and analysis associated with the National Environmental Policy Act and occurrences are currently avoided to the extent possible. No ongoing recreational impacts have been documented at the Black Elk Wilderness occurrences, in spite of the close proximity of an intensively used trail. Other potential future risk factors could include plant collection and invasion by invasive plant species, including those designated as noxious weeds.

The most recent data available were used in designing monitoring for *Platanthera orbiculata*. Designated core occurrences 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 categorical estimate of the number of individuals is to be collected. If any of the core occurrences is not present, then the reason is to be documented if it can be determined and additional sites will be randomly selected to serve as core sites.

The second aspect of the monitoring as originally designed was to provide baseline data on the persistence of *Platanthera orbiculata* during dry conditions. During a drought, the design included monitoring three additional sites for presence/absence and census the number of individuals during the first and 2nd consecutive drought years. The assumption was that the high numbers of *P. orbiculata* observed in 2000 were partially reflective of several years of above average precipitation. As specified in the monitoring design, the nine core sites and the three additional sites were monitored for presence or absence, and a census was taken during the second non-drought year following the dry period. In addition, Black Hills National Forest completed the same type of drought year monitoring through 2005. Relative to 2000 data, 2005 counts were lower on seven sites and higher on five sites. For six of the seven sites with declining numbers, monitoring did not find evidence of disturbances that could have affected the number of individuals. The seventh site was impacted by hardwood restoration/logging activities. These 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 modifying the monitoring design for 2006.

Monitoring occurred on the three additional drought year monitoring sites in 2002, 2003, 2004, and 2005 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 individuals documented in 2005 were relatively similar to numbers documented in 2004 and 2003, and individuals were present at all of the monitored locations. Snow pack and precipitation for calendar year 2006 is considered near normal but predictions are for abnormally dry conditions for the next three months. There is a possibility that *Platanthera orbiculata* individuals could be absent from a number of the known occurrence sites.

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

2006 Monitoring Design:

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 key 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).
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 key

- 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).
3. Annually monitor presence/absence of three key monitoring occurrence sites in the northwestern Black Hills: site numbers PLOR4-6, PLOR4-12 and PLOR4-19. If any of the key monitoring occurrence sites is not present (refer to discussion above regarding climatic ties), document reason if it can be determined (i.e. drought, fire, noxious weeds). Continue to record impacts at PLOR4-6 from hardwood restoration activities in 2004.
 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.
 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.
 6. Document any weeds designated as noxious by South Dakota or Wyoming or other invasive plant species. Document if the weeds are co-located with *Platanthera orbiculata*, or at what distance the weed species are located away from the occurrence site if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence

Salix candida (sageleaf willow; hoary willow)

Salix candida was designated as a Region 2 sensitive species in December 2003. *Salix candida* is currently known on Black Hills National Forest within the McIntosh Fen Botanical Area. The persistence of this species in the Black Hills is dependent on conserving this single occurrence.

A recent species assessment was completed in 2003 and baseline data were collected for *Salix candida* in 2002 and 2003. Monitoring data were collected for *S. candida* in 2004 and 2005. 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 or insect infestations have been identified as potential risks for this species. *Cirsium arvense* (Canada thistle) currently occurs within the McIntosh Fen Botanical Area. Although high soil moisture levels in the fen itself appear to exclude *C. arvense* from the wettest part of *S. 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 native riparian species, including *Salix candida*. Insect and rust infestations have been documented on *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. At this time, no impacts have been documented to *S. candida* from either activity. Although minimal impacts have been documented from wildlife use and none from livestock grazing (since McIntosh Fen was designated a Botanical Area and fenced to exclude livestock), both could be potential risks in McIntosh Fen.

A rigorous monitoring strategy (similar to that for *Salix serissima*) was designed and implemented in 2004 for the *Salix candida* occurrence at McIntosh Fen. Based on what Black Hills National Forest learned about density issues for determining individuals and stem breakage issues while gathering data, consultation occurred with Rocky Mountain Research Station on the monitoring design for the 2005 monitoring season. The current revised 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?

The modified design continues to attempt to detect and respond in a timely manner to changes in extent and condition of *S. candida* and its habitat. The revised design focuses on annually monitoring: 1) contraction or expansion extent of the McIntosh Fen occurrence, including 2) an estimated percent of reproductive individuals; 3) the condition of willows and providing an estimated percentage of plants infected with any damaging agent; 4) water table levels; 5) presence of invasive species; and 6) any effects of weed treatment activities. In 2005, an assessment of the contraction or expansion at McIntosh Fen was made based on the previous GPS documentation of the population endpoints. In addition, markers were placed at a number of locations around the perimeters of the largest high density patches of *S. candida*. These permanent markers will be used for future assessments as landmarks for detecting any contraction or expansion that may occur, providing an estimated percentage of stems with reproduction capability, and providing an estimated percentage of the occurrence that may be affected by any type of damaging agent such as a rust fungus, insect predation, livestock grazing or wildlife grazing.

Salix candida monitoring should occur when the species is blooming in late May to early June so that the total number of reproductive individuals can be determined.

2006 Monitoring Design:

On an annual basis:

1. At McIntosh Fen, GPS new endpoints of the occurrence if site size has changed. Revisit markers placed in 2005 around the perimeter of the largest dense patches of *Salix candida*.
 - Collect data on the 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, livestock grazing, wildlife grazing, etc.). Specify the agent that is observed. Document observations regarding whether *S. candida* occurrence at McIntosh Fen Botanical Area is grazed by livestock.
2. Measure aboveground water levels along the permanent depth point water measurement transects at McIntosh Fen described under monitoring design for *Salix serissima*. Transects should be read at the same time as *S. candida* is in good phenological stage for monitoring.
3. Document any weeds designated as noxious by South Dakota or Wyoming or other invasive plant species. Document if the weeds are co-located with *Salix candida*, or at what distance they are from the occurrence site if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with

district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence

Salix serissima (autumn willow)

Prior to the 2004 monitoring season, two occurrences of *Salix serissima* were known to occur on land administered by the 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 within a fenced enclosure along Middle Boxelder Creek in 2002. Late in 2004, two new *S. serissima* occurrences were discovered at Nahant and Silver Creek. Baseline data was collected on these occurrences 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 natural or human-induced. Noxious weeds, invading woody species (conifer encroachment), fungal infections or insect infestations, and livestock grazing have been identified as posing concern for this species. *Cirsium arvense* (Canada thistle) currently occurs within the McIntosh Fen Botanical Area, although high soil moisture levels in the fen itself generally appear to exclude *C. arvense* from the specific sites where *S. serissima* individuals and patches occur during average to higher precipitation years. The Middle Boxelder Creek occurrence area has abundant populations of *Cirsium arvense*, *Cynoglossum officinale* (houndstongue), *Linaria vulgaris* (yellow toadflax), and *Carduus nutans* (musk thistle) in the wetland area. *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 originally noted on the leaves of *S. serissima* at McIntosh Fen in 2001, and has been documented to become more evident on the leaves as the season progresses. Willow borer has been documented at all occurrences except the new Nahant occurrence. Fishing occurs along Castle Creek (the creek is located near an edge of the fen) in the McIntosh Fen Botanical Area, and 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. Minimal impacts have been documented from wildlife use at any site. However, use by livestock has been documented with negative impacts to *S. serissima* and its habitat at Middle Boxelder Creek and Silver Creek occurrences. Due to persistence concerns for willow emphasis species in Black Hills National Forest, Phase II amendment to the Black Hills LRMP, Standard 2505 directs no authorized utilization will be allowed by domestic livestock on known occurrences of willow emphasis species (e.g. *Salix candida*, *Salix serissima*, *Salix lucida*). Allotment management planning is currently underway for the Wolff allotment, which includes both the Middle Boxelder Creek and Silver Creek occurrences. Effective fencing (supported by fence monitoring and maintenance) of the occurrences is included in the allotment plans. Monitoring botanists will continue to monitor for livestock utilization as well.

A rigorous monitoring strategy was designed and implemented in 2000 for the occurrence at McIntosh Fen, and had been revised to add the second *Salix serissima* occurrence at Middle Boxelder Creek. Based on what Black Hills National Forest has learned about the 2004 *S. serissima* counts at McIntosh Fen compared to previous counts, stem breakage issues while gathering counts, and the 2004 discovery of two additional locations for this species, consultation occurred on the monitoring design which has been further revised for the 2006 monitoring season. These modifications continue to attempt to detect and respond in a timely manner to changes in extent and condition of *S. serissima* and its habitat.

The current revised monitoring design involves assessing the status of the four Forest occurrences 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 of weed treatment activities?; and 6) is any utilization by livestock occurring in *S. serissima* sites?

The revised design focuses on annually monitoring: 1) contraction or expansion of subpopulations at the McIntosh Fen occurrence; 2) extent of the Middle Boxelder Creek occurrence; 3) estimated percent of reproductive individuals at each location; 4) the condition of *Salix serissima* at each location and providing an estimated percentage of plants impacted by rust fungus, willow borer, livestock grazing, or other damaging agents; 5) water table levels; and 6) presence of invasive species. In 2005, an assessment of the contraction or expansion at McIntosh Fen was based on the GPS documentation of subpopulation endpoints. In addition, plans were to place boundary markers (PVC or other type of marker) at a number of locations around the perimeters of the largest high density patches of *S. serissima* at both sub-populations in 2005. These permanent markers will be used for future assessments in detecting any contraction or expansion that may occur at this location, providing an estimated percentage of stems with reproduction capability, and providing an estimated percentage of the occurrence that may be affected by any type of damaging agent, such as a rust fungus, insect predation, or livestock grazing.

Two piezometers were installed at McIntosh Fen in 2001 to annually monitor water levels. However, the piezometers may have destabilized, possibly because of freezing/thawing conditions, or because the fen is a floating mat of organic material. Because the water level had been observed above ground during higher precipitation years, it was determined that an above ground water level sampling method would be appropriate. Therefore, two permanent transects were placed at McIntosh Fen in 2004 and depth point measurements were collected. A similar transect was also placed at the Middle Boxelder Creek occurrence location in 2004. Transects extend into the dry area above where surface water is expected to expand.

In reviewing placement of the 2004 transects and site conditions at McIntosh Fen with Rocky Mountain Research Station in May 2005, it was suggested that placement of a third transect might provide more information on water table levels. However, botanists in the field determined in 2005 there were no additional locations for water transects at McIntosh Fen that could be considered more representative than the two already chosen. In addition, this protocol measuring surface water at just one point in time provides an extremely coarse presence/absence indicator for water. It was decided that investing more time in collecting water transect data would not result in any better understanding or documentation of hydrologic conditions. Consequently, a third transect was not established in 2005.

Salix serrisima monitoring occurs during the blooming period in June so that the total number of reproductive individuals can be determined.

2006 Monitoring Design:

1. At McIntosh Fen, GPS new endpoints of subpopulations if site size has changed. Revisit the twelve 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 *Salix serissima* occurrence at McIntosh Fen Botanical Area is grazed by livestock.
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.
 3. Measure aboveground water levels along the permanent depth point water measurement transects at McIntosh Fen (two permanent transects: one transect at each subpopulation) and at Middle Fork Boxelder Creek (one permanent transect). This monitoring should occur when the willow species are in good phenological stage for monitoring.
 4. Document any weeds designated as noxious by South Dakota or Wyoming or other invasive plant species. Document if the weeds are co-located with *Salix serissima*, or at what distance the weed species is located away from the occurrence site if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.

Sanguinaria canadensis (bloodroot)

Sanguinaria canadensis, occurring in the northern/northeastern Black Hills, is one of the most abundant R2 sensitive plant species on Black Hills National Forest. There were 22 known occurrences of bloodroot on Black Hills National Forest lands at the time that a recent 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 Black Hills National Forest at this time. However, due to limited potential habitat and the fact that a number of sites have characteristics lending themselves to an increase in invasive plant species, weeds and their treatment have been identified as a risk to *S. canadensis*. Persistence of *S. canadensis* on Black Hills National Forest is not currently considered at risk from livestock grazing because nine sites are currently not grazed and one site is not accessible to livestock. Timber harvest is generally not deemed a persistence risk to *S. canadensis* because occurrences are currently being avoided or mitigated, or vegetative treatments may be designed to benefit the species. Collection (or illegal *S. canadensis* harvest) is not currently an issue in the Black Hills. However, due to the value of *S. canadensis* as a medicinal herb and experiences with over-collection in other parts of the country, harvesting is considered a risk. If collection were to occur here, it could be detrimental to the population of *S. canadensis* on Black Hills National Forest.

Black Hills National Forest's approach for monitoring *Sanguinaria canadensis* involved selecting core occurrences using four criteria: size (estimated number of individuals), geographic distribution of the occurrence, potential risk from livestock grazing, and community type. The largest estimated number of individuals observed at a given site was a primary factor used in delineating potential core occurrences. To incorporate geographic distribution, sites widely distributed from one another were selected over sites in close proximity to other occurrences. Sites in allotments currently not being grazed were selected over sites grazed by livestock. Finally, the selection of core sites included at least one in each vegetative

community type that is associated with occurrences of *S. canadensis*. Based on these criteria, 10 core occurrences were selected. Of these 10 occurrences, four were designated as key, that is, occurrences of over 1,000 individuals deemed most critical to maintaining the metapopulation of *S. canadensis* on Black Hills National Forest. Based on what Black Hills National Forest has learned from monitoring *S. canadensis* occurrences from (for example, a number of occurrences have been determined to be larger than originally documented; in one case, two occurrences were joined into a single one in 2005 after discovering them to be continuous rather than nearby), the monitoring design has been modified to include eight core occurrences for monitoring rather than 10. The original four key occurrence locations for monitoring are retained.

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

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

Monitoring results from recent years on the abundant presence of noxious weed species in the key monitoring sites for *Sanguinaria canadensis* are a trigger that BHNF plant monitoring personnel and BHNF district weed management personnel should begin interacting to design and implement noxious weed treatment in the key SACA13 monitoring sites (See Phase II Amendment Standards 4304 and 4309 and Guideline 4303). Weed treatment itself will be an added risk to SACA13 individuals, so monitoring the success of weed treatment as well as possible impacts to the health/vigor of SACA13 sites will be critical to successfully developing an effective treatment that is conservative of SACA13 while reducing weed populations/sources. Possible impacts include direct effects from the tools chosen (i.e., handpulling (proper ID skills needed), chemical application, etc.) as well as indirect effects from delivering the treatments (i.e., added trampling in and around the sites by personnel on foot and in vehicles, etc.). With support from Phase II direction, monitoring botanists will analyze data collected in 2006 to develop a weed treatment strategy for R2 sensitive and SOLC plant species/sites to use in interacting with Black Hills National Forest weed managers to direct noxious weed treatment in and around R2 sensitive/SOLC occurrences in 2007. This plan does not prevent monitoring botanists from requesting weed treatment immediately if noxious weed species of particular concern/concentration are noted in 2006. However, a prioritization must be developed to best direct treatment efforts.

The 2006 monitoring design involves assessing the status of the four key occurrences. The monitoring is designed to address three questions from previous years plus a fourth question prompted by persistence concerns related to weed treatment impacts: 1) is *Sanguinaria*

canadensis present?; 2) is there evidence of plant collecting?; 3) are invasive plant species present in occurrences?; and 4) are there effects from weed treatment activities on the occurrence?

2006 Monitoring Design:

1. Annually monitor presence/absence of the four key sites. If relocated, gather baseline data and gather GPS data at the endpoints if the site is long (e.g. some sites are ½ mi to 1 ½ mi long in drainages) or collect GPS points around the entire occurrence if the site is small (less than ½ acre).
2. During a drought year, monitor presence/absence of all key and core sites. If any key or core sites are absent, select another known site to monitor presence/absence.
3. Document any weeds designated as noxious by South Dakota or Wyoming or other invasive plant species at the key monitoring sites. Document if the weeds are co-located with *Sanguinaria canadensis*, or at what distance the weed species are located away from the occurrence site if they are occupying the same ecological type. Document any weeds designated as noxious by South Dakota or Wyoming or other invasive plant species. Document if the weeds are co-located with *S. canadensis*, or at what distance the weed species are located away from the occurrence site if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence
4. Document any evidence of *Sanguinaria canadensis* collection at the four key monitoring sites.

Key monitoring sites for *Sanguinaria canadensis*:

1. *S. canadensis* site SACA13-1 (District number 99004; False Bottom site)
2. *S. canadensis* site SACA13-2 (District numbers 99007, 99008 and 95033; Lost Gulch site/Pillar Peak Allotment site; includes SACA13-6 as of 2005)
3. *S. canadensis* site SACA13-3 (District numbers 94011 and 94018; Meadow Creek site)
4. *S. canadensis* site SACA13-14 (Park Creek site)

Core monitoring sites for *Sanguinaria canadensis*:

5. SACA13-4 (District number 93003; Deadman Gulch -- south)
6. SACA13-5 (District number 93004; Deadman Gulch -- central)
7. SACA13-9 (District number 93002; North Deadman Gulch tributary)
8. SACA13-10 (District number 94BC3; Boulder Canyon site)

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

Thirteen occurrences of *Viola selkirkii* are currently known to occur within the Black Elk Wilderness, Upper Pine Creek Research Natural Area, and Norbeck Wildlife Preserve in Black Hills National Forest. Occurrences are also located in Custer State Park and Mount Rushmore National Memorial in the Black Hills (approximately eight additional occurrences). The thirteen occurrences on lands administered by Black Hills National Forest are located within four distinct watersheds. Because additional potential habitat is believed to occur in relatively remote areas of the Black Elk Wilderness and Upper Pine Creek Research Natural Area, there may be additional occurrences that have not yet been discovered and documented.

On Black Hills National Forest, *Viola selkirkii* is relatively secure from most potential risks, with the exception of extreme climatic change. Most of the currently known occurrences on Black Hills National Forest lands are not generally at risk from management activities (i.e. timber harvest 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. Feedback from the monitoring program to district staff on expected severe impacts from pile burning to the ground and immediately adjacent vegetation resulted in scattering several of the piles so they will not be 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, or future fire suppression efforts, are potential risks at some sites. Naturally occurring periodic flooding may reduce the size and extent of some patches, but may create habitat for others.

A portion of the Sunday Gulch occurrence is located approximately 30 meters from a permitted summer cabin in the Norbeck Wildlife Preserve. A portion of this occurrence extends into Custer State Park and other portions are located near sections of the Sunday Gulch Trail. No observed trampling effects were documented in 2003, 2004, or 2005 during data collection periods; however it is recognized as a potential risk because of the proximity to the cabin and the trail. In addition, a portion of the occurrence is located below an overhead electric line, and maintenance activities have occurred (tree trimming). Some of the *Viola selkirkii* plants occur in among the slash from the tree trimming activities.

In 2005, site number VISE2-13, located within the Upper Pine Creek Research Natural Area and within the area of the Elkhorn Mountain Fire of October 2003, was revisited and data collected. *Viola selkirkii* is very dense in some areas of the occurrence. It does not appear that the site was adversely affected by the direct effects of the fire. Most plants occur out of the actual burned area, but several plants were observed coming up in the burned area (> 50 plants). No abnormal flooding was apparent, but the nature of the site (e.g., loose soil, burned area, lots of gullies for runoff) appears conducive to a possible flooding event. Several invasive plant species (*Cirsium arvense*, *C. vulgare*, and *Verbascum thapsus*) were found in the same ecotype as *V. selkirkii*, appearing to be an indirect effect of the disturbance caused by the fire due to the frequent patches of these species in the surrounding burned area.

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) have invasive plant species invaded the site?; 3) has treatment of invasive plant species affected the occurrence?; and 4) has a flood or fire event affected an occurrence?

The monitoring strategy for *Viola selkirkii* on Black Hills National Forest land currently includes: 1) surveys for additional occurrences, 2) inventory of new and revisit of currently known occurrences on a periodic basis, and 3) annually monitoring three of the largest occurrences. Potential survey sites include watersheds where the species is known to occur as well as other high elevation watersheds with deep canyons and boreal vegetation. Surveys and monitoring should take place during *Viola selkirkii*'s flowering period when the species is most easily identified, which is generally between mid-May and early June.

The monitoring design includes revisit to all known Black Hills National Forest occurrences at least every five years (last completed in 2003). In addition to periodic revisits, monitoring includes obtaining data on known Black Hills National Forest occurrences during and following a drought cycle (or at least two consecutive years of below average precipitation). Categorical

estimates of occurrence numbers collected in 2000 and 2001 may be a reflection of a series of relatively wet years since 1996 (NOAA 1996-2001). Documenting relative occurrence levels and extent of *Viola selkirkii* during dry years will hopefully provide insights into the role that precipitation plays in the distribution and abundance of this species. Finally, the monitoring design includes monitoring *V. selkirkii* sites that are affected by fire or significant flood event.

The current protocol design includes annual monitoring of “Violet Valley” in Norbeck Wildlife Preserve. The “Violet Valley” site was selected because it is one of the three largest occurrences of *Viola selkirkii* on Black Hills National Forest lands, it is relatively accessible, and it has the largest combination of potential risks from hikers, elk, random stochastic events (i.e. wildfire, flooding), and invasive plant species (includes noxious weeds) invasion. Annual monitoring of the Sunday Gulch occurrence is included in the protocol design because of the combination of potential risks associated with powerline activities, human trampling, and fuels reduction. Further, because these are two of the lower elevation sites for *V. selkirkii*, it is likely that declines associated with drought conditions would occur here before they occur at higher elevations. Because of the unknown effects that the Elkhorn Fire may have on the persistence of *Viola selkirkii*, the potential risk of invasion by invasive plant species associated with the fire disturbance, and the large population numbers at the Pine Creek Natural Area VISE2-13 occurrence, annual monitoring of the VISE2-13 occurrence is included into the monitoring design for the 2006 season. “Violet Valley” and Sunday Gulch locations will be used as indicators to determine whether other sites will be monitored. The current trigger for additional monitoring is the absence of one or more of the four largest sub-occurrences (there are nine distinct sub-occurrences) at the “Violet Valley” site, or the absence of the Sunday Gulch occurrence. If this occurs, an effort will be made to document the reason (that is, drought, elk, invasive plants, etc.) and select two additional *Viola selkirkii* occurrences to monitor based on the cause of the disruption and current information on known risks to other sites.

2006 Monitoring Design:

1. On an annual basis, monitor presence/absence of the four largest sub-occurrences at site number VISE2-2, “Violet Valley”, and site number VISE2-11, Sunday Gulch. If one or more of the four largest sub-occurrences at “Violet Valley” or the Sunday Gulch occurrence is not present, document the reason (i.e. drought, elk, noxious weeds) if it can be determined. Select two other sites in other drainages to monitor presence/absence to determine if other occurrences are being affected in the same way.
2. Document any weeds designated as noxious by South Dakota and Wyoming or other invasive plant species. Document if the weeds are co-located with *Viola selkirkii* or at what distance the weed species are located away from the occurrence site. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.
3. On any currently known *Viola selkirkii* site that is affected by a flood or fire event, monitor for presence/absence. For 2006, monitor presence/absence of VISE2-13 (Pine Creek Natural Area/Elkhorn Mountain 2003 Fire area).

Species in preparation for monitoring protocol: collecting baseline data

In general, as identified in the following designs, the main focus for 2006 for these species will be to attempt to relocate a number of the previously reported locations in combination with locating new sites. Plans include gathering baseline data and assessing risks at locations, with a goal of eventually designing and implementing a monitoring protocol for each species.

Botrychium campestre (prairie moonwort; Iowa moonwort)

Botrychium campestre was confirmed in March 2006 (through genetic analysis by Dr. Don Farrar of Iowa State University) to occur on the Black Hills National Forest. One occurrence was located in the Hell Canyon Ranger District in South Dakota and one occurrence in the Bearlodge Ranger District in Wyoming (at a site previously known as an occurrence for *B. lineare*). Two additional occurrences were confirmed in Wind Cave National Park in March 2006.

Baseline data were gathered at the Black Hills National Forest sites in 2005. As with other *Botrychium* species, dry conditions are expected to limit the emergence of aboveground stems and the individuals may not emerge during a succession of dry or drought years. *Botrychium campestre* individuals were located at sites between May 24 and May 28, 2005. Periodic return visits during the following weeks documented that plants wither soon after the spores are released. It is currently anticipated that data collection needs to occur in late May to early June for *B. campestre*; however, this will likely depend on temperatures associated with the current year's climatic conditions.

Monitoring data for known sites, along with information available from elsewhere for this species, indicate potential risks to *Botrychium campestre* could include succession of site vegetation to a later successional stage resulting in more shade. Additional potential risks could include changes to hydrology of the sites, noxious weed invasion, or alterations from the small amounts of low level disturbances currently taking place at the sites.

The current monitoring design involves assessing the status of the Black Hills National Forest occurrences on an annual basis. The monitoring is designed to address five questions: 1) is the species present?; 2) are there changes in extent to the aboveground portions of the occurrences?; 3) are invasive plant species present in the site?; 4) are there any effects of weed treatment?; and 5) are there new disturbances or new levels of pre-existing disturbances?

2006 Monitoring Design:

1. Revisit the known *Botrychium campestre* occurrences on Black Hills National Forest (BOCA5-1, BOCA5-2) on an annual basis. Document any new disturbances or changed levels of pre-existing disturbances.
2. Gather baseline data on any new occurrences that may be discovered. Assess risks.
3. Document any weeds designated as noxious by South Dakota or Wyoming or other invasive plant species. Document if the invaders are co-located with *Botrychium campestre* or at what distance they are located away from the occurrence site if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence

Botrychium lineare (narrowleaf grapefern; slender moonwort)

Botrychium lineare was determined in December 2003 to occur on the Black Hills National Forest in the Bearlodge Ranger District in Wyoming. Three new occurrences were confirmed in 2005 (through genetic analysis by Dr. Don Farrar, Iowa State University) – in Hell Canyon District in South Dakota, at a second site in Bearlodge Ranger District in Wyoming, and in Wind Cave National Park. Two of the three new occurrences also include *B. campestre* (Hell Canyon site and Wind Cave National Park site).

Baseline data were gathered at the Dugout Gulch *Botrychium lineare* site in 2003 and 2004. 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. Periodic return visits during weeks following data collection documented that the plants wither soon after the spores are released. It is currently anticipated that data collection for *B. lineare* will most likely provide accurate details if accomplished in early to late-June depending on the site's elevation; however, this will also likely depend on temperatures associated with the current year's climatic conditions.

Monitoring data indicate potential risks to *Botrychium lineare* could include succession of site vegetation to a later successional stage resulting in more shade. Additional potential risks could include changes to hydrology of the sites, noxious weed invasion, or alterations from the small amounts of low level disturbances that currently exist at the site.

The current monitoring design involves assessing the status of Black Hills National Forest occurrences on an annual basis. The monitoring is designed to address four questions: 1) is the species present?; 2) are there changes in extent to the aboveground portions of the occurrence?; 3) have invasive plant species invaded the site?; and 4) are there new disturbances or new levels of pre-existing disturbances?

2006 Monitoring Design:

1. Revisit the known *Botrychium lineare* occurrences on Black Hills National Forest (BOLI7-1, BOLI7-2, BOLI7-3) on an annual basis. Document any new disturbances or changed levels of pre-existing disturbances.
2. Gather baseline data on any new occurrences that may be discovered. Assess risks.
3. Document any weeds designated as noxious by South Dakota or Wyoming or other invasive plant species. Document if the invaders are co-located with *Botrychium lineare* or at what distance they are located away from the occurrence site if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence

Cypripedium parviflorum (lesser yellow lady's slipper)

Cypripedium parviflorum was designated as a Region 2 sensitive species in December 2003. Based on an assessment in 2003 and recent evaluations completed for this species, the total number of sites reported for the Black Hills varies widely from greater than 50 to approximately 100 occurrences. The variability in numbers is largely the result of different ways sites have been documented in the field. It may be that a number of adjacent smaller sites are actually portions of larger occurrences.

Reports from Black Hills occurrences prior to the 2005 field season 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.

Orchids are commonly collected and *Cypripedium parviflorum* has been impacted through collection elsewhere throughout its range. To determine if this is a risk to any of the occurrences on the Black Hills, documentation of collection has been included in the monitoring design.

The current monitoring design involves gathering baseline data for this species. This type of monitoring is designed to: 1) validate reported location information and whether the species is still present; 2) determine if specific site and risk data can be gathered to support a monitoring design; and 3) assess if there is evidence of collection and of invasive plant species at the sites.

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

2006 Monitoring Design:

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.
2. Document any evidence of collection at any of the sites.
3. Document any evidence of livestock grazing on occurrences in botanical areas.
4. Document any weeds designated as noxious by South Dakota or Wyoming or other exotic plants known to be invasive. Document if the invaders are co-located with *Cypripedium parviflorum*, or at what distance the weed species are located away from the occurrence site if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence

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

Prior to the 2005 monitoring season, there were more than 30 occurrences of *Viburnum opulus var. americanum* reported on the Black Hills National Forest. Known locations are geographically dispersed in at least ten sixth level watersheds in the Northern Hills in South Dakota and Wyoming (Lawrence, Meade, Pennington and Crook Counties). There are also reports of this species from private land in the Black Hills as well.

Viburnum opulus var. americanum is often intermingled with a number of other shrub species in dense thickets. Unless the species is specifically targeted during surveys, it is possible that it would not be noticed, especially in high density shrub thickets. Because many thickets are so dense that they are basically impenetrable, it is likely that the numbers of individuals reported at occurrences as well as the number of occurrences are conservative. Few risks were apparent at

sites where baseline data were gathered in 2005. Insect predation was noted at sites where data was gathered later in the season (late July).

The current monitoring design involves the gathering of baseline data for this species. This type of monitoring is designed to: 1) validate reported location information and whether the species is still present; 2) determine if specific site and risk data can be gathered to support monitoring design; and 3) assess if invasive plant species are present in sites.

2006 Monitoring Design:

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 *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 those sites.
2. Document any weeds designated as noxious by South Dakota or Wyoming or other invasive plant species. Document if the invaders are co-located with *Viburnum opulus* var. *americanum* or at what distance they are located away from the occurrence site if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.

Monitoring Item 19: Species of Local Concern - Plants
(Revised May 12, 2006; RMRS consultation occurred May 19, 2006)

Authority: Forest Plan

Indicators: Individual species monitoring. Population persistence.

Method of Data Collection: Field monitoring using the Black Hills National Forest Rare Plant Survey/Monitoring Form, Species Specific Monitoring Forms or Global Positioning System with Data Recording Capabilities.

Unit of Measure: Populations or occurrences (sites)

Sample Design: (Indicated by species below)

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

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

Black Hills National Forest plant SOLC and habitat information

Species	Habitat
<i>Adiantum capillus-veneris</i> maidenhair fern	The single known Black Hills occurrence is documented to be restricted to the moist, calcareous substrates associated with warm springs at Cascade Creek. Year-round flows of warm spring water in Cascade Creek may be an important component of <i>A. capillus-veneris</i> 's survival.

Species	Habitat
<i>Carex bella</i> southwestern showy sedge	Four Black Hills occurrences (3 on BHNF and one in Custer State Park) are documented among granitic outcrops and bouldery areas in cool, moist, shaded white spruce or paper birch forest at between 6,600 and 7,100 feet.
<i>Eleocharis rostellata</i> beaked spikerush	<i>Eleocharis rostellata</i> occurs in coastal salt marshes and in inland saline, alkaline, or strongly calcareous wetland habitats (e.g., around hot springs). Year-round flows of warm spring water in Cascade Creek may be an important component of <i>E. rostellata</i> 's survival at that one location in the Black Hills.
<i>Gentiana affinis</i> pleated gentian	Habitat information is documented for eight known sites on Black Hills National Forest. In the Black Hills, <i>Gentiana affinis</i> occurs primarily in moist areas in open conditions, sometimes near wet meadows, fens, and stream margins in limestone areas.
<i>Listera convallarioides</i> broadlipped twayblade	Two sites are known on Black Hills National Forest (one on BLM/BHNF). Elevations range from 5,120 to 6,500 feet. Individuals are growing in saturated soil conditions adjacent to springs and located under tree overstories dominated by spruce.
<i>Lycopodium annotinum</i> stiff clubmoss	Nine known occurrences on Black Hills National Forest are associated with high moisture microhabitats within remnant boreal white spruce and paper birch/beaked hazelnut communities.
<i>Oxyria digyna</i> alpine mountainsorrel	Two Black Hills National Forest occurrences are located at the highest elevations in the Black Hills (6,000 to 7,200 ft.), in areas of coarse-textured soils in steep, granite outcrop areas and narrow gullies.
<i>Petasites sagittatus</i> arrowleaf sweet coltsfoot	Habitat information for <i>Petasites sagittatus</i> is documented for 15 known sites on Black Hills National Forest. The species is reported to be associated with cold and wet, marshy conditions and is a facultative wetland species. Spruce, aspen, and ponderosa pine are the documented associated tree species. A variety of willow species occur at the majority of reported locations.
<i>Polystichum lonchitis</i> northern hollyfern	On Black Hills National Forest, <i>Polystichum lonchitis</i> is associated with moist, shaded, north-facing slopes in forested ravines and gulches on limestone substrates. Twenty occurrences of <i>P. lonchitis</i> are reported to occur on Black Hills National Forest.
<i>Salix lucida</i> shining willow	<i>Salix lucida</i> is commonly associated with streambanks, shores, wet meadows, and seeps. The species is considered a facultative wetland plant in South Dakota and eastern Wyoming. Two of the five reported occurrences of <i>S. lucida</i> are in the central granitic core of the Black Hills; two occurrences are in the Bearlodge Mountains; and one occurrence is in Spearfish Canyon.

***Adiantum capillus-veneris* (maidenhair fern)**

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

Cascade Creek valley. The population appears to be stable or increasing, but there is insufficient data to demonstrate a trend at the present time.

The confinement of this species 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, unless the water source quantity or quality is seriously altered (such as the extraction of water from recently proposed large capacity wells associated with a Southern Hills water development project). The existence of multiple subpopulations of the species in the watershed could be expected to potentially help buffer against some catastrophic disturbances in the area. However, since the subpopulations are along the same creek, any drastic alterations in water quality or quantity would likely be expected to affect all sub-populations.

Effects associated with ongoing recreational use and invasion by, or treatment of, exotic plant species (including noxious weeds) are currently considered to be the most significant risks to the fern and its habitat on the Black Hills National Forest administered lands. Footpaths and visitor created “nick trails” (visitor created paths to access the creek from the main Forest Service developed trail), trampling of vegetation, or mowing near *Adiantum capillus-veneris* patches have been identified as past or current impacts to the species and its habitat. Portions of the population occur in areas that are naturally restrictive to recreational access by dense vegetation or inaccessible steep slopes, and therefore are unlikely to be impacted by recreational use. *Cirsium arvense* (Canada thistle) is a state-listed noxious weed and *Elaeagnus angustifolia* (Russian olive), and *Tamarix* sp. (salt cedar) are non-native invasive species of concern which are found in the Cascade Creek Valley. *Lythrum salicaria* (purple loosestrife) is not known to occur within the Cascade Creek Valley or anywhere close by, but due to its aggressive nature, if it were to invade it would have the potential to impact riparian native species such as *Adiantum capillus-veneris*.

Additional potential risks to the species could include alterations to the habitat by hydrologic or geologic modifications or from erosion. Although no evidence of plant collection has been documented to date, it could also be a potential future risk to *Adiantum capillus-veneris* along Cascade Creek since the area has been identified as a botanical attraction in local tourist information and other publications.

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

Quantitative monitoring is problematic as some areas at Cascade Springs and Cascade Falls are naturally inaccessible or involve high risk of damage to the plants from trampling or dislodging them on steep slopes. Also, because *Adiantum capillus-veneris* expands clonally, it is not possible to determine the number of individual plants. Baseline monitoring data was gathered in June 2000 (while the species was on the R2 Sensitive Species list) and annual monitoring has been occurring. Monitoring of *Adiantum capillus-veneris* can occur any time during the growing season. Current monitoring design includes verification of presence/absence of mapped patches along stream transects and recording any new occurrences. The current design includes documenting any changes to the population to be indicated on baseline map diagrams for both Cascade Springs and Cascade Falls locations. Monitoring documents “nick points or trails” (visitor created paths that have been or can be created simply by recreationists leaving the

developed established trail system to access sections of Cascade Creek) that actually extend into *Adiantum capillus-veneris* patches. Monitoring also includes documenting stream bank erosion, weeds, and other disturbances in or near the patches. If the extent of the mapped patches declines by 10 percent or more, the monitoring design includes consultation with ecologists, botanists and biometricians knowledgeable about the species to develop a more rigorous monitoring strategy.

As of 2001, the U. S. Geological Services (USGS) gauging station at the southern end of J. H. Keith Cascade Springs Picnic Ground is no longer being monitored by USGS. A water level monitoring system (use of a piezometer) had been considered for installation for 2002 but the site does not lend itself to using this monitoring method. In consultation with the Rocky Mountain Research Station in 2003, the monitoring design to measure water levels was revised and included permanently placing water level measuring devices at two of the springs in 2003, if possible. Because of heritage resource concerns, these two water measuring devices were not installed. Continued consultation led to the evaluation of placing permanent transects at two points along Cascade Creek at J. H. Keith Picnic Ground in 2004. These transects were installed and water level measurements were recorded in 2004 and 2005 to coarsely document presence/absence of water in Cascade Creek.

2006 Monitoring Design:

1. Monitor presence/absence of *Adiantum capillus-veneris* patches along stream transects on an annual basis. If the number of patches decline by 10% or more, consult on a more rigorous design with the Rocky Mountain Research Station.
2. Recreation nick point: Document the number of nick point trails that actually extend into *Adiantum capillus-veneris* patches.
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.
4. Document any weeds designated as noxious by South Dakota and Wyoming, and the following non-native invasive species of concern, *Elaeagnus angustifolia* (Russian olive), and *Tamarix* sp. (salt cedar). For each *Adiantum capillus-veneris* patch, document if any weeds are co-located with the patch. Document the distance weed species are located away from specific patches if invasive species of concern are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.
5. Document erosion patches occurring at any *Adiantum capillus-veneris* patch.
6. Document any verifiable unauthorized collections of *Adiantum capillus-veneris*.

Carex bella (southwestern showy sedge)

Three *Carex bella* occurrences are located on lands administered by the Black Hills National Forest are all located within a single square mile section at the highest elevations of the Forest, with all reported locations occurring within Pennington County, South Dakota on the Hell Canyon Ranger District. These occurrences are located near Harney Peak, Nelson Creek and Lost Cabin Creek within the Black Elk Wilderness Area. One occurrence has also been reported within in the northern portion of Custer State Park, which lies adjacent to Black Elk Wilderness.

The approximate flowering period in the Black Hills is July through August. 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). This indicates this species may be approaching the limit of habitat availability in the Black Hills under the present climatic conditions. In recent years (primarily since 2001, when it was located on lands administered by Black Hills National Forest), emphasis has been placed on targeting and reporting *Carex bella* occurrences during plant surveys completed on Black Hills National Forest. No additional occurrences of *C. bella* have been discovered during a number of recent surveys completed throughout the Black Hills since 2001. This further supports the likelihood that this species may be restricted to the highest elevations in the granitic core area of the Black Hills.

On Black Hills National Forest, *Carex bella* is considered to be relatively secure from most potential risks, with the exception of extreme climatic change. *Carex bella* is reportedly intolerant to drought. Based on the existence of four reported *C. bella* occurrences (three on Black Hills National Forest), the likelihood that a single, high-intensity, localized event may result in the loss of all occurrences may be limited. However, sites are located within a limited geographic area. Other potential future risks may include increases in activities associated with recreational rock climbing and hikers, browsing by non-native mountain goats (*Oreamnos americanus*), invasion by noxious weeds or other exotic plant species, and efforts to control them. In addition, future fire suppression efforts could be expected to be potential risks at some sites.

2006 Monitoring Design:

1. Relocate the three previously reported *Carex bella* locations in the Black Elk Wilderness when the plant is most identifiable (primarily during the flowering period) and gather baseline data through full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form, including collecting herbarium vouchers and completing photo documentation. Assess risks to the species at those sites.
2. Document any weeds designated as noxious by South Dakota or Wyoming or other non-native invasive plant species. Document if invaders are co-located with *Carex bella*, or at what distance weed species are located away from the occurrence site if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.

***Eleocharis rostellata* (beaked spikerush)**

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. The occurrence is comprised of numerous suboccurrences that extend along Cascade Creek to approximately one-half mile above its confluence with the Cheyenne River. Black Hills National Forest administers only a small percentage (approximately 10 percent) of the *E. rostellata* occurrence along Cascade Creek.

Eleocharis rostellata is an obligate wetland species that occurs in saturated to inundated

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

Potential direct impacts to the approximately 10 percent of the *Eleocharis rostellata* occurrence at Cascade Creek on lands administered by Black Hills National Forest could be expected to be associated with changes in climatic conditions (such as drought), alterations to the hydrologic system where it is located, trampling by humans, wildlife use, invasion by noxious weeds and other non-native invasive plants, and collection/harvest (since this species occurs along Cascade Creek, refer to additional discussion in the section on *Adiantum capillus-veneris*).

2006 Monitoring Design:

1. Relocate the previously reported *Eleocharis rostellata* location at Cascade Falls when the plant is most identifiable (primarily during the flowering period) and gather baseline data through the full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form. Determine if it is appropriate to map the species using a similar process as is being used for *Adiantum capillus-veneris*. Collect herbarium vouchers and complete photo documentation. Assess risks to the species at the site.
2. Document any weeds designated as noxious by South Dakota and Wyoming, and the following non-native invasive species of concern: *Elaeagnus angustifolia* (Russian olive) and *Tamarix* sp. (salt cedar). Document if any weeds are co-located with *Eleocharis rostellata*. Document the distance weed species are located away from patches if invasive species of concern are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.

***Gentiana affinis* (pleated gentian)**

Less than 10 *Gentiana affinis* occurrences have been reported on Black Hills National Forest, primarily in limestone areas at elevations from approximately 5,000 to 6,500 feet of elevation on the Mystic and Northern Hills Districts. These reports were from observations in 1994, 1996, and 2002. It is unknown if *Gentiana affinis* is more widely distributed on Black Hills National Forest than is currently known, however, it is suspected that it is likely under-reported on the limestone plateau. The reported locations are distributed within four sixth order watersheds and are located in Pennington and Lawrence Counties, South Dakota. There is limited occurrence, abundance, and distribution information available for the Black Hills.

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 primarily to occur in moist (not saturated) areas in open conditions (no tree canopy) sometimes near wet meadows, fens, and stream margins in limestone areas.

The primary risks for *Gentiana affinis* are expected to be related to intensive grazing or trampling by livestock since the species is sensitive to disturbance, including trampling by animals. Thus, *G. affinis* is expected to decline with heavy grazing (Larson and Johnson 1999). This species is reported to primarily occur in areas without tree canopies, or in areas of full or almost full sun condition. Consequently, conifer encroachment is expected to present a risk to this species. As with other emphasis species, other risks likely include invasion by noxious weeds or other non-

native invasive plant species, drought, and wildfire and suppression activities.

2006 Monitoring Design:

1. Relocate the eight previously reported locations of *Gentiana affinis* on Black Hills National Forest when the species is most identifiable (primarily during the flowering period) and gather baseline data through the full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form, including collecting herbarium vouchers and completing photo documentation. Assess risks to the species at that site.
2. Document any weeds designated as noxious by South Dakota or Wyoming or other non-native invasive plant species. Document if invaders are co-located with *Gentiana affinis* or at what distance the weed species is located away from the occurrence site if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.

***Listera convallarioides* (broadlipped twayblade)**

In the Black Hills, *Listera convallarioides* was first discovered in 1970 at Englewood Springs and a second site was located in 1994 along West Strawberry Creek. Both sites are located within Lawrence County. Both were thought to occur on land administered by the Black Hills National Forest. Recent availability of technical mapping equipment (Global Positioning System) at West Strawberry Creek location revealed that the plants observed in 2005 were on land administered by the Bureau of Land Management and adjacent Black Hills National Forest land.

The Englewood Springs occurrence is within the Englewood Springs Botanical Area. This occurrence has been visited multiple times with the most recent observation data collected on June 10, 2004. At that time greater than 1,000 individuals were estimated to occur at a small portion of the site; additional plants made be present, as the main portion of the occurrence was not surveyed at this location. The elevation range of the sites administered by Forest Service and Bureau of Land Management is from 5,800 to 6,200 feet and individuals are located in saturated soil conditions adjacent to wet springs, and under tree canopies composed mostly of *Picea glauca* (white spruce).

Expected potential risks to the species include invasion by noxious weeds or other non-native invasive plant species, grazing or trampling by livestock or wildlife, collection, loss of riparian habitat, or alteration of hydrologic function where the species occurs (Allen et al. 2005). The most recent information indicates the greatest risk to the species may be that it is limited to two currently known occurrences. Therefore, high intensity disturbance events such as a crown fire during drought or sediment covering the sites could be expected to result in the loss of both occurrences. However, *Listera convallarioides* is considered to be highly tolerant to fire and shade (USDA Natural Resources Conservation Service 2004). Another risk identified for northern boreal plant species such as *L. convallarioides* is a climatic trend towards warming and drying conditions. This species may not be able to persist in the Black Hills following this type of climatic trend.

2006 Monitoring Design:

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

site.

2. Document any weeds designated as noxious by South Dakota or Wyoming or other exotic non-native invasive plant species. Document if invaders are co-located with *Listera convallarioides* or at what distance the weed species is located away from the occurrence site if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.

Lycopodium annotinum (stiff clubmoss)

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 these reported occurrences are located very close to each other and once baseline data are gathered, some reported locations may be combined into fewer larger occurrences composed of sub-components.

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

The persistence of *Lycopodium annotinum* in the Black Hills is considered to be at risk due to both the small number and small size of occurrences, which makes the species vulnerable to random stochastic events (such as from high intensity fire events) and invasion by noxious weeds and other invasive plants or their treatment. Livestock use, timber harvest and road building are precluded at sites that were known at the time the assessment was prepared. Some occurrences are in topographic situations that provide natural barriers to these activities. Other potential risks to *L. annotinum* could be expected to include fire line creation and other fire suppression disturbances that may disturb occurrences, targeted fuels reduction activities within the Wildland Urban Interface near designated At Risk Communities (since a number of occurrences are reported from these locations), and vegetation treatment activities to remove encroaching conifers and enhance regeneration of hardwood habitats.

2006 Monitoring Design:

1. Relocate at least 50% of the previously reported *Lycopodium annotinum* locations and gather baseline data through the full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form, including collecting herbarium vouchers and completing photo documentation. Assess risks to those sites.
2. Document any weeds designated as noxious by South Dakota or Wyoming or other non-native invasive plant species. Document if invaders are co-located with *Lycopodium annotinum* or at what distance weed species are located away from occurrence sites if they are occupying the same ecological type. Use this information

to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.

Oxyria digyna (alpine mountainsorrel)

First documented in the Black Hills in 1983, this species is currently known from three occurrences in a limited geographic range within the Harney Peak area: two 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. Of the two occurrences in the Black Elk Wilderness, the largest occurrence was documented in the estimated range class of 500-1,000 individuals. The other occurrence in the Wilderness has less than 50 individuals. The Custer State Park occurrence was estimated to have 300 - 500 individuals.

Elsewhere in its range, associated habitat characteristics generally include damp rocky places in mountains, especially by streams (Clapham et al. 1962), rocky areas in mountains (Dorn 2001), or moist ground in alpine or subalpine areas (Hitchcock and Cronquist 1973). In addition, the species is described as being adapted to coarse textured soils, rather than fine textured soils. Within the Black Hills, the species is found in similar conditions. 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. All Black Hills National Forest occurrences are located within approximately the same section (one square mile).

On Black Hills National Forest, *Oxyria digyna* is considered to be relatively secure from most potential risks associated with a variety of activities (roads, harvest activities, livestock use). Potential risks to this species in the Wilderness and nearby Custer State Park may include vulnerability to disturbance by hikers and climbers, potential trail maintenance activities and trampling and browsing from non-native mountain goats (*Oreamnos americanus*) or browsing by elk (*Cervus elaphus*). Due to the limited number of occurrences, disturbances at or near these sites could pose significant risks to individual occurrence persistence. In addition, invasion by noxious weeds or other invasive plant species and efforts to control them and future fire suppression efforts could be potential risks.

2006 Monitoring Design:

1. Relocate the two previously reported *Oxyria digyna* locations in the Black Elk Wilderness when the plant is most identifiable (primarily during the flowering period) and gather baseline data through the full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form, including collecting herbarium vouchers and completing photo documentation. Assess risks to the species at those sites.
2. Document any weeds designated as noxious by South Dakota or Wyoming or other non-native invasive plant species. Document if invaders are co-located with *Oxyria digyna* or at what distance weed species are located away from occurrence sites if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.

Petasites sagittatus (arrowleaf sweet coltsfoot)

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 of these reported locations could be combined into single 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. Two additional reports in the Black Hills are documented from private land.

A variety of associated conditions have been recorded at the reported Black Hills locations for this boreal associated species. Information includes sites that are characterized by open to partial shade tree canopies and ranging in elevation from 5,400 to 6,750 feet. Individuals are reported to be 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 six sites (again with very low canopy conditions); however, *Populus tremuloides* (aspen) and *Pinus ponderosa* (ponderosa pine) are also included in some reports. A variety of *Salix* (willow) species are documented at the majority of the reported locations.

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

2006 Monitoring Design:

1. Relocate at least 50% of the previously reported locations when the plant is most identifiable (primarily during the flowering period) and gather baseline data through the full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form, including collecting herbarium vouchers and completing photo documentation. Assess risks to those sites.
2. Document any weeds designated as noxious by South Dakota or Wyoming or other non-native invasive plant species. Document if invaders are co-located with *Petasites sagittatus*, or at what distance weed species are located away from occurrence sites if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.

Polystichum lonchitis (northern hollyfern)

Black Hills National Forest has information on 20 records for this species in the Black Hills: 19 reports from lands administered by Black Hills National Forest and one report from private land. 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 reported to be associated with moist, shaded, north facing slopes in forested ravines and gulches on limestone substrates at elevations from 4,160 to 5,540 feet. Occurrences are distributed across approximately eight sixth order watersheds and 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. The most recently discovered sites (nine) 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.

The species' persistence in the Black Hills is likely 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. Most likely potential risks that have been identified for this species are associated with the potential for Off Road Vehicle impacts, livestock trampling, water developments, and activities associated with road construction. It is also expected that noxious weeds and other non-native plant species invasions could be a risk. Wildfire and suppression activities can be considered a risk to occurrences. Collectors may desire the species and depending on the level of interest, collection could potentially present a risk to this species.

2006 Monitoring Design:

1. Relocate at least 50% of the previously reported *Polystichum lonchitis* locations when the species is most identifiable (fronds present) and gather baseline data through the full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form, including collecting herbarium vouchers and completing photo documentation. Assess risks to those sites.
2. Document any weeds designated as noxious by South Dakota or Wyoming or other non-native, invasive plant species. Document if invaders are co-located with *Polystichum lonchitis* or at what distance weed species are located away from occurrence sites if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.

Salix lucida (shining willow)

This shrub was historically documented (1913) from the Black Hills but was never relocated and thought to be no longer present until an individual was located at a different location along a small tributary of Iron Creek in 1993. Since that time, three additional occurrences have been discovered (2002 and 2003). Two occurrences are located in the Bearlodge Mountains north of Sundance, Wyoming. The other two occurrences are located within the central granitic core area of the Black Hills, northeast of Custer, South Dakota.

This widespread species is commonly associated with streambanks, shores, wet meadows, and seeps and is considered a facultative wetland plant elsewhere in South Dakota and eastern Wyoming. The occurrences within 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 and are approximately three miles apart. Occurrences within the granitic core (Pennington County, South Dakota) are located at mid elevations (5,000 and 5600 feet) within the Black Hills

and are approximately six miles apart. Individuals are reported to occur in open (full sun) to partially shaded conditions. Less than five individual plants are reported at each of the occurrence locations. The 1993 reported location was described as a male individual and at that time it was unknown if a breeding population existed within the Black Hills. Plants located at the new sites have been described as vegetative individuals, so it is still unknown if there is a breeding population with potential for seed production.

The long term persistence of *Salix lucida* in the Black Hills is uncertain since current information is that less than a total of 10 individuals are known to exist. Since only four occurrences of *S. lucida* have been documented on Black Hills National Forest with a limited number of individuals it is assumed that the specific microsite conditions that are associated with this species may be very limited within the broader more general riparian conditions which occur across Black Hills National Forest. This species is considered to be vulnerable to catastrophic and stochastic events. Because this is a facultative wetland species, the primary risk to its persistence and reproductive success is likely considered to be any lowering of the water table where it occurs, whether natural or human induced. Noxious weeds and other non-native invasive plants and their treatment, invading woody species (conifer encroachment), and fungal or insect infestations are likely to pose risks for this species

2006 Monitoring Design:

1. Relocate the four previously reported *Salix lucida* locations when the plant is most identifiable (primarily during the flowering period) and gather baseline data through the full completion of the Black Hills National Forest Rare Plant Survey/Monitoring Form, including collecting herbarium vouchers and completing photo documentation. Assess risks to those sites.
2. Document any weeds designated as noxious by South Dakota or Wyoming or other non-native, invasive plant species. Document if invaders are co-located with *Salix lucida* or at what distance weed species are located away from occurrence sites if they are occupying the same ecological type. Use this information to develop a weed strategy with prioritization by species (all R2 sensitive and SOLC) and sites as a basis for interaction with district weed managers with a goal of implementing treatments in 2007. Document if any weed treatment activity has affected the occurrence.

Monitoring Details for Black Hills National Forest Monitoring of R2 Sensitive Plants

Data Precision and Reliability: Class A (Quantitative)

Frequency of Reporting: Annually.

Information Storage System: Black Hills National Forest plant database (potentially national database system, when available), GIS system, Forest Plan monitoring files, the respective state natural heritage programs. Most herbarium vouchers have been and are to be sent to the Rocky Mountain Herbarium in Laramie, WY. Some vouchers have been and will be sent to various other herbaria (i.e. *Botrychium* vouchers to Iowa State University, Research Natural Area vouchers to South Dakota State University). Data are currently stored in Forest access databases. Baseline data is stored at:

J:\jfsfiles\unit\rwsw\2600_wfrp\2670_plants\plant_database\bhnfplants.mdb.

A Forest Service nationwide database to support the tracking of data and monitoring of individual plant occurrences has been released in 2006 that is expected to be compatible

with state natural heritage program databases. Black Hills data will move into the nationwide database system when a system for migrating legacy data has been developed (projected date unknown).

Responsibility: Supervisor's Office and Districts

Cost: The combined monitoring cost estimate for sensitive plant monitoring in 2001 was \$98,000 annually, which included conducting surveys, compiling data, managing GIS layers and databases, revising monitoring strategies, and consulting with the Rocky Mountain Research Station. The R2 sensitive species list was revised and reissued in December 2003, and another modification made in May 2005. Black Hills National Forest is still collecting baseline data on some species associated with the 2003 R2 sensitive species issuance, as well as collecting baseline data on several R2 sensitive species recently located on Black Hills National Forest for the first time. In addition, Black Hills National Forest designated a species of local concern (SOLC) list in November 2005. Phase II Amendment to the Black Hills LRMP directs that SOLC will be treated as R2 sensitive in planning and implementation of forest management activities. Consequently, ten new plant SOLC have been added to the monitoring program for baseline data collection in 2006. Survey and baseline data are needed on occurrences to support any quantitative monitoring that may be designed for those species. Because the cost estimate is from 2001, and there are additional costs associated with baseline data collection for new species, the total funding need for 2005 and subsequent years is expected to be higher than the \$98,000 estimated in 2001.

The minimum combined monitoring cost estimate for Species of Local Concern plant monitoring is approximately \$75,000 annually, which includes gathering baseline or monitoring data as designed, compiling data, managing GIS layers and plant databases, designing or revising monitoring strategies, and consulting with the Rocky Mountain Research Station.

Periodically, the R2 sensitive species list and Black Hills National Forest species of local concern list are expected to change. It is anticipated that costs associated with baseline data collection and development of monitoring designs would change with any revisions of the lists. Increases in noxious weeds have the potential to occur within the Black Hills. Increasing noxious weeds and weed treatment priorities to focus effective yet undamaging (to species of concern) weed control in R2 sensitive/SOLC plant occurrences also have the potential to contribute to higher costs associated with monitoring.

Submitted to the Forest Resources/Planning Staff for the Forest Plan Monitoring Record on May 25, 2006.