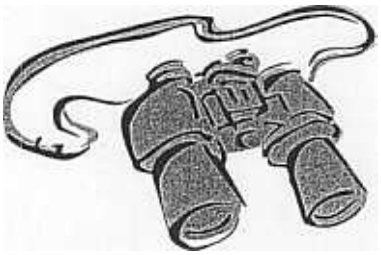
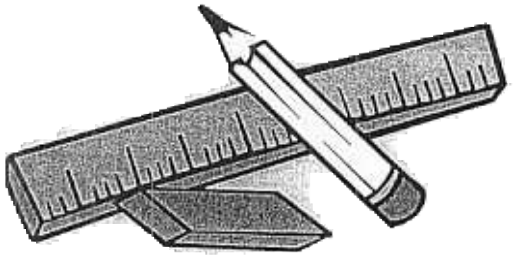
Monitoring Implementation Guide

for the

Black Hills National Forest Land and Resource Management Plan

October 2005





Approved:

Craig Bobzien, Forest Supervisor

Date: 10/27/05

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Introduction

This document provides guidance on how to implement the monitoring and evaluation requirements of the Black Hills Land and Resource Management Plan (Forest Plan) as amended. It contains the methods and protocols to be used in implementing Chapter Four of the Forest Plan. Other techniques may also be used if they are approved in advance by the Forest Service. All data collected are subject to field checks and verification before they are accepted.

The guide is intended to be flexible and may be changed as new methods, techniques, and needs are identified. Monitoring of any given item may be conducted in whole or in part, and is dependent on funding, personnel, and other considerations. Monitoring may be performed by the Forest Service or other interested parties.

The guide uses information in the Forest Plan but it is not part of the Forest Plan. Changes to this document are not considered to be an amendment to the Forest Plan.

Format

This document contains a section on each of the monitoring items listed on pages IV-4 through IV-6 in the Forest Plan. The following information is provided for each monitoring item. Some monitoring items are separated further into sub-items.

Authority - This section describes the legal basis for the monitoring requirement. There are three levels. If funding limits preclude the ability to perform all monitoring, items specifically required by law or regulation would be the last to be affected.

The authority levels are:

1 - Monitoring is required by law.

2 - Monitoring is required by regulation.

3 - All other monitoring required by the Forest Plan.

I**ndicator** - One or more indicator is specified. Indicators are variables to be measured which represent the monitoring item.

Methods - The approach used for monitoring is discussed. This includes the survey method, what equipment is used, and any analysis methods.

Unit of Measure - The measurements that are used for the indicator.

Sample Design - The sample design includes the number of samples, how they are located, and the frequency of sampling. When possible, the statistical basis of the sample design is discussed.

Precision/Reliability - Two classes of precision and reliability are indicated in the Forest Plan for each monitoring item and are repeated here because sub-items may vary.

The precision/reliability classes are:

Class A: These methods are generally well accepted for modeling or measuring the resource. The methods used produce repeatable results and are often statistically valid. Reliability, precision and accuracy are very good. The cost of conducting these measurements is higher than other methods. These methods are often quantitative in nature.

Class B: These methods of measurement are valuable tools that are based on a variety of techniques. These tools include project records, communications, on-site ocular estimates, and less formal measurements like pace transects, informal visitor surveys, air photo interpretation and other similar types of assessments. Reliability, accuracy, and precision are good but usually less than Class A. Class B methods are often qualitative in nature, but still provide valuable information on the status of resource conditions.

Reporting Frequency - The reporting frequency is indicated in the Forest Plan for each monitoring item and is repeated here because sub-items may vary. The reporting frequency (in years) should not be confused with the monitoring frequency described in the sample design. When scheduled for reporting, all Forest Plan monitoring and evaluation will be reported in the annual monitoring and evaluation report.

I**nformation Storage** - This describes where the data collected from monitoring can be found.

Responsibility - This describes who will be doing the monitoring. This includes Forest Service personnel, other agencies, and opportunities for private citizens.

Cost - Estimates of costs are provided. However, this is not a budget document, and actual implementation costs may vary considerably from year to year.

Monitoring Item 1: **AIR - Air Quality**

Authority: Level Three

Indicators: Any violation or near violations.

Method of Data Collection: Violations as recorded at Rapid City monitoring sites.

Unit of Measure: Number of violations.

Sample Design: Monitoring by the state through its Rapid City monitoring sites.

Data Precision and Reliability: Class A

Frequency of Reporting: Annually

Information Storage System: The annual "South Dakota Ambient Air Monitoring Network Review" and the quarterly "Rapid City PM10 Monitoring Report" by the South Dakota Department of Environment and Natural Resources.

Responsibility: Forest Air Quality Officer

Cost: Three weeks time of air quality officer, about $3,000 per year

Monitoring Item 2: **SOILS - Soil Productivity**

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

Indicators: Physical condition of surface soils: level of erosion, compaction, and disturbance.

Method of Data Collection:

Intensively monitor two timber sale cutting units per year. Monitor five other timber sale cutting units less intensively, i.e. using a tile spade.

Intensively monitor two rangeland sites using the same procedure; and monitor a minimum of five other rangeland sites less intensively to determine if excessive erosion is occurring.

Visual monitoring of new soil disturbing activity, e.g. road construction, trail construction.

Unit of Measure: Acres of Timber sale cutting units, Acres of rangeland sites, Acres of other soil disturbing activities.

Sample Design: See "Guidelines for Sampling Some Physical Conditions of Surface Soils", USFS 1985, based on a sample size analysis and indicators provided by the Rocky Mountain Station.

Data Precision and Reliability: Intensive Monitoring: Class A; Visual Monitoring: Class B

Frequency of Reporting: 5 Years

Information Storage System: SO soils monitoring files

Responsibility: Soil Scientist with assistance from District personnel, or Contract for collection and lab preparation of samples. R2 Regional Soil Scientist analyzes the data to determine results. Public can be involved in collection of the samples and lab processing of samples collected.

Cost: Four weeks of soils scientist's time. Four weeks total of district assistance. Total approximate cost $6,000/year.

Monitoring Item 3: **SOILS - Revegetation**

Authority: Level Three

Indicators: Signs of erosion: rock or plant pedestalling; rills; gullies; stability of streambanks, or lack of acceptable ground cover.

Method of Data Collection: Forms from Contract administrators, Resource Management Reviews, field observation by district and SO personnel

Unit of Measure: Acres with each Project Area

Sample Design: Information collected from all timber sale projections. Sample review of disturbance from project or management activities as needed; Minimum of 2 districts annually to be reviewed.

Data Precision and Reliability: Class B

Frequency of Reporting: 5 years

Information Storage System: SO soils monitoring files

Responsibility: District and Supervisor's Office personnel. Public can be involved.

Cost: Two weeks of soil scientist time. Two weeks per district. Approximate cost of $10,000 per year.

Monitoring Item 4: **WATER – Watershed Health**

Sub-Item: **Watershed Assessment**

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

Indicators: MAR classification:

Class I: REGIMEN ATTAINMENT. Robust health. No long-term changes result from even major storms. Risks of human-caused deterioration are very low. Dynamic equilibrium is shown by a stable stream network, and are so maintained by using preventive WCPs, BMPs, BMMPs, and Forest Standards and Guidelines.

Class II: SPECIAL EMPHASIS. The watershed does not meet Class I criteria. Some streams, upland soils, and riparian areas may need restoration but major capital investments are not needed to restore Class I conditions. The watershed may be sensitive to disturbance due to fragile streams and soils, or may not yet have reached a dynamic equilibrium following past damage. Class I condition can be restored by slowing the rate or changing the nature of management actions, or by applying WCPs, etc., more rigorously.

Class III: INVESTMENT EMPHASIS. The watershed requires capitol investments to restore Class II conditions. Watersheds can be restored only if management is limited to actions that complement watershed recovery, and if watershed improvements are applied.

Methods of Data Collection: Based on existing knowledge; especially maps and the knowledge of field-going personnel and State information and stream classifications, this information will be mapped and watersheds assigned a MAR class of I, II, or III. Watersheds assigned a class II or III will be scheduled for additional monitoring. The Proper Functioning Condition (PFC) methodology (Bureau of Land Management TR 1757-9, 1993) will be used to further assess Class II and III watersheds. This is an interdisciplinary approach. The IDT looks at stream reaches and determines the capability and potential of the reach. Class III watersheds, or those with stream reaches which have been listed by the states as either non-supporting or partially supporting of state designated beneficial use, will be assessed first using the PFC process, followed by Class II watersheds. Watershed assessments will be updated with additional data gathered from project-level analysis.

Unit of Measure: 6th-level watershed.

Sample Design: All watersheds will be assessed at this level once during the planning period or as needed.

Data Precision and Reliability: Class B

Frequency of Reporting: Changes in watershed class due to project level analysis will be discussed in the Analysis of the Management Situation. Re-analysis of all 6th level watershed classes will occur during the next Forest Plan revision process.

Information Storage System: SO watershed files; ARC/INFO files on IBM system.

Responsibility: SO and District personnel.

Cost: 2 weeks for Forest Hydrologist, 3 weeks, GIS coordinator, 4 days for district personnel, approximately $10,000 per year as needed.

Sub-Item: **Stream Health**

Authority: Level Three (Forest Plan Objectives 103, 104b, 108, 217, 219 and 221 and FSH 2509.25)

Indicators: Stream health class and changes to stream parameters over time.

Method of Data Collection: Onsite quantitative measurements of the stream longitudinal profile, channel cross-section, floodplain and bankfull indicators, discharge and bed/bank material are to be collected using the techniques described by Harrelson et al. (1994). As part of the Integrated Resource Inventory (IRI) – Common Water Unit (CWU) effort, approximately 1,045 sample sites were established along the stream/drainage network on the Forest. Physical stream attribute data were collected at the majority of these points per the NRIS-Water protocol named "R2 IRI VALSEG3". Bank stability will be monitored using the Green Line Vegetation Composition methodology identified as Exhibit GL in the Rangeland Analysis and Management Training Guide (USDA Forest Service 1996).

Unit of Measure:

- Stream health class = robust, at-risk or diminished
- Longitudinal profile = elevational change along the stream over a given distance
- Channel cross-section = elevation change perpendicular to the stream channel/floodplain
- Bankfull indicator = active floodplain (flat, depositional surface adjacent to the stream channel)
- Discharge = flow in cubic feet per second (cfs)
- Bed/bank material = pebble count size class (mm)
- Bank stability = percent vegetated/unvegetated and stable/unstable

Sample Design: Up to fourteen references reaches (sites) representing the best conditions across a variety of watershed/stream types are to be established on the Forest using the methodology of Harrelson et al. (1994). These reference reaches are expected to serve as "controls". Additional reference sites may be established as needed for project or program-level monitoring. A subset of the IRI-CWU stream points and all of the stream reference reach sites are to be resampled on a 3-5 year cycle. Additional sample sites may be added at "key areas" or "benchmarks" as defined in Rangeland Analysis and Management Training Guide to assess Program-level activities such as range management. Sampling should be conducted during base flows in the same year to minimize the variability in environmental conditions. Changes at IRI-CWU sites will be compared to changes at representative reference reach sites to determine stream health class and trend.

Data Precision and Reliability: Class A

Frequency of Reporting: 3-5 years

Information Storage System: Aquatic Inventory (AI) module of NRIS-Water

Responsibility: Forest Hydrologist with assistance from District personnel.

Cost: $114,400. This includes $1,600 to establish each reference reach site (n=14), including permanent setup, data collection and data processing. Approximately $80,000 to remeasure IRI-CWU sites and $12,000 to process the data.

Sub-Item: **Water Quality**

Stream health includes chemical, physical and biologic integrity. Water Quality here refers to meeting State chemical water quality standards.

Authority: Level 1 (State Law - Clean Water Act)

Indicators: Meeting State water quality standards

Methods of Data Collection: The Forest will work cooperatively with the states of South Dakota and Wyoming to monitor water quality.

Unit of Measure: dependent upon parameter.

Sample Design: Program or project-level monitoring may be initiated on water bodies where available information suggests that water quality standards may not be met or beneficial uses may be impaired. Monitoring of water bodies identified as impaired or threatened in the States' 303(d) list and/or 305(b) report may also occur as needed to track restoration of these water bodies.

Data Precision and Reliability: Class A

Frequency of Reporting: Data collected by the Forest will be shared with the State water quality agencies for use in their Clean Water Act biannual reporting.

Information Storage System: Data from the last 13 years is currently stored in the RWSW PC Database. Data previous to this is on the Environmental Protection Agency's STORET system accessed at: http://www.epa.gov/STORET/dbtop.html

Responsibility: Supervisor's Office and District personnel

Cost: to be determined based on project-level needs

Sub-Item: **Non-point source water pollution control**

Authority: Level Three (Forest Plan Objectives 103 and 104 and FSH 2509.25)

Indicators: Implementation and effectiveness of Forest Plan Standards and Guidelines, Regional Watershed Conservation Practices, Best Management Practices (BMPs) and Best Minerals Management Practices (BMMPs).

Method of Data Collection: Implementation and effectiveness monitoring will follow the process identified in the national Best Management Practices Evaluation Program (BMPEP) User's Guide (May 2005 Draft). The overall approach for evaluation consists of an office review of project files and applicable standards and management measures and a field-based review of project sites using ocular estimates and measurements of conditions at the site of BMP application. Onsite evaluations should typically be completed by interdisciplinary teams that include watershed personnel and those responsible for execution of the practices. Monitoring forms have been developed by a Forest team that will be updated to include national protocol direction and any updates to the Region 2 Watershed Conservation Practices Handbook (FSH 2509.25). These, or similar forms will be filled out by district personnel working at the project level. Completed hard copy onsite evaluation field forms are submitted to the Forest's BMPEP Data Steward in the Supervisor's Office.

Unit of Measure:

- Application
  - 1 = Exceeds contract/project requirements.
  - 2 = Meets contract/project requirements.
  - 3 = Minor departure from contract/project requirements.
  - 4 = Major departure from contract/project requirements.
- Effectiveness
  - 1 = Improved Protection
  - 2 = Adequate Protection
  - 3 = Minor Effects
  - 4 = Major Effects

Sample Design: A stratified random sample of projects with ground disturbing effects that may effect water bodies (streams/lakes) will be annually reviewed on each District. Effectiveness is assessed by making measurements and/or ocular estimates at the site of BMP implementation. The forms will be collected and analyzed in the SO annually. Additional timber sale units may be considered and evaluated during the field audits that are cooperatively done by the states of South Dakota and Wyoming in cooperation with the Black Hills Forest Resource Association and the Wyoming Timber Industry Association and the Wyoming Department of Environmental Quality (WYDEQ) and the Wyoming State Forestry Division. These audits are done on a 3-year cycle. The most recent audits were done in 2004.

Data Precision and Reliability: Class A/B.

Frequency of Reporting: The Forest will prepare two different types of BMPEP reports on a three-year cycle. Every third year, a comprehensive *BMPEP Monitoring Report and Action Plan* will be produced. On the first and second year of each reporting cycle, a summary *BMPEP Progress Reports* will be developed. Forest reports will be provided by January 30 of each year. Monitoring of BMP implementation and effectiveness on selected activities on the Wyoming portion of the Forest will be reported annually, per the Memorandum of Understanding (05-MU-11020000-021) between the USDA Forest Service - Rocky Mountain Region and the Wyoming Department of Environmental Quality.

Information Storage System: District Project files, S.O. watershed files, RWSW PC Database and/or BMPEP Database (not currently online).

Responsibility: Districts and S.O.

Cost: $28,400

$8,400 for implementation and effectiveness monitoring by 2 Zone Hydrologists (14 days each).

$8,000 for implementation and effectiveness monitoring by 2 Zone Hydrologic Technicians (20 days each).

$12,000 for Forest Hydrologist for implementation and effectiveness monitoring and Data Steward responsibilities.

Implementation monitoring by timber sale administrators, approximately $5,000 per year, included as part of normal duties.

Monitoring Item 5: **WATER – Water Quantity (Water Yield*)***

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

Indicators: Evaluation of water yield and comparison with Forest Plan projections.

Method of Data Collection: Calculations are based on the RIS database used in FORPLAN. The RIS sites and an isohyetal map are overlaid on the watershed maps using ARCINFO. Water yield can be calculated as a Forest average also.

Unit of Measure: Acre-feet; based on proposed changes in basal area and average watershed precipitation

Sample Design: All Sixth-level watersheds, reviewed every five years.

Data Precision and Reliability: Class A. (Reliable to the extent that the WRENNS model, based on data from the Sturgis Experimental Watershed, is transferable to other Forest watersheds.)

Frequency of Reporting: 5 years

Information Storage System: S.O. watershed files and RWSW PC Database

Responsibility: Forest Hydrologist

Cost: 2 weeks of hydrologist's time per year, approximately $2,000. One week of Forest Plan Analyst's time, approximately $1,000.

Monitoring Item 6: **RIPARIAN – Condition and Trend**

Authority: Level Three (Forest Plan Objectives 104b and 213)

Indicators: Trend in riparian condition based on changes in vegetation communities and streambank alteration.

Methods of Data Collection: Long-term riparian condition will be monitored using two protocols identified in the Rangeland Analysis and Management Training Guide (USDA Forest Service 1996). These protocols are the (1) Cross-section Composition and (2) Green Line Vegetation Composition.

Unit of Measure:

- Cross-section composition = percent composition of vegetation communities perpendicular to perennial water
- Green line vegetation composition = percent composition of vegetation communities parallel to perennial water
- Bank stability = percent vegetated/unvegetated and stable/unstable

Sample Design: The protocols for long-term monitoring are to be conducted at a subset of sites where baseline data were gathered for the Integrated Resource Inventory (IRI) - Common Water Unit (CWU) effort. Approximately 1,045 sample sites were established along the stream/drainage network on the Forest as part of the IRI-CWU task. Additional sites may be established at "key areas" and "benchmarks" as identified in USDA Forest Service (1996) to meet Program-specific needs, such as range management. This monitoring should be done at the same time as the stream health monitoring. Sites are to be sampled on a 3-5 year cycle.

In addition, short-term annual monitoring may be conducted at key areas or benchmarks where the Proper Functioning Condition (PFC) of stream systems has been determined to be "at-risk" or "nonfunctional" and/or in those watersheds defined as Class II or III (1997 revised Forest Plan FEIS; Appendix J; Table J-3). PFC will be determined using the PFC protocol (Exhibit PFC) in the Rangeland Analysis and Management Training Guide (USDA Forest Service 1996). Short-term monitoring should measure stream bank alteration (Exhibit SA), stubble height (Exhibit SH) and woody browse utilization (Exhibit OE) or other representative parameters to provide quick feedback to modify management practices in a timely manner, e.g., the current season of use.

Data Precision and Reliability: Class A

Frequency of Reporting: 3-5 years.

Information Storage System: NRIS corporate database

Responsibility: Forest Interdisciplinary Team

Cost: $40,000. Some costs savings may be realized if the long-term riparian monitoring is completed at the same time by those completing stream health monitoring. Short-term riparian monitoring and riparian data management costs would be additive to long-term riparian/stream health monitoring costs.

Monitoring Item 7: **RIPARIAN / WETLANDS – Habitat Restoration**

Authority: Level Three (Forest Plan Objectives 107, 214 and 215)

Indicators: Completion of riparian and wetland restoration projects

Method of Data Collection: The accomplishment of restoration targets will be identified through direct contact with individual Program/project leaders, by reviewing the Wildlife/Fish/Rare Plants – Management System (WFRP-MS) database, and/or by reviewing the FACTS database.

Unit of Measure:

- Objective 107 = acres of wetlands restored;
- Objective 214 = acres of riparian shrub communities restored;
- Objective 215 = number of stream reaches where riparian restoration has been implemented

Sample Design: All Programs/Activities that may contribute to riparian/wetland restoration acres or stream reaches restoration will be sampled. These Programs include primarily Wildlife/Fish (NFWF), Vegetation and Watershed Management (NFVW) and Knutson-Vandenburg (K-V) activities, but restoration activities may also be implemented through other programs, such as Range Betterment (RB) and Grazing (NFRG).

Data Precision and Reliability: Class B

Frequency of Reporting: 1 - 5 years

Information Storage System: District project files, WFRP-MS and/or FACTS database

Responsibility: District personnel with assistance from Supervisor's Office

Cost: Approximately $700 (2-3 days) per year to solicit data from program managers or extract data from corporate database and report the data. [The personnel cost to enter restoration acres/reaches and maintain corporate databases are included in the project costs].

Monitoring Item 8: **VEGETATIVE DIVERSITY – Vegetation Species Composition**

Authority: Level Two

Indicators: vegetation cover type

Method of Data Collection: corporate vegetation inventory

Unit of Measure: Acres by cover type

Sample Design: corporate vegetation inventory

Data Precision and Reliability: class A/B

Frequency of Reporting: annual

Information Storage System: corporate vegetation database

Responsibility: Supervisor's Office

Cost: Black Hills National Forest

Monitoring Item 9: **VEGETATIVE DIVERSITY – Structural Stages**

Authority: Level Two

Indicators: structural stage

Method of Data Collection: corporate vegetation inventory

Unit of Measure: acres of structural stage by cover type and management area

Sample Design: corporate vegetation inventory

Data Precision and Reliability: class A/B

Frequency of Reporting: annual

Information Storage System: corporate vegetation database

Responsibility: Supervisor's Office

Cost: Black Hills National Forest

Monitoring Item 10: **VEGETATIVE DIVERSITY – Large Trees**

Authority: Level Two

Indicators: tree size

Method of Data Collection: corporate vegetation inventory

Unit of Measure: from database, query of tree size variable

Sample Design: corporate vegetation inventory

Data Precision and Reliability: class A/B

Frequency of Reporting: annual

Information Storage System: corporate vegetation database & FIA

Responsibility: Supervisor's Office

Cost: Black Hills National Forest

Monitoring Item 11: **VEGETATIVE DIVERSITY – Snags**

Authority: Level Two

Indicators: number of snags per acre

Method of Data Collection: corporate vegetation inventory & Forest Inventory Analysis (FIA)

Unit of Measure: number of snags per acre

Sample Design: corporate vegetation inventory & Forest Inventory Analysis (FIA); snags per acre by structural stage

Data Precision and Reliability: class B (Class A when data collection and retrieval is based on stand examinations).

Frequency of Reporting: annual

Information Storage System: corporate vegetation database and FIA

Responsibility: Supervisor's Office

Cost: Black Hills National Forest

Monitoring Item 12: **VEGETATIVE DIVERSITY – Burned Forest Habitat**

Authority: Level Two

This monitoring item will be coordinated with Monitoring Item 23 – Insects and Diseases, insect mortality to address Forest Plan objective 11-03.

Indicators: acres of burned forest

Method of Data Collection: Burned areas will be mapped, measured and reported through incident command (IC), burned area emergency rehabilitation (BAER), and / or Forest specialist teams using satellite imagery, GPS, or other means.

Unit of Measure: burned acres (low/moderate/high intensity) by cover type and structural stage.

Sample Design: wildfire acreage (usually GPS)

Data Precision and Reliability: class B

Frequency of Reporting: annually

Information Storage System: corporate vegetation database & fire history database

Responsibility: Supervisor's Office

Cost: Black Hills National Forest

Monitoring Item 13: **COMMODITY PRODUCTION – Growth Rate**

Authority: Level Three

Indicators: Yield of merchantable wood fiber

Method of Data Collection: Stand inventory surveys (permanent plot surveys - Stage I).

Unit of Measure: Cubic feet per acre per year

Sample Design: High intensity plot surveys.

Data Precision and Reliability: Class A

Frequency of Reporting: 10 years

Information Storage System: Forest Inventory and Analysis (FIA) Report

Responsibility: Forest Silviculturist

Cost: Most costs associated with forest inventory program of work. Additional cost of $1,000 to evaluate the data.

Monitoring Item 14: **COMMODITY PRODUCTION – Regeneration**

Authority: Level Two [36 CFR 219.27(c)(3)]

Indicators: Trees per acre

Method of Data Collection: Regeneration Surveys (post treatment surveys)

Unit of Measure: Trees per acre.

Sample Design: High intensity plot surveys of all regeneration harvests (walk through in some areas)

Data Precision and Reliability: Class A

Frequency of Reporting: Annually

Information Storage System: RIS database (using ORACLE software)

Responsibility: Districts

Costs: $2,000 per timber sale.

Monitoring Item 15: **COMMODITY PRODUCTION – Timber Production**

Authority: Level One (National Forest Management Act)

Indicators: Yield of forest products.

Method of Data Collection: Timber sale accounting and reports.

Unit of Measure: 100 cubic feet.

Sample Design: Timber cruises, very high intensity.

Data Precision and Reliability: Class A

Frequency of Reporting: Annually

Information Storage System: Timber Sale Statement of Accounts (TSSA).

Responsibility: S.O. and districts

Cost: No additional cost above normal program of work.

Monitoring Item 16: **COMMODITY PRODUCTION – Rangeland Trend**

Authority: Level Two (36 CFR 219.20(a), Forest Plan Objective 302 and Guideline 2504)

Indicators: Variation from desired conditions and long term trend.

Method of Data Collection: Cover-Frequency analysis is the Black Hills National Forest Service standard method, at a minimum this will be done in accordance with the on the ground management document. If the situation warrants as determined by Forest Supervisor, additional techniques found in the "Rangeland Analysis and Management Training Guide" (USDA FS R2, 1996) can also be used..

Unit of Measure: Acres meeting or moving towards desired condition.

Sample Design: Follow accepted procedures and methodologies for determining trend. Compare them with reference sites (desired condition locations). Repeat methodology as scheduled in Allotment Management Plans initial readings to determine trend of vegetation under management as compared to the first readings.

Data Precision and Reliability: Class A

Frequency of Reporting: 3 years

Information Storage System: Allotment Management Project file and INFRA.

Responsibility: Monitoring may be performed by the Forest Service, permittees, or other interested parties. Cover-Frequency analysis will be the standard method that will be used by the permittees or interested parties additional methods are to be approved by the Forest Supervisor prior to data collection. The Rangeland Analysis and Management Training Guide (USDA FS R2, 1996) provides additional techniques for trend monitoring. Other techniques that are widely used by the scientific community may also be used if they are approved by the Forest Service. All data collected is subject to field checks and verification before it is accepted.

Cost: Costs associated with routine Allotment permit administration. Additional cost of $7,000 to evaluate and input the data.

Monitoring Item 17: **COMMODITY PRODUCTION – Forage Utilization/Residual**

Authority: Level Three (Forest Plan Guideline 2505)

Indicators: Percent utilization.

Method of Data Collection: Ocular Estimates (Rangeland Analysis and Management Training Guide USDA FS R2, 1996) or Landscape Appearance (Wyoming Rangeland Monitoring Guide, August 2001) are the standard method, for the Black Hills National Forest. These 2 methods are basically the same techniques. If the situation warrants as determined by Forest Supervisor, additional techniques found in these two guides can be used.

Unit of Measure: Percent of utilization.

Sample design: To follow accepted procedures of the methodologies listed in the Rangeland Analysis and Management Training Guide, Wyoming Rangeland Monitoring Guide, or other widely accepted scientific methodologies. Permittee performs analysis each year. Forest Service performs the analysis on allotments which in the Range Specialist's opinion are showing signs of excess use. Forest Service verifies permittee or other interested party monitoring.

Data Precision and Reliability: Class B

Frequency of Reporting: Annually

Information Storage System: Allotment Management Project file and INFRA.

Responsibility: Monitoring may be performed by the Forest Service, permittees, or other interested parties in cooperation with the Forest Service. Methods that will be used by the permittees or interested parties are to be approved prior to data collection. The Rangeland Analysis and Management Training Guide (USDA FS R2, 1996) and Wyoming Rangeland Monitoring Guide (August 2001) provide a variety of acceptable techniques for utilization monitoring. Other techniques that are widely used by the scientific community may also be used if they are approved by the Forest Service. All data collected by other than Forest Service employees or contractors is subject to field checks and verification before it is accepted.

Cost: Costs associated with routine allotment permit administration. Additional cost of $7,000 per year to evaluate and input the data.

Monitoring Item 18: **EMPHASIS SPECIES – Sensitive Species**

Authority: Level 2 (FSM 2670.45, Objective 221)

Sub-Item: **Plants**

(Revised April 11, 2005; RMRS Consultation Occurred September 15, 2004 and February 16, 2005)

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 and 2003, state heritage database information, survey and/or monitoring information for individual species, the number of currently known occurrences, or 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 exotic species and/or noxious weeds have potential to invade 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 of risks that could affect the long-term persistence of the species were also used as factors in the design of the monitoring. For the species that are more widely distributed throughout the Black Hills and have a larger number of sites and 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 populations are absent, severely degraded, or noxious weeds or other exotic plants known to be invasive are present, active measures are to be taken in accordance with the Black Hills National Forest Land and Resource Management Plan, along with any current amendments to the Plan

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.

Viola selkirkii **(Great Spurred Violet)**

Twenty one occurrences of *Viola selkirkii* are currently known to occur within the Black Elk

Wilderness, Upper Pine Creek Research Natural Area, Norbeck Wildlife Preserve, Custer State Park and Mount Rushmore National Memorial in the Black Hills. Thirteen of the occurrences are located within four distinct watersheds on lands administered by the Black Hills National Forest. 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 documented.

On the Forest, *Viola selkirkii* is relatively secure from most potential risks, with the potential exception of an 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 management and grazing is not currently occurring at known occurrences) but may be vulnerable to impacts from hikers and rock climbers in the future. In addition, invasion by noxious weeds or other exotic plant species and efforts to control them, and 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 or 2004 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 2004, baseline data were collected at the two most recently discovered occurrences (site numbers VISE2-12 and VISE2-13) located within the Upper Pine Creek Research Natural Area. Site number VISE2-13 is located within the boundary of the Elkhorn Fire (40 acre fire that burned fall of 2003). Individuals at this occurrence were documented both within burned and unburned areas. It is unknown what long-term effects this burn may have on this occurrence. Since it has been observed elsewhere that invasive exotic plant species have colonized burned areas elsewhere on the Forest, it is recognized that this could present a risk to *Viola selkerkii* at this location.

The current monitoring design involves assessing the status of the three core occurrences on an annual basis. The monitoring is designed to address three questions: 1) is the species present, 2) have invasive plant species invaded the site, and 3) has a flood or fire event affected an occurrence?

The monitoring strategy for this species on Forest Service land currently includes: 1) surveys for additional occurrences, 2) inventory of new and currently known occurrences on a periodic basis, and 3) 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 need to occur during the violet's flowering period, which is generally from May 10 to May 30, when the species can most easily be identified.

The monitoring design includes re-inventory of known Forest occurrences at least every five years, and to sample all known sites in the same year. In addition to periodic inventories, monitoring includes obtaining baseline data on known Black Hills National Forest occurrences during and following a drought cycle (or at least two consecutive years of below average precipitation). Occurrence numbers 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 great-spurred violet 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 great-spurred violet sites that are affected by a 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 great-spurred violet 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 exotic plant (includes noxious weeds) invasion. Annual monitoring of the Sunday Gulch occurrence was included into the 2004 protocol design because of the combination of potential risks associated with powerline activities and human trampling. Although no weeds have been observed at the site Sunday Gulch site, there is potential for exotic plant invasion. Further, because these are two of the lower elevation sites, 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* and the potential risk of invasion by exotic plant species associated with the fire disturbance, annual monitoring of the Elkhorn Fire occurrence was included into the monitoring design for the 2005 season. Violet Valley and Sunday Gulch locations are to be used as an indicator of whether other sites are to be monitored. The current trigger for additional monitoring would be the absence of one or more of the four largest patches (there are nine distinct patches) 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, or invasive plants) 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.

***2005 Monitoring Design*:**

1. On an annual basis, monitor presence/absence of the four largest sub-populations at site number VISE2-2, "Violet Valley", and the VISE2-11, Sunday Gulch occurrence. If one or more of the four largest sub-populations 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 populations are being affected in the same way.
2. Document any weeds designated as noxious by South Dakota and Wyoming or other exotic plants known to be invasive. Document if the weeds are co-located with *Viola selkirkii* or at what distance the weed species is located away from the occurrence site.
3. On any currently known violet site that is affected by a flood or fire event, monitor for presence/absence. For 2005, monitor presence/absence of VISE2-13 (site is within the 2003 Elkhorn Fire event).

***Epipactis gigantea* (Giant Helloborine)**

The only known occurrence of *Epipactis gigantea* is located along Cascade Creek in the southern Black Hills. The species is located on land administered by the Black Hills National Forest at Cascade Springs. This occurrence is a small portion of a much larger population, of which the majority occurs downstream on The Nature Conservancy's Whitney Preserve. Recent data (2000-2002) document increased extent of

the orchid in comparison to earlier reports. However, the current size of the orchid population 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. In addition, the existence of multiple patches or subpopulations of the species in the watershed would be expected to potentially help buffer against any potential catastrophic disturbances in the area.

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 orchid and it's habitat on the Black Hills National Forest administered lands. Footpaths and visitor created "nick 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), 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 State listed noxious weed and, *Elaeagnus angustifolia* (Russian olive), and *Tamarix* sp. (salt cedar), are non-native invasive species of concern, which 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 riparian natives 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 Forest occurrence on an annual basis. The monitoring is designed to address five 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) 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 are inaccessible or involve high risk of damage to the plants from trampling or dislodging them on steep slopes. Also, because the species expands 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 sub-population patches. The current design includes documenting any changes to the population to be indicated on baseline map diagrams. Monitoring is to document "nick points or trails" that actually extend into *Epipactis gigantea* patches. Monitoring also includes documenting stream bank erosion, weeds or other disturbances in or near the *E. gigantea* patches located at Cascade Springs. 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. Monitoring is most efficiently conducted during the orchid'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, but was then determined that 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 in 2004. These transects were installed and water level measurements were documented in 2004.

2005 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 actually extend into *Epipactis gigantea* patches.
3. Monitor water levels at the two permanent transect locations on an annual basis on the same calendar date from year to 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.
5. Document erosion patches occurring at any *Epipactis gigantea* patch.
6. Document any verifiable unauthorized collections of *Epipactis gigantea*.

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 single individual *S. serissima* occurrences were discovered. Until baseline data are gathered at the new occurrences, the assumption is that the persistence of this species in the Black Hills is dependent on conserving the two largest occurrences at McIntosh Fen and Middle Boxelder Creek.

Because this is an obligate wetland species, the primary risk to its persistence and reproductive success is any lowering of the water table where it occurs, whether it is natural or human-induced. Noxious weeds, invading woody species (conifer encroachment), fungal infections or insect infestations 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 *Cirsium arvense* from the specific sites where *S. serissima* individuals and patches occur during average to higher precipitation years. In 2004, following a series of below average precipitation years, *Cirsium arvense* was not observed during the usual monitoring time period for *Salix serissima*, but was noted among *S. serissima* individuals during a late season return visit in September 2004. *Lythrum salicaria* (purple loosestrife) is not known to occur at either of the sites, or anywhere close by, but is very aggressive and has the potential to out compete riparian natives, 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 the Middle Boxelder Creek 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 the willow from either activity. Although no impacts have been documented from wildlife use or trespass cattle at these sites, both could be a potential risk at either site.

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 the 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 2005 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 four questions: 1) is the species present, 2) is there contraction or expansion occurring 3) are hydrological changes occurring, and 4) have invasive plant species invaded the site?

The revised design focuses on annually monitoring: 1) contraction or expansion extent of sub-populations at the McIntosh Fen occurrence, 2) the extent of the Middle Boxelder Creek occurrence 2) an estimated percent of reproductive individuals at each location, 4) assessing the condition of willows and providing an estimated percentage of plants infected with rust fungus or other damaging agents, 4) water table levels, 5) presence of exotic invasive species and 6) gathering baseline data at the recently discovered Nahant and Silver Creek occurrences. In 2005, an assessment of the contraction or expansion at McIntosh Fen can be based on the GPS documentation of the sub-population endpoints. In addition, plans are 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. It is assumed that these permanent markers can be used for future assessments in detecting any contraction or expansion that may occur at this location, for providing an estimated percentage of stems with reproduction capability (other than vegetative) and for providing an estimated percentage of the occurrence that may be affected by any type of damaging agent, such as a rust fungus or insect predation.

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, an above ground water level sampling method may be used. 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, it was concluded that placement of a third transect could be expected to provide more information on water table levels.

Monitoring of *Salix serrisima* needs to occur in June during the blooming period so that the total number of reproductive individuals can be determined.

2005 Monitoring Design:

1. At McIntosh Fen, GPS new endpoints of sub-populations if site size has changed. Place multiple (a minimum of 10) PVC posts (or other type of post markers) around the perimeter of the largest dense patches of *Salix serissima* at both sub-populations. Mark each post with the sub-population and date.
    - Select the five closest plants to each perimeter marker and note whether they are reproductive or vegetative.
    - Assess the condition of these closest five plants to each perimeter marker and document the number of plants at each location that is observed to be affected by some agent (e.g. rust, stem borer, etc.). Specify the agent that is observed.
2. At Middle Boxelder Creek, GPS new endpoints if the *Salix serissima* site boundaries have changed. Count individuals during the blooming period (documenting total number of individuals

and total number of reproductive individuals). If the number of individuals declines by more than 10%, 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 (one permanent transect at each sub-population) and at Middle Fork Boxelder Creek (one permanent transect) occurrences. Install a third permanent depth point measurement transect at McIntosh Fen, permanently mark transect ends, and measure water levels at least every meter. This monitoring needs to occur on the same calendar date from year to year.
4. Gather baseline data at the two *Salix serissima* occurrences discovered in 2004 (Nahant and Silver Creek locations).
5. Document any weeds designated as noxious by South Dakota or Wyoming or other exotic plants known to be invasive. 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.

Lycopodium complanatum **(Trailing Clubmoss)**

Four occurrences of *Lycopodium complanatum* were known from Forest Service administered lands in the Black Hills prior to the 2004 monitoring season (these sites are identified as 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 new *L. complanatum* occurrences were discovered in 2004 and baseline data were collected. New 2004 occurrences include site numbers LYCO3-5 (Tilson Creek west), LYCO3-6 (Tilson Creek east), and LYCO3-7 (Buskala Creek).

The original monitoring design for this species was tiered to baseline data gathered for the early known occurrences (site numbers LYCO3-1 and LYCO3-2). At that time the greatest risk to the species long term persistence on the Black Hills National Forest was primarily 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. Exotic, 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 their proximity. 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 invasion 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 the Forest. It was determined that the monitoring needed to be revised to consider and reflect the new information. The Forest consulted with the Rocky Mountain Research Station to refine the monitoring design for the 2005 monitoring season.

The persistence of this species is currently known to be contingent on conserving occurrences on public land. Monitoring design has not only been modified based on new information, but to keep site disturbance associated with monitoring to a minimum since that disturbance may present a risk to this species. A portion of the monitoring design continues to include gathering information to assess changes in the extent and condition of the species and its habitat.

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 three questions: 1) is the species present, 2) is there evidence of contraction or expansion of the largest location, and 3) have invasive plant species invaded the site?

Core monitoring sites for *Lycopodium complanatum*:

2. 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.
3. 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.
4. LYCO3-5 (Tillson Creek site – west) and LYCO3-6 (Tillson Creek site – east) – These are two of the three occurrences that are the 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 these *Lycopodium complanatum* occurrences. Although little cattle use was noted on the slopes (21-40%) where these occurrences are located, and it was apparent that it would be difficult for cattle to negotiate through down spruce material to access the plants, these two occurrences are located within an active grazing allotment. In comparing the associated site conditions to other sites, these two sites would probably have the greatest potential for actually realizing any risks associated with grazing activities.

Since changes in climatic conditions (periods that are warmer and drier) are considered a risk to this boreal remnant species, detection of changes in extent of the Sand Creek (LYCO3-1) occurrence are still relative. 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 at this location 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, while trying 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 re-inventory (gathering data similar initial baseline data that were initially gathered at the occurrences) of known Forest occurrences at least every five years, and to sample all known sites in the same year.

The species is an evergreen and can be monitored at any time during the growing season (May to September) but 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 exotic plants known to be invasive.

2005 Monitoring Design:

1. Monitor the following *Lycopodium complanatum* sites for presence/absence on an annual basis: LYCO3-1, LYCO3-4, LYCO3-5 and LYCO3-6.
2. Once every five years, re-inventory all seven known *Lycopodium complanatum* occurrences.
3. Place a series of permanent markers at points along the boundary edges of the Sand Creek *Lycopodium complanatum* occurrence (site number LYCO3-1). Place the markers in areas where it is considered likely contraction or expansion of the site can be detected and at locations where disturbances due to monitoring is expected to be minimal.
4. Document any weeds designated as noxious by South Dakota or Wyoming or other exotic plants known to be invasive. 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.

***Platanthera orbiculata* (Large Roundleaf 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 type: 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. However, 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. 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 exotic plants, including those designated as noxious weeds.

The most recent data available were used in designing monitoring for this species. Designated “core” orchid 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 three questions: 1) is the species present, 2) is there evidence of plant collecting, and 3) have noxious weeds and other exotic invasive species become established at the site? 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 then to randomly select additional sites to serve as core sites.

The second aspect of the monitoring as originally designed was to provide baseline data on the persistence of the orchid 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 orchids observed in 2000 were partially reflective of several years of above average precipitation. As specified in the monitoring design, the nine core sites and these 3 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, the Forest completed the same type of drought year monitoring through 2004. Relative to 2000 data, 2004 counts were lower on eight sites and higher on four sites. For seven of the eight sites with declining numbers, the Forest did not find evidence of disturbances that could have affected the number of individuals. These data on orchid population persistence and numbers in both wet and dry years were important for reassessing the species and for re-examining and modifying the monitoring design for 2005.

Monitoring occurred on the three additional drought year monitoring sites in 2002, 2003 and 2004, 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 above-ground individuals on a number of sites. Numbers of individuals documented in 2004 were relatively similar to numbers documented in 2003, and individuals were present at all of the monitored locations. Because snow pack and precipitation for calendar year 2005 is already considered "below normal", there is a likelihood that *Platanthera orbiculata* individuals could be absent from a number of the known occurrence sites.

Monitoring of this plant 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

2005 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).
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.

***Sanguinaria canadensis* (Bloodroot)**

Sanguinaria canadensis, occurring in the northern/northeastern Black Hills, is the one of the most abundant R2 Sensitive Species on the Forest. There were 22 known occurrences of bloodroot on Black

Hills National Forest lands at the time that a recent species assessment was written (completed 2003). Bloodroot occurs in hardwood forests, shrub thickets and floodplain habitats. The species is considered secure on the forest at this time, but due to limited potential habitat, and that a number of the sites have characteristics that lend themselves to invasion by noxious weeds and other invasive plants, weeds and their treatment have been identified as a risk to this species. The persistence of bloodroot on Forest Service administered land is not currently at risk from livestock grazing, as nine sites are currently not grazed and one site is not accessible to livestock. Timber harvest is not deemed a persistence risk to bloodroot because occurrences are currently being avoided, mitigated or vegetative treatments may be designed to benefit the species. Collection (or illegal bloodroot harvest) is not currently an issue in the Black Hills but due to its value as a medicinal herb, harvesting could be detrimental.

The Forest has taken a conservative approach for this species and monitoring. Recent data available were used in developing monitoring guidelines for the Black Hills National Forest. "Core" bloodroot occurrences were selected using four criteria: size (estimated number of individuals), geographic distribution of the occurrence, potential risk from livestock grazing, and community type. Thus, 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 bloodroot occurrences. Based on these criteria, 10 core occurrences were selected for monitoring. Of these 10 occurrences, four were designated as "key," that is, occurrences of over 1,000 individuals deemed most critical to maintaining the bloodroot metapopulation on the Black Hills National Forest. Based on what the Forest has learned regarding species persistence during the recent series of dry years, and that a number of the occurrences are larger than originally documented based on survey of adjacent habitat and updated land ownership map information, the monitoring design has been modified to include nine core occurrences for monitoring. The same four "key" occurrence locations for monitoring are retained in the design modification.

The current monitoring design involves assessing the status of the four "key" core occurrences on an annual basis. The monitoring is designed to address three questions: 1) is the species present, 2) is there evidence of plant collecting, and 3) have invasive plant species invaded the site?

The second aspect of the following monitoring direction is to provide baseline data on the extent of bloodroot occurrences on all nine, designated "core" sites and a reassessment of the status of each occurrence during a drought year. Our assumption is that the high numbers of plants observed in 2001 were partially the result of several years of above-average precipitation. By documenting the size and extent of bloodroot occurrences during dry years, we hope to have a better understanding of the role that precipitation levels play in the distribution and abundance of bloodroot. Any changes in the occurrence boundaries, evidence of plant collection or the presence of invasive or noxious plant species will be documented at the time of follow-up surveys.

The third aspect of the original monitoring design for this species was to assess any additional changes in the extent of bloodroot occurrences following a second consecutive dry, or below-average precipitation year. Data gathered during drought years was considered to be critical for reassessing the monitoring design. No decline was noticed at bloodroot occurrences during drought years. The modified monitoring design still retains presence/absence monitoring at core locations during drought locations, however, since contraction was not evident at core occurrences during drought years, endpoint data collection is no longer included in the design.

2005 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 large (over ½ acre) or collect GPS points if the site is 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 exotic plants known to be invasive at the key monitoring sites. Document if the weeds are co-located with *Sanguinaria canadensis*, or at what distance the weed species is located away from the occurrence site if they are occupying the same ecological type.
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 and 99008; Lost Gulch site/Pillar Peak Allotment site)
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. SACA13-6 (District number 95022; Lost Gulch sit -- east)
9. SACA13-9 (District number 93002; North Deadman Gulch tributary)
10. SACA13-10 (District number 94BC3; Boulder Canyon site)

***Carex alopecoidea* (Foxtail Sedge)**

Based on recent confirmation (2000) of the identity of *Carex alopecoidea* and that it does occur on lands administered by the Black Hills National Forest, 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 were likely to 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. 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 the Forest suspects that more occurrences are likely and this is reflected in the monitoring design.

Based on the surveys for this species, *Carex alopecoidea* is currently known to primarily occur 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 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 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 vulgare* (yellow toadflax) and *Tanacetum vulgare* (common tansy). A number of the *Carex alopecoidea* occurrences are located in close proximity to roads.

The current monitoring design involves assessing the status of five core occurrences on an annual basis. The monitoring is designed to address three questions: 1) is the species present, 2) is there evidence of contraction or expansion of occurrences, and 3) have invasive plant species invaded the site?

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 other occurrences. 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.

2005 Monitoring Design:

1. Annually count individuals 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 any weeds designated as noxious by South Dakota or Wyoming or other exotic plants known to be invasive. Document if the weeds are co-located with *Carex alopecoidea*, or at what distance the weed species is located away from the occurrence site if they are occupying the same ecological type.

Species Recently Added to the R2 Sensitive Species List (December 2003) or Recently Known to Occur on the Black Hills National Forest

In general, as identified in the following designs for most of the following species, the main focus for 2004, and to continue into the 2005 monitoring season, will be to attempt to relocate a number of the previously reported locations (or a combination of previously located and newly located sites) of these new species. Plans include gathering baseline data and assessing risks at those locations.

Botrychium multifidum (Leathery grapefern)

Botrychium multifidum was designated as a Region 2 Sensitive Species in December 2003. Five of the currently known occurrences were documented in 2003. There are seven currently known occurrences, all of which are located in the Norbeck Wildlife Preserve and Black Elk Wilderness. Baseline data were collected at all seven locations in 2004.

This evergreen species is currently known are located in three watersheds on the Black Hills National Forest. Occurrences of this boreal species are located at some of the higher elevations (5,100 - 6,500 feet) and are located in areas with mesic soil conditions, and not saturated soil conditions. Occurrences are located in areas receiving periodic disturbances and individuals are documented on gravel bars and in old stream channels on substrates associated with the granitic core region. Some of the areas are not associated perennial flowing water (but are sites that lend themselves to still be affected by periodic flooding events). Varying levels of canopy cover are present at the sites with *Picea glauca* (white spruce) and *Populous tremuloides* (aspen) being the primary overstory components. Numbers of individuals documented at the sites in 2003 and 2004 ranged from six to 65. In 2004, greater than 10 individuals were documented at four of the seven locations. Additional similar habitat conditions occur in the Black Elk Wilderness and the Norbeck Wildlife Preserve, and are likely present on adjacent lands administered by Custer State Park and Mount Rushmore National Memorial.

Occurrences are located within the Norbeck Wildlife Preserve (14% of the locations) and the Black Elk Wilderness (86% of the locations), so generally, there would be few risks associated with vegetation treatments or grazing. 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 occurrence locations, 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. 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 species' occurrences and geographic distribution of known sites. The current revised monitoring design involves assessing the status of four Forest occurrences on an annual basis. The monitoring is designed to address three 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, and 3) have invasive plant species invaded the site?

Four core sites were selected for annual monitoring: three located nearby to trails that have heavy foot traffic (BOMU-1, BOMU-4, and BOMU-5) and site BOMU-7 which is located the farthest from these sites.

2005 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 those that are close to heavy trail traffic areas (site numbers BOMU-1, BOMU-4, and BOMU-5), and site number BOMU-7, which is in a geographically different area.
3. Every five years, re-inventory all locations within the same year.

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 *Botrychium multifidum*, or at what distance they are located away from the occurrence site if they are occupying the same ecological type.
5. Check adjacent, likely habitat for additional plants and gather baseline data on any new locations.

Botrychium lineare (Narrowleaf Grapefern/Slender Moonwort)

Botrychium lineare was recently determined (December 2003) to occur on the Black Hills National Forest. An occurrence was located in Dugout Gulch on the Bearlodge Ranger District in Wyoming.

Baseline data were gathered at the site in 2003 and 2004. 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. Plants were located on June 19, 2003 and periodic return visits during the following weeks documented that the plants wither soon after the spores are released. During 2004, data were gathered on June 7. Based on these two data gathering years, it is currently anticipated that data collection needs to occur during early to mid-June at this location; however, this will likely depend upon temperatures associated with the current year's climatic conditions.

Monitoring data for this site, along with information available from elsewhere for this species indicate potential risks to this species at this location 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 site, noxious weed invasion or alterations from the amounts of the currently low level disturbances that now exist at the site.

The current monitoring design involves assessing the status of the Forest occurrence on an annual basis. The monitoring is designed to address three questions: 1) is the species present, 2) are there changes in extent to the above-ground portion of the Dugout Gulch occurrence, and 3) have invasive plant species invaded the site,

2005 Monitoring Design:

1. Re-inventory the Dugout Gulch occurrence (BOLI7-1) on an annual basis.
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 exotic plants known to be invasive. 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.

Cypripedium parviflorum (Yellow ladyslipper)

Cypripedium parviflorum was designated as a Region 2 Sensitive Species in December 2003. A minimum of 50 occurrences were known to be located on the Black Hills prior to the 2004 field season. The total number of sites reported varies widely from greater than 50 to approximately 100 occurrences based on recent assessments and evaluations for this species. The number of occurrences is based on historic reports and how sites have been documented in the field. It may be that a number of adjacent smaller sites are actually portions of larger occurrences. An additional ten new locations were discovered during surveys completed on the Black Hills National Forest in 2004.

Reports prior to the 2005 field season indicate that the species 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 this species 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 for this species.

The current monitoring design involves gathering baseline data for this species new to the list. 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 on the site?

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

2005 Monitoring Design:

1. Relocate at least ten 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. Assess risks to those sites.
2. Document any evidence of collection at any of the sites.
3. 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 is located away from the occurrence site if they are occupying the same ecological type.

Salix candida **(Hoary willow)**

Salix candida was designated as a Region 2 Sensitive Species in December 2003. *S. candida* is currently known on land administered by the 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 (2003) has been completed and recent baseline data (2002 and 2003) have been collected for *Salix candida*. 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 *S. candida* habitat. *Lythrum salicaria* (purple loosestrife) is not known to occur at McIntosh Fen, or anywhere close by, but is very aggressive and has the potential to out compete riparian natives, including *Salix candida*. No insect or rust infestations have been documented on *S. candida,* but other *Salix* species in the Black Hills have been infested with stem borers. 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 sub-populations of the *Salix candida* occurrence. At this time, no impacts have been documented to the willow from either activity. Although no impacts have been documented from wildlife use or trespass cattle, both could be a potential risk at the site.

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 the

Forest has learned about density issues for determining individuals and stem breakage issues while gathering data, consultation occurred on the monitoring design for the 2005 monitoring season. The current revised monitoring design involves assessing the status of the Forest occurrence on an annual basis. The monitoring is designed to address four questions: 1) is the species present, 2) is there contraction or expansion occurring 3) are hydrological changes occurring, and 4) have invasive plant species invaded the site?

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, 2) an estimated percent of reproductive individuals, 3) assessing the condition of willows and providing an estimated percentage of plants infected with any damaging agent, 4) water table levels, and 5) presence of exotic invasive species In 2005, an assessment of the contraction or expansion at McIntosh Fen can be based on the previous GPS documentation of the population endpoints. In addition, plans are 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. candida* in 2005. It is assumed that these permanent markers can be used for future assessments in detecting any contraction or expansion that may occur at this location, for providing an estimated percentage of stems with reproduction capability (other than vegetative) and for providing an estimated percentage of the occurrence that may be affected by any type of damaging agent, such as a rust fungus or insect predation.

Monitoring of *Salix candida* needs to occur in May during the blooming period so that the total number of reproductive individuals can be determined.

2005 Monitoring Design:

On an annual basis at the *Salix candida* site:

1. At McIntosh Fen, GPS new endpoints of the occurrence if site size has changed. Place multiple (a minimum of 10) PVC posts (or other type of post markers) around the perimeter of the largest dense patches of *Salix candida*. Mark each post with an assigned patch (sub-population) label and date.
    - Select the five closest plants to each perimeter marker and note whether they are reproductive or vegetative.
    - Assess the condition of these closest five plants to each perimeter marker and document the number of plants at each location that is observed to be affected by some agent (e.g. rust, stem borer, etc.). Specify the agent that is observed.
2. Measure aboveground water levels along the permanent depth point water measurement transects at McIntosh Fen described under monitoring design for *Salix serissima.* Install a third permanent depth point measurement transect at McIntosh Fen, permanently mark transect ends, and measure water levels at least every meter. This monitoring needs to occur on the same calendar date from year to year.
3. 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 *Salix candida*, or at what distance they are from the occurrence site if they are occupying the same ecological type.

***Viburnum opulus var. americana* (Highbush cranberry)**

Prior to the 2004 monitoring season, there were more than 30 occurrences of this shrub reported on the Black Hills National Forest. Approximately 80 percent of these occurrences were reported in 2002 and 2003. During the 2004 field season, three new locations for this

species were documented. 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.

This shrub species 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. Many thickets are so dense that they are basically impenetrable and 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 2004. Insect predation was noted at sites where data was gathered later in the season (July).

The current monitoring design involves the gathering of baseline data for this species new to the list. 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 have invaded the site.

2005 Monitoring Design:

1. Relocate at least ten 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 (during the flowering period) and gather baseline data. Assess risks to those sites.
2. 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, *Viburnum opulus* var. *americana* or at what distance they are located away from the occurrence site if they are occupying the same ecological type.

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: Forest Database (potentially National Database system, when available), GIS system, Forest Plan Monitoring Files, the respective State 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). Data are currently stored in Forest access databases. Baseline data is stored at:

J:\fsfiles\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 is planned for testing in 2005 that is expected to be compatible with State Heritage Program databases. If and when this occurs, the plan is to move Black Hills data into the nationwide database system.

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. The Forest is addressing a number

of “new species” associated with the 2003 R2 Sensitive Species issuance. 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 with the 2003 R2 Sensitive Species list, the total funding need for 2004 and subsequent years is expected to be higher than the $98,000 estimated in 2001.

Periodically, the R2 Sensitive Species list is 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 R2 Sensitive Species list. Increases in noxious weed invasions (i.e. purple loosestrife) have the potential to occur within the Black Hills. Increasing noxious weeds also have the potential to contribute to higher costs associated with monitoring.

Sub-Item: **Mammals – American Marten**

Indicators: Amount of preferred habitat (spruce) on the Forest.

Method of Data Collection: Monitoring item 8 (Vegetative Diversity: Vegetation Species Composition) will be used to show the amount of the spruce cover type.

Unit of Measure: Number of acres in the spruce cover type on the Forest (see monitoring item 8).

Sample Design: See monitoring item 8.

Data Precision and Reliability: See monitoring item 8.

Frequency of Reporting: Every two years.

Information Storage System: See monitoring item 8.

Responsibility: See monitoring item 8.

Cost: See monitoring item 8.

Sub-Item: **Mammals – Bats (Townsend's Big-eared Bat, Fringed Myotis)**

Indicators: Cave and mine roost protection measures will be used to indicate the conservation or enhancement of nursery (maternity) and winter habitat. Human disturbance at known cave and mine roosts will be used to indicate conservation needs. Both species of sensitive bats use caves and mines for nurseries and hibernacula.

Snags are also important maternity roosts for the fringed bat, and will be used as an additional indicator of nursery habitat conservation. See monitoring item 11 (Vegetative Diversity: Snags) for this indicator.

Caves, mines, and snags were chosen as indicators because they are important and limited roost substrates that are affected by Forest management.

Method of Data Collection: Applicable roost types are nurseries and winter hibernacula for any species of bat, because roosts are often interchangeable, not all species are readily detected, and thorough, repeated surveys may present a safety issue to bats or humans. Mines included in this monitoring item are limited to underground mines, as open pit mines do not provide cave-like conditions. Site visits, reports from district staffs, and reports from recreational cave users will be the primary sources for data on cave and mine roosts. For data collection on snags, see monitoring item 11.

Unit of Measure:

1. Protective measures:
    a. Percent of abandoned underground mines evaluated for bat habitat prior to closure;
    b. Number of bat gates installed (including those resulting from mine pre-closure evaluations);
    c. Number of bat gates maintained.
2. Disturbance: Number of roosts with known or suspected human disturbance.
3. Snags: See monitoring item 11.

Sample Design:

1. 1Protective measures: All underground mines closed on the Forest in the reporting fiscal year will be categorized as either having or not having bat habitat evaluations. Reportable evaluations are those conducted by a biologist, and performed to a level deemed adequate by the biologist for the specific situation. All bat gates installed or maintained will be reported, and those that resulted from mine pre-closure recommendations will be tracked separately.
2. Disturbance: Human disturbance will be monitored by inspecting cave roosts, mine roosts and bat gates for signs of vandalism, incompatible uses, and non-compliance with established closure dates. All gates on the Forest will be inspected annually. Additionally, five other sites (any combination of caves and/or mines) that are known nursery or hibernation roosts will be inspected annually (Forest-wide). This applies to roosts of any species of bat, because roosts are often interchangeable, not all species are readily detected, and thorough, repeated surveys may present a safety issue to bats or humans. Non-gated caves and mines inspected should be selected and rotated based on importance of roost, potential threats, and safety concerns. Mine inspections will likely involve external observations only, due to inherent safety issues.
3. Snags: See monitoring item 11.

Data Precision and Reliability: Class B

Frequency of Reporting: Every two years.

Information Storage System: The corporate wildlife database (NRIS Fauna) will be used to store bat monitoring data. Known roost sites will be entered as "use area features" (security), and monitoring visits will be entered as "visits" to the features. Detection of individual species should be noted in the comments section of each feature visit, and entered as associated "observations." For snags, see monitoring item 11.

Responsibility: District biologists will monitor roost sites and bat gates, or administer contracts and agreements to conduct the monitoring. District biologists will enter the resulting monitoring data into the corporate wildlife database within the fiscal year that the monitoring occurred. The S.O. wildlife monitoring coordinator will query the database for pertinent records. The S.O. coordinator will also obtain a list of the mines closed from the S.O. Environmental Program Manager, and inquire with district biologists about which mines were evaluated for bat habitat and/or were protected. For snags, see monitoring item 11. The S.O. coordinator will prepare the LMP monitoring report.

Cost: Approximately $10,000 annually.

Sub-Item: **Mammals – Black-tailed Prairie Dog**

Indicators: Number and area of occupied prairie dog towns will be used to indicate the attainment of Objective 237 (200-300 acres occupied by prairie dogs in > 3 towns).

Method of Data Collection: Spatial delineation of prairie dog towns with a GPS unit.

Unit of Measure: Number and size (acres) of occupied prairie dog towns.

Sample Design: Every two years, all known prairie dog towns on the Forest will be monitored for occupancy (presence / absence) and size. Size will be determined with a GPS unit by walking around the outer-most burrows. If previously-occupied towns appear unoccupied, investigation of the cause should occur.

Data Precision and Reliability: Class A.

Frequency of Reporting: Every two years.

Information Storage System: The corporate wildlife database (NRIS Fauna) will be used to store prairie dog data. Known towns will be entered as "use area features" (population or herd boundaries), and monitoring visits will be entered as "visits" to the features. Occupancy (presence / absence) should be noted in the comments section of each feature visit, and can be entered as associated "observations" if time allows.

Responsibility: District biologists will monitor prairie dog towns, and will enter the resulting data into the corporate wildlife database within the fiscal year that the monitoring occurred. The S.O. wildlife monitoring coordinator will query the database for pertinent records and prepare the LMP monitoring report.

Cost: Approximately $2,500 once every two years.

Sub-Item: **Birds – American Three-toed woodpecker**

Indicators:

1) Amount of preferred habitat (white spruce forests).

2) Relative density in preferred habitat.

Method of Data Collection:

1) Habitat: The amount of white spruce existing on the Forest will be obtained from monitoring item 8 (Vegetative Diversity: Vegetation Species Composition).

2) Relative density: Relative density will be estimated through an elaborate point-count methodology documented in Panjabi (2004). This methodology is currently being used to monitor multiple species in multiple habitats, including the three-toed woodpecker in spruce. In summary, observers walk along transects, stop at established points, and record the distance to each bird detected. A density estimate specific to each habitat sampled is then calculated.

Transects are randomly located within stratified habitats (e.g., cover types and other vegetative features). Transects located in white spruce habitat will be used to monitor relative density of three-toed woodpeckers. Transects in other habitats may also yield useful data on three-toeds, but monitoring these transects is lower priority than monitoring transects in preferred habitats.

Due to the high skill levels required for an effective bird monitoring program, the Forest has partnered (through formal agreement) with the Rocky Mountain Bird Observatory (RMBO) to oversee the design, implementation and statistical analysis of this protocol.

Unit of Measure:

1) Habitat: Acres of white spruce cover type on the Forest.

2) Relative density: Number of birds detected per square kilometer (birds/km2). This should also be reported as (converted to) birds per acre (birds/acre) to facilitate comparison with other forest measurements.

Sample Design:

1) Habitat: See monitoring item 8.

2) Relative density: A target of 30 transects with 15 points each are sampled in white spruce habitat. Points are spaced at 250 meter intervals. Bird counts are conducted for 5 minutes at each point. Three-toed woodpeckers detected between points of a transect shall also be recorded. Counts are conducted during morning hours between mid May and mid July. Spruce habitat should be sampled at least once every two years.

Transects were originally established in 2001, and were intended to be permanent. However, transects may be (or have been) added or deleted in subsequent years if habitats aren't accurately represented, or if access is unsafe or otherwise problematic. White spruce transects were randomly located within spruce stands across the Forest.

See Panjabi (2004) for additional details on sample design of relative density.

Data Precision and Reliability: Habitat data = Class B; Relative density data = Class A.

Frequency of Reporting: Every two years

Information Storage System:

1) Habitat: See monitoring item 8.

2) Relative density: Annual RMBO reports will be posted on the Forest's internet site in Adobe (.pdf) format at http://www.fs.fed.us/r2/blackhills/projects/wildlife/index.shtml. Transect and point coordinates will be obtained from RMBO in a Microsoft Excel spreadsheet, then converted to a GIS shapefile by SO personnel. Bird count data will be in a separate Excel spreadsheet with a common field that relates to the transect data. These will be stored in J:\fsfiles\office\rwsw\ba-be\bird_data.

Responsibility:

1) Habitat: See monitoring item 8.

2) Relative density: An S.O. biologist will administer the agreement with RMBO to collect, analyze and report data. The S.O. wildlife monitoring coordinator will summarize the information from the RMBO reports for inclusion in the LMP monitoring report.

Cost:

1) Habitat: See monitoring item 8.

2) Relative density:

1 habitat @ $12,000 each	= $12,000
Agreement administration	= $ 400
Total (every 2 years)	= $12,400

Sub-Item: **Birds – Northern Goshawk**

Indicators:

1. Nest stand habitat: Amount and trend of structural stages 4B, 4C and 5 within designated goshawk nest stands will be used as an indicator of the attainment of Objective 221 (conserve or enhance habitat for R2 sensitive species).

   Rationale: Standard 3108 states that 180 acres of the best habitat will be delineated within known goshawk nesting areas when tree removal is proposed in goshawk habitat. The standard acknowledges that all 180 acres might not be suitable at a given time, but it limits vegetation treatments to those that would maintain or enhance value to goshawks. Because goshawks typically nest in vegetation structural stages 4B, 4C or 5, additions or deletions of these stages would likely increase or decrease (respectively) habitat value. Therefore, monitoring structural stages within these designated nest areas would indicate attainment of Objective 221 as well as compliance with Standard 3108.

2. Habitat diversity: Structural stage diversity in relatively intensively-managed ponderosa pine forests will be used as an additional indicator for Objective 221.

   Rationale: A diversity of structural conditions benefit goshawks by ensuring that nesting, fledging, and foraging habitat are provided across space and time. Structural diversity is most likely to be compromised in areas receiving relatively intensive management. This equates primarily to ponderosa pine stands in five management areas: 4.1, 5.1, 5.4, 5.43, and 5.6. These management areas encompass nearly 85% of the Forest. A desired structural stage assemblage has been assigned to pine in the five management areas; these are defined in Forest Plan objectives 4.1-203, 5.1-204, 5.4-206, 5.43-204, and 5.6-204, and they are monitored through monitoring item 9 (Vegetative Diversity: Structural Stages). This desired condition would provide diverse and well-distributed habitat for goshawks (see Phase II Amendment Biological Evaluation), and therefore progress toward it would also show progress toward Objective 221.

3. Occupancy: The presence of territorial goshawks within known territories will be used to indicate persistence of breeding goshawks on the Forest.

   Rationale: Territoriality is a good indicator that an established (capable of breeding) pair exists in an area, and is easier to detect than breeding status or nest success (Woodbridge and Hargis 2005). Criteria used to confirm territorial goshawks provide high confidence that subadult or "floater" birds are not mistaken as established birds. Goshawks exhibit territoriality even in years when breeding does not occur. Goshawks do not usually breed every year, but they do usually remain faithful to their territory and their mate. Therefore, the presence of territorial goshawks is a good indicator that a stable breeding population exists.

Method of Data Collection:

1. Nest stand habitat: Designated nest stands will be characterized by structural stages. Changes in these structural stages will be monitored over time to determine the trend of suitable nesting habitat.

2. Habitat diversity: See monitoring item 9. Changes in structural stages will be monitored over time to determine the trend of habitat diversity.

3. Occupancy: Known goshawk territories will be visited to determine presence of one or more territorial goshawks. Monitoring methods and criteria for determining occupancy will follow those outlined in Woodbridge and Hargis (2005), and are summarized below.

Types of evidence used to determine occupancy are: 1) goshawks seen or heard; 2) defensive behavior; 3) molted feathers; 4) feces; 5) presence of prey remains; and 6) new construction (greenery) or down feathers on nest, even if the nest appears inactive.

To confirm occupancy, at least one of the following conditions must be met: 1) detection of adult goshawks exhibiting defensive behavior (alarm calls, approaching observer while vocalizing), or any auditory detection during the courtship period (mid Feb – mid April); 2) any combination containing 3 of the 6 evidence types listed above; or 3) combination of visual / auditory detection and molted feathers, visual / auditory detection and new nest construction, or molted feathers and new nest construction.

Possible occupancy is indicated by at least one of the following: 1) location / observation of either a visual / auditory detection, molted feathers, or new nest construction; or 2) combination of prey remains and feces.

Unit of Measure:

1. Nest stand habitat: Percentage of designated nest areas that are in structural stages 4B, 4C and 5.

2. Habitat diversity: See monitoring item 9.

3. Occupancy: Percentage of sampled goshawk territories on the Forest with confirmed occupancy in a given year. Possible occupancy and "surveyed with no detection" will also be tracked.

Sample Design:

1. Nest stand habitat: At minimum, nest areas will be designated around known nests of a territory whenever a project planning area involving tree removal is established within ½ mile of a nest. Designated nest areas may be (or have already been) delineated for other reasons as well. All designated nest areas will be overlaid with the corporate vegetation database to determine the amount of habitat in structural stages 4B, 4C and 5.

2. Habitat diversity: See monitoring item 9.

3. Occupancy: A random sample of 20 percent of all goshawk territories known to be occupied within the last 10 years will be monitored annually for occupancy. Sampled territories will be monitored for 5 years, at which time a new set will be randomly selected.

   A stepwise process (displayed as levels below) involving more than one methodology will be used to confirm occupancy. Summaries of each protocol are provided here, but see Woodbridge and Hargis (2005) for more detailed information.

   Level 1 Survey: The Dawn Acoustical Survey Protocol will be employed first if access and other logistics allow, because it has a very high probability of detection regardless of pair breeding status. The survey should occur during the 2 months preceding egg laying (courtship period); this is typically mid Feb – mid April, but may be delayed up to a month in particularly cold or wet springs. Stations will be positioned within 200 m (656 feet) of known nests or other suspected nesting habitat. The observer will listen for goshawk presence at a station from 45 minutes before to 1.5 hours after sunrise. If a goshawk is detected, the territory is coded as occupied. No attempt will be made to locate the active nest (if needed for other purposes) until incubation or nestling stages. If no detection occurs, another visit to this or other stations are necessary, or Level 2 surveys are used.

   And / Or

   Level 1 Survey: Use the Intensive Search Protocol if Dawn surveys are not practical. This protocol

should be used after hatching through 3 weeks post-fledging, (usually mid May – August). Surveys may be conducted during incubation, but detections are less likely then and may require additional surveys. Beginning at the last known active nest, observers survey a 100 m radius area around all known nests. If birds are not seen upon entering the nest stands, recorded goshawk vocalizations should be broadcast. It is key to this protocol that surveyor look intensely for goshawks and their sign at and between nests and call points. If occupancy is not detected during the incubation period, repeat the Level 1 Intensive Search survey. If occupancy is not detected after the incubation period, go to Level 2 survey.

Level 2 Survey: Conduct the Intensive Search Protocol in all forested habitats within 500 m (1640 ft) of last known nest. Call points should be spaced in a 250 m x 250 m grid (820 ft x 820 ft). Three surveyors (one broadcaster and two observers spaced 30 m on both sides of broadcaster) maximizes detection effectiveness, and should be used whenever possible. If occupancy is not detected, go to Level 3 survey.

Level 3 Survey: Conduct Broadcast Acoustical Survey Protocol within a 1600 m (1 mile) radius of the last known nest. Exclude areas already covered by Level 1 and 2 surveys. Prior to field visit, use aerial photographs or topographic maps to determine optimal placement of survey transects. The maximum distance between parallel transects is 250 m (820 ft). Call stations should be located 200 m apart along each transect, with points on adjacent transects offset 100 m to maximize coverage. At each point, broadcast calls at 60 degrees from the transect line for 10 seconds, then listen and watch for 30 seconds. Repeat this sequence two more times, rotating 120 degrees from the last broadcast. Repeat the 3 call sequence again. During the nestling period, use the adult alarm call. During the late nestling and post-fledging period, broadcast the juvenile begging or wail call. If goshawks or sign are not detected after 2 visits, the territory is coded as surveyed without detection.

Data Precision and Reliability: Class A and B.

Frequency of Reporting: Every two years.

Information Storage System: The corporate wildlife database (NRIS Fauna) will be used to store goshawk data. Designated nest areas will be entered as “administrative features” (management area). Nests will be entered as “biological features” (nests), and monitoring visits will be entered as “visits” to the features. Occupancy (presence / absence) should be noted in the comments section of each feature visit, and can be entered as associated “observations” if time allows. Level 3 (broadcast) survey areas will be entered as “surveys.” The corporate vegetation database will be the data source and storage system for structural stages; see monitoring item 9.

Responsibility: District biologists will conduct goshawk occupancy monitoring, and designate nest stands that comply with Standard 3108. District biologists will enter the resulting data into the corporate wildlife database within the fiscal year that the monitoring or designation occurred. The S.O. wildlife monitoring coordinator will query the corporate wildlife and vegetation database for pertinent records, and will prepare the LMP monitoring report. Assistance from S.O. GIS personnel will be requested if necessary. Also see monitoring item 9.

Cost: Approximately $30,000 annually.

Sub-Item: **Birds – Rare Birds (American Peregrine Falcon, Burrowing Owl, Flammulated Owl, Lewis's Woodpecker, Loggerhead Shrike, Northern Harrier, Yellow-billed Cuckoo)**

Note: This sub-item specifically excludes American Three-toed woodpecker, Black-backed Woodpecker, Grasshopper Sparrow and Northern Goshawk, even though these species can also be considered rare birds. Protocols for these species can be found in the following locations as their own sub-items under the Birds heading:

American Three-toed Woodpecker: Item 18 (Emphasis Species – Sensitive Species)

Black-backed Woodpecker: Item 21 (Emphasis Species – Management Indicator Species)

Grasshopper Sparrow: Item 21 (Emphasis Species – Management Indicator Species)

Northern Goshawk: Item 18 (Emphasis Species – Sensitive Species)

Indicators: Incidental observations.

Method of Data Collection:

Each of the species included in this monitoring item is considered uncommon, rare, casual or accidental to the Black Hills (Tallman et al. 2002). Therefore, there are no effective means of monitoring them with an acceptable level of accuracy, precision, or cost. This is confirmed through four years of point-count monitoring conducted by the Rocky Mountain Bird Observatory, which has yielded very few observations (and no density estimates) of these species despite intense sampling effort (Panjabi 2001, 2002, 2003, 2004). In order to capture data opportunistically, observations of the above species will be recorded whenever they are encountered.

Unit of Measure: Number of incidental observations on the Forest by species.

Sample Design: All observations made by biologists within NFS lands will be recorded, whether they occur incidental to other duties or activities, or when specific searches are conducted (this includes RMBO observations). Observations on non-NFS lands within or in close proximity to the Forest boundary will be recorded when deemed applicable. Reports from non-biologists, including members of the public, will be recorded when they are thought to be reliable.

Data Precision and Reliability: Class B

Frequency of Reporting: Every two years.

Information Storage System: Corporate wildlife database (NRIS Fauna).

Responsibility: District biologists will enter their observations into the corporate wildlife database within the fiscal year that the observation occurred. The S.O. wildlife monitoring coordinator will query the database, review RMBO reports, and prepare the LMP monitoring report.

Cost: $500 annually.

Sub-Item: **Reptiles – Black Hills Redbelly Snake**

Indicators: Trend of riparian habitat condition, and amount of hardwood habitats on the Forest.

Method of Data Collection: For riparian data, see monitoring item 6 (Riparian/Wetlands: Condition and Trend). For hardwood information, see item 8 (Vegetative Diversity: Species Composition and Structure).

Unit of Measure: See monitoring items 6 and 8.

Sample Design: See monitoring items 6 and 8.

Data Precision and Reliability: See monitoring items 6 and 8.

Frequency of Reporting: Every two years.

Information Storage System: See monitoring items 6 and 8.

Responsibility: See monitoring items 6 and 8.

Cost: See monitoring items 6 and 8.

Sub-Item: **Amphibians – Northern Leopard Frog**

Indicators: Continued persistence at a sample of known occupied habitats (index sites).

Method of Data Collection: Presence / absence surveys will be conducted at index sites.

Unit of Measure: Percent of index sites monitored that have leopard frogs present.

Sample Design: Forty sites (10 per district) that are known to support northern leopard frogs will be established as index sites. Approximately twenty percent of the index sites will be monitored annually for species presence. This will normally be accomplished by conducting presence / absence surveys at 2 sites per district per year. Sites should be rotated annually so that all 40 sites are monitored once during a five year period. Presence or absence will be determined through visual observations of adults and subadults during July and August. Two visits occurring at least two weeks apart should be made before absence is assumed.

Data Precision and Reliability: Class B

Frequency of Reporting: Every two years.

Information Storage System: The corporate wildlife database (NRIS Fauna) will be used to store leopard frog monitoring data. Index sites will be entered as "use area features" (breeding sites), and monitoring visits will be entered as "visits" to the features.

Responsibility: District biologists will identify and monitor index sites, and will enter the resulting data into the corporate wildlife database within the fiscal year that the monitoring occurred. The S.O. wildlife monitoring coordinator will query the database and prepare the LMP monitoring report.

Cost: Approximately $2,000 annually.

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

Background: The finescale dace, lake chub and mountain sucker are Region 2 sensitive fish species that occur on the Black Hills National Forest. The mountain sucker is also a Management Indicator Species (MIS) and a monitoring protocol for this species can be found in monitoring item 21 (Emphasis Species – Management Indicator Species).

In the Wyoming Black Hills, finescale dace are limited to the Redwater River drainage (Isaak et al 2003). The distribution of finescale dace in the Bear Lodge Mountains has been influenced by transplants (WGFD 1996). Finescale dace have typically been found in lentic (standing water) habitat versus lotic (flowing water) habitat (B. McDowell pers. comm. 2004). Finescale dace have not been documented on the South Dakota portion of the Forest (Isaak et al. 2003).

Lake chub distribution on the Forest is currently restricted to Deerfield Reservoir (Isaak et al. 2003).

Indicators:

Distribution and numbers of finescale dace and/or habitat status on National Forest System lands in the Bear Lodge Mountains.

Trend in catch per unit effort (CPUE) of lake chub and/or trend in Trophic State Index (TSI) in Deerfield Reservoir.

Method of Data Collection: The BHNF will conduct surveys for finescale dace in cooperation with the Wyoming Game and Fish Department (WGFD) to the maximum extent practicable. Initial step is to inventory streams that historically had finescale dace to determine current presence. Monitoring sites will be established at ponds or on streams currently containing finescale dace and sampled on a 2-5 year cycle to track persistence. A variety of sampling techniques may be used, including seines, traps or backpack electrofishing, depending on site-specific habitat conditions.

The South Dakota Department of Game, Fish and Parks (SDGFP) annually monitors fish populations in Deerfield Reservoir. Lake chub are collected in gillnet sampling in the reservoir. SDGFP also collects water quality data annually to determine the Trophic State Index (TSI) of the reservoir. The South Dakota Department of Environment and Natural Resources (SDDENR) also collects water quality data in Deerfield Reservoir on a four-year cycle with the most recent sample collected in 2004. The Forest will solicit Deerfield Reservoir water quality data and lake chub data annually from SDGFP Region 1 Fisheries staff and/or the SDDENR.

Unit of Measure: Finescale dace status will be based on the distributional presence/absence of the species. This status may be further refined by site-specific CPUE to be defined based on the sampling gear used. Habitat trend will be based on the quality and quantity of primarily standing water habitat, such as surface area, depth, etc.

Lake chub trend will be based on the CPUE of lake chub captured in overnight gillnet sets. Deerfield Reservoir habitat trend will be based on the Trophic State Index (Carlson 1977) derived from data collected by the SDGFP or the SDDENR.

Sample Design: Sampling for finescale dace should occur during base flow periods, typically late summer through early fall and will focus on standing water habitat along historically or currently occupied streams on NFS lands. Sampling frequency should occur on a 2-5 year cycle and should be responsive to natural disturbances, such as fire, drought or floods, which may potentially alter the dace's numbers, distribution or habitat suitability. Habitat monitoring will focus primarily on the quality and quantity of lentic (standing water) habitat, such as beaver ponds and human-created impoundments (e.g. Hemler Reservoir), along streams.

On Deerfield Reservoir, SDGFP has established four overnight gillnet set locations and two water chemistry sampling sites. Gillnet sampling and water chemistry testing generally occurs in July/August/September on an annual basis.

Data Precision and Reliability: Class A

Frequency of Reporting: CPUE and/or habitat trend data for finescale dace and lake chub will be reported in the Forest Plan Monitoring and Evaluation Report in the year following the calendar year in which the data was collected.

Information Storage System: Stream habitat data will be stored in the Aquatic Inventory (AI) module of the Forest Service's NRIS-Water database. Finescale dace population data will be stored in the Aquatic Biota (AB) module of the NRIS-Water database and/or in project files in hardcopy format in the District and/or Supervisor's office. Finescale dace data will be made available to the WGFD to be entered into their Streams and Lakes Inventory Database at their discretion. Lake chub population data and Deerfield Reservoir aquatic habitat data will be stored in the monitoring files in a hardcopy format in the Supervisor's Office.

Responsibility: Supervisors office, with occasional assistance from District personnel.

Cost:

Finescale Dace: Approximately $11,000-12,000. Costs assume a 5-person crew sampling for five days and includes travel, vehicle and indirect costs.

Lake Chub: Approximately $700 ($2-3 days) per year to solicit and report fish population and habitat data from SDGFP and/or SDDENR

Sub-Item: **Invertebrates – Cooper's Mountainsnail**

Indicators: Continued presence of Cooper's mountainsnails within known occupied habitat, and number of new sites discovered with live mountainsnails will be used as indicators of habitat conservation.

Method of Data Collection: Soil and litter samples will be examined for presence of live Cooper's mountainsnail. For this monitoring item, Cooper's mountainsnail includes both the large and small *Oreohelix* morphs present in the Black Hills. Because the taxonomy of *Oreohelix* in the Black Hills is in dispute (see Anderson 2005, Frest and Johannes 2002), the morphs should be reported distinctly so that the data is more useful if taxonomic revisions are formally adopted.

Unit of Measure:

1. Percentage of Frest and Johannes (2002) sites monitored that have continued presence of live mountainsnails.

2. Number of new sites discovered with live mountainsnails.

Sample Design: Sites identified in Frest and Johannes (2002) as having live mountainsnails will be revisited to determine continued presence of the species. Twenty percent of all sites will be monitored annually, and sites will be rotated each year so that all sites are monitored at least once every 5 years. Some sites may be visited more than once if project planning or implementation creates a need. To determine presence of live snails, soil and litter samples will be sifted through in the field or office. Sampling will occur during moist periods between late spring and early fall, since snails are most active then and are no longer aestivating. The number and specific locations of samples are at the discretion of the monitoring biologist, but should be chosen to maximize the likelihood that live snails will be found if they are present.

New sites encountered incidentally or during surveys should be reported as well, since this information will help refine known distribution of the species.

Data Precision and Reliability: Class B.

Frequency of Reporting: Every two years.

Information Storage System: Frest and Johannes (2002) site locations are currently stored in a GIS coverage at J:\fsfiles\ref\library\gis\forest\blkh\restricted\te_fauna\frest99. Sites and corresponding monitoring data will be entered in to the corporate wildlife database (NRIS Fauna) as sites are monitored, so that all sites are in the database within 5 years. Sites will be entered as "use area features," (population or herd boundary) feature type. Monitoring visits will be entered as "visits" to the features. Original hard copy monitoring forms will be kept in district files, and copies sent to the S.O. will be kept in the snail monitoring file in the Forest Biologist's office.

Responsibility: District biologists will monitor snails and document the findings on field forms. District biologists will enter the data in NRIS Fauna within the fiscal year that the monitoring occurred. The S.O. wildlife monitoring coordinator will query the database for pertinent records and prepare the LMP monitoring report.

Cost: Approximately $4,000 annually.

Sub-Item: **Invertebrates – Regal Fritillary**

Indicators: Amount of grassland habitats on the Forest.

Method of Data Collection: For grassland information, see monitoring item 8 (Vegetative Diversity: Species Composition and Structure).

Unit of Measure: Number of acres of the grassland cover type on the Forest (see monitoring item 8).

Sample Design: See monitoring item 8.

Data Precision and Reliability: See monitoring item 8.

Frequency of Reporting: Every two years.

Information Storage System: See monitoring item 8.

Responsibility: See monitoring item 8.

Cost: See monitoring item 8.

Monitoring Item 19: **EMPHASIS SPECIES – Species of Local Concern**

Authority: Level 2 (FSM 2622.01 [Black Hills Supplement], Objective 221)

Sub-Item: **Mammals – Bats (Long-Eared Myotis, Long-Legged Myotis, Northern Myotis, Small-Footed Myotis)**

Indicators: The availability of snags will be used to indicate conservation or enhancement of nursery (maternity) roosts. With the exception of the small-footed myotis, all of the bats in this monitoring item use snags for nurseries. Small-footed myotis use cliffs and other rocky areas as maternity sites; because these features typically are not affected by management activities, they will not be monitored.

Cave and mine roost protection measures will be used to indicate conservation or enhancement of winter roost sites. Human disturbance at known cave and mine roosts will be used to indicate conservation needs. Without exception, all of these species use caves and/or mines for winter hibernacula.

Method of Data Collection: For snag data, see monitoring item 11 (Vegetative Diversity: Snags). For cave and mine data, see monitoring item 21 (Sensitive Species: Bats).

Unit of Measure: See monitoring items 11 and 21.

Sample Design: See monitoring items 11 and 21.

Data Precision and Reliability: See monitoring items 11 and 21.

Frequency of Reporting: Every two years.

Information Storage System: See monitoring items 11 and 21.

Responsibility: See monitoring items 11 and 21..

Cost: No additional costs beyond those estimated for monitoring items 11 and 21.

***Sub-Item**:* **Mammals – Meadow Jumping Mouse**

Indicators: Trend in condition of preferred habitat (riparian).

Method of Data Collection: See monitoring item 6 (Riparian: Condition and Trend).

Unit of Measure: See monitoring item 6.

Sample Design: See monitoring item 6.

Data Precision and Reliability: See monitoring item 6.

Frequency of Reporting: See monitoring item 6.

Information Storage System: See monitoring item 6.

Responsibility: See monitoring item 6.

Cost: See monitoring item 6.

Sub-Item: **Mammals – Northern Flying Squirrel**

Indicators:

Amount of preferred habitat (spruce forests and stands of dense mature and late-successional ponderosa pine with large trees).

Method of Data Collection:

Acres of preferred habitats will be queried from the corporate vegetation database. Acres will be itemized as spruce (all structural stages combined), structural stage 4C pine stands with very large tree size, and structural stage 5 pine stands. See monitoring items 8 (Vegetative Diversity: Vegetation Species Composition), 9 (Vegetative Diversity: Structural Stages) and 10 (Vegetative Diversity: Large Trees) for more information.

Unit of Measure: Acres of spruce cover type; acres of ponderosa pine with very large tree size in structural stage 4C; and acres of ponderosa pine in structural stage 5.

Sample Design: See monitoring items 8, 9, and 10.

Data Precision and Reliability: See monitoring items 8, 9, and 10.

Frequency of Reporting: Every two years.

Information Storage System: See monitoring items 8, 9, and 10.

Responsibility: See monitoring items 8, 9, and 10.

Cost: See monitoring items 8, 9, and 10.

Sub-Item: **Mammals – Ungulates (Rocky Mountain Bighorn Sheep, Mountain Goat)**

Indicators: Population estimates.

Method of Data Collection: Population Estimates: Population estimates for both species will be obtained from the South Dakota Department of Game, Fish and Parks (SDGFP) big game harvest projection report (e.g., Huxoll 2004). Neither species occurs in the Wyoming portion of the Forest, so no data is needed for Wyoming.

If population estimates are not available, trend of hunting licenses sold will be used. This information may be a useful proxy in indicating population trend. For example, if the state game agencies increase the number of hunting licenses available, it may indicate population levels are higher than desired.

Unit of Measure: Estimated number of animals in the Black Hills herd units.

Sample Design: The state conducts ground and aerial surveys to census mountain goats. Ground surveys are conducted for bighorn sheep.

Data Precision and Reliability: Class B

Frequency of Reporting: Every two years.

Information Storage System: SD big game harvest projection reports can be obtained electronically from http://www.sdgfp.info/Wildlife/hunting/Harvest/Projections.htm, and will then be stored at K:\rwsw\2600_wfrp\forest_plan_monitoring\ annual_rpt in the appropriate fiscal year folder.

Responsibility: The S.O. wildlife monitoring coordinator will request copies of the appropriate state wildlife agency reports if copies are not received in the mail or available on-line.

Cost: Provided by state wildlife agencies at no cost to the BHNF.

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

Indicators:

1) Incidental observations.

2) Summer breeding surveys (dipper only).

Method of Data Collection:

All of the species included in this monitoring item are considered uncommon or rare in the Black Hills (Tallman et al. 2002), and typically are difficult to monitor. Additional monitoring challenges are present for some of the species. For example, saw-whet owls are nocturnal and are not readily detected during point-counts or other diurnal surveys, and the hawks often change nest locations every year. Therefore, repeatable monitoring methods that provide meaningful results would be cost prohibitive to the Forest. In point, four years of bird monitoring conducted by the Rocky Mountain Bird Observatory has yielded few observations (and no density estimates) of these species despite intense sampling effort (Panjabi 2001, 2002, 2003, 2004). Because little data is better than no data, the Forest will monitor these species through incidental observations. In other words, observations of the above species will be recorded whenever they are encountered.

Although the dipper is rare, it is relatively easy to monitor because it has a limited distribution in the Black Hills, and is fairly conspicuous in its stream habitat. Currently, the South Dakota Department of Game, Fish and Parks monitors this species for nest attempts, nest success and number of fledged young (Backlund 2004).

Unit of Measure: Number of incidental observations on the Forest by species. Number of nesting pairs will also be reported for dippers.

Sample Design:

1) Incidental observations: All observations made by biologists within NFS lands will be recorded, whether they occur incidental to other duties or activities, or when specific searches are conducted. Observations on non-NFS lands within or in close proximity to the Forest boundary will be recorded when deemed applicable. Reports from non-biologists, including members of the public, will be recorded when they are thought to be reliable.

2) Dipper Nest Success: The SDGFP plans to monitor all known nests during the breeding season until nest success or failure can be determined.

Data Precision and Reliability: Incidental Observations = Class B. Dipper nest success = Class A.

Frequency of Reporting: Every two years.

Information Storage System: Incidental observations will be stored in the corporate wildlife database (NRIS Fauna). SDGFP dipper survey reports can be obtained electronically from http://www.sdgfp.info/Wildlife/Diversity/dipper/index.htm, and will then be stored in the appropriate fiscal year subdirectory in K:\rwsw\2600_wfrp\forest_plan_monitoring\annual_rpt.

Responsibility: District biologists will enter their observations into the corporate wildlife database within the fiscal year that the observation occurred. The S.O. wildlife monitoring coordinator will query the database, review RMBO and SDGFP reports, and prepare the LMP monitoring report. If a District Biologist does not enter the data into the database, they must send hard-copy records with all relevant information to the wildlife monitoring coordinator at the end of the fiscal year in which the observation occurred.

Biologists on the Forest will assist the SDGFP with dipper monitoring as needed.

Cost: $1,000 annually.

Sub-Item: **Invertebrates – Butterflies (Atlantis Fritillary and Tawny Crescent)**

Indicators: Trend of riparian habitat condition (Atlantis fritillary) and amount of grassland habitat (tawny crescent).

Method of Data Collection: For riparian information, see monitoring item 6 (Riparian/Wetlands: Condition and Trend). For grassland information, see item 8 (Vegetative Diversity: Species Composition and Structure).

Unit of Measure: See monitoring items 6 and 8.

Sample Design: See monitoring items 6 and 8.

Data Precision and Reliability: See monitoring item 6 and 8.

Frequency of Reporting: See monitoring item 6 and 8.

Information Storage System: See monitoring item 6 and 8.

Responsibility: See monitoring item 6 and 8.

Cost: See monitoring item 6 and 8.

Sub-Item: **Invertebrates – Snails (Callused Vertigo, Frigid Ambersnail, Mystery Vertigo, Striate Disc)**

Indicators: Continued presence of emphasis snails within known occupied habitat will be used as an indicator of habitat conservation.

Method of Data Collection: Soil and litter samples will be examined for presence of live snails.

Unit of Measure: Percentage of Frest and Johannes (2002) sites monitored that have continued presence of live snails of the emphasis species.

Sample Design: A random sample of sites identified in Frest and Johannes (2002) as having live snails will be revisited once every five years to determine continued presence of the species. To determine presence of live snails, soil and litter samples will be sifted through in the field or office. Sampling will occur during moist periods between late spring and early fall, since snails are most active then and are not aestivating. The monitoring should be conducted by individual(s) trained in snail identification, and may require a contractor with strong snail expertise.

Data Precision and Reliability: Class B.

Frequency of Reporting: Every five years.

Information Storage System: Frest and Johannes (2002) site locations are currently stored in a GIS coverage at J:\fsfiles\ref\library\gis\forest\blkh\restricted\te_fauna\frest99. Sites and corresponding monitoring data will be entered in to the corporate wildlife database (NRIS Fauna) when sites are monitored, so that sampled sites are in the database within 5 years. Sites will be entered as "use area features," (population or herd boundary) feature type. Monitoring visits will be entered as "visits" to the features. Original hard copy monitoring forms will be kept in the snail monitoring file in the Forest Biologist's office (S.O.).

Responsibility: The Forest Biologist will ensure that snail monitoring is conducted by a biologist that is well-trained in snail identification. If a contract is necessary, the Forest Biologist will administer the contract. The Forest Biologist will ensure all monitoring data are entered into the NRIS Fauna database, and may request that District Biologists assist by entering some of the records for their respective districts. The S.O. wildlife monitoring coordinator will query the database for pertinent records and prepare the LMP monitoring report.

Cost: Approximately $25,000 once every five years.

Monitoring Item 20: **EMPHASIS SPECIES – Threatened and Endangered Species**

Authority: Level Two (FSM 2670.45, Objective 220)

Sub-Item: **Bald Eagle**

Indicators: Counts of wintering bald eagles will be used to indicate the attainment of objective 220 (conserve or enhance habitat for threatened, endangered or proposed species).

Method of Data Collection: Eagles will be counted along standardized driving routes.

Unit of Measure: Number of eagles observed.

Sample Design: Four routes (one per district) will be driven once each winter. All routes should be driven on the same day. If this is not possible, they should be driven within the same week. Routes will be 10 miles long, and have the same start and end points each year.

Data Precision and Reliability: Class B.

Frequency of Reporting: Every 2 years.

Information Storage System: Survey routes and associated observations will be stored in the corporate wildlife database (NRIS Fauna).

Responsibility: The S.O. wildlife monitoring coordinator will establish the driving routes, enter the routes into NRIS Fauna, and coordinate the timing of the annual surveys. District biologists will conduct the surveys and update the database each year. The S.O. wildlife monitoring coordinator will query the database and prepare the LMP monitoring report.

Cost: $1,000 annually.

Monitoring Item 21: **EMPHASIS SPECIES – Management Indicator Species**

Authority: Level Two (36 CFR 219.19 and 219.14[f], FSM 2620.3 and 2621.5, Forest Plan Objective 238)

Sub-Item: **Mammals – Beaver**

Indicators:

1) Amount of aspen stands within 600 feet of perennial water will be used to indicate maintenance or enhancement of beaver habitat on the Forest (Objective 238) and progress toward restoring hardwoods in potential beaver habitat (Objective 201).

2) Beaver food caches will be used as an index of beaver abundance.

Method of Data Collection:

1) Habitat: A GIS coverage of perennial waters will be overlaid with a coverage of the aspen covertype. The water coverage will be buffered by 600 feet, and any aspen stands that intersect the buffered area will be reported.

2) Food caches: Aerial surveys.

Unit of Measure:

1) Habitat: Acres of the aspen cover type that occur within 600 feet of perennial water.

2) Food caches: Number of food caches per kilometer of perennial stream.

Sample Design:

1) Habitat: Acres of aspen covertype will be counted if they occur on NFS lands that are within 600 feet of perennial water. Entire stands will be included regardless if any part of them fall outside of the buffered area. This may still underestimate the amount of aspen habitat available to beaver because many aspen stands are inclusions within other forest cover types, and are not considered separate stands. Perennial waters analyzed may eventually be limited to those most closely correlated with preferred beaver habitat (e.g., low gradient), if parameters are quantifiable and compatible with existing databases (i.e., don't require gathering new information). Such parameters have not been identified at the time this protocol was developed, but they could be before preparation of the next monitoring report.

2) Food caches: Each 6^{th} level hydrological unit code (HUC) watershed on the Forest will be assessed and categorized (stratified) as high, medium or low quality beaver habitat, or as nonhabitat. Each year, fifteen high and moderate quality HUCs (30 total) will be randomly selected for monitoring. Fewer HUCs could initially be selected in order to test the protocol design. Low quality HUCs may also be sampled occasionally to detect beaver expansion and contraction. Aerial surveys (e.g., from helicopter or fixed wing aircraft) would be conducted along the entire length of perennial streams, rivers, and water bodies within all selected HUCs. The number of food caches observed per HUC would then be used to compute an estimate of food caches per kilometer.

Data Precision and Reliability: Habitat data = Class B; Food caches = Class A.

Frequency of Reporting: Every two years.

Information Storage System:

1) Habitat: Aspen stands will be obtained from (and stored in) the corporate vegetation database. Perennial waters will be obtained from the most current GIS database(es) that identify perennial water. At the time of this protocol development, this coverage is not finished or considered a corporate database, but it is expected to be in an acceptable form for this monitoring item by the time the next monitoring report is prepared. Aspen stands will be obtained from (and stored in) the corporate vegetation database.

2) Food caches: Caches will be entered as "biological features" in the corporate wildlife database (NRIS Fauna). Because the database does not list food caches as a type of feature, "other" will assigned as the feature type, and "beaver food cache" will be listed in the comment field.

Responsibility: The Forest Wildlife Biologist in the S.O. will be responsible for all aspects of monitoring beaver and beaver habitat, including conducting surveys, arranging and / or administering contracts for flights, entering data into Fauna, and performing analyses from all relevant databases. Assistance will be requested from S.O. GIS personnel as necessary.

The Rocky Mountain Regional Office and the University of Wyoming are working with the BHNF to refine and test the beaver protocol. The resulting updates will be incorporated in this guide when available.

Cost:

1) Habitat: No additional cost beyond maintenance of corporate databases.

2) Food caches: Approximately $5,000 per 8 hours of helicopter surveys.

Sub-Item: **Mammals – White-tailed Deer**

Indicators:

1) Population estimates.

2) Habitat suitability estimates.

Method of Data Collection:

1) Population Estimates: The South Dakota population estimate will be obtained from the South Dakota Department of Game, Fish and Parks (SDGFP) big game harvest projection report (e.g., Huxoll 2004). The Wyoming estimate will be obtained from the Wyoming Game and Fish Department's job completion reports (e.g., Sandrini 2004).

If population estimates are not available, trend of hunting licenses sold will be used. This information may be a useful proxy in indicating population trend. For example, if the state game agencies increase the number of hunting licenses available, it may indicate population levels are higher than desired.

2) Habitat suitability: The Arc/HSI model will be used to determine habitat suitability. This GIS model estimates the ability of an area (e.g., the Forest) to meet a species's requirements for food and cover. The model uses vegetation data to determine the distribution and abundance of forage and cover. The effects of roads on deer habitat use are also computed in the modeled, with different types of roads (e.g., paved vs. native surface) modifying the value of otherwise suitable habitat. A single numerical value for current habitat conditions is then calculated from all of the information. Values are generated for both summer habitat and winter habitat. The HSI value can range from 0 (no suitable habitat) to 1 (maximum habitat). A map is also generated. Documentation for the model (including applicability, assumptions, and limitations) is found in Juntti and Rumble (2004).

Unit of Measure:

1): Population estimates: Number of white-tailed deer in the Black Hills herd units.

2) Habitat suitability: Numerical HSI value (0 – 1) for both summer and winter habitat conditions. These can be converted to percent by multiplying by a factor of 100.

Sample Design:

1) Population estimates: The states use population models to derive population estimates. Model inputs include harvest structure, age class structure, and fawn mortality rates. Data for the model inputs are obtained through hunter surveys and field studies. Both South Dakota and Wyoming estimates apply to nearly all of the BHNF land in their respective states. Because daily and seasonal deer movements include lands off-Forest, adjacent lands of any ownership are included in the Black Hills herd unit estimates. If separate estimates are available for Custer State Park, these numbers will not be included in the Black Hills estimates.

2) Habitat suitability: The Forest-wide vegetation and road coverages will be inputs to the model. The output will reflect a Forest-wide habitat suitability index.

Data Precision and Reliability: Population estimates = Class B; Habitat data = Class B

Frequency of Reporting: Every two years.

Information Storage System:

1) Population Estimates: SD big game harvest projection reports can be obtained electronically from http://www.sdgfp.info/Wildlife/hunting/Harvest/Projections.htm. Hard copies can be requested through the SDGFP office in Pierre or Rapid City. The WGFD annually mails an electronic copy of the JCRs to the Forest

Biologist. Electronic copies from both states will then be stored at K:\rwsw\2600_wfrp\forest_plan_monitoring\game_reports.

1) Habitat suitability: Vegetation data will originate from the corporate vegetation database. The roads coverage will be obtained from the SO GIS library. Model outputs will be stored in the monitoring report administrative record.

Responsibility:

1) Population estimates: The S.O. wildlife monitoring coordinator will request copies of the appropriate state wildlife agency reports if copies are not received in the mail or available on-line.

2) Habitat suitability: The S.O. wildlife monitoring coordinator will obtain the most recent vegetation database, roads GIS layer, and habitat suitability model to conduct the analysis. The coordinator will request assistance from GIS personnel if necessary.

Cost:

1) Population estimates: Provided by state wildlife agencies at no cost to the BHNF.

2) Habitat suitability: $1,500

Sub-Item: **Birds – Black-backed Woodpecker**

Indicators:

1) Acres of preferred habitat (unsalvaged burned areas, areas with bark beetle infestations, and dense mature to late-successional stands.

2) Relative density.

Method of Data Collection:

1) Acres of Habitat:

a. Burned Areas: Acres of ponderosa pine habitat burned during the five most recent years and not salvaged during this same time period. Burned acres will be obtained from monitoring item 12 (Vegetative Diversity: Burned Forest Habitat), and will include only acres of pine affected by high or moderate intensity fire (i.e., excluding acres with low tree mortality). Unsalvaged acres will be calculated by subtracting salvaged acres from burned acres. Salvaged acres will be obtained from timber contract modifications and NEPA decisions.

b. Bark Beetle Infestations: Acres of ponderosa pine habitat with epidemic levels of bark beetle activity during the five most recent years and not salvaged during this same time period. Epidemic areas will be obtained from monitoring item 23 (Insects & Diseases: Population, Tree Mortality, and Hazard). Unsalvaged acres will be calculated by subtracting salvaged acres from total acres. Salvaged acres will be obtained from timber contract modifications and NEPA decisions.

c. Dense Mature and Late Successional Stands: Acres of ponderosa pine habitat in structural stages 4C and 5. This information will be obtained from monitoring item 9 (Vegetative Diversity: Structural Stages).

2) Relative Density: Relative density will be estimated through an elaborate point-count methodology documented in Panjabi (2004). This methodology is currently being used to monitor multiple species in multiple habitats, including the black-backed woodpecker in burned and mature/late successional areas. In summary, observers walk along transects, stop at established points, and record the distance to each bird detected. A density estimate specific to each habitat sampled is then calculated.

Transects are randomly located within stratified habitats (e.g., cover types and other vegetative features). Transects located in burned habitat (primarily the Jasper Burn) and mature/late successional habitat will be used to monitor relative density of black-backed woodpeckers. Transects in other habitats may also yield useful data on black-backs, but monitoring these transects is lower priority than monitoring transects in preferred habitats.

Due to the high skill levels required for an effective bird monitoring program, the Forest has partnered (through formal agreement) with the Rocky Mountain Bird Observatory (RMBO) to oversee the design, implementation and statistical analysis of this protocol.

Unit of Measure:

(1) Habitat: Acres. See monitoring items 9, 12, and 23.

(2) Relative Density: Number of birds per square kilometer (birds/km^2) converted to birds per acre (birds/acre).

Sample Design:

1) Habitat: See monitoring items 9, 12, and 23.

2) Relative Density: A target of 30 transects with 15 points each will be sampled from within both habitat types (burned area and mature/late successional stages). Transects were originally established in 2001, and were intended to be permanent. However, transects may be (or have been) added or deleted in subsequent years if habitat types aren't accurately represented, or if access is unsafe or otherwise problematic. Burned area transects were randomly located within the Jasper Burn. Mature / late successional transects were randomly located within any 4c or 5 stand on the Forest, with a specific goal of sampling stands that exhibit late successional conditions (e.g., large trees, dense snags). Points within transects are 250 meters apart. Bird counts will be conducted for 5 minutes at each point. Black-backed woodpeckers detected between transect points shall also be recorded. Counts should be conducted in the morning between mid May and mid July. Each habitat should be sampled at least once every two years.

See Panjabi (2004) for additional details on sample design of relative density.

Data Precision and Reliability: Habitat data = Class B; Relative density data = Class A.

Frequency of Reporting: Every two years.

Information Storage System:

1) Habitat: See monitoring items 9, 12, and 23.

2) Relative density: Annual RMBO reports will be posted on the Forest's internet site in Adobe (.pdf) format at http://www.fs.fed.us/r2/blackhills/projects/wildlife/index.shtml. Transect and point coordinates will be obtained from RMBO in a Microsoft Excel spreadsheet, and converted to a GIS shapefile by SO personnel. Bird count data will be in a separate Excel spreadsheet with a common field that relates to the transect data. These will be stored in J:\fsfiles\office\rwsw\ba-be\bird_data.

Responsibility:

1) Habitat: See monitoring items 9, 12, and 23.

2) Relative Density: An S.O. biologist will administer the agreement with RMBO to collect, analyze and report data. The S.O. wildlife monitoring coordinator will summarize the information from the RMBO reports for inclusion in the LMP monitoring report.

Cost:

1) Habitat: See monitoring items 9, 12, and 23.

2) Relative Density:

2 habitats @ $12,000 each	= $24,000
Agreement administration	= $ 400
Total (every 2 years)	= $24,400

Sub-Item: **Birds – Brown Creeper**

Indicators:

1) Acres of preferred habitat (spruce forests and stands of dense mature and late-successional ponderosa pine).

2) Relative densities in preferred habitats.

Method of Data Collection:

1) Habitat: Acres of preferred habitats will be obtained from monitoring items 8 (Vegetative Diversity: Vegetation Species Composition) and 9 (Vegetative Diversity: Structural Stages). Acres of spruce (all structural stages combined) will be gained from item 8, and acres of 4C and 5 pine stands will be gained from item 9.

2) Relative density: Relative densities will be estimated through an elaborate point-count methodology documented in Panjabi (2004). This methodology is currently being used to monitor multiple species in multiple habitats, including the brown creeper in its preferred habitat. In summary, observers walk along transects, stop at established points, and record the distance to each bird detected. A density estimate specific to each habitat sampled is then calculated.

Transects are randomly located within stratified habitats (e.g., cover types and other vegetative features). Transects located in spruce habitat and pine structural stages 4C and 5 (mature / late successional) will be used to monitor relative densities of brown creepers. Transects in other pine structural stages may also yield useful data on brown creepers, but monitoring these transects is lower priority than monitoring transects in preferred habitats.

Due to the high skill levels required for an effective bird monitoring program, the Forest has partnered (through formal agreement) with the Rocky Mountain Bird Observatory (RMBO) to oversee the design, implementation and statistical analysis of this protocol.

Unit of Measure:

1) Habitat: Acres

2) Relative density: Number of birds detected per square kilometer (birds/km^2). This should also be reported as (converted to) birds per acre (birds/acre) to facilitate comparison with other forest measurements.

Sample Design:

1) Habitat: See monitoring items 8 and 9.

2) Relative density: A target of 30 transects with 15 points each are sampled from within both preferred habitat types (spruce and mature/late pine). Points are spaced at 250 meter intervals. Bird counts are conducted for 5 minutes at each point. Counts are conducted during morning hours between mid May and mid July. Each habitat should be sampled at least once every two years.

Transects were originally established in 2001, and were intended to be permanent. However, transects may be (or have been) added or deleted in subsequent years if habitat types aren't accurately represented, or if access is unsafe or otherwise problematic. Spruce transects were randomly located within spruce stands across the Forest. Mature / late successional transects were randomly located within any 4C or 5 ponderosa pine stand on the Forest, with a specific goal of sampling stands that exhibit late successional conditions (e.g., large trees, dense snags).

See Panjabi (2004) for additional details on sample design of relative density.

Data Precision and Reliability: Habitat data = Class B; Relative density data = Class A.

Frequency of Reporting: Every two years.

Information Storage System:

1) Habitat: See monitoring items 8 and 9.

2) Relative density: Annual RMBO reports will be posted on the Forest's internet site in Adobe (.pdf) format at http://www.fs.fed.us/r2/blackhills/projects/wildlife/index.shtml. Transect and point coordinates will be obtained from RMBO in a Microsoft Excel spreadsheet, then converted to a GIS shapefile by SO personnel. Bird count data will be in a separate Excel spreadsheet with a common field that relates to the transect data. These will be stored in J:\fsfiles\office\rwsw\ba-be\bird_data.

Responsibility:

1) Habitat: See monitoring items 8 and 9.

2) Relative density: The S.O. wildlife monitoring coordinator will administer the agreement with RMBO to collect, analyze and report data. The coordinator will also summarize the information from the RMBO reports for inclusion in the LMP monitoring report.

Cost:

1) Habitat: See monitoring items 8 and 9.

2) Relative density:

2 habitats @ $12,000 each	= $24,000
Agreement administration	= $ 400
Total (every 2 years)	= $24,400

Sub-Item: **Birds – Golden-crowned Kinglet**

Indicators:

1) Acres of preferred habitat (white spruce).

2) Relative density in preferred habitat.

Method of Data Collection:

1) Habitat: The amount of white spruce existing on the Forest will be obtained from monitoring item 8 (Vegetative Diversity: Vegetation Species Composition).

2) Relative density: Relative density will be estimated through an elaborate point-count methodology documented in Panjabi (2004). This methodology is currently being used to monitor multiple species in multiple habitats, including the golden-crowned kinglet in its preferred habitat. In summary, observers walk along transects, stop at established points, and record the distance to each bird detected. A density estimate specific to each habitat sampled is then calculated.

Transects are randomly located within stratified habitats (e.g., cover types and other vegetative features). Transects located in spruce habitat will be used to monitor relative density of kinglets. Transects in other habitat types may also yield useful data on kinglets, but monitoring these transects is lower priority than monitoring transects in preferred habitats.

Due to the high skill levels required for an effective bird monitoring program, the Forest has partnered (through formal agreement) with the Rocky Mountain Bird Observatory (RMBO) to oversee the design, implementation and statistical analysis of this protocol.

Unit of Measure:

(1) Habitat: Acres of white spruce on the Forest.

(2) Relative density: Number of birds detected per square kilometer (birds/km^2). This should also be reported as (converted to) birds per acre (birds/acre) to facilitate comparison with other forest measurements.

Sample Design:

1) Habitat: See monitoring item 8.

2) Relative density: A target of 30 transects with 15 points each are sampled from within the preferred habitat type (spruce). Points are spaced at 250 meter intervals. Bird counts are conducted for 5 minutes at each point. Counts are conducted during morning hours between mid May and mid July. The spruce transects should be sampled at least once every two years.

Transects were originally established in 2001, and were intended to be permanent. However, transects may be (or have been) added or deleted in subsequent years if habitat types aren't accurately represented, or if access is unsafe or otherwise problematic. Spruce transects were randomly located within spruce stands across the Forest.

Data Precision and Reliability: Habitat data = Class B; Relative density data = Class A.

Frequency of Reporting: Every two years.

Information Storage System:

1) Habitat: See monitoring item 8.

2) Relative density: Annual RMBO reports will be posted on the Forest's internet site in Adobe (.pdf) format at http://www.fs.fed.us/r2/blackhills/projects/wildlife/index.shtml. Transect and point coordinates will be obtained from RMBO in a Microsoft Excel spreadsheet, then converted to a GIS shapefile by SO personnel. Bird count data will be in a separate Excel spreadsheet with a common field that relates to the transect data. These will be stored in J:\fsfiles\office\rwsw\ba-be\bird_data.

Responsibility:

1) Habitat: See monitoring item 8.

2) Relative density: An S.O. biologist will administer the agreement with RMBO to collect, analyze and report data. The S.O. wildlife monitoring coordinator will summarize the information from the RMBO reports for inclusion in the LMP monitoring report.

Cost:

1) Habitat: See monitoring item 8.

2) Relative density: $1,000 annually (BHNF costs only).

1 habitat @ $12,000 each	= $12,000
Agreement administration	= $ 400
Total (every 2 years)	= $12,400

Sub-Item: **Birds – Grasshopper Sparrow**

Indicators:

1) Amount of preferred habitat (grasslands).

2) Relative density in preferred habitat.

Method of Data Collection:

1) Habitat: Acres in the grassland cover type will be obtained from monitoring item 8 (Vegetative Diversity: Species Composition and Structure).

2) Relative density: Relative density will be estimated through an elaborate point-count methodology documented in Panjabi (2004). This methodology is currently being used to monitor multiple species in multiple habitats, including the grasshopper sparrow in grasslands. In summary, observers walk along transects, stop at established points, and record the distance to each bird detected. A density estimate specific to each habitat sampled is then calculated.

Transects are randomly located within stratified habitats (e.g., cover types and other vegetative features). Transects located in the mixed-grass prairie habitat will be used to monitor relative density of song sparrows. Transects in other habitats may also yield useful data on grasshopper sparrows, but monitoring these transects is lower priority than monitoring transects in preferred habitats.

Due to the high skill levels required for an effective bird monitoring program, the Forest has partnered (through formal agreement) with the Rocky Mountain Bird Observatory (RMBO) to oversee the design, implementation and statistical analysis of this protocol.

Unit of Measure:

1) Habitat: Acres of grassland on the Forest. See monitoring item 8.

2) Relative density: Number of birds detected per square kilometer (birds/km^2). This should also be reported as (converted to) birds per acre (birds/acre) to facilitate comparison with other forest measurements.

Sample Design:

1) Habitat: See monitoring item 8.

2) Relative density: A target of 30 transects with 15 points each are sampled in mixed-grass prairie habitat. Points are spaced at 250 meter intervals. Bird counts are conducted for 5 minutes at each point. Counts are conducted during morning hours between mid May and mid July. Prairie habitat should be sampled at least once every two years.

Transects were originally established in 2001, and were intended to be permanent. However, transects may be (or have been) added or deleted in subsequent years if habitats aren't accurately represented, or if access is unsafe or otherwise problematic. Mixed-grass prairie transects were randomly located within grasslands and prairies across the Forest.

See Panjabi (2004) for additional details on sample design of relative density.

Data Precision and Reliability: Habitat data = Class B; Relative density data = Class A.

Frequency of Reporting: Every two years.

Information Storage System:

1) Habitat: See monitoring item 8.

2) Relative density: Annual RMBO reports will be posted on the Forest's internet site in Adobe (.pdf) format at http://www.fs.fed.us/r2/blackhills/projects/wildlife/index.shtml. Transect and point coordinates will be obtained from RMBO in a Microsoft Excel spreadsheet, then converted to a GIS shapefile by SO personnel. Bird count data will be in a separate Excel spreadsheet with a common field that relates to the transect data. These will be stored in J:\fsfiles\office\rwsw\ba-be\bird_data.

Responsibility:

1) Habitat: See monitoring item 8.

2) Relative density: An S.O. biologist will administer the agreement with RMBO to collect, analyze and report data. The S.O. wildlife monitoring coordinator will summarize the information from the RMBO reports for inclusion in the LMP monitoring report.

Cost:

1) Habitat: See monitoring item 8.

2) Relative density:

1 habitat @ $12,000 each	= $12,000
Agreement administration	= $ 400
Total (every 2 years)	= $12,400

Sub-Item: **Birds – Ruffed Grouse**

Indicators:

1) Acres of preferred habitat (aspen).

2) Relative densities.

Method of Data Collection:

1) Habitat: The amount of aspen existing on the Forest will be obtained from monitoring item 8 (Vegetative Diversity: Vegetation Species Composition).

2) Relative density: Surveyors will drive established routes and stop at predetermined locations to listen for "drumming" grouse. Drumming is a reproductive behavior exhibited by male grouse, whereby they rapidly beat their wings to produce a characteristic sound. Surveyors record the number and location of birds they hear drumming.

Unit of Measure:

(1) Habitat: Acres of aspen on the Forest. See monitoring item 8.

(2) Relative density: Number of grouse heard per mile.

Sample Design:

1) Habitat: See monitoring item 8.

2) Relative density: Ten driving routes have been established in the northern and central Black Hills. All routes are approximately 10 miles, but six routes are classified as linear, and four are classified as stationary. Linear routes are surveyed by stopping every one-half mile and listening for 4 minutes at each stop. Stationary routes are surveyed at ten predetermined locations for 8 minutes. Surveys are conducted in the spring when grouse are drumming (e.g., April and May).

Data Precision and Reliability: Habitat data = Class B; Relative density data = Class B.

Frequency of Reporting: 2 years

Information Storage System:

1) Habitat: See monitoring item 8.

2) Relative density: The SDGFP annually prepares a ruffed grouse spring survey report, and this will be the data source for the LMP monitoring report.

Responsibility:

1) Habitat: See monitoring item 8.

2) Relative density: The SDGFP has indicated commitment to monitoring ruffed grouse, and it is assumed they will continue to lead this monitoring project. The Forest biologists will assist the SDGFP by surveying approximately 2 routes annually or as requested and available. The S.O. wildlife monitoring coordinator will obtain a copy of the annual GFP report, and summarize this data for inclusion in the LMP monitoring report.

The Rocky Mountain Research Station is working with the BHNF and SDGFP to revise the ruffed grouse protocol. The resulting update will be incorporated in this guide when available.

Cost:

1) Habitat: See monitoring item 8.

2) Relative density: $1,000 annually (BHNF costs only).

Sub-Item: **Birds – Song Sparrow**

Indicators:

1) Trend in condition of preferred habitat (riparian).

2) Relative density in preferred habitat.

Method of Data Collection:

1) Habitat: See monitoring item 6 (Riparian: Condition and Trend).

2) Relative density: Relative density will be estimated through a point-count methodology documented in Panjabi (2004). This methodology is currently being used to monitor multiple species in multiple habitats, including the song sparrow in its preferred habitat. In summary, observers walk along transects, stop at established points, and record the distance to each bird detected.

Transects are randomly located within stratified habitats (e.g., cover types and other vegetative features). Transects located in both montane and foothills riparian areas will be used to monitor relative density of song sparrows. Transects in other habitat types may also yield useful data on song sparrows, but monitoring these transects is lower priority than monitoring transects in preferred habitats.

Due to the high skill levels required for an effective bird monitoring program, the Forest has partnered (through formal agreement) with the Rocky Mountain Bird Observatory (RMBO) to oversee the design, implementation and statistical analysis of this protocol.

Unit of Measure:

1) Habitat: See monitoring item 6.

2) Relative density: Number of birds detected per square kilometer (birds/km^2). This should also be reported as (converted to) birds per acre (birds/acre) to facilitate comparison with other forest measurements.

Sample Design:

1) Habitat: See monitoring item 6.

2) Relative density: A target of 30 transects with 15 points each are sampled in both montane and foothills riparian areas. Points are spaced at 250 meter intervals. Bird counts are conducted for 5 minutes at each point. Counts are conducted during morning hours between mid May and mid July. Riparian habitats should be sampled at least once every two years.

Transects were originally established in 2001, and for most habitats were intended to be permanent. However, riparian transects required substantial adjustments after the first year of surveys when differences in habitat conditions and associated bird communities became apparent. Currently there are two habitats sampled that have a riparian component: montane riparian and foothills riparian. All transects were randomly located within riparian habitats across the Forest. Transects may continue to be added or deleted if access is unsafe or otherwise problematic.

See Panjabi (2004) for additional details on sample design of relative density.

Data Precision and Reliability: Habitat data = Class A; Relative density data = Class A.

Frequency of Reporting: Habitat data = 3-5 years; Relative density data = every two years.

Information Storage System:

1) Habitat: See monitoring item 6.

2) Relative density: Annual RMBO reports will be posted on the Forest's internet site in Adobe (.pdf) format at http://www.fs.fed.us/r2/blackhills/projects/wildlife/index.shtml. Transect and point coordinates will be obtained from RMBO in a Microsoft Excel spreadsheet, then converted to a GIS shapefile by SO personnel. Bird count data will be in a separate Excel spreadsheet with a common field that relates to the transect data. These will be stored in J:\fsfiles\office\rwsw\ba-be\bird_data.

Responsibility:

1) Habitat: See monitoring item 6.

2) Relative density: An S.O. biologist will administer the agreement with RMBO to collect, analyze and report data. The S.O. wildlife monitoring coordinator will summarize the information from the RMBO reports for inclusion in the LMP monitoring report.

Cost:

1) Habitat: See monitoring item 6.

2) Relative density:

2 habitats @ $12,000 each	= $24,000
Agreement administration	= $ 400
Total (every 2 years)	= $24,400

Sub-Item: **Fish – Mountain Sucker**

Authority: Level 2 & 3 (36 CFR 219.19 and 219.14(f), FSM 2620.3 and 2621.5, Forest Plan Objectives 217, 219, and 238d)

Background: The mountain sucker is native to the Black Hills. Recent surveys suggest mountain sucker occur in many of its historic drainages throughout the Black Hills (Isaak et al. 2003), but localized population reductions or absence at selected sites may have occurred (USDA Forest Service 2005). Management activities may affect aquatic habitat conditions or connectivity (Isaak et al. 2003).

Indicators:

- Distribution and numbers of mountain sucker and/or habitat condition and connectivity on National Forest System lands.

Method of Data Collection: The BHNF will conduct surveys for mountain sucker in cooperation with the South Dakota Department of Game, Fish and Parks (SDGFP) and the Wyoming Game and Fish Department (WGFD) to the maximum extent practicable. Sampling will occur using primarily backpack electrofishing equipment.

Habitat monitoring will include repeat sampling at sites where mountain sucker occur at, or in close proximity to sites sampled in the Integrated Resource Inventory (IRI) -- Common Water Unit effort. Habitat connectivity will be evaluated by tracking the status of natural and human-created barriers that may block the movement of mountain sucker. Human-created barriers are most likely to be dams or culverts at road crossings.

Unit of Measure:

- Species Persistence (presence of mountain sucker at core sites)
- Species Recruitment (multiple-age classes)
- Species Distribution (occurrence at core sites and historic sites)
- Habitat Connectivity (presence of impassable barriers, e.g., dams/culverts)
- Habitat Quality and Quantity
    - site-specific parameters (channel width/depth, bank stability, etc.)
    - reach-specific parameters (e.g., drought-influenced flows, etc.)

Sample Design: Sites where mountain suckers currently occur, based on survey work since the early 1990s, would constitute “core” sites. Core sites that may exist on private lands may be randomly reestablished on adjacent National Forest System lands or in the vicinity of an IRI – Common Water Unit point. Sampling at these core sites will occur on a 2-3 year cycle to determine if the distribution of mountain sucker is being maintained and to see if recruitment is occurring. Sampling will occur during base flow periods, typically late summer through early fall, using a three-pass depletion method with block nets at the upstream and downstream end of a 100-meter stream segment. The actual number of mountain suckers collected at a site are expected to fluctuate year-to-year due to a variety of natural and human-related causes, such as drought and sampling bias.

Sampling at sites that historically (pre-1990) contained mountain sucker but where the species currently is not documented would be sampled less frequently than core sites to determine if the species is reoccupying previously suitable habitat. The Forest would also consider data from ongoing fish surveys conducted by the state resource agencies, primarily SDGFP or WGFD, to provide supplemental data on streams that are routinely monitored for the attainment of designated beneficial uses. These include tailwater reaches below dams on Castle, Rapid and Spring creeks that provide recreational fishing opportunities. It also includes streams such as Whitewood, Strawberry and Annie creeks and portions of Bear Butte Creek that contain mountain sucker, but where the watershed is primarily influenced my private landownership and/or mining activities.

Baseline conditions for habitat connectivity will be established by documenting existing barriers to fish passage based on aerial photos, Geographic Information System (GIS) data and/or on-the-ground surveys. Connectivity on perennial streams within the 5th-level watersheds currently and historically occupied by mountain sucker would be the first priority. Trend would be based on the addition or removal of instream structures that affect fish passage.

Stream habitat monitoring will resample points along streams containing mountain suckers using the IRI – Common Water Unit inventory methodology to determine long-term trend in stream physical characteristics. Additional data on overall watershed and riparian condition will be collected using the methods identified in the Watershed/Stream Health monitoring item. Habitat sampling may be less frequent than fish sampling. A qualitative stream inventory will occur seasonally, generally late fall/early winter, during drought years to determine if mountain sucker streams have dried-up.

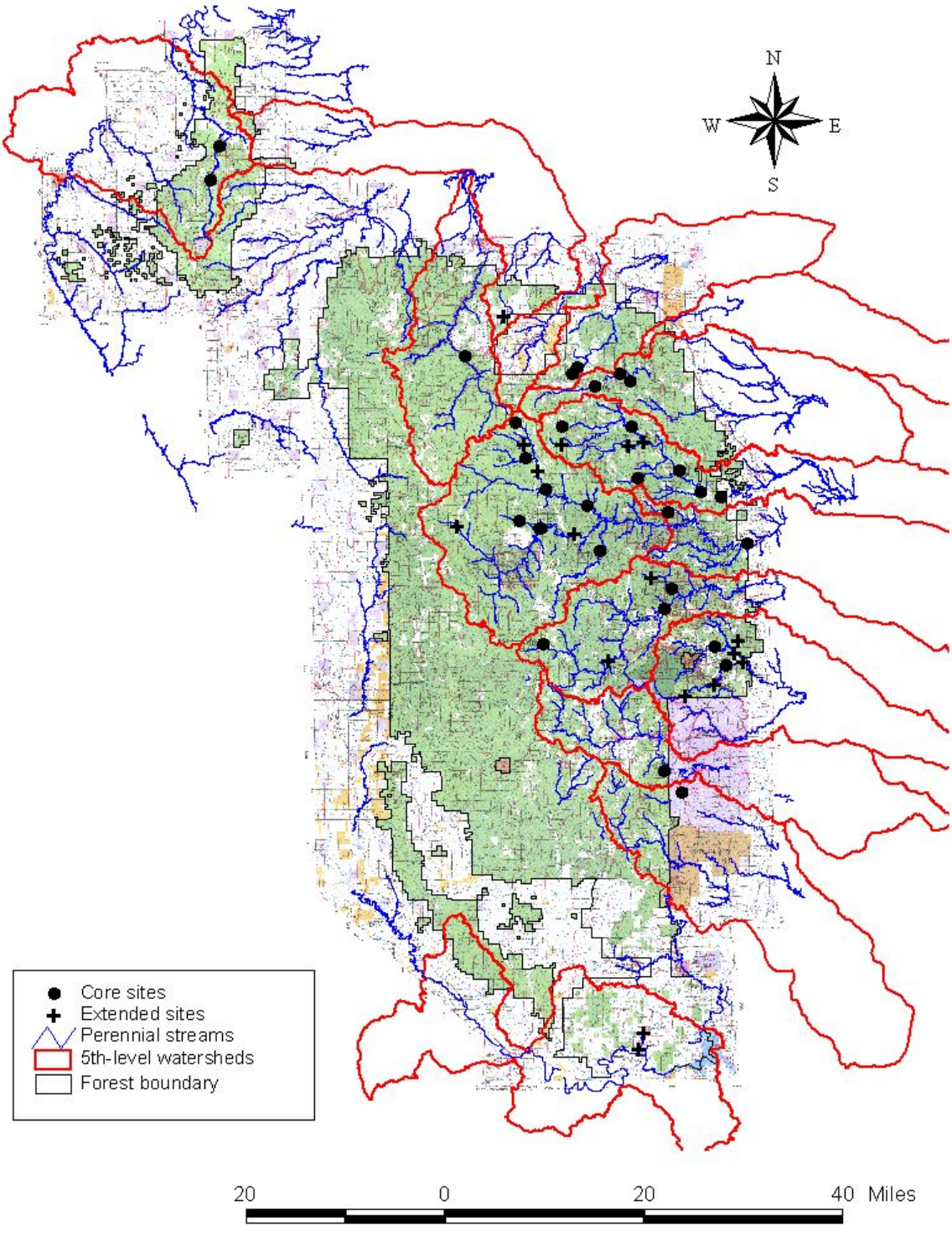
Data Precision and Reliability: Class A

Frequency of Reporting: Data will be reported in the year following the calendar year in which the data was collected.

Information Storage System: Mountain sucker population data will be stored in the Aquatic Biota module of the NRIS-Water database and/or in project files in hardcopy format in the District and/or Supervisor's office. The data will be shared with the South Dakota Department of Game, Fish and Parks and the Wyoming Game and Fish Department for entry into their respective databases at their discretion. Stream habitat data will be stored in the Aquatic Inventory module of the Forest Service's NRIS-Water database. Stream connectivity data will be stored in the INFRA database and/or the Aquatic Inventory module of NRIS-Water database.

Responsibility: Supervisors office, with occasional assistance from District personnel [A contract crew may be used to conduct the sampling].

Cost: Approximately $38,000 to sample core monitoring sites. This assumes a 5-person crew sampling 15 days and includes equipment, travel, vehicle and data analysis costs.



Mountain sucker monitoring sites.

Monitoring Item 22: **NOXIOUS WEEDS – Noxious Weeds, Species, Trend**

Authority: Level Two [36 CFR 222.8(b), Forest Plan Objective 231]

Indicators: Increase or decrease in total acres of infestation by species.

Method of Data Collection: General surveys for species of weeds present. Site visits to verify existence of weeds. In-depth survey of the extent of the infestation.

Unit of Measure: Acres of infestation by species

Sample Design: General field observations by Forest employees, with more intensive surveys of newly located infestations.

Data Precision and Reliability: Class B

Frequency of Reporting: 5 years

Information Storage System: Forest database

Responsibility: Generally requires information from all field going personnel of the Forest Service followed by more intensive site surveys. Monitoring may be performed by the Forest Service, permittees, or other interested parties. Methods that will be used by the permittees or interested parties are to be approved prior to data collection. Techniques that are widely used by the scientific community may be used if they are approved by the Forest Service. All data collected is subject to field checks and verification before it is accepted.

Cost: Costs borne by field personnel who observe infestations while performing other work. Additional cost of $5,000 per year to review and verify information.

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

Sub-Item: **Population**

Authority: Level Two [36 CFR 219.19(a)]

Indicators: insect and disease population or damage levels and trends

Method of Data Collection: Biological evaluations of insects and diseases of concern for project-level planning. Methods will vary depending upon insect or disease species. Walk-through and ground surveys of project areas for damage caused by insects or diseases, especially those such as Ips, root disease, and red turpentine beetle that may increase following disturbances.

Unit of Measure: Units of measure will vary depending upon insect or disease species being evaluated. May include number of insects per unit area, number of trees affected, acres affected, or other appropriate measure, and percent of change from year to year.

Number of trees affected per unit area by pest species.

Sample Design: Surveys for project-level biological evaluations will be designed and conducted as needed.

Data Precision and Reliability: class B

Frequency of Reporting: annually

Information Storage System: Forest Health Management survey reports, maps, annual monitoring report and corporate database.

Responsibility: Ground surveys and evaluations may be coordinated as needed between Forest/District personnel and R2 Forest Health staff.

Cost: R2 Forest Health Management and Black Hills National Forest.

Sub-Item: **Tree Mortality**

Authority: Level Two [36 CFR 219.27(a)(3)]

(This monitoring item may be useful for identifying insect killed trees for Objective 11-03, i.e. >1,000 acre blocks).

Indicators: tree mortality caused by beetles; evidence of defoliation.

Method of Data Collection: Aerial and ground surveys of tree mortality by beetles and observations of defoliation.

Unit of Measure: estimated acres, number of trees, and estimated timber volume; and estimated tree defoliation.

Sample Design: Aerial mapping of the forest conducted annually in late August or early September. Ground checks and surveys will be conducted as needed.

Data Precision and Reliability: class B

Frequency of Reporting: annually

Information Storage System: Forest Health Management survey reports, maps, annual monitoring report and corporate database.

Responsibility: R2 Forest Health Management and Black Hills National Forest.

Cost: R2 Forest Health Management and Black Hills National Forest.

Sub-Item: **Hazard**

Authority: Level Two [36 CFR 219.27(a)(3)]

Indicators: hazard rating for mountain pine beetle

Method of Data Collection: Ponderosa pine stands will be rated using the link to structural stages, see chart below:

Link Between Structural Stage and Insect Hazard

Structural Stage	Insect Hazard
1	Low
2	Low
3A	Low
3B	Medium
3C	High
4A>9 " QMD	Medium
4A<9" QMD	Medium
4B>9" QMD	High
4B<9" QMD	High
4C>9" QMD	High
4C<9" QMD	High
5	High

Unit of Measure: acres of ponderosa pine timber stands at low, medium and high hazard.

Sample Design: forest-wide hazard estimates are generated from the forest vegetation database. All forested polygons have structural stage.

Data Precision and Reliability: class B

Frequency of Reporting: annual for new projects and 10 years for new baseline

Information Storage System: Forest vegetation database, GIS, R2 Forest Health monitoring.

Responsibility: Forest personnel query and evaluation of vegetation.

Costs: The costs of biological evaluations conducted by the Rapid City Service Center staff is covered by the R2 Forest Health Management. The costs of forest vegetation database query and evaluation is by the National Forest.

Monitoring Item 24: *INSECTS AND DISEASE – Exotics*

Authority: [36 CFR 219.19(a)(3)] Level Two

Indicators: presence of gypsy moth life stage(s). Number of non-native organisms detected per unit area or sample unit.

Method of Data Collection: detection surveys using pheromone traps for new introductions of gypsy moth in high probability locations such as moderate to high use in developed recreation sites identified by Forest Health staff. Detection surveys for other insects and diseases as needed based upon knowledge of potential for introduction.

Unit of Measure: number and distribution of positive gypsy moth trap catches. May be displayed on maps. Number of gypsy moth egg masses or other life stages detected per unit area or sample unit. For other non-natives, numbers of insects, diseases or affected plants detected depending upon species involved.

Sample Design: Two gypsy moth detection traps per location for 30 locations on the Black Hills National Forest. Traps to be placed by early June each year, retrieved and checked in the following September. Detection surveys for other insect or disease introductions to be developed and conducted as needs arise.

Data Precision and Reliability: class B

Frequency of Reporting: annually

Information Storage System: Forest Health Management survey reports, maps, annual monitoring report and corporate database.

Responsibility: Forest Health staff will coordinate detection, delimitation and control programs on Forest land in cooperation with National Forest staff. Cooperation may also include appropriate state forestry and agricultural agencies.

Cost: R2 Forest Health Management and Black Hills National Forest.

Monitoring Item 26: **FIRE – Fuel Treatment**

Authority: Level Three

Indicators: Numbers of fuel treatment acres

Method of Data Collection: Actual project acreage using appropriate measurement and/or mapping techniques.

Unit of Measure: Acres

Sample Design: Actual project acres and determined by mapping exercise or field traverse. Acres will be reported by District Fire Management staff and stored in vegetation database.

Data Precision and Reliability: Class A

Frequency of Reporting: Annually

Information Storage System: Vegetation database (using ORACLE software) and NFPORS.

Responsibility: District and Forest Fire Management Officers

Cost: Most costs associated with forest inventory program of work. Additional cost of $1,000 per year to evaluate the data.

Monitoring Item 27: **FIRE – Prevention and Suppression**

Sub-Item: **Prevention**

Authority: Level Three

Indicators: Interagency involvement and or assessment of the following items:

Status of fire management agreements with partner agencies;

Involvement in interagency fire training exercises;

Involvement in pre-suppression and prevention activities;

Involvement in South Dakota Interagency Fire Council meetings and activities;

Effectiveness of the Custer Interagency Dispatch Center as assessed by fire management partners;

Assessment of suppression support afforded partners through ICS process and as might be identified through post fire reviews, reports or exit conferences;

All other information which might cast light on the Forests record of performance related to efficiency of operation in the fire management arena through interagency cooperation and prevention activities.

Method of Data Collection: Collect and document all information related to partnership activities within the Fire Management Program with particular emphasis on information related to monitoring indicators.

Unit of Measure: Narrative in Annual Report.

Sample design: Annually document the Forests' annual involvement in interagency fire management activities. Assimilate data making subjective comparisons of previous years activities and document in an annual report.

The Forest Fire Management Officer collects and or documents information related to the monitoring indicators and incorporates it into the Annual Monitoring Plan. Adjustments to the Fire Management Program are made as needed to maintain a high level of interagency involvement.

Data Precision and Reliability: Class B

Frequency of Reporting: Annually

Information storage system: Annual Monitoring Report

Responsibility: Forest Fire Management Officer

Cost: One week's time of Fire Management Officer, approximately $1,000 per year.

Sub-Item: **Suppression**

Authority: Level Three

Indicators: Documented deviation between the annual actual and the predicted wildfire acreage identified for the Most Efficient Level (MEL) fire management program as defined in the most current National Fire Management Analysis System (NFMAS) analysis for the Forest.

Annual wildfire losses which appear to establish a trend which is inconsistent with historical wildfire data from the period 1962 through the current monitoring year based on the current year fire weather data and number of ignitions.

Methods of Data Collection: Wildfire statistical information is recorded through individual fire reports by Fire Staff at each Forest Unit. The Forest Dispatcher serves as the clearing center for fire reports and enters the data into the FIRESTAT data base. FIRESTAT is the National wildfire data base located at Kansas City, Kansas. Weather data from Forest Weather Stations is archived through the Weather Information Management System (WIMS).

Unit of Measure: Number of fires and acres burned by wildfire.

Sample Design: The Forest Fire Management Officer compiles and reviews annual fire statistics, completes an analysis and documents conclusions in the Annual Monitoring report.

Data Precision and Reliability: Class A

Frequency of Reporting: Annually

Information Storage System: National Weather Information Management System (WIMS), the National Wildfire Database located at Kansas City, KS

Responsibility: Forest Fire Management Officer

Cost:

Data entry - $4,000 based on an average year.

Statistical analysis and report - $1,000 per year.

Monitoring Item 28: **FIRE – Non-emergency Watershed Condition**

Protocol will be developed at a later date.

Monitoring Item 29: **SCENERY – Scenic Integrity**

Authority: Level Three.

Indicators: Scenic Condition.

Method of Data Collection:

1. Computer simulations of proposed projects.

2. Review of project EAs, including an inventory of existing scenic integrity and discussion of established SIOs for project area. Photo control points may be established for critical viewing areas which may be affected by the project.

3. Field review of completed projects.

Unit of Measure: Existing Scenic Integrity and Scenic Integrity Objectives.

Sample Design:

SIO	% SAMPLE	% OF FOREST	REVIEW PROJECTS
High	100%	12%	3
Moderate	50%	42%	5
Low	10%	30%	1
Very Low	0%	16%	0

(Assuming 9 major projects needing review annually.)

Data Precision and Reliability: Class B

Frequency of Reporting: Annually for projects and 5 years for cumulative effects.

Information Storage System: District project files, SO scenic management files, Vegetation database and ARC/INFO

Responsibility: Landscape Architect and District Recreation Specialist.

Cost:

(9 major project review per year)x(2 people per review) = (18 person days)x($200 per day) = $3,600 per year.

Monitoring Item 30: **HERITAGE RESOURCES – Protection of Resources**

Authority:

Level Two - Sub-items 1,2,3,4 (36 CFR 219.24).

Level Three - Sub-items 5,6,and 7.

Indicators:

1. Heritage resources compliance process completed prior to signing of environmental decision document (comply with NEPA, NHPA and Chief's Direction).

2. Avoidance of mitigation requirements effectively implemented prior to, during, and after project (comply with NHPA/NEPA).

3. Inventories conducted to comply with Archeological Resource Protection Act, as amended 1988.

4. Protection of heritage resources listed in, or eligible for listing in National Register of Historic Places. May or may not be associated with project specific activities (comply with NHPA).

5. Number of heritage resource interpretive sites provided (include sites, signs, roadside pullouts, brochures, public participation opportunities, sponsorship of heritage activities, etc.)

6. Number of heritage resources stabilization and rehabilitation projects conducted (comply with NHPA).

7. Increase in heritage resources listed in the National Register of Historic Places (comply with NHPA).

Method of Data Collection: Field visits, Forest Heritage Resource Management Project Summary Forms and Annual accomplishment reports.

Unit of Measure:

1. Completion of NHPA compliance process before date environmental decision document is signed.

2. Field monitoring projects for proper implementation of avoidance or mitigation requirements.

3. Numbers and acres of inventory completed for project and non-project related areas.

4. Field monitoring NRHP eligible and listed heritage resources.

5. Interpretive sites and opportunities provided for the public.

6. Stabilization and rehabilitation projects conducted.

7. Increasing numbers of heritage resources listed on the National Register of Historic Places.

Sample Design:

1. Heritage resource work accomplished as indicated by Heritage Resource Management Project Summary Forms.

2. Field monitoring of NRHP listed heritage resources (ten sites annually and all sites every five years), five percent of NRHP eligible but unlisted heritage resources, and ten percent of projects completed on each district.

Data Precision and Reliability: Class A

Frequency of Reporting: Annually

Information Storage System: Forest Heritage Resources Database and hardcopy files.

Responsibility: Forest Historic Preservation Officer and District Heritage Specialists.

Cost:

INDICATOR NUMBER	DISTRICTS	S.O.	TOTAL
1. Compliance process completed	$2,000	$500	$2,500
2. Avoidance/Mitigation completed	$1,000	$200	$1,200
3. ARPA Inventory Compliance	$800	$200	$1,000
4. Annual Field Monitoring and Long Term Monitoring	$11,000	$1,500	$12,500
5. Interpretive Opportunities	$2,000	$500	$2,500
6. Stabilization and Rehabilitation Projects	$2,000	$500	$2,500
7. NRHP Nominations	$800	$200	$1,000

Monitoring Item 31: **WILDERNESS – Condition, Use and Trend**

Authority: Level Three, except for heritage resource Inventories (Level 2)

Indicators: Wilderness Condition.

Method of Data Collection:

Specific long term monitoring plans include:

1. Complete human impacted site re-inventory every 5 years, including Trail 9, Centennial Trail, and Harney Peak Lookout Complex.

2. Extensive social data survey summary, to determine trends of use, to be completed every 7 years.

3. Insect and disease inventory to be summarized every 7 years.

4. Harney Peak Lookout structural inventory to be completed and summarized every 7 years.

5. Outfitter Guide, special use impacts to be monitored and evaluated every 5 years.

6. Fire occurrence and effects will be evaluated for impacts on wilderness every 5 years.

Annual monitoring process: All management personnel, outfitter guides, and special use permittees will monitor trail and human impacted site conditions during the course of their travels. Specific short term monitoring plans include:

1. Forage utilization (horses) to be monitored annually in transition areas, trailheads and horse staging areas (to be determined).

2. Monitoring of overall use patterns, activities and level of use will take place annually.

3. As a minimum, (transition) trail and destination point (Harney Peak) encounters will be monitored weekly during June, July, and August. Intermediate monitoring, at least once a month, to occur on transition trails and at Harney Peak Lookout area the rest of the year.

4. Heavily used areas will be inventoried annually and changed noted and summarized. Sites containing human impacted areas that violate standards will be rehabilitated and posted. They will be monitored at two- and five- year intervals to determine the effectiveness of managerial actions. Human impacted sites closed due to violations of standards will be monitored annually. Closures will be in effect until conditions are acceptable (lower 1/3) of the range for each indicator.

5. Those trails exceeding trail encounter standards will be monitored for 15 days throughout the season. This monitoring will verify that the standard is, in fact, exceeded before any management actions are initiated.

Unit of Measure: Recreation Visitor Days, trail encounters, trail conditions, helicopter overflights, campsite conditions, condition of Harney Peak Lookout, water quality and user satisfaction surveys.

Sample Design: Long term and short term monitoring as described above.

Data Precision and Reliability: Class B

Frequency of Reporting: 5 years

Information Storage System: S.O. Black Elk Wilderness Files.

Responsibility: Wilderness Group Leader

Cost: Long term priorities: $23,500

Annual priorities: $24,000

Monitoring Item 32: **RECREATION – Recreation Opportunities**

Authority: Two (36 CFR 219.21a).

Indicators: Variety of Recreation Opportunities

Method of Data Collection: Field review of management areas.

Unit of Measure: Acres of Recreation Opportunity Spectrum (ROS) and Recreation Visitor Days (RVDs) by activity.

Sample Design: Utilize data collected by other agencies to identify trends in various activities. For example, state game agencies for hunting and fishing use, and state highway departments for road traffic use.

Data Precision and Reliability: Class A

Frequency of Reporting:

Monitoring	**Frequency**
ROS Review	Annually

Information Storage System: District project files, Vegetation data base, Recreation Information Management System and Infrastructure.

Responsibility: Forest and District Recreation Specialists

Cost:

Estimated cost is $7,000, or approximately 5 percent of the general area recreation budget..

Monitoring Item 33: **RECREATION – Recreation Use, Trend and Demographics**

Authority: Level Two (36 CFR 219.21a).

Indicators: Condition and Use of Recreation Facilities

Method of Data Collection: On-site questionnaires for visitor's use; campground fee collection data; incident reports of vandalism; visual observations by FS and concession personnel; random surveys by site; marketing surveys; and hazard tree analysis.

Unit of Measure: Facility condition; number of public comments; number of vandalism incidents; amount of use in each site by design type; and site use figures in Recreation Visitor Days.

Sample Design: 100% sample using fee receipts at fee sites and randomly selected sample survey at non-fee facilities

Data Precision and Reliability: Class A

Frequency of Reporting:

MONITORING	FREQUENCY
Facility Condition	5 Years
Customer Report Cards	5 Years
Recreation Use	Annually

Information Storage System: Management Attainment Report, Recreation Information Management System, and Infrastructure Database.

Responsibility: Forest and District Recreation Specialists

Cost*:*

Estimated cost is $25,000 or approximately 5 percent of the developed recreation annual budget.

Monitoring Item 34: **ACCESS – Road Mileage**

Authority: Level Three

Indicators: Miles of Forest Development Road, Locations of Entrance Devices, Electronic Quads. (Each of these indicators already has a system in place for measurement.)

Method of Data Collection:

Use the Transportation Database, which tracks changes in the Forest Development Road system. Also track the attributes of new roads, changes to existing roads, travel management actions, and road obliterations. This data uses GPS as much as possible to identify the location of road facilities.

Unit of Measure: Miles of road by management category. Number and type of travel management devices and their effectiveness.

Sample Design: Monitor annually the Forest Development Road system to classify roads as follows:

FDR Maintenance Levels 1, 2, 3, 4, 5

FDR Miles constructed

FDR Miles reconstructed

FDR Miles under Forest Service jurisdiction

FDR Miles under local government jurisdiction

FDR miles obliterated

FDR Miles open year long, seasonally for low clearance vehicles

FDR Miles open year long, seasonally which are accessible to high clearance vehicles only

Data Precision and Reliability: Class A

Frequency of Reporting: Annually

Information Storage System: Cartographic Feature Files, Infrastructure or the Region 2 Transportation Feature File

Responsibility: Transportation Coordinator

Cost:

Most of the costs are borne by engineering zone roads engineers during normal project area planning and transportation inventories. Additional $3,000 per year to conduct field reviews and evaluate data.

Monitoring Item 35: **ACCESS – Off-Road Vehicle Access**

Authority: [36 CFR 295.5]

Level Two

Indicators: Acres, Physical Location, Locations of Entrance Devices, Electronic Quads, Signing (Each of these indicators already has a system in place for measurement.)

Method of Data Collection:

1. Conduct field reviews of travel management actions to assess their effectiveness in meeting resource management objectives.

2. Conduct field reviews of areas receiving concentrated use to assess whether resource damage is excessive and warrants a change in management strategy for the area.

Unit of Measure: Acres available year long or seasonally and their location.

Sample Design: Monitor annually acres by off-road motorized vehicle use management strategy as follows:

Acres open year long with no restrictions
Acres open seasonally with no restrictions
Acres closed year long
Acres closed seasonally.
Acres and number of areas where, due to unacceptable resource damage, off-road vehicle management should be re-evaluated.

Data Precision and Reliability: Class A

Frequency of Reporting: Annually

Information Storage System: GIS - travel management layer

Responsibility: Off Road Vehicle Coordinator

Cost: Most of the costs are associated with travel management inventories. Additional $3,000 per year to conduct field reviews and evaluate data.

Monitoring Item 36: **ACCESS – Trail Opportunities**

Authority: [36 CFR 295.5]

Level Two

Indicators: Miles, Miles of Trail by User Type, Trail Development (Each of these indicators already has a system in place for measurement.)

Method of Data Collection:

1. Use the transportation inventory, which maps the location of changes to the forest trail system. Also track the attributes of trails, changes to existing trails, trail travel management, new trails, and trail obliterations. This data uses GPS as much as possible to identify the location of trail facilities.

2. Conduct field reviews of trail travel management actions to assess their effectiveness in meeting resource management objectives.

Unit of Measure: Miles of trail forest wide, Miles of trail by user type

Sample Design: Monitor annually the forest trail system to classify trails as follows:

Forest development trail miles constructed

Forest development trail miles reconstructed

Forest development trail miles obliterated

Forest development trail miles by user type

Trails where user conflicts exist or where user type constraints are not effective, or where unacceptable resource damage is occurring .

Data Precision and Reliability: Class A

Frequency of Reporting: Annually

Information Storage System: Trail coverage in ARC/Info of Infrastructure

Responsibility: Forest Trail Coordinator

Cost:

Most of the costs are associated with transportation inventories. Additional $1,000 per year to conduct field reviews and evaluate data.

Monitoring Item 37: **ACCESS – Right-of-Way Acquisition**

Authority: Level Three

Indicators: Number of right-of-way cases, Miles of acquisition. (Each of these indicators already has a system in place for measurement.)

Method of Data Collection:

Use the transportation inventory, which maps the location of changes to the Forest Development Road or Trail system due to right-of-way acquisition. Also track the attributes of acquired roads or trails. This data uses GPS as much as possible to identify the location of road facilities.

Unit of Measure: Number of Right-of-Way Cases, Miles of road acquired as Forest Development Roads or Trails.

Sample Design:

Number of right-of-way cases completed

Miles of Forest Development Road or Trail acquired in right-of-way cases.

Miles of Forest Development Road or Trail conveyed to other jurisdiction in right-of-way cases.

Data Precision and Reliability: Class A

Frequency of Reporting: Annually

Information Storage System: Cartographic Feature Files, Road and Trail Management Objectives, Infrastructure or the Region 2 Transportation Feature File.

Responsibility: Forest Lands Coordinator

Cost: Most of the costs are associated with transportation inventories. Additional $1,000 per year to conduct field reviews and evaluate data.

Monitoring Item 38: **REAL ESTATE – Land Adjustment**

Authority: Level Three

Indicators: Acres, Physical Location, Net Change in National Forest ownership each Fiscal year (Each of these indicators already has a system in place for measurement.)

Method of Data Collection:

1. Track acres acquired, acres conveyed, and the net change in National Forest lands for each Fiscal year. Track these same three items for those lands in the pipeline for exchange.

2. Track those parcels that change ownership or are proposed for exchange using GIS and an appropriate database.

Unit of Measure: Acres

Sample Design:

List acres acquired, acres conveyed to other ownership, and the net change to National Forest ownership in each Fiscal year.

List acres by these same three categories that are actively being considered for exchange in the future.

Data Precision and Reliability: Class A

Frequency of Reporting: Annually

Information Storage System: Cartographic Feature Files and an associated database.

Responsibility: Forest Lands Coordinator.

Cost: Most of these costs are associated with the normal program of work for land adjustment.

Monitoring Item 39: **ECONOMIC EFFICIENCY – Cost**

Authority: Level Three

Indicators: Dollars expended, benefits received.

Method of Data Collection: Through Forest Service Accounting reports.

Unit of Measure: Dollars

Sample Design: Through accounting procedures.

Data Precision and Reliability: Class A

Frequency of Reporting: Annually

Information Storage System: Forest Service accounting reports.

Responsibility: Forest Budget Coordinator and Forest Economist

Cost: Costs associated with accounting programs. No additional costs for Forest Plan monitoring.

Literature Cited

Backlund, D. 2004. American dipper news for 2004. http://www.sdgfp.info/Wildlife/Diversity/dipper/index.htm. Accessed Sept. 1, 2005. South Dakota Dept. Game, Fish and Parks, Pierre.

Carlsen, R.E. 1977. A trophic state index for lakes. Limnology and Oceanography 22(2): 361-369.

Harrelson, Cheryl C; Rawlins, C. L.; Potyondy, John P. 1994. Stream channel reference sites: an illustrated guide to field technique. Gen. Tech. Rep. RM-245. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.

Huxoll, C. 2005. Big game harvest projections, 2004 annual report. South Dakota game report no. 2005-03. South Dakota Dept. Game, Fish and Parks, Pierre.

Isaak, D. J., W.A. Hubert and C. R. Berry, Jr. 2003. Conservation assessment for Lake Chub, Mountain Sucker, and Finescale Dace in the Black Hills National Forest, South Dakota and Wyoming. USDA Forest Service, Black Hills National Forest, Custer, SD. http://www.fs.fed.us/r2/blackhills/projects/planning/assessments/index.shtml

Juntti, T. and M. Rumble. 2004. Arc habitat suitability index computer software. Draft general technical report. USDA Forest Service Rocky Mountain Research Station, Rapid City, South Dakota.

McDowell, B. 2004. E-mail message dated April 1, 2004 from Bob McDowell, Wyoming Game and Fish Department, Sheridan, WY to Steve Hirtzel, Black Hills National Forest, Custer, SD regarding finescale dace in the Bear Lodge Mountains, WY.

Panjabi, A. 2004. Point transect protocol for monitoring the birds of the Black Hills. Rocky Mountain Bird Observatory, Brighton, CO. 28pp.

Sandrini, J. 2005. 2004 job completion report. Species: white-tailed deer, Herd Unit: Black Hills. Wyoming Game and Fish Department, Cheyenne.

USDA Forest Service. 1996. Rangeland Analysis and Management Training Guide. Rocky Mountain Region. August 1996.

USDA Forest Service. 2005. Black Hills National Forest 2004 Monitoring and Evaluation Report. United States Department of Agriculture, Forest Service. http://www.fs.fed.us/r2/blackhills/projects/planning/2004Monitor/2004_mon_rpt_all.pdf

WGFD (Wyoming Game and Fish Department). 1996. Belle Fourche River Basin Plan. Plan Number FXSN8BF. Sheridan Region Fisheries Management Crew. pp 27.

Woodbridge, B. and C.D. Hargis. 2005. Northern goshawk inventory and monitoring technical guide. USDA Forest Service, Washington, D.C. 62pp.