

## APPENDIX B: MITIGATION MEASURES

This appendix is a summary of the mitigations referred to in Chapter 3. It is broken out into four separate sections: Mitigations Common to all Alternatives; Unit Specific Mitigation Measures; Mitigations Unique to Alternative 2; Mitigations Unique to Alternative 4

### Mitigations Common to all Alternatives

<b>Resource</b>	<b>Mitigation</b>
<b>GEOLOGY</b>	In karst areas (Minnelusa, Paha Sapa, or Madison Limestone), consider special precautions in operating plans to avoid damage to significant cave resources”.
	All cave entrances will be protected. If cave entrances are located during the planning or operations of this project, there will be a 500 foot avoidance zone at the entrance where no activities will occur. Cave entrances will be identified on a map and provided to the district Recreation Specialist and Wildlife Biologist for monitoring purposes.
	SDBMP IIA4: Locate roads on stable geology, including well-drained soils and rock formations that tend to dip into the slope.
	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. (FSH 2509.18).
<b>SOILS</b>	Maintain or improve long-term levels of organic matter and nutrients on all lands. Forest Guideline 1102/WCPHB Standard 14
	Forest Standard 1112/WCPHB Standard 2: Manage land treatments to maintain enough organic ground cover in each land unit to prevent harmful increased runoff. Maintain the organic ground cover of each land unit so that pedestals, rills and surface runoff from the land unit are not increased.
	Forest Guideline 1104/WCPHB Standard 6: Minimize soil compacting by reducing off-road passes, by skidding on snow, frozen or dry soil conditions, or by off-ground logging.
	Implement Guideline 1308 (to be treated as a Standard): Perform on-site slope-stability examinations on slopes over 30% prior to design of roads or activities that remove most or all of the timber canopy on Citadel soils found in the northern Black Hills. Perform on-site slope-stability examinations on slopes over 55% prior to design of roads or activities that remove most or all of the timber canopy on all other soil types found in the northern Black Hills.

<b>Resource</b>	<b>Mitigation</b>
	Implement NRCS (1979) recommended guidelines for groundcover percentages for the Citadel, Vanocker Citadel, and Grizzly Virkula, Citadel Association, and Vanocker-Citadel Associations, to maintain erosion within acceptable limits. NRCS recommends 40-70% ground cover for slopes ranging from 10-30% for Citadel type soils. 70-95% is recommended for Vanocker-Citadel soils and 75-90% for Grizzly-Virkula soils. Coordinate groundcover applications and percentages with the district fuels specialist to address any associated fuel issues.
Slash Treatment	If machine piling of slash is done, conduct piling to leave topsoil in place and to avoid displacing soil into piles or windrows. Operate heavy equipment for land treatments only when soil moisture is below the plastic limit, or protected by at least 1 foot of packed snow or 2 inches of frozen soil.
Prescribed Fire	Forest Standard 1103/WCPHB 13: 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 (FSH 2509.18). Conduct prescribed fires when soil, humus, and large fuels are moist.
	Limit water quality impacts of prescribed fire by constructing water bars in firelines, not placing slash in drainage channels, maintaining the streamside management zone, and avoiding intense fires unless needed for management goals.
	Restrict roads, landings, skid trails, developed recreation areas, livestock gathering areas, and similar soil disturbances to designated sites.
	Operate heavy equipment for land treatments only when soil moisture is below the plastic limit, or protected by at least 1 foot of packed snow or 2 inches of frozen soil.
	Forest Guideline 4106: Promote revegetation of prescribed burned areas. a. Following broadcast burning, seed to initiate revegetation if ground cover is 60 percent or less and slopes are 30 percent or more. b. If piled and burned fuel creates ash piles deeper than three inches, scatter the ash, scarify and mix it with mineral soil, or bury it.
Skid Trails	SDBMP IIIC1: Tractor skid when compaction, displacement, and erosion will be minimized. Avoid tractor or wheeled skidding on unstable, permanently or seasonally wet, or easily compacted soils, and on slopes that exceed 40% unless operation can be conducted without causing excessive erosion. Avoid skidding on highly erodible soils, or with blade lowered. SDBMP IIIA5: Design and locate skid trails and skidding operations to minimize soil disturbance.
	SDBMP IIIA6: Locate skid trails to avoid concentrating runoff and provide breaks in grade. Locate skid trails and landings away from natural drainage systems and divert runoff to stable areas. Use mitigating measures, such as water bars and grass seeding to reduce erosion on skid trails.
	SDBMP IIIA7: Avoid locating landings that require skidding across drainage bottoms.
Roads	SDBMP IIA7: Locate roads to provide access to suitable log landing areas to reduce soil disturbance.
	Forest Standard 1105/WCPHB Standard 9: Limit roads and other disturbed sites to the minimum feasible number, width, and total length consistent with the purpose of specific operations, local topography and climate.

<b>Resource</b>	<b>Mitigation</b>
	Construct roads on ridge tops; stable upper slopes, or wide valley terraces if feasible. Stabilize soils onsite. End-haul soil if full-bench construction is used. Avoid slopes steeper than 70%.
	Forest Standard 1106/WCPHB Standard 11: Stabilize and maintain roads and other disturbed sites during and after construction to control erosion.
	Forest Standard 1114: when construction of maintenance level 1 roads, temporary roads, skid trails and landings occur, install structures to divert runoff when needed.
	SDBMP IID7: Consider road surfacing to minimize erosion.
<b>Streamside Management Zone</b>	SDBMP IIA5: Locate roads a safe distance from streams when roads are running parallel to stream channels. Provide an adequate streamside management zone (SMZ) or other appropriate management technique to trap sediment and prevent its entry into the stream.
	SDBMP IID6: Route road drainage through the Streamside Management Zone (SMZ), filtration fields, or other sediment settling structures. Install road drainage features above stream crossings to route discharge into filtration zones before entering a stream.
	Remove all temporary stream crossings (including all fill material in the active channel), restore the channel geometry, and revegetate the channel banks using certified local native plants as feasible; avoid persistent or invasive exotic plants.
	Forest Guideline 1116/WCPHB Standard 2: Manage land treatments to conserve site moisture and to protect long-term stream health from damage by increased runoff.
	SDBMP IIIB1: Designate streamside management zones (SMZ) to provide stream shading, sediment and water filtering effects, and wildlife habitat. The width of the SMZ should extend beyond the 50' minimum to include wetlands along a stream bottom and to provide additional protection in areas of steep slopes or erosive soils.
	Define and mark on the ground during layout, Streamside Management Zones (SMZ), as required in SD BMP IIIB1, for all perennial streams. This is to provide stream shading, soils, stabilization, sediment and water filtering effects and wildlife habitat. The SMZ should encompass a strip of at least 50 ft on each side of the stream measured from the ordinary high-water mark or definable bank. The width should extend beyond 50 ft to include wetlands along a stream bottom and to provide additional protection in areas of steep slopes or erosive soils.
	Consult with the hydrologist and/or botanist during layout to properly define SMZ's. Document SMZ's on sale maps, and include a list of the required BMP's and other mitigation measures so that they are properly implemented and maintained.
	Implement SD BMP's III.B.2 a and c to retain hardwoods, seed trees, submerchantable trees and shrubs adjacent to streams and maintain or provide sufficient ground cover to the maximum extent possible in coordination with the fuels specialist. Consult with the fuels specialist during SMZ layout to incorporate methods, to the maximum extent possible, to ensure the retain and integrity of riparian vegetation. Methods of modification to consider are: reducing crown spacing distance, leaving group selections of larger trees where there is already little understory, dropping and bucking submerchantable trees vs. the use of whole tree yarding, and the retention of hardwoods.

<b>Resource</b>	<b>Mitigation</b>
	Conduct whole tree and other harvest activities when the ground is frozen to a depth of 2" or protected by at least 1' of packed snow (WCPHB Standard 12.1 Design Criteria 1c).
Connected Disturbed Areas	Install cross drains to disperse runoff into filter strips and minimize connected disturbed areas. Make cuts, fills, and road surfaces strongly resistant to erosion between each stream crossing and at least the nearest cross drain. Revegetate using certified local native plants as feasible; avoid persistent or invasive exotic plants. Construct roads where feasible, with rolling grades instead of ditches and culverts.
	SDBMP IIA6: Minimize the number of stream crossings and choose stable crossing sites. Design Criteria: Avoid soil-disturbing actions during periods of heavy rain or wet soils. Apply travel restrictions to protect soil and water.
	Forest Standard 1113/WCPHB Standard 10: Construct roads and other disturbed sites to minimize sediment discharge into streams, lakes and wetlands.
	In each 3rd-order and larger watershed, limit Connected Disturbed Areas (CDAs) so the total stream network is not expanded by more than 10%. Progress toward zero CDA as much as feasible. Do not add CDAs to Class III watershed.
	Forest Standard 1201/WCPHB Standard 5: Conduct actions so that stream pattern, geometry, and habitats are maintained or improved toward robust stream health.
	Do not encroach fills or introduce soil into streams, swales, lakes, or wetlands. Properly compact fills and keep woody debris out of them. Revegetate cuts and fills upon final shaping to restore ground cover, using certified local native plants as feasible; avoid persistent or invasive exotic plants. Provide sediment control until erosion control is permanent.
	Do not disturb ditches during maintenance unless needed to restore drainage capacity or repair damage. Do not undercut the cut slope.
	Space cross drains, from no more than 120 feet in highly erodible soils on steep grades, to no more than 1,000 feet in resistant soils on flat grades (ex. 01). Do not divert water from one stream to another.
	Empty cross drains onto stable slopes that disperse runoff into filter strips. On soils that may gully, armor outlets to disperse runoff. Tighten cross-drain spacing so gullies are not created. NOTE: Avoid streamheads, unstable soils, and highly erodible soils (Burroughs and King 1989; WRENS II.56, II.58, II.59, II.63, II.64).
	SDBMP IIC4: Provide energy dissipators as needed on the downstream ends of ditch relief culverts or where water is discharged onto erodible soils or fill slopes.
	Harden rolling dips as needed to prevent rutting damage to the function of the rolling dips. Ensure that road maintenance provides stable surfaces and drainage.
	SDBMP IIE2: Maintain erosion control features through periodic inspection and maintenance during construction and road use. SDBMP IVC1: Minimize stream channel disturbances and related sediment problems during construction and installation of stream crossings by using silt fences, interlocking strawbales, etc to prevent sediment introduction to the stream until soil stabilization has occurred. Do not place erodible material into stream channels. SDBMP IIE2: Maintain erosion control features through periodic inspection and maintenance during construction and road use.

<b>Resource</b>	<b>Mitigation</b>														
	Forest Standard 1109/WCPHB 12: Reclaim roads and other disturbed sites when use ends, as needed, to prevent resource damage. Site-prepare, drain, revegetate, and close temporary and intermittent use roads and other disturbed sites within one year after use ends. Provide stable drainage that disperses runoff into filter strips and maintains stable fills. Do this work concurrently. Use certified local native plants as feasible; avoid persistent or invasive exotic plants.														
	SDBMP IID1: Keep slope stabilization, erosion and sediment control work as current as possible with road constructions.														
	SDBMP IID5: Prevent downslope movement of sediment by using sediment catch basins, drop inlets, changes in road grade, headwalls, or recessed cut slopes.														
	Implement SD BMP's IV.B.1 and 2, IV.C.1, 2, and 3, for construction of any stream crossings. Implement SD BMP's V.B.4, 5, and 7 to designate stream course prior to snowfall, restore stream crossings to near pre-road conditions to prevent ice dams, to compact now for skid road locations, and do not leave slash and tops in streams.														
<b>Revegetation &amp; Reclamation</b>	Forest Guideline 1110: Initiate revegetation as soon as possible not to exceed 6 months, after termination of ground-disturbing activities. Use Native species when available that are noxious weed free (See Forest Plan for full prescription).														
	Forest Guideline 1111: Stabilize, scarify, or recontour temporary roads, constructed skid trails, and landings prior to seeding.														
<b>WATER</b>	Forest Standard 1201/WCPHB Standard 5: Conduct actions so that stream patterns, geometry, and habitats are maintained or improved toward robust stream health.														
	Forest Standard 1203/WCPHB Standard 4: Design and construct all stream crossings and other in-stream structures to pass normal flows, withstand expected flood flows, and allow free movement of resident aquatic life.														
	Install stream crossings to meet Corps of Engineers and State permits, pass normal flows, and hardened to withstand floods as follows:														
	<table border="1"> <tbody> <tr> <td>Design Life (years):</td> <td>1</td> <td>2</td> <td>5</td> <td>10</td> <td>20</td> <td>50</td> </tr> <tr> <td>Design Flood (years):</td> <td>10</td> <td>10</td> <td>25</td> <td>50</td> <td>100</td> <td>200</td> </tr> </tbody> </table>	Design Life (years):	1	2	5	10	20	50	Design Flood (years):	10	10	25	50	100	200
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	Install stream crossings on straight and resilient stream reaches, as perpendicular to flow as feasible, and to provide passage of fish and other aquatic life. Install stream crossings to sustain bankfull dimensions of width, depth, and slope and keep streambeds and banks resilient. Favor hardened fords and bridges on streams with flood plains, and bottomless arches instead of pipe culverts.														
	Manage vegetation treatments so that stream flows are not changed to the extent that long-term stream health is degraded.														
	Forest Guideline 1204: Naturally occurring debris should not be removed from stream channels unless it is a threat to life, property, important resource values, or otherwise covered by legal contract.														
Forest Guideline 1205: Natural and beneficial amounts of large, woody debris should be retained in the riparian areas.															

<b>Resource</b>	<b>Mitigation</b>
Riparian Areas, Water Influence Zones, & Wetlands	Forest Standard 1301/WCPHB 3: In the water influence zone next to perennial and intermittent streams, lakes, and wetlands, allow only those land treatments that maintain or improve long-term stream health.
	Keep heavy equipment out of streams, swales, and lakes, except to cross at designated points, build crossings, or do restoration work, or if protected by at least one foot of packed snow or two inches of frozen soil.
	Locate new concentrated-use sites outside the SMZ if feasible, and outside of riparian areas always. Harden or reclaim existing sites in the SMZ to prevent detrimental soil and bank erosion.
	SDBMP IID2: Stabilize erodible, exposed soils by seeding, compacting, riprapping, benching, mulching, or other suitable means prior to fall or spring runoff.
	Forest Standard 1302/WCPHB 6: Maintain long-term ground cover, soil structure, water budgets, and flow patterns in wetlands to sustain their ecological function per 404 regulations.
	Forest Standard 1304: As opportunities arise, and need dictate, relocate or implement mitigation measures for roads, trails, watering tanks, ponds, water catchments, and similar facilities currently located within the water influence zone.
	Forest Standard 1306: Prohibit log landing, decking areas, and mechanical slash piling within riparian areas unless the integrity of the riparian area can be protected (e.g., frozen, snow covered ground conditions).
	Do not locate slash piles within the water and wetlands influence zones. Remove all logging related slash from intermittent and perennial stream channels. The contractor is responsible for proper slash disposal regardless of whether or not disposal sites are defined on related sales maps
	Use skidder mats (available at the RD) as needed in addition to harvest during frozen or conditions meeting required snowfall.
	During layout a district hydrologist will accompany the layout forester to make “on the ground” changes to individual boundaries. Boundaries will be adjusted to eliminate or minimize the inclusion of defined wetlands within unit boundaries. USFWS maps (1995) would be used to help locate such areas.
	Define a streamside management zone(SMZ) for any streams associated with the wetlands adjacent to or included in a unit, if it is not possible to exclude the wetlands/stream by unit boundary modification (SDBMP IIIB1). Implement SD BMP’s IIIB2a, b, e, f, g, h, and i, IIIB3, 4, 5 and 6 as appropriate to the individual sites.
Water Quality and Deadman Gulch	During layout a district hydrologist will accompany the layout forester to make “on the ground” changes to individual boundaries. Boundaries will be adjusted as needed to eliminate or minimize opportunities for sediment or logging debris to enter Deadman Gulch or its tributaries. unit boundaries.
	Define a streamside management zone(SMZ) for any streams associated with the wetlands adjacent to or included in a unit, if it is not possible to exclude the wetlands/stream by unit boundary modification (SDBMP IIIB1). Implement SD BMP’s IIIB2a, b, e, f, g, h, and i, IIIB3, 4, 5 and 6; IVB, C1, 2, 3, and VA1.

<b>Resource</b>	<b>Mitigation</b>
	Incorporate required BMP's into sales contract to ensure understanding with the contractor prior to harvest. Conduct BMP implementation monitoring by the district hydrologist.
	Insure that all prescribed sediment measures are maintained in conjunction with Sd BMP IIE1-7.
<b>TRANSPORTATION</b>	Refer to Soils, Water, Botany, Scenery
<b>FUELS</b>	4109 Guideline -- Utilize the Black Hills National Forest Fire Protection Assessment (FPA) for purposes of identifying and prioritizing fire management program activities.
	4110a Guideline -- Base activity and natural fuel treatment on area matrix values within the Black Hills National Forest FPA in accordance with the following treatments. In areas identified as having high ratings for risk, hazard or value: <p>(1) Reduce or otherwise treat all fuels (activity fuels within three years of cutting) so the potential fireline intensity does not exceed 200 BTUs/second/foot on 90 percent of the days when fires occur, or break up continuous fuel concentrations exceeding the above intensity into units 30 to 40 acres maximum size, surrounded by fuel breaks.</p> <p>Interim activity fuel treatment will be accomplished by requiring all slash to be lopped to 18 inches or less at the time of cutting.</p>
	4105 Standard -- Utilize prescribed fire through planned and natural ignitions to achieve management objectives for each Management Area as shown in the Fire Management Direction Summary Table in the Forest Plan. (**See Forest Plan page II-54)
	4105 Guideline -- When feasible and appropriate use broadcast burning to dispose of slash in order to return the inorganic and organic chemicals in the foliage and small woody material to the soil, to reduce fire hazard, and to provide seed beds for natural regeneration.
	4112 Guideline -- Treat activity fuels adjacent to roads and trails as follows: a. For Forest Development Roads classified as collectors, and Forest Development Trails, manage activity fuels to meet adopted SIO. b. For federal, state, county and Forest Development Roads classified as arterials, remove 70 to 90 percent of the activity fuels seen from the road's edge up to a maximum distance of 300 feet. Treat debris within 1 year of harvest completion. There are roads in the project area that are classified as arterials and are adjacent to proposed harvest units. These areas will be piled and burned or will be whole tree harvested to remove slash that may be seen from the roadway.
	4113- Standard -- Reduce the threat of wildfire to public and private developments by following standards in the National Fire Protection Association Publication 299, Protection of Life and Property from Wildfire, and reduce the fuel loading to acceptable standards.
	5.1—4101 Guideline -- Utilize appropriate fuel treatment practices, including prescribed fire, to meet management objectives.

<b>Resource</b>	<b>Mitigation</b>
	2303b Standard -- Design vegetation management activities, including prescribed fire, to maintain ten sound logs per acre (eight logs minimum length 10 feet, 10 inches diameter; two logs minimum length 10 feet, 20 inches diameter) to provide future den sites, resting sites, and prey habitat within areas currently occupied by martens or with high potential for occupancy. (See Table with 2301.)
	2307 Guideline -- Leave large woody debris on harvested or thinned sites to help retain moisture, trap soil movement, provide microsites for establishment of forbs, grasses, shrubs, and trees, and to provide habitat for wildlife.
	4107 Guideline -- Prescribed burn plans will identify acceptable levels of tree mortality for seedling/saplings, poles, and sawtimber; burning prescriptions will be established to meet these levels. In planning prescribed burns, consider how the potential loss of trees is offset by the beneficial effects of fire in terms of overall stand health and wood fiber production.
	4107 Guideline -- Defer prescribed burned areas from livestock grazing for a portion or all of the following growing season to ensure regrowth of forage species.
	4105 Guideline -- Promote revegetation of prescribed burned areas. a. Following broadcast burning, seed to initiate revegetation if ground cover is 60 percent or less and slopes are 30 percent or more. b. If piled and burned fuel creates ash piles deeper than three inches, scatter the ash, scarify and mix it with mineral soil, or bury it.
	A site-specific burn plan will be written for prescribed burn areas. All forest plan standards and guidelines will be met. Ground cover of less than 60 percent is not expected in any of the prescribed burn units.
<b>VEGETATION</b>	All snags will be retained unless they are a safety hazard. Where possible, snags cut as safety hazards will remain on site, and not skidded to landings. Guideline 2305, to be treated as a standard
	Sufficient down woody material will remain on site in treated units to meet or exceed the Revised Forest wide standard of 50 linear feet per acre, with a minimum diameter of 10 inches (where material is available). Revised Standard 2308. The timber sale contract will require contactors to return and scatter cull logs.
<b>WILDLIFE</b>	Existing snags shall be protected during logging operations under any action alternative except where they would endanger the lives of the loggers. With OSHA regulations, some existing snags may be lost as "safety hazards". Therefore, treatment units need to be monitored and the number of replacement trees adjusted accordingly. To discourage unnecessary felling, snags removed as safety hazards shall be left where felled. They shall not be salvaged, skidded to landings, nor removed by the loggers as firewood. Clauses C2.302# and C6.321# should be used in the sale contract to protect snags.
	Any raptor nests found during project layout or implementation will be reported to a district biologist and necessary mitigation measures implemented. Actual mitigation will depend upon species found.
	Raptor nest records will be reviewed prior to implementation to determine if nests exist within a treatment unit.
	Any fuel break proposed within suitable goshawk nesting habitat will only remove stems less than 5 inches DBH, considered part of the understory. No change in habitat structural stage will occur.

<b>Resource</b>	<b>Mitigation</b>
	Prescribed burning application in meadows during the period September 1 - April 31 will require presence absence surveys for regal fritillary butterflies. If surveys reveal butterfly presence, prescribed burning will be scheduled outside this period.
<b>FISHERIES</b>	Maintain a 100-foot buffer (Streamside Management Zone) on all perennial streams and 50-foot buffer (SMZ) on all intermittent streams.
	Within the streamside management zone leave hardwood trees, shrubs, grasses, and rocks wherever they afford shade over a stream or maintain the integrity of the soil near a stream.
	Within the streamside management zone log mature timber in such a way that filtering effects of the buffer zone are not destroyed. Retain 75% of the shade present prior to harvest and all snag trees that are not hazardous.
	Downed timber present prior to harvest and un-merchantable logs must be left.
	Skidding logs in or through streams is prohibited. Tractor or wheel skidding is prohibited on slopes exceeding 45% gradient immediately adjacent to all perennial and intermittent streams within the project area.
	Use large cobble rocks at stream crossings, which hold up well under traffic, prevent muddying of the water and serve as suitable substrate for fish juveniles and hatchlings to hide in after the timber sale has closed. In the event more permanent structures are needed, preference should be given to low water concrete slabs and open box culverts, properly installed.
<b>BOTANY</b>	Some of those roads are located in or near high quality R2 Sensitive plant and Species of Interest plant habitat. A botanist in conjunction with a road engineer would layout those particular roads to prevent direct effects from creation of any new roads. Road 10 Needs layout at the end of the road. Road 15 Needs layout near the middle of the road. Road 22 Needs layout at the end of the road (shorten).
	Complete avoidance of Special Interest plants and high quality habitats would be required for all action alternatives. Throughout the planning process the team utilized GIS software to map proposed activity areas outside of known occurrences and high quality habitat for Special Interest plant species. The RIS data areas within 100 feet of mapped Special Interest plant occurrences or high quality habitat areas are in Appendix C. Either the current GIS map layer created by the Black Hills National Forest botany staff (called EB_suit) or information pulled from the RIS data table should be used to display the areas that need particular attention so that during implementation of the Elk Bugs and Fuels Project, the contractor stays within the areas prescribed for treatment only.
	Additional treatment areas (fuel breaks) were developed during the planning process. Approximately 107 acres have been identified from GIS Hillshade command mapping as likely high quality R2 Sensitive plant and Species of Interest plant habitat. The unsurveyed treatment areas would be surveyed prior to project implementation. If any Special Interest plants or high quality habitats are found during those surveys, they would be avoided during project implementation.
<b>RANGE &amp; NOXIOUS WEEDS</b>	Purchaser must clean off- road equipment prior to moving between cutting units that are know to be infested with noxious weeds and other units, if any, that are free of such weeds.

<b>Resource</b>	<b>Mitigation</b>
	Purchaser shall employ whatever cleaning methods are necessary to ensure that off road equipment is free of noxious weeds.
	Purchaser shall agree on methods of cleaning, locations for cleaning, and control of off site impacts, if any.
	Instructions to be included in all new contracts: (refer to BHNF Weed Management Plan).
	The Forest Service must identify on the sale area map units that are infested with specific noxious weeds of concern. The prospectus for the sale must notify prospective purchasers that maps of the known locations are available from the local Forest Service office.
	Significant changes in the status of noxious weed infestations on the sale may require contract modifications to deal with changed condition.
	Practice 7. Workers (loggers, contractors, employees) need to inspect, remove, and properly dispose of weed seed and plant parts found on clothing.
	Coordinate project activities with any nearby herbicide application to maximize cost effectiveness of weed treatments.
	Prevent the introduction and spread of weeds caused by moving infested sand, gravel, borrow, and fill material in Forest, contractor and cooperator operations.
	The District weed personnel will coordinate the inspection of material sources on site, and ensure that they are weed free before use and transport. Treat weed infested sources for eradication and strip and stockpile contaminated material before any use of pit material.
	Inspect and document the area where material from treated weed infested sources is used, annually for at least three years after project completion to ensure that any weeds transported to the site are promptly detected and controlled.
	Maintain stockpiled uninfested material in a weed free condition.
	In those vegetation types with relatively closed canopies, retain shade to the extent possible to suppress weeds and prevent their establishment and growth.
	Retain native vegetation in and around project activity to the maximum extent possible consistent with project objectives.
	Avoid creating soil conditions that promote weed germination and establishment.
	Minimize soil disturbance to the extent practical consistent with project activities.
	Where project disturbance creates bare ground consistent with project objectives, reestablish vegetation to prevent conditions to establish weeds.
	Revegetate disturbed soil in a manner that optimizes plant establishment for that specific site.
	Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed free mulch as necessary.
	Approved District seeding guidelines and procedures will be used concerning specific seed species mix and testing of seed mix to assure weed free requirements.

<b>Resource</b>	<b>Mitigation</b>
	Inspect and document all limited term ground disturbing actions in noxious weed infested areas for at least three growing seasons following completion of the project.
<b>RECREATION</b> (Centennial Trail)	Silvicultural prescriptions and layout of timber sale units adjacent to the Centennial Trail will protect the aesthetics along the trail corridor and improve diversity along the trails. This may be done by leaving a variety of size and age classes near the trails and breaking up large blocks of the same type of treatments. Timber sale layout personnel will coordinate with the District Recreation Specialist and Forest Landscape Architect prior to layout of these areas. A basal area range of 60 to 80 should be maintained along both sides of the trail for at least 100 feet.
	Skidding logs on or across the Centennial Trail will not be permitted, forwarding will be allowed at crossings approved by the District Recreation Specialist. The trail will also not be used for log haul, though log trucks will be permitted to cross the trail on haul roads. Any damage to the trail will be repaired and the trail restored to its original condition. To best protect the trail resources and to reduce visitor conflicts thinning activities 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.
	Appropriate signing or other cautionary measures will be implemented in conjunction with all management activities to protect the public safety of trail users. Implementation of these measures will be the responsibility of the person initiating the action (e.g., logging contractor, prescribed fire manager).
	Interpretive signs may be placed along the Centennial Trail, Forest Highway 26 and other, heavily traveled roads to inform and educate the public about forest management activities.
<b>SCENERY</b> (Unit Design & Layout)	Harvest units should be shaped to mimic natural patterns found in the landscape. Do not use straight lines or geometric shapes for unit design. Unit edges should be natural appearing (uneven/feathered), mimicking the adjacent natural landscape character.
	Do not locate landings perpendicular to the haul road. Landings should be located so the forest visitor cannot look up a road and see right into the landing. The landing needs to be set off from the main road. Minimize the amount of slash on the landings by cutting and leaving unmerchantable sections in woods.
Areas in Immediate Foreground	<p>The following mitigation will apply to areas in the immediate foreground (300 feet or sight distance, whichever is less) of areas adjacent to residential developments on private land and stands within primary travel corridors. The objective of these measures is to reduce negative visual effects of logging slash and other harvest-related disturbances.</p> <p>Whole-tree harvesting will be used where possible. Slash piles, skid trails and landing areas will be minimized where possible. Skid trails will be returned to as near natural condition as possible.</p>

<b>Resource</b>	<b>Mitigation</b>
Revegetation	Disturbed areas, including but not limited to exposed soil from timber harvesting, road, and landing construction, log skidding, etc. will be revegetated after the site has been satisfactorily prepared. The operator will be advised as to species, methods of revegetation, and seasons to plant by the District Staff. Seeding and/or planting will be repeated until satisfactory revegetation is accomplished. Revegetation may include, but will not be limited to seeding native grasses, legumes, wildflowers and spruce seedlings. Planting and seeding should be dispersed to mimic existing patterns of the vegetative mosaic. Aspen regeneration will be encouraged.
Slash treatment	Stockpiled slash, consisting of trees and limbs, will be randomly lopped and scattered over the disturbed areas to a depth no higher than 18". The effect of scattering the slash should mimic the adjacent environment.
	Remove slash within 300' buffer when timber harvesting activities are within primary travel corridors.
Road Construction and Reconstruction	New road construction will be designed to meet the scenic integrity objective. The location of the road should fit the landscape with a minimum degree of landform alteration limiting the amount of earthwork. Planning the design of alignments and reseeded of cut and fill slopes needs to consider minimizing impacts to scenic resources. Avoid excessive cut and fill slopes for road construction.
	Amount and size of cut and fill slopes from along road beds shall be reduced and graded to conform to adjacent terrain. This can be accomplished by the use of slope rounding and warping slopes. Disturbed sites will be prepared to provide a seedbed for reestablishment of desirable vegetation. Practices may include contouring, terracing, ripping, and scarifying.
	Minimize the vegetative clearing limits above and below the road prism to help screen the road. As opportunities arise, create openings for scenic views.
	When possible avoid new road construction on lightly colored soils that would heavily contrast with the natural landscape character.
	Excess slash from roadwork will be piled and burned or buried.
	Cut the ends of culverts to conform with the terrain, or bury the culverts to blend with the adjacent environment.
Skid Trails	Use the same mitigation measures above for roads and to reduce the effects of skid trails on scenic resources. Identify "buffer" trees along the skid trails to decrease the potential damage to the remaining trees. Remove the buffer trees that are severely damaged after hauling on the skid trail is completed.
General	All equipment and construction debris will be removed from the site.
<b>HERITAGE</b>	Mitigations common to all culturally sensitive areas, Traditional Cultural Properties, National Register of Historic Places eligible and potentially eligible heritage properties, are avoidance with the placement of a 60 meter (200 feet) safety buffer, for all future planned and/or foreseeable potential affects. A designation of "no cut" should be established for the above-mentioned cultural areas, in all future treatments.

<b>Resource</b>	<b>Mitigation</b>
	If culturally sensitive areas, Traditional Cultural Properties, National Register of Historic Places eligible and potentially eligible heritage properties can not be avoided, appropriate mitigation measures will be designed and implemented in consultation with the State Historic Preservation Office, Tribal Historic Preservation Offices, Native American Tribes, American Indians, and other applicable parties, as directed by the NHPA, Section 106.
	Consultation with interested Native American Tribes, American Indians, and other applicable parties is performed and documented prior to any decisions being made, pursuant to the National Historic Preservation Act of 1966, as amended and current Section 106 standards, as amended 2001.
	Effects to heritage resources, Traditional Cultural Properties, and other culturally significant areas were only considered within the previously surveyed areas on lands administered by the Black Hills National Forest. Privately owned lands and lands administered by other government agencies were not inventoried during this analysis.
	All heritage resource site specific measures be developed in consultation with the State Historic Preservation Office, Native American Tribes, and pertinent interested parties, pursuant to the National Historic Preservation Act of 1966, as amended.

### Unit Specific Mitigation Measures

<b>Resource</b>	<b>Mitigation</b>
Wildlife	<p>Provide a no-treatment buffer of 100 feet around known mollusk sites in the following stands:</p> <p>0812020118      0813030034      0813030035      0813040009      0815070006</p> <p>Also apply the following:</p> <ul style="list-style-type: none"> <li>a) Any snail colonies found prior to or during project layout or implementation should be reported to a district biologist.</li> <li>b) If sites are found within treatment areas, move skid trails to either side of colonies to avoid soil compaction.</li> </ul> <p>Preserve existing microclimate by providing small (100 foot radius) no cut areas around populations; in most cases, this can likely be accomplished with mid and understory trees.</p>

### Mitigations Unique to Alternative 2

<b>Resource</b>	<b>Mitigation</b>
Botany	Some of those roads are located in or near high quality R2 Sensitive plant and Species of Interest plant habitat. A botanist in conjunction with a road engineer would layout those particular roads to prevent direct effects from creation of any new roads. Road 3 Needs

<b>Resource</b>	<b>Mitigation</b>
	layout about 1/3 of the way from beginning. Road 8 Needs layout near the sharp bend in the road. Road 18 Needs layout at the end of the road (shorten). Road U080088 Needs layout near the end of the road.

## Mitigations Unique to Alternative 4

<b>Resource</b>	<b>Mitigation</b>
Botany	Some of those roads are located in or near high quality R2 Sensitive plant and Species of Interest plant habitat. A botanist in conjunction with a road engineer would layout those particular roads to prevent direct effects from creation of any new roads. Road 3 Needs layout about 1/3 of the way from beginning. Road 8 Needs layout near the sharp bend in the road. Road 18 Needs layout at the end of the road (shorten). Road U080088 Needs layout near the end of the road.

