

**APPENDIX B
DESIGN CRITERIA
MITIGATION MEASURES
AND
MONITORING**

APPENDIX B – DESIGN CRITERIA, MITIGATION MEASURES, AND MONITORING

Specific design criteria, mitigation measures, and monitoring procedures described herein have been developed to be used as part of the action alternative. It may be determined that certain Federal, State, local, or other permits, cooperative agreements, MOUs, etc., are necessary or required as part of implementing Slate Castle Project Area project actions. The appropriate documentation will be obtained prior to initiation of applicable actions.

Soil and Water Resource Design Criteria

Management requirements and design criteria are incorporated in the project design to reduce the impacts of the proposed project on the soils and watersheds. All management requirements and design criteria are designed to insure compliance with USFS Region 2 Watershed Conservation Practices (WCPs) and South Dakota BMPs, both of which are Forest Plan management requirements. South Dakota Forestry BMPs will be applied as the absolute minimum protection requirement. Timber sale layout crews, contract preparers, Sale Administrators, fire and fuels managers, and engineering personnel should consult the Zone Hydrologist prior to operations to identify site-specific needs.

1. Minimizing Soil Disturbance (Mass movement, erosion, and compaction):

- Restrict roads, landings, skid trails, concentrated-use sites, and similar soil disturbances to designated sites to limit additional soil disturbance. (R2 WCP Management Measure 13a; Forest Plan Guideline 1104, Standard 1105, 1112).
- Existing landing locations should be used, except where located within stream or riparian buffers or meadows that contribute to waters of the United States. Roads should also be used as landings where practical versus creating new locations. Minimize landing size and number to the minimum needed. (Forest Plan Standard 1105, 1306; Guideline 4111).
- Keep heavy equipment out of ephemeral drainages and swales to the extent practical in order to prevent soil rutting and compaction in these drainages (R2 WCP Management Measure 3c).
- Ground-based equipment operations within and immediately surrounding hardwood stands and “spruce bottoms” should take place during frozen conditions. Frozen conditions are those where at least 2 inches of frozen soil or at least 1 foot of packed snow is present. (R2 WCP Management Measure 13b, 13d).
- Skidding through hardwood stands and “spruce bottoms” should also be minimized, except at designated crossings, in order to protect the moist soils in these areas and prevent soil compaction and riparian disturbance. (Forest Plan Guideline 1104; Standard 1113, 1306).
- Off-road, ground-based equipment operations should take place during dry or frozen conditions. Dry soil conditions are when the soil moisture is below the plastic limit – if the soil can be rolled into 3 mm threads or larger without breaking or crumbling, the soil moisture exceeds the plastic limit. Frozen conditions are those where at least 2 inches of frozen soil or at least 1 foot of packed snow is present. In certain instances, low-impact equipment or equipment operations on slash may be used with close monitoring, where site-specific conditions allow. (R2 WCP Management Measure 13a, 13b, 13d; Forest Plan Guideline 1104).

- Avoid soil-disturbing actions during periods of heavy rain or wet soils in order to prevent rutting, compaction, erosion, and sediment delivery to streams. Apply travel restrictions to protect soil and water until soil has dried out. (R2 WCP Management Measure 9b; Forest Plan Guideline 1104).
- On areas with potential for slope failures, ground-based equipment operations, including temporary roads, road construction, and off-road travel, should be avoided to prevent slope failures. A map of these locations is attached to the Soil and Water Resources Report in the project file. Large, contiguous areas intended for vegetation management will require suspended logging systems (i.e. cable logging). If access across small, isolated areas is absolutely necessary, the Zone Hydrologist should be consulted prior to work to identify a stable travel route, if possible, and any necessary mitigation measures. (R2 WCP Management Measure 9g; Forest Plan Guideline 1108).
- Manage land treatments to limit the sum of severely burned and detrimentally compacted, eroded, and displaced land to no more than 15% of any land unit (R2 WCP Management Measure 13; Forest Plan Standard 1103). If, during or following implementation of activities, Timber Sale Administrators or Soils personnel find detrimental soil disturbance levels have exceeded the 15% threshold, rehabilitation actions will be taken to improve soil conditions with a net improvement in soil quality (Forest Plan Standard 1106, 1109, 1110, Guideline 1111). Such actions could include, but are not limited to: scarifying skid trails and/or landings to alleviate soil compaction; adding slash to scarified surfaces to aid in hydrologic recovery; and seeding and fertilizing the site to aid in revegetation.
- If machine piling of slash is done, conduct piling to leave topsoil in place and to avoid displacing soil into piles or windrows. (R2 WCP Management Measure 14b).
- Conduct prescribed fires and pile burning when soil and humus are moist to minimize fire intensity and soil heating (Forest Plan Standard 1103, 1112).
- Minimize the amount of fire line necessary to conduct prescribed burns safely (Forest Plan Standard 1105).
- Build firelines with rolling grades and minimum downhill convergence. Outslope or backblade, permanently drain, and revegetate firelines immediately after the burn. Use certified local native plants as practicable; avoid persistent or invasive exotic plants. (R2 WCP Management Measure 11h; Forest Plan Standard 1106, 1109, 1110; Guideline 1111, 4106).
- Design landings to have proper drainage. After use, rehabilitate landings by scarifying, seeding, and fertilizing (R2 WCP Management Measure 9j; Forest Plan Standard 1106, 1109, 1110; Guideline 1111, 4106).

2. Maintain Soil Nutrients and Coarse Woody Debris (CWD):

- Shelterwood and group-selection harvest units on soils with low organic matter should retain 50% or more of fine logging slash (less than 3 inches in diameter) in the unit (Forest Plan Standard 1102a). Fine slash should be evenly distributed throughout the unit, avoided large concentration areas. Slash should be left over-winter prior to burning except where this would contradict with WUI objectives.
- To ensure soil productivity is maintained, silvicultural and burning prescriptions would be developed to retain 5-10 tons/acre of coarse woody debris on site after harvest and slash disposal, except where this would contradict with WUI objectives. CWD should be

dispersed throughout the unit and should include both a diversity of size and decay stages. (Forest Plan Guideline 2307).

3. Protected Stream Courses and Wetland/Riparian Buffers:

Streams, wetlands, riparian areas, wet meadows, and fens will have protective buffers on all sides in order to comply with Region 2 Watershed Conservation Practices, Forest Plan Standards and Guidelines, and State BMP requirements.

- Protected Stream Courses include all perennial and intermittent streams. These include but are not limited to the following streams in the project areas: South Fork Rapid Creek, Solomon Gulch, Smith Gulch, Poverty Gulch, Castle Creek, Bittersweet Creek, Crooked Creek, Whitetail Gulch, Dougherty Gulch, Lind Gulch, Wheeler Gulch, Bobcat Gulch, Pony Gulch, South Slate Creek, Slate Creek, Frink Draw, Gooseberry Draw, Friday Gulch, California Gulch, Spruce Gulch, Skull Gulch, Horton Gulch, Spaw Gulch, and other un-named channels. A map of Protected Stream Courses is attached to the Soil and Water Resources report in the project file (Forest Plan Guideline 1115).
- All known wetlands and riparian areas, and protected stream courses within harvest units will be identified on the Sale Area Map, and Timber Sale Contract Standard Provisions B(BT)6.5# and Special Provision C(CT)6.50# will be used to control purchaser's activities near streams, riparian areas and other wetlands. Timber Sale Contract Standard Provisions B(BT)6.422# and B(BT)6.6# would be used to restrict equipment use in wetlands that may be discovered during implementation of logging activities. (Forest Plan Standard 1113, 1301; Guideline 111, 3212).
- A 100-foot buffer in the Water Influence Zone (WIZ) will be established on either side of Protected Stream Courses, wetlands, riparian areas, fens, and other wet areas. Management activities can still occur within the WIZ as long as activities are done carefully and in such a manner as to limit damage to riparian vegetation, soil disturbance, rutting, sediment delivery to waters, etc. (Forest Plan Standard 111, 1301, 1302; Guideline 1115, 3212).
- Ground-based equipment operations should be avoided within the 50-foot buffer, the Streamside Management Zone (SMZ) surrounding streams, wetlands, and riparian areas. Fell trees in a way that protects vegetation in the SMZ from damage. Ensure at least one-end log suspension in the SMZ. Yard logs up out of each filter strip with minimum disturbance of ground cover. (R2 WCP Management Measure 10d; Forest Plan Standard 1113, 1301, 1302, 1306; Guideline 1115, 3212).
- Silvicultural prescriptions for treatment areas adjacent to streams and within floodplains should be written to protect riparian vegetation such as spruce and willows, and to provide sufficient remaining trees to provide shade-cover for maintaining stream temperatures in support of assigned beneficial uses pertaining to coldwater fisheries. This is especially applicable to the following coldwater fisheries streams: Rapid Creek, South Fork Rapid Creek, Bittersweet Creek, California Gulch Creek, Castle Creek, North Fork Castle Creek, Crooked Creek, Friday Gulch Creek, Frink Draw Creek, Lind Gulch Creek, Skull Gulch Creek, Spruce Gulch Creek, Slate Creek, and South Slate Creek. Consult the Zone Hydrologist when developing treatment prescriptions that affect these streams.

- Avoid any loss of rare wetlands such as fens and springs. (R2 WCP Management Measure 6e). Fens will be avoided completely during all seasons within the 50-foot SMZ buffer. Ground-based equipment operations should be avoided within the 100-foot WIZ buffer to the extent possible. No landings or designated crossings should be located within the 100-ft WIZ buffer around fens. (Forest Plan Standard 1113, 1301, 1302, 1306; Guideline 1115, 3212).
- Do not disrupt water supply or drainage patterns into wetlands. Avoid long-term reduction in organic ground cover and organic soil layers in any wetland (including peat in fens). (R2 WCP Management Measure 6a, 6c).
- Landings should be located outside the 100-foot WIZ buffer for all streams, wetlands, riparian, and other wet areas (Forest Plan Standard 1113, 1301, 1302, 1306; Guideline 1115, 3212). Landings that are scheduled for burning should not be located in meadows that contribute to waters of the United States (Forest Plan Guideline 4111).
- Skid trails should be located outside the 100-foot WIZ buffer to the extent possible, except for designated crossing locations. (Forest Plan Standard 1113, 1301, 1302; Guideline 1115, 3212).
- Avoid crossing Protected Stream Courses to the extent practical. If a stream crossing is absolutely necessary, the Zone Hydrologist(s) should be consulted to identify a stable crossing location and any site-specific mitigation needs. (Forest Plan Standard 1113, 1201, 1301; Guideline 9107, 9108).
- Do not excavate earth material from or store excavated soil, fill, or other debris in any WIZ buffer, Protected Stream Course, wetland, riparian areas, floodplains, or drainage bottoms (including swales) except where engineered stream crossings are installed. (R2 WCP Management Measure 3m, 11a; Forest Plan Standard 1113, 1201, 1301, 1302).
- Do not build firelines in or around streams, lakes, wetlands, and other wet areas within the 100-ft WIZ buffer unless needed to protect life, property, or wetland features. Use hand lines with minimum feasible soil disturbance. Use wetland and riparian features as natural firebreaks if practicable. Retain organic ground cover in filter strips during prescribed fires. (R2 WCP Management Measure 6f, 10e).

4. Stream Crossings:

- Access routes that do not involve establishing new stream crossings should be used to the extent practical. (Forest Plan Standard 1113, 1201; Guideline 9107, 9108).
- Avoid creating permanent low water crossings or “fords” of streams. Install temporary cabled-concrete mats (or similar temporary, armored ford structure) at existing un-improved, low-water crossings. (Forest Plan Standard 1113, 1201, 1304; Guideline 9107, 9108).
- Rapid Creek, Castle Creek, and Slate Creek stream crossings: No additional permanent culvert or ford (low-water) stream crossings should be established on these perennial streams. Temporary bridge crossings may be established on these streams if cross-stream access is necessary and unavailable through existing routes. (Forest Plan Standard 1113, 1201; Guideline 9107, 9108).
- New and replacement stream crossing structures will be designed to pass flood flows, sediment, and bedload, as well as provide for aquatic organism passage. Stream crossings will meet U.S. Army Corps of Engineers and State permits where applicable. Install stream crossings on straight and resilient stream reaches, as perpendicular to flow as practicable,

and to provide passage of fish and other aquatic life. Engineering personnel should work with Watershed personnel to appropriately size and place structures. (R2 WCP Management Measure 4a, 4b, 4c; Forest Plan Standard 1201, 1203, 1304).

- Install stream crossings to sustain bankfull dimensions of width, depth, and slope and keep streambeds and banks resilient. Favor bridges, bottomless arches or buried pipe-arches for those streams with identifiable flood plains and elevated road prisms, instead of pipe culverts. Favor armored fords for those streams where vehicle traffic is either seasonal or temporary, or the ford design maintains the channel pattern, profile and dimension. Temporary bridges or vented fords (fords with pipes to pass low flows) are potential options where appropriate depending upon traffic use. Temporary bridges should be installed and removed seasonally. Temporary fords should be removed when the need for the crossing no longer exists. (R2 WCP Management Measure 4d).
- The floodplain adjacent to the stream channels should receive minimal fill associated with stream crossing structures to limit floodplain constriction and allow for flood passage. (Forest Plan Standard 1113, 1201).
- Equipment used to install, maintain, or replace stream crossing structures should work from stream banks as much as possible and avoid working in the stream itself. Equipment crossings during construction should be minimized. (Forest Plan Standard 1113, 1201).
- Installation and construction work should be accomplished during low stream flows to minimize sediment transport downstream. Temporary coffer dams or routing of water around the site may be necessary. (Forest Plan Standard 1113, 1201).
- Discharge of dredged or fill material shall not take place between October 15 and April 1, when water flow is present, in the following streams identified as supporting coldwater fisheries: Rapid Creek, South Fork Rapid Creek, Bittersweet Creek, California Gulch Creek, Castle Creek, North Fork Castle Creek, Crooked Creek, Friday Gulch Creek, Frink Draw Creek, Lind Gulch Creek, Skull Gulch Creek, Spruce Gulch Creek, Slate Creek, and South Slate Creek (SDDENR, 1999; SD Army Corps of Engineers, Regional Requirement). These activities are typically bridge or culvert placement at road-stream crossings. This regional condition meets the mandatory provision to avoid discharges into spawning areas if practicable alternatives exist (33CFR§323.4). Consult the Fisheries Biologist prior to stream crossing installations on these streams for site-specific design needs.
- Remove temporary crossings, including all fill material in the active channel and floodplain, within one year following end of use and prior to unit acceptance as complete. Restore the channel geometry (width and depth) and channel slope to match natural, stable conditions. Re-vegetate the channel banks using certified local native plants as practicable; avoid persistent or invasive exotic plants. (R2 WCP Management Measure 12a, 12b; Forest Plan Standard 1113, 1201, 9105).

5. Fuel Breaks:

- Silvicultural prescriptions for fuel breaks along streams and within floodplains shall be written to protect riparian vegetation such as spruce and willows, and to provide sufficient remaining trees to provide shade-cover for maintaining stream temperature in support of assigned beneficial uses, particularly coldwater fisheries.
- Fuel breaks along streams and within floodplains will avoid ground-based equipment operations to protect soil and water resources within the 100-ft WIZ.

- Refer also to Design Criteria for protected stream courses, operations on areas with slope failure potential, landing locations within riparian buffers, stream crossings, operations in hardwood stands, and operations adjacent to fens.

6. Roads and Trails:

- Construct roads on ridge tops, stable upper slopes, or wide valley terraces if practicable. Stabilize soils onsite. End-haul soil if full-bench construction is used. Avoid slopes steeper than 70%. (R2 WCP Management Measure 9a).
- Avoid new roads or heavy equipment use on unstable or highly erodible soils. Retain stabilizing vegetation on unstable soils. (R2 WCP Management Measure 9e).
- Construct roads where practicable, with outsloped and rolling grades instead of ditches and culverts. (R2 WCP Management Measure 9d).
- Temporary roads will be rehabilitated within one year following completion of use to prevent soil erosion and sediment delivery to streams and wetlands. Site-prepare, drain, de-compact, re-vegetate, and close temporary and intermittent use roads and other disturbed sites. Provide stable drainage that disperses runoff into filter strips and maintains stable fills. Do this work concurrently. Stockpile topsoil during construction where practicable to be used in site restoration. Restore cuts and fills to the original slope contours where practicable and as opportunities arise to re-establish subsurface pathways. Rehabilitation work can include pulling displaced topsoil back onto the route, scarifying, full or partial slope re-contouring, water bars, slash placement, entrance blockades, stream bank stabilization, and seeding as site-specific conditions dictate.
- Install and maintain drainage structures on roads, temporary roads, skid trails, and landings throughout use and following completion of activities (Forest Plan Standard 1113, 1114).
- Existing road segments immediately adjacent to fens and wetlands: road segments that are identified as access or haul routes for timber harvest activities that are adjacent to fens will receive road surface armoring to minimize erosion and sediment transport to fens. Rolling dips will be installed on either side of the fen areas to direct road runoff away from fens. Erosion control devices such as silt fence, wood-straw bales, and/or fiber rolls will be installed parallel to the road edge to prevent sediment delivery to fens. (Forest Plan Standard 1113, 1201, 1301, 1302, Guideline 1115, 3212).
- Road segments included in the closure orders for Solomon Gulch (FSR 124 between private lands and the junction with 124.1A; 124.1B, and 124.1C) and along the Rochford Cemetery Fen (FSR 127.1B) are not available for timber harvest operations, including equipment mobilization or demobilization, skidding, temporary roads, hauling, or access by support vehicles (refueling, repair, etc). Timber Sale Contract preparers will note these routes as restricted on Sale Area Maps.
- During winter operations, maintain roads as needed to keep the road surface drained during thaws and break-ups. Perform snow removal in such a manner that protects the road and other adjacent resources. Do not use riparian areas, wetlands or streams for snow storage or disposal. Remove snow berms where they result in accumulation or concentration of snowmelt runoff on the road or erodible fill slopes. Install snow berms where such placement will preclude concentration of snowmelt runoff and will serve to rapidly dissipate melt water. (R2 WCP Management Measure 11j).

Monitoring for Soil and Water Resources

- Monitoring of soil disturbances and coarse woody debris within ground-based harvest units as part of BMP reviews and/or Forest level monitoring.
- Monitoring of implementation and effectiveness of design criteria, including WCPs and BMPs.
- Monitoring of fens for integrity of organic ground cover and organic soil layers, plant community composition and structure, soil structure, water levels, and drainage patterns.
- Monitoring of success of revegetation efforts on disturbed sites such as skid trials, landings, temporary roads, and road cuts/fills.

Transportation

Transportation improvements with the Slate Castle project are proposed to begin during the 2009-2010 construction season. The following recommendations should be considered during project implementation:

- Road closure devices, including gates, barriers, slash or other devices needed to prohibit or eliminate use, would be located on the ground to provide the most effective means of accomplishing the desired travel management strategy.
- Physical closures, such as slash, stumps, rocks and revegetation are to be used to eliminate use. Earthen barriers may be used when there is not adequate material available for slash, stumps or rock closures. This will be done after activities, to allow use of a road by the purchaser, or as funds become available. Closure gates may be utilized where administrative access is needed.
- Whenever possible, roads shall be relocated or constructed out of draw bottoms to improve drainage and protect soil and water resources. Abandoned roadbeds shall be revegetated and returned to as natural a state as possible.
- All temporary roads and newly constructed system roads used to access harvest units would be closed after management activity is completed, unless Road Management Objective states otherwise.
- Where sod and vegetation have effectively stabilized existing roadbeds, efforts would be made to minimize disturbance to the sod layer during maintenance and reconstruction activities.
- Unauthorized roads used for temporary access will be closed/decommissioned after use as part of the commercial logging operations.
- Coordination between Botanist, Hydrologist, Silviculturist and Engineering is required for any road reconstruction or realignment for U180012 in the northern section of the project area.
- NFSR 656 and NFSR 388 will get plating material placed in locations determined by Engineering, Hydrologist, Botanist and Archeologist to protect sites during log hauling activities. The specialists listed will identify these areas in the field.

Route verification will be held by engineering, prior to road contract preparation, to show Forest and District Specialists the exact location of planned relocation, realignment and new construction to ensure the road will not have additional adverse effects on the resources.

Mitigation Measures

Maintenance on all roads used for timber harvest will be the responsibility of the Timber Purchaser for the life of the Timber Sale Contract. Maintenance includes cleaning out silt from sediment collecting ponds and depositing it in upland locations, keeping silt fence upright and functioning by cleaning out any sediment collected in front of the silt fence and depositing it in upland locations, keeping all drainage structures clear and functional, eliminating erosion of cut and fill slope and roadway soils, maintaining vegetative buffers, encouraging revegetation, and blading road surfaces. Post use maintenance is required by the Purchaser as part of the Timber Sale Contract.

Best Management Practices (BMP) Site Specific Concerns

Below is a list of specific soil and water problems identified during inventory and reviewed by the District Hydrologist and Transportation/Road Engineer. The existing areas of concern do not fully meet some BMP and design guidelines. (See Appendix D and E, for the BMP and Design Guidelines). These roads may not be utilized during project implementation, depending on the alternative selected. If the roads are used, the proposed corrective action will be included in the road design.

<u>Road Number</u>	<u>Area of Concern</u>	<u>Proposed Corrective Action:</u>
181, East of Castle Peak CG	Road is located too close to Castle Creek in spots and road fill/creek bank is being washed into the creek.	Realign road to move away from creek and place large size rip rap to support creek bank/road fill. Restore creek bank and channel to its natural state.
181, West of Castle Peak CG	The road has drainage crossings where the culverts washed out and drainage flows down the road during heavy rain.	Replace culverts with adequate size culverts, install hardened low water crossings and raise the road elevation where water runs down the road. Restore creek bank and channel to its natural state.
182	The road is located in and near the drainage bottom and has numerous drainage crossings that are not adequately designed	Relocate road to move out of drainage and providing a vegetative buffer between the drainage bottom and the road. Coordinate proper crossing design with Hydrologist.
182.1C	Bride at NFSR 181 intersection was removed.	Design and install proper crossing structure with Hydrologist recommendation if needed for access.
187.2G	There are multiple live water crossings and some areas of the roadway are developing ruts.	Design and install proper crossing structure with Hydrologist recommendation
231.1A	A small seasonal stream is flowing down and eroding the roadway.	Design and install proper crossing structure with Hydrologist recommendation
241	There are multiple live water crossings; the road is located very close to an intermittent creek	Design and install proper crossing structure with Hydrologist recommendation

	located around the Dougherty Spring area.	
241.1C	Some areas of roadway are in drainage bottom.	Reconstruct and realign to protect drainage.
242	Road is located on flat terrain with numerous culverts. Water ponds on the road and eventually seeps into drainage, depositing sediment.	Relocate where feasible and plate road surface to maintain surface material and keep sediment from depositing into the drainage.
300.1D	Live stream crossing.	Design and install proper crossing structure with Hydrologist recommendation
443	Live stream crossing and water is pooling on roadway in some areas.	Design and install proper crossing structure with Hydrologist recommendation
428	The road is located in and near the drainage bottom and has numerous drainage crossings that are not adequately designed	Relocate road to move away from the drainage providing a vegetative buffer between the drainage bottom and the road. Coordinate proper crossing design with Hydrologist.
428.1N	Seasonal/Intermittent stream is flowing in roadway.	Design and install proper crossing structure with Hydrologist recommendation

Closure/decommissioning of roads used for logging operations will be closed by the Timber Purchaser as part of the post use maintenance activities. Cost to close these roads will be included in the timber sale maintenance appraisal.

Monitoring Recommendations

Implementation monitoring of road maintenance, reconstruction and new construction activities will be accomplished through site inspections conducted by District personnel and certified Engineering personnel to ensure contract specifications and road designs are implemented as described in the road contract. Measured and visual monitoring would determine physical effects, success of natural and enhanced revegetation, and to ensure traffic safety and compliance with state and federal laws.

Forest Service Road Damage Guidelines would be adhered to in order to limit soil movement and road damage during hauling activities. (Road Damage Guidelines are found in USDA-FSH, 2409.15 – Timber Sale Administration Handbook, Chapter 50, Specified Transportation Facilities, Black Hills Supplement No. 2409.15-92-1)

Minerals

- Maintain access to unpatented mining claims per the 1872 Mining Laws and amendments.
- Protect all mining corner posts and active mining developments.
- Protect all documented National Forest System lands boundary, corners, posts, and bearing trees.

Vegetation

Monitoring Recommendations

The objective of monitoring for the silvicultural resource will be to: Insure that decisions made as a result of the analysis are implemented; and determine the effects of harvest activities and related treatments identify adverse impacts and mitigate if necessary.

During timber sale layout and marking, inspections will be made to insure that marking and layout follows decisions made and mitigations outlined in the analysis. These inspections will be made by the presale shop and outlined in their inspection reports. During the layout and marking process the district silviculturist, or silviculture technician acting on his behalf, will inspect the layout and marking process to provide assistance with interpretation of marking and layout guides and remedy site specific changed conditions that may occur. Minor changes involving stand inclusions will usually require changing marking techniques, while major changes will be evaluated and recommendations made to the District Ranger to determine the appropriate course of action.

The Forest Service Representative (FSR), Timber Sale Administrator (TSA) and/or Sale Inspector (SI) will administrate the Timber Sale Contract and harvesting. During the timber harvesting activities, additional inspections will be made by the district silviculturist and/or silviculture technician to insure harvest activities are accomplishing the objectives and mitigation specified. Inspections will also provide feedback for future project analysis.

All stands treated with shelterwood removals will be examined after harvest to determine if planned treatments were successful in establishing a new stand or if additional treatments are needed to reforest the stand. Upon completion of the timber harvesting activities, a post sale review will be conducted to determine if objectives in the analysis were essentially achieved and if additional silvicultural treatments are needed or if planned post sale silvicultural treatments may not be needed. Regeneration surveys will be conducted to see if site preparation, seeding or planting may be necessary. Upon completion of the surveys, the district silviculturist will certify those stands that have adequately regenerated. Stands that have regeneration failures will be scheduled for either site preparation or artificial regeneration.

Records of surveys and findings generally will be recorded and filed in the district stand files located at the Rapid City office of the Mystic Ranger District. Summaries of accomplishments will also be reported electronically in the FACTS database on the Black Hills National Forest for upward reporting and district use.

Fire and Fuels

Prescribed burn plans will address burning concerns related to smoke, risk of escape, scenic appearance, and air quality. There are several required elements that are addressed when writing a burn plan. The elements describe when, under what conditions, and what the expected and desired outcomes are for the burn. The most important of these elements describe the conditions under which a burn can be conducted and are based on parameters such as temperature, relative humidity, wind speed and direction, and smoke dispersal requirements. The difficulty and

complexity of a prescribed burn are determined by a very site specific analysis, which dictate number of firefighters, equipment, and contingency resources required to conduct the prescribed burn. These elements must be documented in a burn plan that is reviewed for technical adequacy and approved in writing by the District Ranger prior to initiation of the burn.

Smoke impacts can be minimized utilizing the following design criteria and are incorporated into the burn plan as appropriate.

- Burn when duff fuel moistures allow for complete combustion or when fire will generally be limited to the surface fuel layer to lower particulate emissions.
- Limit the size of burn blocks and construct sub-unit fire lines to allow for burning to be stopped if smoke concerns arise.
- Specify transport winds by speed and direction to keep smoke from sensitive receptors.
- Require minimum mixing heights to ensure smoke emissions disperse and do not pool.
- Determine end ignition times to ensure fuels consumption. This will help reduce smoke emissions during night time.
- Provide notification and attempt to determine public in areas that may be adversely affected by smoke concentrations.
- Set up contingency notification list in case smoke dispersion forecast is inaccurate to inform the local public.
- Prescribed fire implementation along busy travel routes and highways requires special mitigations that may include signing and/or emergency vehicles to slow and warn traffic or possible hazards.

Monitoring Recommendations

Monitoring of fuel treatments and prescribed burns will be completed within one to five years post treatment as specified in the fuel treatment plans and prescribed fire plans. Long term monitoring may be necessary to determine the effectiveness of treatments in meeting resource goals and objectives.

Range and Noxious Weeds/Invasive Plants

- Range improvements and fences to be protected by the service/logging contractor during the life of the service contract or forest products sale will be delineated on the contract map. Fences need to be kept intact during the grazing season to keep livestock in authorized use areas. Water developments, if damaged, need to be maintained to provide water for livestock and prevent erosion from discharging water. If a service contract or product sale is active, any fence crossings created by the contractor needs to be repaired or other methods used (e.g., install cattleguard) before cattle move into a pasture. Some stock ponds have substantial drainages, which need to be maintained and cleared of debris during and after service or product sale activities.
- If MPB mortality, vegetation activities, or prescribed fire treatments remove natural barriers to cattle distribution, or create roads or trails which allow cattle to enter portions of an allotment not previously accessible, fences, gates, cattleguards, slash or other devices will be needed to control livestock distribution as defined by the Allotment Management Plan.

- Use integrated weed management practices, in accordance with Management of Control of Noxious Plants on the Black Hills National Forest (FONSI, January 18, 2003) and Forest Plan standards and guidelines, to provide timely treatments of noxious and invasive weeds.
- Consider the use of a biological control (e.g., Aphanthia flea beetle) insect mix in the Leafy spurge areas and Canada thistle insects as a means of integrated noxious weed control over a 3 to 5 year period.
- To reduce the potential for noxious and invasive species establishment, initiate re-vegetation as soon as possible, not to exceed 6 months after termination of ground-disturbing activities. Re-vegetate all disturbed soils with native species in seed/plant mixtures that are noxious weed free. On areas needing immediate establishment of vegetation, non-native, non-aggressive annuals (e.g., wheat, oats, rye) or sterile species may be used while native perennials are becoming established, or when native species are not available ... Other aggressive non-native perennials (e.g., smooth brome, timothy) will not be used. Seed will be tested for noxious weeds. If mulches are used, they are to be noxious-weed free. Weed free alfalfa seed may be used only when native legume seed is not available and only when there is extensive disturbance associated with road construction or mine reclamation where top soil is no longer available (Standard 1110).
- Use certified noxious weed-free seed, feed, and mulch. Seed will be tested for noxious weeds at the time of purchase (Standard 4306). Monitor and treat areas within the perimeter of the project area and adjacent to known private land weed infestations.

Monitoring Recommendations

- Monitor known disturbed soil locations that occurred during timber sale efforts.
- Monitor for effectiveness of using the integrated noxious weed management approach such as field verification, GPS/GIS data records, and local generated spray sheets, for control of invasive weed species. Information collected from spray sheet and GPS data have proven an increase of noxious weeds through past timber sale and recreational ground disturbance. Treat as soon as practical and funding permits for noxious weeds and follow-up action need to be 3 to 5 years after initial treatment.
- Monitor and treat known disturbed soil locations due to prescribed burning. Reseed area of disturbed ground with noninvasive annual grasses and perennial native grasses to reduce the potential for noxious and invasive weeds establishment. Treat immediately for noxious weeds and follow-up action needs to be 3 to 5 years after initial treatment.

Wildlife/Biodiversity

The measures included herein apply to all action alternatives, and are considered an integral component of this specialist report. The effects for each species are contingent upon, to varying degrees, implementation of mitigation measures. Any modification to these mitigation measures shall be reviewed by a wildlife biologist or ecologist. A thorough documentation of the effects to all species potentially affected by changes in design measures will be completed and placed in the Slate Castle Project file. Documentation will include a review of the determination of effects to each species, and amendment of determinations, if necessary.

Specific design criteria and mitigation measures described herein have been developed to be implemented as part of the action alternatives. Some mitigation measures not included here are Forest Service standard operating procedures. An example would be the standard provisions of a Timber Sale Contract and road design specifications. Other mitigation measures not included here are additional Forest Plan Standards and Guidelines too numerous and lengthy to include here (including but not limited to those relating to water, soils, riparian areas, travel and transportation, noxious weeds, and livestock grazing). Project implementation will incorporate all Forest Plan Standards and Guidelines, with the exception of those identified for site-specific amendment in the Record of Decision.

Design Criteria/ Mitigation Measures Common to All Action Alternatives

Species of Local Concern (SOLC)

Any SOLC species located after contract or permit formation will be appropriately managed by active coordination between permittee, contractor, or purchaser, Forest Service line officer, project administrator, and biologist. Viable solutions will be based on circumstances surrounding each new discovery and must consider the individual sensitive species needing protection, contractual obligations and costs, and mitigation measures available at the time of discovery (Standard 3115).

Manage known sensitive species and species of local concern snail colonies to prevent adverse effects caused by management activities (Standard 3103). Management activities include vegetation treatment, road maintenance, construction or reconstruction, noxious weed treatment, prescribed fire and livestock grazing.

Prior to prescribed burns and noxious weed treatment, surveys for regal fritillary and tawny crescent butterflies will be completed during the breeding season to determine if localized populations exist within the treatment area. If found, such activities should occur after host plants are no longer needed for butterfly life cycle (September through April), (Guideline 3105).

Prescribed fire used in native butterfly habitat should have clear objectives developed to enhance and protect sensitive butterfly host and nectar species (Guideline 3105).

Use of herbicides and pesticides should be limited to target areas (individual plant or group of plants) instead of broadcast treatments (Standard 4304). Other means of Integrated Pest Management that do not involve the use of herbicides or pesticides (e.g. biological control agents) should be considered to treat noxious weeds (Guideline 4302).

Defer prescribed burn units from livestock grazing for at least one year after burning to ensure re-growth of forage species, butterfly host and nectar species, and soil stabilization (Guidelines 3105 and 4107).

Do not locate landings or slash piles in hardwood stands or inclusions unless no alternative sites are available. Do not locate skid trails in hardwood stands or inclusions unless and until all other

options have been explored. When there is no option but to locate a skid trail in such a site, limit the number and length of skid trails to those that are necessary to accomplish objectives.

Locate slash piles that are scheduled for burning out of grasslands, meadows, and riparian areas to protect from invasion of non-native species and loss of habitat for butterfly species.

Snags. During treatment of hardwoods for regeneration and with District Wildlife Biologist review, retain live hardwoods that show signs of cavity nesting where this will not conflict with management objectives (e.g. regeneration) (Guideline 2204).

All soft snags should be retained unless they are determined to be a safety hazard (Standard 2305). All such snags should be designated as leave trees prior to treatment. Existing snags will be protected during prescribed burning where feasibility and safety permits. Snags determined to be a safety hazard should be felled and left in place.

Retain at least six hardwood snags per acre in hardwood stands. Retain all snags in hardwood stands with snag density of less than six per acre. (Standard 2301b).

Retain all snags greater than 20-inch dbh unless a safety hazard. If snag densities within a project area do not meet objective 211, retain all snags unless they are a safety hazard. If large snags (> 14 in dbh) are not available, retain snags in the largest size class available (Standard 2301a).

Minimize the length of time during which temporary roads are open to facilitate timber harvest and other management activities to minimize removal of standing dead and large down woody debris for fuelwood. Remove only those trees that pose a safety hazard along roads that will be open (seasonally or yearlong) to the public.

Cutting of standing dead trees for fuelwood is prohibited, except in designated areas (Standard 2304).

Dead and Down Woody Debris. Leave large woody debris on harvested or thinned sites to help retain moisture, trap soil movement, provide microsites for the establishment of forbs, grasses, shrubs, and trees, and to provide habitat for wildlife (Guideline 2307). On conifer forested sites, retain an average of at least 50 linear feet per acre of coarse woody debris with a minimum diameter of 10" DBH (Standard 2308a).

Northern Goshawk. From April 1 through August 15, minimize additional human caused noise and disruption beyond that occurring at the time of nest initiation (e.g. road traffic, timber harvest, construction activities) within one-half mile of all active goshawk nests up until the nest has failed or fledglings have dispersed. (Standard 3111).

Other Raptors. Protect known current and historic raptor nests (Standard 3204). Any active raptor nest (other than goshawk) discovered during sale layout, sale operations, or post sale treatments will be reported to the District Wildlife Biologist for evaluation. Modifications to Forest Service contracts, and or mitigation measures such as seasonal or other restrictions (e.g. April 1 – August 15) may be required to protect the nest.

Riparian Habitats. Avoid disturbance (e.g. road building, trail building, skid trails), non-commercial and commercial harvest adjacent to and within riparian communities (Standards 1304 and 1306, and Guideline 3212). Buffer distance from riparian habitats will vary on a site-specific basis, and will be determined based on topography, vegetation community, etc.

Prohibit motorized vehicles from entering streams except at specified points (Guidelines 9107 and 9108).

Use of chemicals in riparian and wet meadow areas should be evaluated for effects to butterfly host and nectar species, and to riparian shrubs and other plant species. Other means of Integrated Pest Management that do not involve the use of herbicides or pesticides (e.g. biological control agents) should be considered to treat noxious weeds (Guideline 4302).

Maintain slash and large woody debris within riparian communities (Guideline 3212). Boundaries of riparian habitats will vary on a site-specific basis, and will be determined based on topography, vegetation community, etc. Large woody debris and slash should not block stream flow or spring flows in these areas.

Caves and Mines. Avoid ground disturbance within 100 feet of an opening of a natural cave (Standard 1401). In addition, avoid ground disturbance within 500 feet of caves or abandoned mines identified as being used by bats (Standard 3207). Slash shall not be piled at the entrance of caves or mines.

Protect caves or mines identified as bat nurseries or hibernacula, and their microclimates when designing management activities (e.g. timber harvest, road construction, recreation facilities, trail construction). Protect known bat day and night roosts (Standard 3102).

Use seasonal closures for known nursery roosts and hibernacula where there are conflicts with people (Standard 3208). Close roads and/or trails to such sites if not needed for public access to arterial or collector roads, or private land.

Protect and monitor known areas of high bat use, including water sources and feeding sites.

Any caves or mines discovered during sale layout, sale operations, or post sale activities will be reported to the District Wildlife Biologist and District Archaeologist for evaluation. If determined that the site may be suitable bat maternity or hibernation habitat, buffers will be maintained to protect the microclimate of the site (Standard 3207).

Monitoring Recommendations

The Forest Plan identifies specific items to be monitored, and the Monitoring Implementation Guides (USDA Forest Service 2005b, 2006b) describes monitoring protocols that have been established for numerous habitat components and emphasis species, as directed by the Forest Plan. The Monitoring Implementation Guide identifies frequency and methods of data collection, unit of measure, sampling design, expected precision and reliability, reporting frequency, data storage location, and costs for each monitoring item identified by the Forest

Plan. For additional information, refer to the Forest Plan (Chapter 4), and the Monitoring Implementation Guides. Refer to the annual Monitoring Reports (USDA Forest Service 1998 - 2007) for results and additional information. Additional monitoring for USCPA is recommended below and its intent is to contribute to Forest wide monitoring efforts.

Caves and Mines. Monitor mines and caves if identified as maternity/hibernacula for bat use, and determine if mitigation measures were effective to maintaining suitable habitat for bats. Goal is to monitor summer and winter habitat trends by determining presence/absence of bat species during critical habitat roosting times.

- Monitoring objective item: Sensitive Animal Species
- Forest-wide Monitoring Item: 18c – Bats
- Monitoring procedure: Winter and Summer Surveys
- Frequency/duration of monitoring: During and post harvest activities every two years

Snails. Monitor various limestone cliffs and outcrops and Frest Survey areas where known snail colonies exist or where suitable snail habitat is present to determine if design criteria were effective in maintaining mesic habitat components for land snails and the continued presence of rare snails.

- Monitoring objective item: Sensitive Species/MIS Species
- Forest-wide Monitoring Item: 18h – Snails and 7a Vegetative Diversity – Species Composition
- Monitoring procedure: Snail sampling/presence absence, Site data includes vegetative composition, site characteristics, percent ground disturbance, and amount of ground litter present.
- Frequency/duration of monitoring: During and every two years post treatment activities.

Vegetative Diversity. Monitor the effects of treatments, including prescribed fire and their associated activities that are geared to restore hardwoods, grasslands, riparian habitat and increased understory forage. Monitor for the effectiveness of design criteria and mitigation to reduce the effects of treatments on MIS, SOLC, and Sensitive Species.

- Monitoring objective item: MIS, SOLC and Sensitive Species.
- Forest-wide Monitoring Item: 18b, 19 and 21
- Monitoring procedure: Walk-through visits to select treated stands. Determine if conifer component was significantly reduced, if hardwoods have responded to treatment (growth and vigor) and if treatment activities have increased the potential for expansion of invasive species. Site data includes species use, vegetative composition, site characteristics, percent ground disturbance, and amount of ground litter present.
- Frequency/duration of monitoring: Three years post treatment activities.

Goshawk. Monitor the effectiveness of silviculture treatments on historic and known goshawk territories to determine if nesting habitat will be available within the next 10 years and the effects of MPB on nest stands. Goal is to provide suitable nesting habitat (4B, 4C or 5) with large overstory components and structural diversity (pockets of dog hair) long-term after MPB populations have decreased.

- Monitoring objective item: Sensitive Species/MIS Species
- Forest-wide Monitoring Item: 18i - Goshawk
- Monitoring procedure: Walk-through visits to select treated stands. Determine crown closure and overall age of stand, and nest site suitability (i.e., wind intercept, large nest

trees). Monitor known nest sites for presence/absent and nest success. Site data includes vegetative composition, site characteristics, percent ground disturbance, and amount of ground litter present.

- Frequency/duration of monitoring: Every year if funding allows

Fish. Monitor the stream crossings for any barriers to fish passage, sediment loads, and stream macro-invertebrate presence to determine the effects of treatments and associated activities on fish habitat. Include in this monitoring the effectiveness BMPs and Forest Plan standards to provide adequate protection of in-stream habitat.

- Monitoring objective item: Water quality and Non-point Pollution
- Forest-wide Monitoring item: 21– MIS (Mountain Sucker) and 4, 6 and 7 (Watershed Health and Riparian Habitat)
- Monitoring procedure: Conduct field reviews to determine if road design and mitigation measures are effective meeting MIS objectives for Fish
- Frequency/duration of monitoring: Route Verification, Post Road Improvements/Construction and Post treatment activities (2nd and 4th year).

Botany

The design criteria included herein apply to all action alternatives, and are considered an integral component of the Slate Castle BA/BE. The determinations of effects for each species are contingent upon, to varying degrees, implementation of design criteria. Any modification to these design criteria will be reviewed by a botanist or biologist. A thorough documentation of the effects to all species potentially affected by changes in design criteria will be completed and placed in the Slate Castle Project file. Documentation will include a review of the determination of effects to each species, and amendment of determinations, if necessary.

Specific design criteria described herein have been developed to be implemented as part of the action alternatives. Some design criteria not included here are Forest Service standard operating procedures. An example would be the standard provisions of a Timber Sale Contract and road design specifications. Other design criteria not included here are additional Forest Plan Standards and Guidelines too numerous and lengthy to include here (including but not limited to those relating to water, soils, riparian areas, travel and transportation, noxious weeds, and livestock grazing). Project implementation will incorporate all Forest Plan Standards and Guidelines, with the exception of those identified for site-specific amendment in the Record of Decision.

- Mechanical treatments will be avoided in unique botanical sites. These are small patches of habitat, generally in drainage bottoms or wet meadows. Skid trail and road construction will also be avoided in these areas. If ground disturbing activities cannot be avoided, a botanist will be available and consulted during layout of the unit to ensure a minimal amount of impact. Additionally, moist soils and riparian areas are protected during timber harvest and road-building on National Forest Land under Best Management Practices and Forest Service Manual 2509.25.
- Mechanical disturbance may occur outside of designated treatment areas (e.g., landings and skid trails). These areas will be located away from unique botanical sites. If these

areas cannot be avoided, a botanist will be available and will be consulted during layout of the unit to ensure a minimal amount of impact to habitat.

- Control lines associated with prescribed burn units will avoid unique botanical sites. If control lines (hand or dozer) intersect with unique botanical sites, a botanist will be available and will be consulted during design of burn plans to ensure minimal amount of impact to suitable habitat.
- Staging and parking of trucks and heavy equipment will not occur within unique botanical areas. If these areas cannot be avoided, a botanist will be available and will be consulted during layout of the unit to ensure a minimal amount of impact to habitat.
- During broadcast prescribed burn, application of drip-torch fuel will be avoided in unique botanical sites. The fuels used to disperse flame can introduce long lasting toxins into the area that can inhibit growth of sensitive plants. Flames can be allowed to creep into these sites, but direct application of fire will be avoided.
- Road construction and conversion activities will avoid unique botanical sites. If these areas cannot be avoided, a botanist will be available and will be consulted during layout of the unit to ensure a minimal amount of impact to habitat.
- Within six months of completion of ground disturbing activities including skid trails, landing sites, and burned piles, revegetation of the area will be initiated using the approved native seed mix (see Standard 1110). The impacts of non-native plant invasion following ground disturbance can be minimized if the treated area is seeded with native plant species soon after mechanical treatment or burning (Haskins & Gehring 2004). The following approved seed mix has been developed for the Black Hills for the elevations found within the project area. It will be applied at 20 pounds per acre. All seeds will be certified weed free.

25% Slender wheatgrass (*Elymus trachycaulus*)
30% Annual ryegrass (*Lolium multiflorum*)
10% Canada wildrye (*Elymus canadensis*)
10% Canby bluegrass (*Poa canbyi*)
20% Green needlegrass (*Nassella viridula*)
5% Purple prairie clover (*Dalea purpurea*) or American vetch (*Vicia Americana*)

Travel and Recreation Use

Mitigation and Design Criteria Common to All Alternatives

- All skid trails and temporary roads will be effectively closed and seeded when they are no longer needed.
- Avoid removing vegetation of any kind within sight distance of existing gates or other physical barriers that currently close roads. If this is not possible, large boulders shall be installed to effectively restrict motorized access.
- Do not use the Mickelson Trail for skidding trees or haul routes. Any haul routes should cross these trails at a perpendicular angle rather than following or paralleling the trail.
- All road and trail signing will be protected from project activities, or replaced if removed or damaged.

Monitoring Recommendations

Monitoring Objective/Item: Road Closure Effectiveness.

- Monitoring procedure: Field reconnaissance.
- Frequency/duration of monitoring: Every two years or on an as needed basis.

Monitoring Objective/Item: Off-Road Vehicle Use (acres, location, signing, effectiveness and appropriateness of closures).

- Monitoring procedures: GIS/GPS records of use based on field inventory and reviews.
- Frequency/duration of monitoring: Annually.

Monitoring Objective/Item: Effectiveness of Travel Management Restrictions.

- Monitoring procedure: Field verification.
- Frequency/duration of monitoring: 1-5 years post-treatment.

Scenery

Follow the most current Black Hills NF “Visual Marking Guides & Map” - at the time of project layout & marking implementation.

Transition Zones – Treatments around private lands, in forested areas, should blend with the current condition on those lands, where possible. Adjust transition zones, and incorporate leave islands to reduce impacts to meet a Moderate SIO in the following stands: 061207-6, 061207-19, 061207-16, 061206-1 & 2, 061206-5, 061207-10, 50, & 51, 20, 061601-19 & 060903-89, 060903-75, 060903-78, 060403-26, 061601-20 & 061601-19, 061207-7, 061207-22, 060903-44, 060903-73, 060401-4, 060401-5, 060401-12, 060402-14, 060903-23

Trails – Break up large blocks of the same type of treatments by leaving a variety of size and age classes near the trails. A Basal Area range of 40 to 80 should be maintained along both sides of the trail for at least 100 feet, in forested areas.

Skidding and hauling logs on the Deerfield or Mickelson Trail should be avoided. Any damage to the trail will be repaired and the trail restored to its original condition. As noise also negatively effect viewing pleasure, non-commercial thinning treatments should be done during the winter (November thru March).

Piling of slash and or thinning materials should be done as far away from the trail as possible so as to reduce the visual impact and to protect the residual basal area left along the trail from burning.

In all units along: Forest Service Road 17 (Deerfield Road segment), the Mickelson Trail, County Roads: 318 (Mystic Road), T308 (Deerfield-Tigerville Road), 307 (Slate Prairie Road), and Forest Development Roads (FDR): 297 (Medicine Mtn Road), 300 (East Slate Road), 181 (Castle Creek), 231 (South Rapid Creek), and the Deerfield Trail #40 the following should be used:

- Where possible along the roads and trails, remaining vegetation should be in a variety of sizes and spacing to maintain a more natural appearance. This technique has been very effective in maintaining a natural appearance.

Lands and Special Uses

- Provide access routes as needed to utility companies for utility line new construction, reconstruction, and maintenance of existing rights-of-ways corridors.
- Protect all documented National Forest System lands boundary corners, posts, and bearing trees.

Heritage

Local Native American groups have been contacted and responses solicited concerning this project. On-going consultation with members of the local Native American community would aid in identification of specific locations and issues of concern. Any identified religious or sacred site would be protected in accordance with the Native American Religious Freedom Act (P.L. 95-341). Additionally, contemporarily used Native American resource areas would be identified and protected, and perpetuation of traditionally used flora and fauna encouraged by Forest Service land management.

Guideline 6101 provides for the consideration of long-term Forest Management needs in determining appropriate use of mitigation of effects to, or avoidance of, heritage resources during project planning. Heritage sites located within treatment areas will be marked according to specifications provided in FS Manual 2309.24 and FSH 2361.28. Marked heritage sites will be avoided during mechanical tree thinning, firewood collecting, fire line construction, road maintenance, and other land disturbing activities associated with the proposed treatments.

It is recognized heritage resources may be present in the subsurface with no surface manifestation. Therefore if additional heritage resources are discovered during earth disturbing (i.e. timber thinning) activities, all operations must cease within a 300 ft. (100 meter) radius of the site and a forest archeologist notified immediately. Any additional heritage resources located during project implementation will be protected based on recommendations of the district archaeologist and State Historic Preservation Officer. All sites will be evaluated under the terms specified in 36 CFR 60.4 and 36 CFR 800 and applicable Forest guidelines [FP Guidelines 4102, 6101, 6106] (USDA Forest Service 2001). If a heritage resource site is damaged during project implementation, work at and within the immediate vicinity of the site will cease until a Forest Service archaeologist evaluates the damage, make stabilization recommendations, and determines what additional protective measures are needed to protect the site. Project work will not restart until authorized by either the District or Forest Archaeologist.

No timber cutting or related activities (skidding, decking, etc.) will be allowed within a 35-meter perimeter of the designated site boundary. No new road construction will be allowed within 35 meters of the site boundary. Existing roads through the site will not be improved. Logging trucks and heavy equipment will not drive through or park within the site boundary, except within existing road prisms. During the planning stage, all proposed road construction through known site areas will be checked on the ground. On-the-ground flagging of the construction effect through known sites will be checked and confirmed. Once confirmed, the District needs to decide which mitigative steps seem most appropriate given the spatial/vertical extent of the NRHP-significant site and its historic values. Additional archeological fieldwork may be required in certain instances to address these issues. The management choices then resolve down to mitigation through data recovery versus mitigation through avoidance. The latter could include permanently capping the site (or portions thereof) that exhibits the significant historic values (i.e., site preservation).

In order to protect known sites and mitigate damage to sites that may be discovered during ground disturbing activities, a special contract provision, *Protection of Heritage Resources*, will be included to assure that such resource damage during harvest operations is minimized. This provision requires the purchaser to protect all known, identified, or discovered historic, architecture, or prehistoric sites, buildings, objects, and properties related to American History, archaeology, and culture against destruction, obliteration, removal or damage during purchaser's operations. The purchaser shall immediately notify the Forest Service if damage occurs to any Heritage resource and immediately halt operations near the resource where damage occurred until the Forest Service authorizes the purchaser to proceed. If such damage is negligently or willfully caused by the purchaser's operations, the purchaser shall bear the costs of an investigation and restoration in accordance with 36 CFR 296.14(c), provided that such payment shall not relieve the purchaser from civil or criminal remedies otherwise provided by law. The Forest Service may unilaterally modify or cancel a contract to protect an area, object of antiquity, artifact, or similar object that may be entitled to protection.

Heritage sites with exposed burnable material will be protected by manually removing surrounding/interior fuels, foaming wooden structures, building fire lines around sites, using back-fires or a combination of measures to be determined on-site by the District or Forest Archaeologist, depending on the site's location. If no protective measures can be effectively applied, sites will be avoided during prescribed burning activities. Each of the proposed prescribed burn areas has protected sites within the boundaries. These areas will need to be avoided by broadcast burn activities. Some pile burning may occur within or adjacent to the protected sites with coordination with the district archeologist. A detailed information packet will be available for these fuel reduction projects, and on the ground identification of the site boundaries will be accomplished by the heritage resource staff prior to implementation. All Forest Service and out-service personnel who may be working in the area of a site will be advised that under the provisions of 36 CFR 261.9, the following are prohibited: digging in, excavating, disturbing, injuring, or destroying any archeological, paleontological or historic site; or removing, disturbing, injuring, or destroying an object in such a site.

There are no known caves in the analysis area. There are a number of rock shelters in the area, and some appear to be suitable bat habitat, as well as containing cultural deposits. As per

Guideline 1401, these resources will be managed to protect or enhance biological, cultural, ecological, hydrological and physical characteristics. Mines are located in the Slate Castle Project area. Protection measures will be implemented and the locations identified during any ground disturbing activity. Mines that represent potential hazards for public safety have been identified. Mines with potential for bat habitat, have been identified to the district wildlife biologist for further review (Guideline 3209).