GOOD SHEPHERD
ENVIRONMENTAL ASSESSMENT

MONTANA DEPARTMENT of NATURAL RESOURCES and CONSERVATION

SOUTHWESTERN LAND OFFICE
CLEARWATER UNIT

GOOD SHEPHERD
ENVIRONMENTAL ASSESSMENT

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CHECKLIST ENVIRONMENTAL ASSESSMENT

Project Name:	Good Shepherd
Proposed Implementation Date:	March 2013
Proponent:	Clearwater Unit, Southwestern Land Office, Montana DNRC
Location:	Sections 6, 7 & 18 T15N R13W; Sections 1, 12, 13 &14 T15N R14W; Sections 31 & 32 T16N R13W; Sections 35 & 36 T16N R14W.
Counties:	Missoula & Powell

I. TYPE AND PURPOSE OF ACTION

The Montana Department of Natural Resources and Conservation (DNRC) is proposing timber management activities on up to 4,899 acres in the Blackfoot Clearwater Game Range. The proposed projects would include commercial timber harvests that would produce approximately 6 million board feet of timber, pre-commercial thinning projects and aspen restoration projects. The proposed treatments would emulate disturbances caused by natural wildfire events, bring stands closer to the desired future condition, remove overstory trees with high defect and improve overall health and vigor. This would result in an overall reduction in stand density which would allow the residual stand to utilize additional sunlight, nutrients and water and thereby promote growth.

Road maintenance and improvement would be needed on existing access roads to improve function and drainage of the haul route. Although not anticipated, some new road construction may occur if an existing road segment is inadequate (stream adjacent parallel roads for example) a new segment may be constructed to replace the existing one. The existing segment would then be abandoned.

The lands involved in this proposed project are held by the State of Montana in trust for the Common Schools, Public Buildings and State Reform School-Pine Hills. (Enabling Act of February 22, 1889; 1972 Montana Constitution, Article X, Section 11). The Board of Land Commissioners and the DNRC are required by law to administer these trust lands to produce the largest measure of reasonable and legitimate return over the long run for the beneficiary institutions (Section 77-1-202, MCA). The DNRC would manage lands involved in this project in accordance with the State Forest Land Management Plan (DNRC 1996), Administrative Rules for Forest Management (ARM 36.11.401 through 450), DNRC Habitat Conservation Plan, FWP Conservation Easement as well as other applicable state and federal laws.

II. PROJECT DEVELOPMENT

1. PUBLIC INVOLVEMENT, AGENCIES, GROUPS OR INDIVIDUALS CONTACTED:

Provide a brief chronology of the scoping and ongoing involvement for this project.

Public scoping took place in November of 2010. Only one comment was received, and it was in favor of the project. There were no other comments received about this project by the public, government agencies (other than FWP) or tribal agencies. Montana Fish Wildlife and Parks (FWP) is fully engaged in this project and holds the conservation easement that affects the entire project area. A Conservation Easement management plan outlines limitations and restrictions that need to be addressed during the project planning process. As per the conservation easement, a formal proposal for the first large commercial project was submitted to FWP for review in April, 2011. The following summer/fall FWP and DNRC representatives met in the field to go over the proposal. It was decided that FWP would not impose any harvest restrictions beyond those required by the rules and laws under which DNRC manages. Internal and external issues and concerns were incorporated into the project design and will be implemented in the associated contracts.

DNRC specialists consulted during the project planning process included Garrett Schairer, Wildlife biologist; Jeff Collins, Hydrologist ; Patrick Rennie, Archeologist and Jordan Larson, Economist..

2. OTHER GOVERNMENTAL AGENCIES WITH JURISDICTION, LIST OF PERMITS NEEDED:

- Montana Fish Wildlife and Parks (FWP) conservation easement land steward Grant Bronk was consulted to ensure compliance with the conservation easement. FWP biologists Jay Kolbe and Kristi Dubious were also consulted during pre-harvest planning. A management plan for the Blackfoot Clearwater Game Range was developed as part of the conservation easement. This management plan outlines procedures and protocol for project planning and implementation. The DNRC followed all commitments outlined in the management plan when designing the project. FWP representatives and the ID team leader worked closely during project development to ensure adherence to the conservation easement and management plan.

- DNRC is classified as a major open burner by DEQ, is issued a permit from DEQ to conduct burning activities on state lands managed by DNRC. As a major open-burning permit holder, DNRC would comply with the limitations and conditions of the permit.

- A Short-term Exemption from Montana's Surface Water Quality Standards (318 Authorization) may also be required from DEQ if activities such as replacing a bridge on a stream would introduce sediment above natural levels into streams.

- DNRC is a member of the Montana/Idaho Airshed Group, which regulates prescribed burning, including both slash and broadcast burning, related to forest-management activities performed by DNRC. As a member of the Airshed Group, DNRC agrees to only burn on days approved for good smoke dispersion as determined by the Smoke Management Unit in Missoula, Montana.

- In addition to DEQ and the Montana/Idaho Airshed Group, Missoula County also restricts slash burning. DNRC will only burn on days deemed acceptable by DEQ, Missoula County and the Montana/Idaho Airshed Group.

- DNRC is managing the habitats of threatened and endangered species on this project by implementing the Montana DNRC Forested Trust Lands Habitat Conservation Plan (HCP) and the associated Incidental Take Permit that was issued by the United States Fish & Wildlife Service (USFWS) in February of 2012 under Section 10 of the Endangered Species Act. The HCP identifies specific conservation strategies for managing the habitats of grizzly bear, Canada lynx, and three fish species: bull trout, westslope cutthroat trout, and Columbia redband trout. This project complies with the HCP. The HCP can be found at www.dnrc.mt.gov/HCP

3. ALTERNATIVES CONSIDERED:

Alternative A – No Action

Under this alternative no forest management activities would occur. Douglas-fir would continue to overcrowd the desired species for the site (western larch and ponderosa pine). Trees with poor growth characteristics (forked tops, crook and sweep) would continue to be present in the overstory using up vital sunlight, water and nutrient resources. Shade tolerant Douglas-fir would continue to out-compete ponderosa pine and western larch in the understory. The mountain pine beetle would continue to cause mortality in all size classes of ponderosa pine. Aspen dominated stands would continue to reduce in density because of encroaching shade tolerant conifers. Current recreational uses would continue.

Alternative B – Forest Management Projects (Action)

Under this alternative, the DNRC would continue current uses, commercially harvest timber, carry out Aspen restoration treatments and conduct pre-commercial thinning projects. Road maintenance would take place to bring existing roads up to BMP standards and improve function and drainage. New road construction is not

anticipated, however if an existing road segment is inadequate (stream adjacent parallel roads for example) a new segment may be constructed to replace the existing one. The existing segment would then be abandoned. A series of commercial treatments would commence, with the first timber sale planned to occur in 2013. Aspen restoration projects may be carried out as part of a large harvest or as a stand-alone project. Pre-commercial thinning projects would occur based on available funding and Clearwater Unit priorities. Weed spraying and grass seeding would occur following harvest to mitigate the spread of noxious weeds.

III. IMPACTS ON THE PHYSICAL ENVIRONMENT

- *RESOURCES potentially impacted are listed on the form, followed by common issues that would be considered.*
- *Explain POTENTIAL IMPACTS AND MITIGATIONS following each resource heading.*
- *Enter "NONE" If no impacts are identified or the resource is not present.*

4. GEOLOGY AND SOIL QUALITY, STABILITY AND MOISTURE:

Consider the presence of fragile, compactable or unstable soils. Identify unusual geologic features. Specify any special reclamation considerations. Identify any cumulative impacts to soils.

Issues and Concerns

The following issue statements were developed during scoping regarding the effects of the proposed timber harvest and road systems to soils:

* Soil Resources – There is a concern that forest management activities may result in increased erosion and reduced soil productivity where excessive disturbance from compaction displacement, and loss of nutrients occurs, depending on extent and degree of harvest related soil effects.

Recommended Mitigation Measures for Soils:

The analysis and levels of effects to Soil resources are based on implementation of the following mitigation measures.

* DNRC would implement all applicable BMP's, Montana Administrative Rules for Forest Management, Streamside Management Zone laws and reasonable mitigation and erosion control practices during timber harvest, road maintenance, and road construction and road use activities

* Limit harvest equipment and hauling operations to periods when soils are relatively dry, (less than 20%), frozen or snow covered to minimize soil compaction and rutting, and maintain drainage features. Check soil moisture conditions prior to equipment start-up. Avoid dispersed skidding unless on snow or frozen ground. Portions of the access roads have clayey segments that tend to remain wet later into the spring which requires strict adherence to dry or frozen season of use to limit impacts in harvest units or damage to roads. Some moister operating conditions are accepted on harvest units where tractors remain on designated trails and timber will be felled and bunched or winched to trails.

* In tractor harvest units the purchaser and sale administrator will agree to a general skidding plan prior to equipment operations to limit trails to 15% or less of the harvest unit. Prefer use of existing skid trails, unless too steep. Limit ground skidding equipment to slopes less than 40% except for short steep slopes. Feller-bunchers may work on slopes up to 45% as long as displacement and turning is minimized to prevent excessive disturbance.

* On moderate to densely stocked stands, where whole tree skidding can reduce slash hazard, woody debris retention will minimize nutrient reduction from growing sites. Target woody debris levels are to retain 5-15 tons/acre well distributed on site while meeting the requirements of the slash law. On thinning sites with lower basal area, retain large woody debris as feasible, since it may not be possible to retain 5 tons/acre, and the emphasis will be on providing additional CWD in the future.

* Existing road segments would be improved and maintained in association with the harvest activities. Road improvements would include surface blading, installation of drainage features to prevent surface erosion and sediment delivery to the stream, ditching to improve road surface stability, gravel surfacing of selected segments as needed to comply with BMP'S and protect water quality.

*Road use would be limited to dry or frozen ground conditions to reduce rutting and erosion. New road construction, including drainage features would be completed in the fall prior to freeze-up. Check snow/frozen ground conditions prior to operations.

* New roads would be closed to motor vehicles upon completion of harvest activities. Slash would be placed on main skid trails to protect soils, reduce erosion and potential unauthorized ATV use where appropriate.

* All newly disturbed soils on road cuts and fills would be promptly reseeded to site adapted grasses to reduce weed encroachment and stabilize roads from erosion.

Predicted Effects on Soil Resources

Direct and Indirect Effects of the No- Action Alternative on Soils

The No-action alternative would be similar to existing conditions and have little effect on soil resources. Existing access roads with inadequate drainage would continue to erode without maintenance.

Direct and Indirect, Effects of the Action Alternative on Soils

The primary risks to long term soil productivity and hydrologic function are excessive impacts to soil properties caused by rutting, compaction and displacement of surface soils by equipment operation and road construction. Most sensitive soils are wet sites, and small areas of steep slopes which will be avoided or protected with mitigation measures.

For the proposed harvest, BMP's and mitigations would be implemented to minimize the area and degree of detrimental soil impacts (displacement, erosion, and compaction). Mitigations include general skid trail planning, limit tractors to moderate slopes, avoiding wetlands and controlling soil disturbance to meet silvicultural goals to reduce competition and improve growth of retained trees. By using mainly historic, existing trails and landings for proposed pre-commercial and commercial thinning the area of potential impacts would be reduced and growth of retained trees, due to reduced competition for soil nutrients and moisture, would be improved. Controlling the area of excessive disturbance, through administration, would limit the area of soil impacts.

Based on DNRC soil monitoring on comparable sites, implementation of BMP's and the recommended mitigation measures has been shown to effectively limit soil impacts to less than 20% of the harvest units. Harvest operations present low to moderate risk of detrimental impacts to soil resources if impacts are restricted to ~20% of the proposed harvest areas. We expect that by protecting at least ~80% of a harvest area in non-detrimental soil impacts, soil properties important to soil productivity will be maintained. The estimates of existing impacts are approximately 10% and additional impacts are expected to add no more than 5% = 15% projected.

All wetlands will be protected by marking SMZ boundaries, maintaining adequate vegetation on perimeters, and minimizing disturbance. No impacts are expected in wetlands where no operations occur.

Aspen restoration activities are planned on up to 40 acres of wetlands mainly in the NE corner of the project area depending on site approval. Aspen restoration activities would occur on site specific locations within wetlands where significant improvements in aspen health and density may be achieved. A combined effort by specialists from the MTFWP as well as the MT DNRC will prioritize which wetlands in the project area should be treated as an alternative practice to ARM and the conservation easement. The aspen restoration would selectively remove a portion of encroaching conifers and implement all requirements of an alternative practice to minimize disturbance and promote regrowth of aspen. Similar aspen treatments have had a beneficial effect on aspen regrowth with minor soil effects of less than 5% of area based on project design and administration.

DNRC focused road design and location efforts to minimize the extent of new road construction, stream crossings and construction costs and includes temporary use roads where feasible. Temporary use roads would be located for minimal construction and stabilized after use. Clay rich soils occur in portions of the project area, and will require season of use limits to avoid rutting, erosion and maintain drainage features.

An inventory of existing access roads requiring repairs, improvements and maintenance needs was completed in 2011 and reviewed in 2012. Road drainage improvements to existing roads will allow seasonal access to the

area and reduce current erosion on inadequately drained roads. Up to 1 mile of temporary new road will be constructed. Use of temporary roads could result in some rutting and compaction, but impacts would be largely restored with ripping the soils surface to break-up compaction and restore infiltration. Following use, temporary roads will be closed, stabilized with long-term drainage features installed, and reseeding with site adapted grass to control erosion and compete with noxious weeds.

Sale administrators will monitor on-going harvest and road construction activities to meet contract requirements, BMP'S for soil and water protection and silvicultural objectives. For all of these reasons the proposed harvest operations and mitigation measures are expected to maintain soil properties important to plant growth and hydrologic function and present low to moderate direct and indirect detrimental impacts to soils.

Cumulative effects of the No-Action Alternative to Soils

Cumulative effects to soils can occur from repeated ground skidding entries into the harvest area and additional road construction, depending on area and degree of detrimental impacts. Minimal timber harvests have occurred in the last 25 years and previous harvest effects have largely recovered with 10% or fewer impacts based on site. No operations would occur and no change in cumulative effects would occur compared to existing conditions.

Cumulative effects of the Action Alternative to Soils

There is low risk of cumulative effects to soils with the proposed harvest based on use of existing roads, skid trail planning using existing trails where feasible and implementation of mitigation measures to limit the area impacted. We expect that effects would be less than 15% of the harvest area based on; modifications to harvest since BMP inception in 1989, implementation of mitigation measures that include season of use limits, skid trail planning to use existing trails where feasible and site specific measures near wetlands. Road drainage would be improved on existing roads throughout the area. Proposed new temporary roads would impact less than 1% of the project parcels

Considering nutrient cycling, the high level of tree mortality of pine has already caused many needles and fine litter to fall to the forest floor. Most needles and fine foliage that have not already fallen would be expected to break off during logging operations. Large woody debris would be maintained on the site with a goal of 5-15 tons/acre (Graham 1994). Coarse wood would be well distributed throughout the units and trampled. The combination of fine litter and coarse woody debris would maintain surface organic matter that provides media for healthy soil fungi and conserves soil nutrients important to tree growth. Improved tree spacing will reduce competition for nutrients and soil moisture, enhance growth of retained trees, and promote regeneration of conifers and aspen on selected sites.

For complete soils analysis see attachment B.

5. WATER QUALITY, QUANTITY AND DISTRIBUTION:

Identify important surface or groundwater resources. Consider the potential for violation of ambient water quality standards, drinking water maximum contaminant levels, or degradation of water quality. Identify cumulative effects to water resources

Issues and Concerns

The following issue statements were developed during scoping regarding the effects of the proposed timber harvest and road systems to water resources:

*Water Quality/Quantity- There is a concern that the proposed action may cause impacts to water quality and quantity. Land management activities such as timber harvest and road construction could impact water quality primarily by accelerating sediment delivery to local stream channels and draw bottoms.

*Cumulative Watershed Effects- There is a concern that the proposed timber harvest may cause or contribute to cumulative watershed impacts as a result of increased water yields.

Recommended Mitigation Measures for Water Resources:

The analysis and levels of effects to Water resources are based on implementation of the following mitigation measures:

* DNRC would implement all applicable BMP's, Montana Administrative Rules for Forest Management and reasonable mitigation and erosion control practices during timber harvest, road maintenance, and road construction and road use activities

* DNRC would locate, clearly mark and maintain suitable water resource protection boundaries including Streamside Management Zones (SMZ's), Riparian Management Zones (RMZ's), and Wetland Management Zones (WMZ's) adjacent to streams and wetlands consistent with State Forest Land Management rules.

* Locate a 50 ft. no cut harvest boundary along Cottonwood Creek and a 90 ft. Riparian Management Zone (RMZ/CMZ) where 50% of representative standing trees would be retained in the 50-90 ft. strip that would be designated parallel to Cottonwood Creek.

* Limit harvest equipment and hauling operations to periods when soils are relatively dry, (less than 20%), frozen or snow covered to minimize soil compaction and rutting, and maintain drainage features. Check soil moisture conditions prior to equipment start-up. Avoid dispersed skidding unless on snow or frozen ground. Portions of the access roads have clayey segments that tend to remain wet later into the spring and requires strict adherence to dry or frozen season of use to limit impacts in harvest units or damage to roads. Some moister conditions are accepted on harvest units where tractors remain on designated trails and timber will be felled and bunched or winched to trails.

* Aspen restoration sites will be marked as Wetland Management Zones and all activities will meet requirements of site specific plans for each designated area. Emphasis will be to minimize disturbance but still achieve goals needed to promote aspen while protecting soils and wetland integrity.

* On tractor harvest units the logger and sale administrator will agree to a general skidding plan prior to equipment operations to limit trails to 15% or less of the harvest unit. Prefer use of existing skid trails, unless too steep. Limit ground skidding equipment to slopes less than 40%. Feller-bunchers may work on slopes up to 45% as long as displacement and turning is minimized to prevent excessive disturbance.

* Existing road segments would be improved and maintained in association with the harvest activities. Road improvements would include surface blading, installation of drainage features to prevent surface erosion and sediment delivery to the stream, ditching to improve road surface stability, gravel surfacing of selected segments to as needed to comply with BMP'S and protect water quality.

* New roads would be closed to motor vehicles upon completion of harvest activities. Slash would be placed on main skid trails to protect soils and reduce erosion potential and potential unauthorized ATV use as needed.

* The replacement of the Cottonwood Creek Bridge would meet the requirements of the FWP 124 permit issued for this project for erosion control and stream protection.

Direct and Indirect Effects of the No- Action Alternative on Water Quality and Quantity
No direct or indirect effects to water quality or quantity would be expected to result other than those described under Existing Conditions in Attachment B. Sedimentation on existing roads with inadequate surface drainage would continue to impact water quality unless mitigations or remedial actions are taken. Continued insect mortality or wildfire may increase runoff and water yield relative to increasing canopy loss.

Direct and Indirect Effects of the Action Alternative on Water Quality and Quantity
The proposed project would treat up to 4,899 acres that includes salvage harvest, commercial and pre-commercial thinning, that are located in Lower Cottonwood Creek and parts of Tributary A & B as noted on watershed map WS-1 found in Attachment B.

The proposed action is mainly low to moderate harvest of trees that are overstocked, dead or in poor condition. The SMZ width for all sites is mainly 50ft based on the shallow slopes with some short reaches of 100 ft SMZ, where short steep slopes exceed 35% adjacent to streams. No SMZ harvest is proposed consistent with DNRC's conservation agreement in this area. No harvest would occur within 50 feet of Class I streams, principally Cottonwood Creek and tributary A, and no ground based equipment would be operated in these SMZ's consistent with the conservation agreement and rules.

Sediment Delivery
Under the action alternative, the primary haul routes would use the existing roads. Maintenance work would be completed on all existing DNRC roads to improve drainage adequate to meet BMP's. If necessary, up to 1 mile of relocated and new roads would be constructed and 1/3 mile of road near Cottonwood Creek would be stabilized and abandoned. Road drainage would be maintained during use. There would be no increase in open road density. Following use, temporary roads will be closed, stabilized with long-term drainage features installed, and reseeding with site adapted grass to control erosion and compete with noxious weeds.

The primary risk to water quality is sediment delivery at crossings, since plans are to maintain adequate stream buffers form harvest. The existing 22 ft log bridge on Cottonwood Creek would be replaced with a 30 ft steel bridge to improve flows and stabilize an undercut bank and ditch adjacent to the crossing. All requirements of the 124 permit and erosion control measures would be implemented, at the proposed bridge/bank stabilization site to minimize erosion. One undersized crossing would be replaced on a tributary B stream segment to improve flow and reduce sedimentation. There would be a temporary increase in sediment when flows return to the stream channels, but sediment is expected to be low, short term and less in the long-term than the current conditions with no-action. All harvest operations are designed to minimize surface disturbance and potential for erosion and sediment delivery by implementing adequate stream and wetland buffers.

Selection harvest would occur within the RMZ of 50-100 foot from Cottonwood Creek where slopes are less than 10%. The spatial distribution of retention trees will be feathered to favor greater retention as one moves closer to the 50 ft. no-harvest boundary adjacent to the stream. The riparian management zones have gentle slopes and well established vegetative buffers and there is low risk of sedimentation to surface waters from harvest operations. Sediment trapping research (Lakel et. al. need a year for the citation) on the effectiveness of stream buffers, found that > 97% of watershed erosion was trapped by vegetation prior to entering streams for SMZ's of 25ft or more.

All requirements of the SMZ laws, Forest management rules, BMP's, 124 and associated stream permits and DNRC Habitat Conservation Plan (HCP) and conservation easement will be implemented. Based on implementation of Best Management Practices, site specific mitigations, and all rules and agreements, the proposed timber harvest and road construction is expected to result in low overall short term direct or in-direct water quality impacts due to erosion and sediment delivery.

Water Yield
The proposed harvest and thinning would occur on up to 4,899 acres, which represents less than 14% of the 35,866 acre Cottonwood Creek drainage. The proposed treatments are located in the drier valley floor and

footslopes of the drainage. There is low potential for surface runoff or measurable water yield increases from the proposed partial harvest, compared to no-action. For the following reasons;
The project areas include multi-story forest stands that are generally well regenerated and overstocked with young trees. The proposed selective and group harvest would remove stagnant trees and promote codominant and understory trees that use water more efficiently. These are low precipitation sites of 16-20" annual precipitation, where evaportranspiration and soil infiltration rates exceed precipitation levels and surface runoff is unlikely, even during storm events. The lower Cottonwood Creek area is estimated to provide only 15% of total runoff, and the project harvest area is less than 19% of lower Cottonwood or roughly accounts for about 4% of runoff. Research has shown that water yield is not likely detectable (MacDonald & Stednick. 2003, Romme et.al.2006) for these low precipitation levels of less than 20" annually, even with aggressive harvests, and the proposal is low to moderate selective harvest over a broad area, using existing roads.

The proposed precommercial thinning would thin overstocked trees of up to 1,000+ stems/acre to a spacing of 200-300/acre. Thinning would also reduce competition and promote faster growth and improved water efficiency by retained trees. For all these reasons there is low risk of direct or in-direct effects of increased water yield or potential change in stream channel forms or flow regimes.

Cumulative Watershed Effects of No-Action Alternative:
Cumulative watershed effects can be characterized as impacts on water quality and quantity that result from the interaction of past, current or foreseeable future disturbances, both human-caused and natural such as wildfires and mortality. The analysis areas for watershed cumulative effects include the watersheds that wholly surround the DNRC project sections and the access roads to those sections. Past, current, and future planned activities within each analysis area have been taken into account for the cumulative effects analysis. Past management activities in the proposed project areas include timber harvest, grazing, road construction, irrigation diversions, agriculture, gravel pits, fire suppression and recreation. Recent timber harvest projects in the general area include: the Kinda Kozy Salvage Permit, Deadman Salvage near Ovando, and Elbow Lake Salvage near Clearwater Junction. A programmatic, BMP audit was completed on Elbow Lake Salvage to monitor administration and mitigations, and operations were found to be in compliance with all BMP's and SMZ rules. Under the no-action alternative, cumulative effects would remain the same as described in existing conditions.

Cumulative Watershed Effects of the Action Alternative:
There would be low risk of adverse cumulative impacts from the proposed action, to water quality and beneficial uses based on implementation of BMPs and mitigation measures during timber harvest and road construction operations. Within the cumulative effects analysis area, DNRC has proposed to treat dead, high risk and overstocked trees on approximately 4,899 acres in the project area.

The proposed harvest presents a low risk of water yield increase, compared to no-action based on the following. Up to 20% of the proposed harvest, is salvage removal of dead, dying and trees at high risk of insect mortality. The harvest and thinning would retain well stocked advance regeneration of pole and sapling trees and representative forest overstory. The current overstocked stands include units with over 1,000+ trees/acre that would be thinned to 200 to 300 trees/acre using primarily existing roads and trails that meet BMP's. The low to moderate levels of harvest are not anticipated to result in measurable changes in water yield, peak flows or affect channel conditions as compared to the no-action alternative and natural ranges associated with disturbances such as tree mortality and fire. Rates of soil infiltration and transpiration generally exceed precipitation. For the proposed harvest sites where annual average precipitation, is 16-20"/year, the potential for increased water yield is unlikely to be detectable (MacDonald & Stednick. 2003, Romme et.al.2006).

The proposed ground based timber harvest and use of existing roads is expected to result in low risk of erosion and sediment delivery to streams. Class 1 streams would be protected by implementation of the SMZ law and RMZ requirements consistent with rules and HCP requirements. Wetlands would be protected and an alternative practice would be implemented to restore and improve aspen growth. A bridge crossing of Cottonwood Creek would be replaced with a longer bridge span to prevent flow constriction and an eroding ditch/stream bank would be stabilized. The replacement of the Cottonwood Creek Bridge in section 31 would improve flow, channel stability and reduce sedimentation at the crossing site. Road drainage improvements, crossing replacements and improved road maintenance would reduce current sediments and maintain or improve water quality. For all these reasons there would be low risk of cumulative effects to water quality, quantity or beneficial uses.

For complete water resource analysis see attachment B.

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6. AIR QUALITY:
What pollutants or particulate would be produced? Identify air quality regulations or zones (e.g. Class I air shed) the project would influence. Identify cumulative effects to air quality.

The DNRC is a member of the Montana/Idaho Airshed Group which was formed to minimize or prevent smoke impacts while using fire to accomplish land management objectives and/or fuel hazard reduction (Montana/Idaho Airshed Group 2006). The Group determines the delineation of airsheds and impact zones throughout Idaho and Montana. Airsheds describe those geographical areas that have similar atmospheric conditions, while impact zones describe any area in Montana or Idaho that the Group deems smoke sensitive and/or having an existing air quality problem (Montana/Idaho Airshed Group 2006).

Alternative A - No Action
Under the No Action Alternative, no slash piles would be burned within the project areas. Thus, there would be no effects to air quality within the local vicinity and throughout Airshed 3B.

Alternative B – Forest Management Projects (Action)
Under the Action Alternative, slash piles consisting of tree limbs and tops and other vegetative debris would be created throughout the project area during harvesting. These slash piles would ultimately be burned after harvesting operations have been completed.

Burning would introduce particulate matter into the local airshed, temporarily affecting local air quality. Over 70% of emissions emitted from prescribed burning is less than 2.5 microns (National Ambient Air Quality PM 2.5). High, short-term levels of PM 2.5 may be hazardous. Within the typical column of biomass burning, the chemical toxics are: Formaldehyde, Acrolein, Acetaldehyde, 1,4 Butadiene, and Polycyclic Organic Matter.

Burning within the project area would be short in duration and would be conducted when conditions favor good to excellent ventilation and smoke dispersion as determined by the Montana Department of Environmental Quality, Missoula County and the Montana/Idaho Airshed Group. Prior to burning a “Prescribed Fire Burn Plan” would be done for the area. The DNRC, would burn only on day for which approval to burn is granted from the above regulatory authorities, resulting in temporary and minor impacts on air quality. For that reason, direct and indirect effects to air quality due to slash pile burning associated with the proposed action would be minimal.

Burning that may occur on adjacent properties in combination with the proposed action could potentially increase cumulative affects to the local airshed and the Class I Areas. The United States Forest Service and large scale industrial forestry operations in the area participate as airshed cooperators and operate under the same Airshed Group guidelines as the DNRC. Non-industrial timberland operators are regulated by the Montana Department of Environmental Quality and burning is only allowed during seasons that provide good ventilation and smoke dispersion. Thus, cumulative effects to air quality due to slash pile burning associated with the proposed action would also be expected to be minimal.

Harvesting and log hauling could create dust which may affect local air quality. Harvesting operations would be short in duration and could occur during the winter months that would minimize dust dispersal. Thus, direct, indirect, and cumulative effects to air quality due to harvesting and hauling associated with the proposed action would be minimal.

7. VEGETATION COVER, QUANTITY AND QUALITY:

What changes would the action cause to vegetative communities? Consider rare plants or cover types that would be affected. Identify cumulative effects to vegetation.

Rare Plants

Ten rare plant species are known to exist within the general proximity of the project area. None of the plants were discovered in the project area. The following plant species may exist based on data from the Natural Heritage Program:

Howell's Gumweed: Most populations are small and many occur on roadsides or other similarly disturbed habitat. This habitat preference in conjunction with the short-lived nature of the species means occurrences may drift from place to place or from year to year and as a result many occurrences may be ephemeral. These attributes make determination of population numbers as well as the number of extant populations at any given time difficult to assess. Invasive weeds are a threat to many occurrences, as the habitat occupied by *G. howellii* is also favorable for many weedy species. Application of herbicides to control these weeds, especially along roadsides may also have a direct, negative impact.

Peculiar Moonwort (*Botrychium paradoxum*): This moonwort species is known to occur in western Montana from over two dozen extant occurrences, almost all of which are on federally-managed lands. Many occurrences are small in size and occupy mesic meadows and bunchgrass communities. Potential impacts to these sites include livestock grazing, weed invasion and recreational uses. Though some threats exist to individual occurrences, the species as a whole is not highly threatened by any single or combination of potential impacts in the state.

English Sundew *(Drosera anglica)*: Known from over two dozen populations in the state, most of these are moderate to large-sized, healthy populations. Most occurrences are on federally managed lands with several of these in designated wilderness areas, research natural areas or Glacier National Park which help to protect the occurrences from many potential threats. However, one population is vulnerable to ski area expansion and activity, and the species may be negatively impacted by fire as observations at one location appear to indicate. Plants are also sensitive to and negatively impacted by trampling of peat mats on which the species grow.

Chaffweed (*Centunculus minimus)*: Known from scattered locations across the state, though it is rare to uncommon in Montana. May be susceptible to some adverse impacts from human-caused disturbance due to its preference for vernally moist habitats in valley locations.

Slender Cottongrass (*Eriophorum gracile*): Known from a very few large populations, several smaller populations and a half dozen historical or poorly documented locations. Populations occur on a mix of federal, state and private ownerships in northwest Montana at low to moderate elevations. Populations are vulnerable to any activities that may alter the hydrology of occupied sites.

Hall's Rush (*Juncus hallii*): Rare, though widespread across the mountainous portions of southwest and central Montana. Threats and potential negative impacts to most known occurrences appear to be minimal.

Beck Water-marigold (*Bidens beckii*): Known from ten occurrences in the western valleys of the state, including 6 moderate to large populations and one historical occurrence from Salmon Lake dating to 1937. However, the species may be more abundant in the state than what current data suggests. Threats and impacts to populations in Montana include boating activity, lake shore development, aquatic weeds and use of aquatic herbicides.

Deer Indian Paintbrush (*Castilleja cervina*): Known from 3 widely separated collections in western Montana, including a 1901 collection in Missoula County near "Sunset Hill", a 1960 collection near Deer Lodge and an 1894 collection near Columbia Falls.

Pygmy Water-lily (*Nymphaea leibergii)*: Known from 4 extant occurrences in western valleys and one historical collection from Salmon Lake in the Seeley Lake area. Populations are susceptible to impacts from development, recreation, siltation and aquatic weeds.

Blunt-leaved Pondweed (*Potamogeton obtusifolius*): Known from over a dozen occurrences in northwest Montana. Several contain moderate to large-size populations and occur in valley and foothill locations in a variety of federal, state, and private ownerships. A few populations are on lands managed specifically for their conservation value. Some populations are vulnerable to impacts associated with development, recreation and increased sediment and nutrient loads.

As mentioned above the previously listed plants were not discovered in the project area. The preferred habitat for the plants is either moist riparian or prairie habitats. Neither of these habitats will be disturbed during harvest

operations. For that reason risks to the plant species would be minimal. If any rare plants are discovered during harvest reconnaissance, layout or implementation they will be documented and protected accordingly.

Noxious Weeds

Issues and Concerns

The following issue statements were developed during scoping regarding the effects of the proposed timber harvest and road systems to noxious weeds.

* Noxious weeds- There is a concern that the proposed forest management activities may introduce or spread noxious weeds and that disturbed roads should be reseeded.

Recommended Mitigation Measures for Soil, Water, Cold Water Fisheries Resources and Noxious Weed Management:

The analysis and levels of effects to Noxious weeds are based on implementation of the following mitigation measures:

* All road maintenance and harvest equipment will be cleaned of plant parts, mud and weed seed to prevent the introduction of noxious weeds. Equipment will be subject to inspection by forest officer prior to moving on site.

* All newly disturbed soils on road cuts and fills will be promptly reseeded to site adapted grasses to reduce weed encroachment and stabilize roads from erosion.

* Weed treatment measures will include roadside and spot herbicide treatment of noxious weeds. Where herbicide treatments are required by the forest officer, herbicide must be applied under the supervision of a licensed applicator following label directions in accordance with Department of Agriculture regulations, applicable laws and rules and regulations of the County weed boards.

* DNRC will monitor the sites for 2 years to evaluate weed control measures implemented and determine if any new noxious weeds establish that were not previously identified.

Existing Conditions

Noxious weeds infestations are mainly a combination of spotted knapweed, houndstongue and spots of thistle which occur along portions of the existing access road system, open forest and rangeland sites. Noxious weeds occurring in the project parcels are mostly knapweed (Centaurea maculosa), houndstongue (Cynoglossum officinale L) and spot infestations of thistle (Cirsium arvense) within project sections and on adjacent lands. Knapweed (Centaurea maculosa) was found along roadsides as well as in some forested portions of the project area. Houndstongue was found mostly along roadsides along the access haul route. Historic cattle grazing, timber harvest activities, and recreational uses, are most likely the reasons for the existing rate of spread of noxious weeds and the potential future spread and introduction of noxious weeds. Previous weed management treatments in the area have been limited to reseeding of some roadcuts and treatments on adjacent private lands.

Noxious Weeds- Direct and Indirect Effects of the No- Action Alternative

With no action, noxious weeds will continue to spread along roads and may increase on the drier site habitats. Following disturbance events such as timber harvest activities, fires, or grazing, the establishment and spread of noxious weeds can be more prevalent than in undisturbed areas. DNRC would treat selected sites on DNRC roads based on priorities and funding availability. If new weed invader species are found they would have highest priority for management. The grazing licensees, if any, would be required to continue weed control efforts consistent with their use.

Noxious Weeds- Direct and Indirect Effects of the Action Alternative

The action alternative will involve ground-disturbing activities that have the potential to introduce or spread noxious weeds in susceptible habitat types. For the action alternative, an Integrated Weed Management (IWM) approach was considered for treatment of existing and prevention of potential noxious weeds. For this project: prevention, revegetation and weed control measures for spot outbreaks are considered the most effective weed management treatments. Prevention measures would require cleaning of off-road equipment. Roadsides would

be sprayed prior to operations and weed control and revegetation would slow noxious weed spread and reduce weed density and occurrence compared to no-action. There would be a potential slight increase in weed infestation with harvest units due to soil disturbance and reduction of tree canopy. The silvicultural prescriptions are designed to control disturbance and scarification to goals needed for sustained forest growth. Control efforts will promote rapid revegetation and emphasize treatment of any new noxious weeds found.

Herbicide application would be completed on segments of DNRC roads along the haul route, to reduce weed spread along roads and promote desired vegetation for weed competition and to reduce sedimentation. Herbicide would be applied according to labeled directions, laws and rules, and would be applied with adequate buffers to prevent herbicide runoff in surface water. Implementation of IWM measures listed in the mitigations would reduce existing weeds, limit the possible spread of weeds, and improve current conditions, to promote existing native vegetation. More weed control would occur compared to the no-action alternative and grass and competitive vegetation would increase along roads.

Noxious Weeds- Cumulative Impacts of No-Action

Impacts of noxious weeds within the project areas are moderate. Weeds have spread through the drainage across ownerships over time and are prone to more dispersal along open roads. Weeds also have spread by multiple uses from wind, traffic, forest management and wildlife. Current weed infestations are mainly limited to roadsides within the project parcel and open forest sites. No control occurs along the main county access road, and this increases the potential for windblown seed. Timber harvest and roads throughout these drainages has increased grass growth and the risk for noxious weeds to spread though ground disturbance. As tree density and vegetation increase, weeds are reduced through vegetative competition.

Noxious Weeds- Cumulative Impacts of the Action Alternative

Impacts of noxious weeds within the project areas are moderate. Weeds have spread through the drainage across ownerships over time mainly along roadsides and open forest sites with multiple uses and by seed dispersal from wind, traffic and wildlife. Timber harvest throughout these drainages has increased grass growth and the risk for noxious weeds to spread though ground disturbance. Within the project area, overall cumulative effects of increased noxious weeds are expected to be low to moderate, based on herbicide treatments of existing weeds along roads and implementing prevention measures to reduce new weeds, by cleaning equipment and planting grass on roads to compete against weeds.

Standard Vegetative Community

Existing Conditions

Cover Types for the Good Shepherd Timber Sale Projects Area

Cover Type	Current Acres	Current Percent of Project Area	Desired Future Condition Acres	Desired Future Condition Percent of Project Area
Ponderosa Pine	1,472	30%	2,189	45%
Non-forested	310	6%	310	6%
Douglas-fir	335	7%	77	2%
Non-Stocked	252	5%	0	0%
Hard Wood	12	<1%	12	<1%
Mixed Conifer	276	6%	29	<1%
Sub Alpine Fir	108	2%	0	0%
WL/DF	2,134	44%	2,260	46%
Lodgepole pine	0	0%	23	<1%

The current stand condition is a result of past harvest, mining and farming activities. All the sections in the project area were previously under private industrial forest ownership. Several entries beginning around the turn of the 20th century up until the early 1990's have left the project area with two distinct stand types.

The first stand type is composed of mixed conifer species approximately 40- 49 years old. The diameter range for these stands is 6”-12”, with heights 30-60 feet tall depending on the site. These stands have a closed canopy with spacing among tree boles varying from 6-12 feet. Signs of stress and competition for nutrients and sunlight can be observed by short leader growth as well as insect and disease mortality. In addition Root rot can be found occasionally in Douglas-fir. Western Spruce Budworm (*Choristoneura occidentalis*) is prevalent in the Douglas-fir understory and overstory and Mountain Pine beetle (*Dendroctonus ponderosae*) is present in the lodgepole and ponderosa pine. When openings are present Douglas-fir advanced regeneration 1’-15’ tall exist in thick patches, with an occasional ponderosa pine or western larch being present.

The second stand type is a multi-storied mixed conifer stand dominated by Douglas-fir on all levels. These stands have a wider age range (0-100+ years) as would be expected in a multi-storied stand. As mentioned the dominant overstory tree is Douglas-fir, however, depending on the location in the project area western larch and ponderosa pine are occasionally well represented. The overstory component contains two separate characteristics. The larger overstory trees (16”-26” dbh) are often high in defect including, but not limited to, rot, crook, sweep and forked tops. This is consistent in all species and could be assumed that these were trees retained during past high grading activities. These trees are scattered throughout the stands existing almost entirely as individual trees but in some rare cases small clumps do exist. The second overstory component is smaller in size (8”-15” dbh) and was most likely too small to harvest during past harvest entries. Overall tree quality and vigor is good to fair in these stands. The above mentioned defect is present, but in a much smaller percentage than the larger stand component. Dominant tree species varies with location in the project areas; Ponderosa pine, western larch and Douglas-fir are all present. Regardless of the dominant species Douglas-fir is interwoven throughout the project area as individual trees and clumps. Mountain Pine beetles are more active in this size class (8”-15” dbh) than any other. Sections 31 & 32 are currently experiencing high mortality in the ponderosa pine. The rest of the project area is also experiencing Mountain pine beetle activity but at a much smaller scale.

Where the larger, more open stand types exist, advanced regeneration is overstocked and dominated by Douglas-fir. It is very common for 1,000+ trees/acre to exist in the understory. Western larch, ponderosa pine and an occasional lodgepole pine are present but these generally exhibit lower vigor due to stress from competing with the shade tolerant Douglas-fir. Not only does this overstocked understory present a hazard to the project area by providing ladder fuels for potential crown fires, it also assists the western spruce budworm in completing its life cycle.

Scattered throughout the project area are wetlands and potholes. These areas play an important role in habitat diversity in this area. Aspen have historically dominated the understory and overstory, until recently. Conifer encroachment, again dominated by Douglas-fir, has begun to crowd out aspen shoots. The result being as older aspen phase out limited numbers of new shoots are available to follow in behind. The overall integrity of the wetlands are changing with this encroachment.

At the larger scale, DNRC lands managed by the Clearwater Unit are approximately 85% forested, mostly in the ponderosa pine and western larch/Douglas-fir cover types. Compared to the desired future condition at this scale, Douglas-fir, subalpine fir, and mixed-conifer cover types are over-represented while ponderosa pine and western larch/Douglas-fir are under-represented. Overall, however, about 85% of these lands do have a cover type that matches the desired future condition. This area falls within climatic section 332B, which was historically about 79% forested. Within the climatic section, the historically dominant cover type was lodgepole pine, followed by Douglas-fir and ponderosa pine on lower slopes (Losensky, 1997).

DNRC has adopted old-growth definitions based on minimum age and number of large live trees as described in Green et al. (1992). Based on Stand Level Inventory age data, timber sale pre-cruise data, and field reconnaissance no stands in the project area meet the minimum criteria to be classified as old growth according to DNRC’s definition. The lack of old growth in the project area is reflective of its past ownership and management by industrial timberland owners.

Environmental Consequences

Alternative A - No Action

Under this alternative no forest management activities would occur. Douglas-fir would continue to overcrowd the desired species for the site (western larch and ponderosa pine). Trees with poor growth characteristics (forked tops, crook and sweep) would continue to be present in the overstory using up vital sunlight, water and nutrient resources. Shade tolerant Douglas-fir would continue to out-compete ponderosa pine and western larch in the understory. The mountain pine beetle would continue to cause mortality in all size classes of ponderosa pine. Aspen dominated stands would continue to reduce in density because of encroaching shade tolerant conifers. Current recreational uses would continue with no revenue being generated for the trusts.

Alternative B – Forest Management Projects (Action)

The proposed action alternative would treat 4,899 acres. Treatment type and size would vary based on stand conditions. The proposed treatment types would include:

- Pre-commercial thinning overstocked sub-merchantable stands to promote western larch and ponderosa pine. Shade tolerant species such as Douglas-fir would be targeted for removal as well as any trees displaying signs of insects, disease and defect such as forked tops. Pre-commercial thinning projects would reduce the stand density to 200-300 trees/acre.
- Approximately 3-4 large scale commercial harvest treatments would be designed to promote future desired conditions and to emulate natural disturbances based on a mixed severity fire regimes. Post harvest the stand appearance would resemble a natural mixed severity disturbance with scattered clumps remaining as well as unevenly spaced overstory trees. The overstory would be dominated by western larch and ponderosa pine with a stand density of 30-60 $ft.^2$ of basal area/acre, depending on the site and stand characteristics. At least two snag and snag recruits per acre will exist scattered among the overstory component. Areas along streams and the majority of wetlands would not be harvested (the only exception being aspen restoration) leaving an unmanaged buffer in compliance with the Montana Fish Wildlife and Parks conservation easement. Post harvest pre-commercial thinning activities may also take place in these areas promoting the desired species in the understory to further increase the success of achieving the future desired condition.
- Several small timber permits may occur in the project area. Timber permits cannot exceed 100mbf in green volume or 500 mbf in salvage volume. These treatments are generally used to address salvage situations or in some instances treat areas that for various reasons such as access, seasonal restrictions, etc., did not make sense to include in a large timber sale. In all cases the timber permits will have the same objectives as a large timber sale. The desired future condition for the stand will be promoted.
- Aspen restoration activities would occur in wetlands where significant improvements in aspen health and density may be achieved. Specialists from the MTFWP as well as the MT DNRC will prioritize which wetlands in the project area should be treated. Restoration treatments will include removing encroaching conifers from the 50 no harvest buffer that exists around each wetland (no harvest buffer is a provision in conservation easement), projects would not exceed a total of 40 treated acres.

Fuel loading concerns would vary according to the pre-harvest stand. In accordance with ARM 36.11.410 and ARM 36.11.414 the majority of fine slash foliage and approximately 5 to 15 tons of coarse woody debris would be left scatted on the forest floor in all harvest units. This would increase the intensity and reduce the ability to control ground fires in all harvest units for approximately three years. In stands that have numerous leave trees following harvest this could result in ground fires killing trees and an increased risk of crown fires. In areas with few leave trees the risk of a catastrophic crown fires would decrease.

The proposed harvest would create favorable conditions for existing weeds to spread throughout the harvest units. These conditions include scarified soil for easier weed seed germination and increased sunlight reaching the forest floor. To prevent introduction of new weeds, off-road equipment would be cleaned and inspected prior to entry into harvest areas. Newly disturbed roads and landing would be seeded to grass. Roadsides with existing weeds and some spot infestations away from the roads would be treated with herbicides.

Because projects occur in areas that have received prior treatments, and post harvest the overall stand health and vigor will be improved, the proposed action would be expected to result in low to moderate direct, indirect, and cumulative impacts on forest vegetation beyond those projected for the no action alternative.

8. TERRESTRIAL, AVIAN AND AQUATIC LIFE AND HABITATS:

Consider substantial habitat values and use of the area by wildlife, birds or fish. Identify cumulative effects to fish and wildlife

Terrestrial and Avian Issues and Concerns

-There is concern that the proposed activities could alter cover, increase access, and reduce secure areas, which could affect grizzly bears by displacing them from important habitats and/or increasing risk to bears of human-caused mortality.

-There is concern that the proposed activities could negatively affect Canada lynx by altering lynx summer foraging habitat, winter foraging habitat, and other suitable habitat, rendering it unsuitable for supporting lynx.
There is concern that the proposed activities could negatively affect bald eagles by reducing nesting and perching structures and/or disturbing nesting bald eagles
There is concern that the proposed activities could reduce the amount and/or quality of fisher habitats, which could alter fisher use of the area.

-There is concern that the proposed activities may alter flammulated owl habitat by reducing canopy closure and increasing tree spacing, and could remove snags needed by flammulated owls for nesting.
The proposed activities could displace gray wolves from important habitats, particularly denning and rendezvous sites, and/or alter prey availability.

-There is concern that the proposed activities could reduce suitable nesting and foraging habitat for pileated woodpeckers, which could alter pileated woodpecker use of the area.
There is concern that the proposed activities could remove forest cover on big game winter range, which could reduce the carrying capacity of the winter range

-There is concern that the proposed activities could remove elk security cover, which could affect hunter opportunity and local quality of recreational hunting.

Issues Eliminated from Further Study

The following species were considered but eliminated from detailed study due to lack of habitat present: black-backed woodpecker, Coeur d'Alene salamander, Columbian sharp-tailed grouse, common loon, harlequin duck, mountain plover, northern bog lemming, peregrine falcon, and Townsend's big-eared bat. Thus there would be a low risk of adverse direct, indirect, or cumulative effects as a result of either alternative.

Suggested Wildlife Mitigations

- A DNRC biologist will be consulted if a threatened or endangered species is encountered to determine if additional mitigations that are consistent with the administrative rules for managing threatened and endangered species (ARM 36.11.428 through 36.11.435) are needed.
- Motorized public access will be restricted at all times on restricted roads that are opened for harvesting activities; motorized public access would revert to existing levels following harvesting. Efforts to discourage additional motorized access (legal and illegal) by reclaiming temporary roads and obstructing skid trails would benefit several wildlife species.
- Snags, snag recruits, and coarse woody debris will be managed according to *ARM 36.11.411* through *36.11.414*, particularly favoring western larch and ponderosa pine. Clumps of existing snags could be maintained where they exist to offset areas without sufficient snags. Coarse woody debris retention would emphasize retention of downed logs of 15-inch diameter or larger.
- Contractors and purchasers conducting contract operations will be prohibited from carrying firearms while working in the project area.
- Food, garbage, and other attractants will be stored in a bear-resistant manner.
- Retention of patches of advanced regeneration of shade-tolerant trees, such as subalpine-fir and Engelmann spruce, in harvest areas #2 and #3 would break-up sight distances, provide horizontal cover, and provide forest structural attributes preferred by snowshoe hares and lynx.
- Antler collection would be prohibited when the area is closed to the general public (November 11- May 14).

- Provide connectivity for fisher, Canada lynx, grizzly bears, and a host of other species by maintaining corridors of unharvested and/or lighter harvested areas along riparian areas, ridge tops, and saddles.

Aquatic Life and Habitats

Issues and Concerns

The following issue statements were developed during scoping regarding the effects of the proposed timber harvest and road systems to cold-water fisheries:

*Cold Water Fisheries- There is a concern that the proposed action may adversely affect fish habitat features; including channel forms, connectivity and stream temperature.

Project Area Dismissed from Further Analysis- Unnamed Tributary B

The proposed harvest within Unnamed Tributary B will be dismissed from fisheries analysis based on the following: 1) the short perennial stream reach does not support fish and 2) tributary B is intercepted by a ditch and ends in field without connectivity to Cottonwood Creek.

Connectivity dismissed from Further Analysis

Initially, fish habitat connectivity was raised internally as a possible concern, but will be dismissed since field review verified there are no obstructions to fish connectivity on the DNRC ownership in the project area. There is one bridge existing crossing of Cottonwood Creek that does not obstruct fish passage. The old log bridge will be replaced by a wider span steel bridge, but there would be no measurable change in connectivity.

Recommended Mitigation Measures for Cold Water Fisheries Resources:

The analysis and levels of effects to Fisheries Resources are based on implementation of the following mitigation measures:

* DNRC would implement all applicable BMP's, Montana Administrative Rules for Forest Management and reasonable mitigation and erosion control practices during timber harvest, road maintenance, and road construction and road use activities

* DNRC would locate, clearly mark and maintain suitable water resource protection boundaries including Streamside Management Zones (SMZ's), Riparian Management Zones (RMZ's), and Wetland Management Zones (WMZ's) adjacent to streams and wetlands consistent with State Forest Land Management rules.

* Locate a 50 ft. no cut harvest boundary along Cottonwood Creek and a 90 ft. Riparian Management Zone (RMZ/CMZ) where 50% of representative standing trees would be retained in the 50-90 ft. strip that would be designated parallel to Cottonwood Creek.

* Existing road segments would be improved and maintained in association with the harvest activities. Road improvements would include surface blading, installation of drainage features to prevent surface erosion and sediment delivery to the stream, ditching to improve road surface stability, gravel surfacing of selected segments to as needed to comply with BMP'S and protect water quality.

* The replacement of the Cottonwood Creek Bridge would meet the requirements of the FWP 124 permit issued for this project for erosion control and stream protection.

For complete wildlife and fisheries analysis see attachment B and attachment C.

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9. UNIQUE, ENDANGERED, FRAGILE OR LIMITED ENVIRONMENTAL RESOURCES:
Consider any federally listed threatened or endangered species or habitat identified in the project area. Determine effects to wetlands. Consider Sensitive Species or Species of special concern. Identify cumulative effects to these species and their habitat.

Unique and/or endangered fisheries and terrestrial species analyses are included in attachment B and attachment C of this document.

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10. HISTORICAL AND ARCHAEOLOGICAL SITES:
Identify and determine effects to historical, archaeological or paleontological resources.

The DNRC staff archaeologist conducted an intensive, on-the-ground (Class II) inventory of selected areas within the Good Shepherd Timber Sale area of potential effect (APE). Intermittent, segments of a possible railroad spur, and a thin scattering of debris associated with a 1940-1950's vintage logging camp were identified (based on makers marks on bottle fragments). The logging camp is outside the current APE. The possible former railroad spur is largely incorporated into the existing access road and will not be impacted with the proposed timber sale.

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11. AESTHETICS:
Determine if the project is located on a prominent topographic feature, or may be visible from populated or scenic areas. What level of noise, light or visual change would be produced? Identify cumulative effects to aesthetics.

Any change to the scenery in the area from these alternatives would be in addition to past timber harvests, road building, power line easements, past mining activity, irrigation development and grazing within the project area. This analysis includes all past and present effects.

No Action
Under the no action alternative ponderosa pine infested with mountain pine beetle would die. Initially this would result in large scattered patches of red-needled trees. In the following years the trees would lose their needles, some would fall to the forest floor layering the material in a jack-straw fashion. Without harvest the residual stand would be dominated by Douglas-fir with forked tops, crook, sweep and other defects. The existing western larch and surviving ponderosa pine would be overshadowed by the shade tolerant Douglas-fir. Thick patches of Douglas-fir will continue to become established in the understory. Aspen stands will continue to decrease because of encroaching conifers. The area will continue to be overgrown with Douglas-fir making the forests almost impassible in some areas and limiting sight distances. In general the stands will exhibit an overcrowded appearance.

Action

In areas that received an individual tree selection harvest the leave tree marking would be done in such a way to emulate natural forest growth. Trees would be left based on quality characteristics, not spacing requirements. This would result in scattered clumps blended with openly spaced trees of all diameter classes. Snag requirements would be met and most often exceeded on a per acre basis so scattered "character" trees can also be observed throughout the stand. Following treatment the stand would exhibit an almost park like appearance in most areas with a quality overstory being present. Western larch and ponderosa pine free of insects, disease, crook, fork and sweep will dominate the overstory. To a lesser extent Douglas-fir displaying desirable growth characteristics may also be represented.

Commercial and pre-commercial thinned treatment areas spacing will be tighter, however the species composition will be similar with the western larch and ponderosa pine being promoted and Douglas-fir being represented on a much smaller scale than it is currently. Stands will have a more uniform appearance, be free of insects and disease and have enough crown spacing to allow some grasses and shrubs to become established.

Throughout the proposed sale area slash from the harvest would be noticeable yet temporary. Generally slash disappears from the site within five years, and is often covered by other vegetation within three years. The tops and limbs from one tree out of every four would be left in the woods to serve as a source of nutrients to the remaining stand. This slash would be lopped to a height not exceeding 18" from the ground.

Harvest systems and activities would be ground-based. The skidding equipment and log trucks may cause temporary dust clouds that would quickly disperse and would only occur during harvest. The proposed harvest would most likely occur during the general "work week".

A small percentage of the overall treatment area can be seen from a county road. The remaining treatment areas have seasonal restrictions and only a small portion will be visible from a vehicle. It will require non-motorized use to observe the bulk of the treatment areas.

Direct, indirect, and cumulative effects to aesthetics due to harvesting and hauling associated with the proposed action would be minimal based on the location of the project and the limited opportunity to see the project from an open road system.

12. DEMANDS ON ENVIRONMENTAL RESOURCES OF LAND, WATER, AIR OR ENERGY:
Determine the amount of limited resources the project would require. Identify other activities nearby that the project would affect. Identify cumulative effects to environmental resources.

No negative direct, indirect or cumulative effects are expected to occur as a result of the proposed project.

13. OTHER ENVIRONMENTAL DOCUMENTS PERTINENT TO THE AREA:
List other studies, plans or projects on this tract. Determine cumulative impacts likely to occur as a result of current private, state or federal actions in the analysis area, and from future proposed state actions in the analysis area that are under MEPA review (scoped) or permitting review by any state agency.

State Forest Land Management Plan EIS, DNRC 1996, set the strategy that guides DNRC management decisions statewide.

Blackfoot-Clearwater Wildlife Management Area EA, DNRC & FWP 2004, used to purchase the Blackfoot Clearwater conservation easement.

IV. IMPACTS ON THE HUMAN POPULATION

- *RESOURCES potentially impacted are listed on the form, followed by common issues that would be considered.*
- *Explain POTENTIAL IMPACTS AND MITIGATIONS following each resource heading.*
- *Enter "NONE" If no impacts are identified or the resource is not present.*

14. HUMAN HEALTH AND SAFETY:
Identify any health and safety risks posed by the project.

Human health would not be impacted by the proposed timber sale or associated activity. Log truck traffic would increase but safety concerns would be minimized by posting signs and, imposing a speed limit, if necessary. There are no unusual safety considerations with the proposed timber sale. The general public and local residents would not face increased health or long term safety hazards because of the proposed timber sale.

No additional negative effects would be expected as a result of the proposed action

15. INDUSTRIAL, COMMERCIAL AND AGRICULTURE ACTIVITIES AND PRODUCTION:
Identify how the project would add to or alter these activities.

The proposed action would lead to a small, temporary increase in industrial activity during implementation. The proposed action would include timber harvesting, pre-commercial thinning and log hauling.

People are currently employed in the wood products industry in the region. Due to the relatively small size of the timber sale, there would be no measurable direct, indirect, or cumulative effects from this proposed action on industrial, commercial and agricultural activities and production.

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16. QUANTITY AND DISTRIBUTION OF EMPLOYMENT:
Estimate the number of jobs the project would create, move or eliminate. Identify cumulative effects to the employment market.

According to the Montana Bureau of Business and Economic Research a general rule of thumb is that for every million board feet of sawtimber harvested in Montana ten person years of employment occur in the forest products industry. This harvest is viewed as a continuation of a sustained yield and as such would not create new employment but rather sustain 60 to 90 person years of employment in the forest products industry. A few short-term jobs in the local area would also be created/sustained by contracting of pre-commercial thinning operations following timber harvest.

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17. LOCAL AND STATE TAX BASE AND TAX REVENUES:
Estimate tax revenue the project would create or eliminate. Identify cumulative effects to taxes and revenue.

The proposed action has only indirect, limited implications for tax collection.

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18. DEMAND FOR GOVERNMENT SERVICES:
Estimate increases in traffic and changes to traffic patterns. What changes would be needed to fire protection, police, schools, etc.? Identify cumulative effects of this and other projects on government services

Aside from contract administration there would be minimal impacts related to demand for government services.

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19. LOCALLY ADOPTED ENVIRONMENTAL PLANS AND GOALS:
List State, County, City, USFS, BLM, Tribal, and other zoning or management plans, and identify how they would affect this project.

The Blackfoot Clearwater Conservation Easement is an agreement signed by the DNRC and Montana Fish, Wildlife and Parks (FWP). The purpose of the conservation easement is to preserve, protect and enhance into perpetuity the conservation values of the land, in particularly the winter-spring habitat for populations of elk, mule deer, and white-tailed deer. (Blackfoot Clearwater CE, 2004). A management plan was developed to guide managers from both agencies during the planning and implementation of projects on the Blackfoot Clearwater game range.

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20. ACCESS TO AND QUALITY OF RECREATIONAL AND WILDERNESS ACTIVITIES:
Identify any wilderness or recreational areas nearby or access routes through this tract. Determine the effects of the project on recreational potential within the tract. Identify cumulative effects to recreational and wilderness activities.

The closest wilderness area is the Bob Marshall Wilderness, 10 air miles to the north. The probability of this project having an effect on the Wilderness area is low.

The proposed project area is entirely on the Blackfoot Clearwater Game Range. This area opens to the public May 15th and closes November 11th. The proposed projects would be implemented in stages and would be concentrated on a small percentage of the overall game range acreage and thus would have low impacts on recreational opportunities.

21. DENSITY AND DISTRIBUTION OF POPULATION AND HOUSING:
Estimate population changes and additional housing the project would require. Identify cumulative effects to population and housing.

There would be no measurable direct, indirect, or cumulative impacts related to population and housing due to the proposed project.

22. SOCIAL STRUCTURES AND MORES:
Identify potential disruption of native or traditional lifestyles or communities.

No measurable direct, indirect, or cumulative effects would be expected under either alternative.

23. CULTURAL UNIQUENESS AND DIVERSITY:
How would the action affect any unique quality of the area?

No negative direct, indirect, or cumulative effects would be expected under either alternative.

24. OTHER APPROPRIATE SOCIAL AND ECONOMIC CIRCUMSTANCES:
Estimate the return to the trust. Include appropriate economic analysis. Identify potential future uses for the analysis area other than existing management. Identify cumulative economic and social effects likely to occur as a result of the proposed action.

Alternative A - No Action
Current recreational use would continue. This use would generate an associated compensation of approximately $815/year for the trust beneficiaries. (Rough approximation based upon $863,694 net recreational use revenue from 5,181,599 surface acres of trust lands in FY2011 = $0.1667/acre X 4,899 acres in project area).

Alternative B – Forest Management Projects (Action)
The proposed action has a projected harvest volume of 6 million board feet (MMBF). We anticipate selling the timber stumpage for approximately $25.00 per ton which is roughly equivalent to $162.50 per thousand board feet (MBF). Total gross revenue is expected to be approximately $975,000. Using the actual Fiscal Year 2011 cost to revenue ratio of 1.8:1 to subtract administrative costs, we anticipate the proposed action would generate a net income of $433,000 for the trust beneficiaries.

Current recreational use would continue at the same level as with the no action alternative with an associated compensation of approximately $815/year to the trust beneficiaries.

EA Checklist Prepared By:	**Names:**	Amy Helena, Garrett Schairer, Jeff Collins Jordan Larson, Patrick Rennie	**Date:**	01/16/2013
	Titles:	Management Forester ,Wildlife Biologist, Soils Scientist, Economist,& Archeologist		

V. FINDING

25. ALTERNATIVE SELECTED:

Two alternatives are presented in Section II. Item 3.of this EA and have been analyzed in detail.
Alternative A "No Action" Under this alternative no forest management activities would occur. Other current uses including recreational use would continue.

Alternative B – Forest Management Projects "Action"

Under this alternative, the DNRC would continue current uses, commercially harvest timber, carry out Aspen restoration treatments and conduct pre-commercial thinning projects. Road maintenance would take place to bring existing roads up to Best Management Practices standards and improve function and drainage. New road construction is not anticipated, however if an existing road segment is inadequate (stream adjacent parallel roads for example) a new segment may be constructed to replace the existing one. The existing segment would then be abandoned. A series of commercial treatments are anticipated to result from this analysis, the first timber sale planned to occur in 2013. Aspen restoration projects may be carried out as part of a large harvest or as a standalone project. Pre-commercial thinning projects will occur based on available funding and Clearwater Unit priorities. Weed spraying and grass seeding would occur following harvest to mitigate the spread of noxious weeds.

During project scoping and analysis, minor changes to Alternative B as well as mitigation measures were identified and incorporated to reduce potential environmental impacts and resolve issues. **I am satisfied this is a reasonable range of alternatives for project proposal given the lack of unresolved issues. I have selected Alternative B with the mitigations noted in the EA for implementation.** This Alternative best meets the obligations associated with the management of school trust lands. As noted in Section 1 **"**The Board of Land Commissioners and the DNRC are required by law to administer these trust lands to produce the largest measure of reasonable and legitimate return over the long run for the beneficiary institutions (Section 77-1-202, MCA)." As noted in Section IV. Item 24.of the EA, Alternative B is estimated to produce a gross revenue between $975,000 and $1,462,500 and result in a net income of between $433,000 and $650,000 for the trust beneficiaries (Common Schools, Public Buildings and State Reform School-Pine Hills). As noted in Section 1, activities would be conducted in compliance with the State Forest Land Management Plan (DNRC 1996), Administrative Rules for Forest Management (ARM 36.11.401 through 450), DNRC Habitat Conservation Plan, FWP Conservation Easement as well as other applicable state and federal laws.

---

26. SIGNIFICANCE OF POTENTIAL IMPACTS:

I have read the analysis of effects contained in this environmental analysis. Implementation of Alternative B with mitigations and in compliance with the State Forest Land Management Plan (DNRC 1996), Administrative Rules for Forest Management (ARM 36.11.401 through 450), DNRC Habitat Conservation Plan, FWP Conservation Easement as well as other applicable state and federal laws will not result in significant environmental effects.

The actions proposed are of relatively short time duration, geographic extent, and the effects are largely mitigated by time. The proposed activities are not unique and there is a reasonable certainty of effects. Similar forest management treatments are common throughout western Montana and there will be little growth inducing or inhibiting impacts associated with this proposal. The project is located within the Blackfoot-Clearwater Wildlife Management Area. This area possesses important big game winter range habitat. The project was designed with extensive consultation with biologists from the Montana Department of Fish Wildlife and Parks to minimize impacts to the winter range while staying true to the obligation to manage these trust lands consistent with state law (77-1-202). The lands involved have been managed as commercial forests for many decades and the proposed activities are in no way precedent setting. Treatments were designed with natural disturbance patterns in mind and with the intent of copying them to the extent possible.

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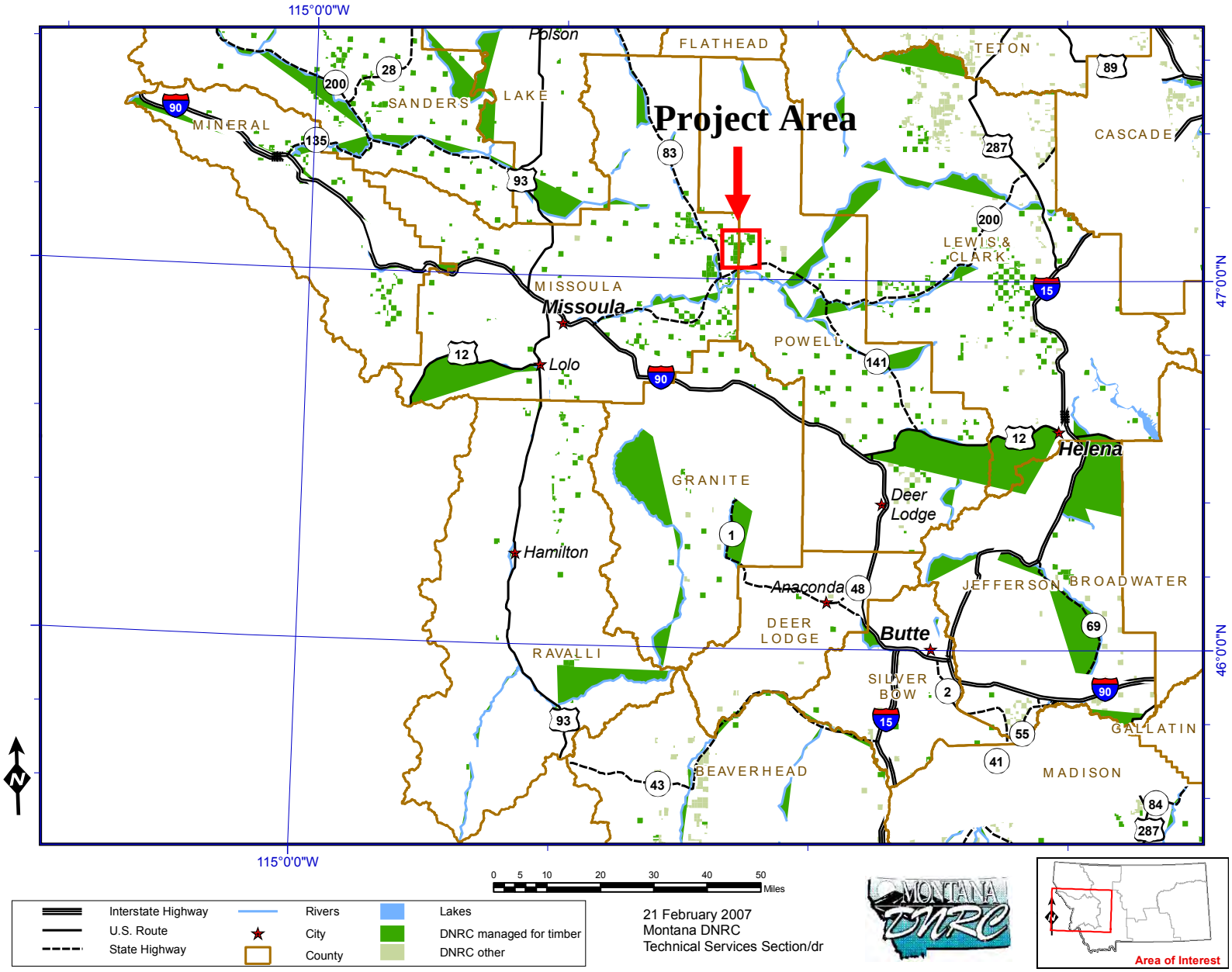
27. NEED FOR FURTHER ENVIRONMENTAL ANALYSIS:

[ ] EIS	[ ] More Detailed EA	[X] No Further Analysis

EA Checklist Approved By:	**Name:**	Robert H. Storer
	Title:	SW Land Office - Trust lands Program Manager
Signature: \s\ Robert H. Storer	**Date**:	March 15, 2013

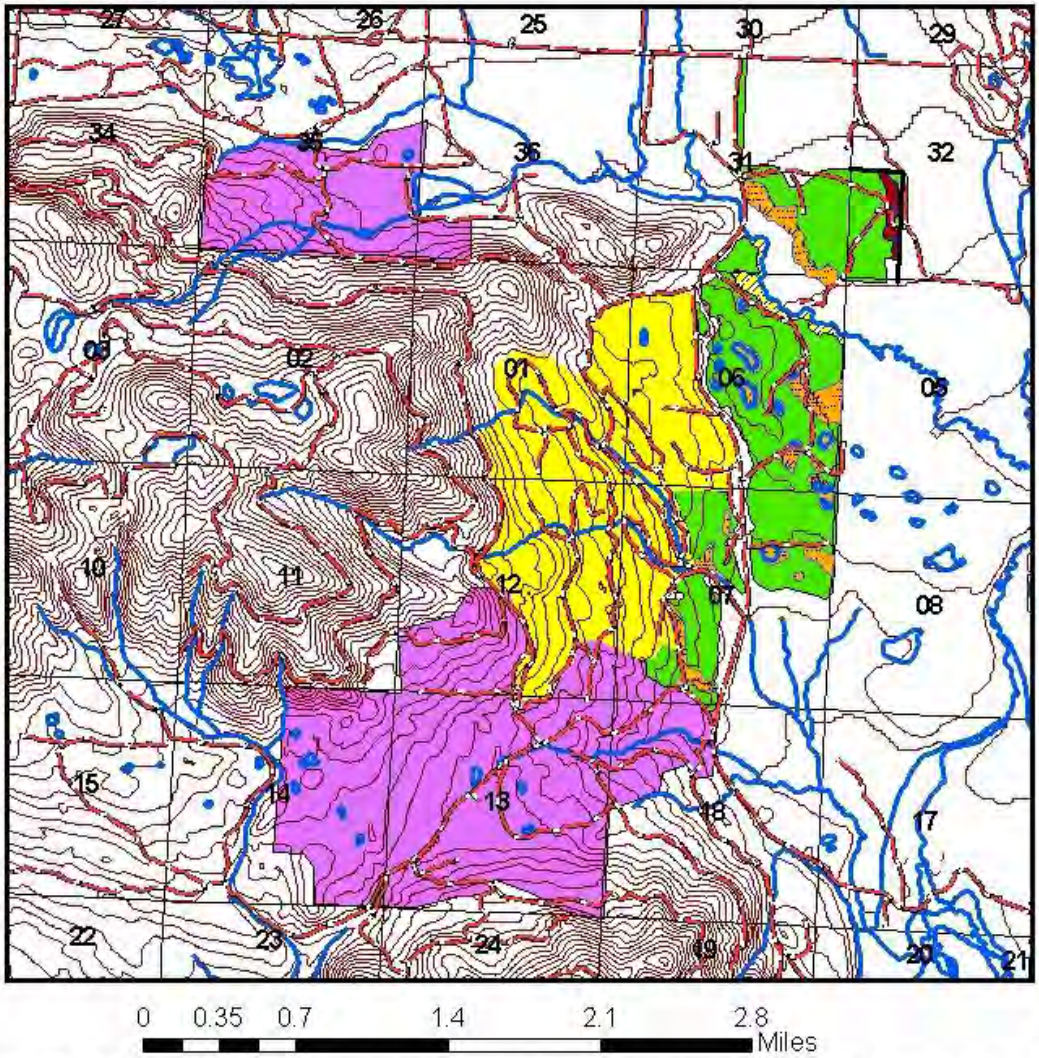
ATTACHMENT A
MAPS

Attachment A-1: Good Shepherd Projects Vicinity Map



Attachment A-2

Good Shepherd Potential Projects
DNRC-CLEARWATER UNIT
Sections 35 & 36 T16N R14W; Sections 31 & 32 T16N R13W;
Sections 6,7 & 18 T15N R13W & Sections 1,12,13 & 14



All harvest unit boundaries are approximate and modifications may result based on further field observations or in the event of insect and disease infestations, wildfire or wind events.
Harvest #1 is the only project that has had all wetlands mapped with a GPS. There will most likely be more identified in the other harvest units upon further field inspection.
Harvest # 3 may be split into two harvests, depending on current stand conditions.
Pre-commercial thinning units may overlap harvest units or be stand alone projects.

N

ROADS | Class 1 SMZ | Confirmed Wetlands | Harvest # 2
Streams | Class 3 SMZ | Harvest #1 | Harvest #3

A. Helena
8/15/2012

ATTACHMENT B
SOILS, WATERSHED, FISHERIES, NOXIOUS WEEDS

December 12, 2012

TO: Amy Helena, Craig Nelson, Jon Hayes, Garrett Schairer

FROM: Jeff Collins, Hydrologist

RE: Watershed/Fisheries/Soils/Noxious Weeds, Report for
Good Shepherd Project Timber Sale, Sections 6, 7 & 18 T15N, R13W
Sections 1, 12, 13, 14 ,T15N R14W, Sections 31, 32 T16N R13W
Sections 35, 36 T16N R14W

Introduction and Issue Statements

The following report describes the existing conditions of soils, water resources, fisheries and noxious weed management for the proposed Good Shepherd project Timber Sale. This report includes the environmental assessments of the expected direct, indirect and cumulative effects of the project for these resources.

Issues and Concerns

The following issue statements were developed from internal and public scoping regarding the effects of the proposed timber harvest and road systems to water resources, cold-water fisheries, soils and noxious weeds. For specific comments and concerns, refer to the project file.

* Soil Resources – There is a concern that forest management activities may result in increased erosion and reduced soil productivity where excessive disturbance from compaction displacement, and loss of nutrients occurs, depending on extent and degree of harvest related soil effects.

*Water Quality/Quantity- There is a concern that the proposed action may cause impacts to water quality and quantity. Land management activities such as timber harvest and road construction could impact water quality primarily by accelerating sediment delivery to local stream channels and draw bottoms.

*Cumulative Watershed Effects- There is a concern that the proposed timber harvest may cause or contribute to cumulative watershed impacts as a result of increased water yields.

*Cold Water Fisheries- There is a concern that the proposed action may adversely affect fish habitat features; including channel forms, connectivity and stream temperature.

* Noxious weeds- There is a concern that the proposed forest management activities may introduce or spread noxious weeds and that disturbed roads should be reseeded.

Recommended Mitigation Measures for Soil, Water, Cold Water Fisheries Resources and Noxious Weed Management:

The analysis and levels of effects to Soil resources, Water resources, Fisheries Resources and Noxious weeds are based on implementation of the following mitigation measures.

* DNRC would implement all applicable BMP's, Montana Administrative Rules for Forest Management and reasonable mitigation and erosion control practices during timber harvest, road maintenance, and road construction and road use activities

* DNRC would locate, clearly mark where needed and maintain suitable water resource protection boundaries, including Streamside Management Zones (SMZ's), Riparian Management Zones (RMZ's), and Wetland Management Zones (WMZ's) adjacent to streams and wetlands consistent with State Forest Land Management rules.

* Locate a 50 ft. no cut harvest boundary along Cottonwood Creek and a 90 ft. Riparian Management Zone (RMZ/CMZ) where 50% of representative standing trees would be retained in the 50-90 ft. strip that would be designated parallel to Cottonwood Creek.

* Limit harvest equipment and hauling operations to periods when soils are relatively dry, (less than 20%), frozen or snow covered to minimize soil compaction and rutting, and maintain drainage features. Check soil moisture conditions prior to equipment start-up. Portions of the access roads have clayey segments that tend to remain wet later into the spring and requires strict adherence to dry or frozen season of use to limit impacts in harvest units or damage to roads. Some moister conditions are accepted on harvest units where tractors remain on designated trails and timber will be felled and bunched or winched to trails.

* Aspen restoration sites would be marked as Wetland Management Zones and all activities will meet requirements of site specific plans for each designated area. Alternative practice mitigations would minimize disturbance to goals needed to promote aspen while protecting soils and wetland integrity.

* On tractor harvest units the logger and sale administrator will agree to a general skidding plan prior to equipment operations to limit trails to 15% or less of the harvest unit. Prefer use of existing skid trails, unless too steep. Limit ground skidding equipment to slopes less than 40%. Feller-bunchers may work on slopes up to 45% as long as displacement and turning is minimized to prevent excessive disturbance.

* Within moderate to densely stocked stands, whole tree skidding can reduce slash hazard, but also remove a portion of nutrients from growing sites. Target woody debris levels are to retain 5-15 tons/acre well distributed on site while meeting the requirements of the slash law. On thinning sites with lower basal area, retain large woody debris as feasible since it may not be possible to retain 5 tons/acre and the emphasis will be on providing additional CWD in the future.

* Existing road segments would be improved and maintained in association with the harvest activities. Road improvements would include surface blading, installation of drainage features to prevent surface erosion and sediment delivery to the stream, ditching to improve road surface stability, gravel surfacing of selected segments to as needed to comply with BMP'S. and protect water quality.

*Road use would be limited to dry or frozen ground conditions to reduce rutting and erosion. New road construction, including drainage features would be completed in the fall prior to freeze-up. Check snow/frozen ground conditions prior to operations. Minimal effects are expected with snow road construction.

* New roads would be closed to motor vehicles upon completion of harvest activities. Slash would be placed on main skid trails to protect soils and reduce erosion potential and unauthorized ATV use where appropriate.

* The replacement of the Cottonwood Creek Bridge would meet the requirements of the FWP 124 permit issued for this project for erosion control and stream protection.

* All road maintenance and harvest equipment will be cleaned of plant parts, mud and weed seed to prevent the introduction of noxious weeds. Equipment will be subject to inspection by forest officer prior to moving on site.

* All newly disturbed soils on road cuts and fills will be promptly reseeded to site adapted grasses to reduce weed encroachment and stabilize roads from erosion.

* Weed treatment measures will include roadside and spot herbicide treatment of noxious weeds. Where herbicide treatments are required by the forest officer, herbicide must be applied under the supervision of a licensed applicator following label directions in accordance with Department of Agriculture regulations, applicable laws and rules and regulations of the County weed boards.

* DNRC will monitor the sites to evaluate weed control measures implemented and determine if any new noxious weeds establish that were not previously identified.

Section 4 Soils Analysis Methods and Area

The soils analysis included an evaluation of Missoula and Powell County soil survey data, air photos, past harvest design and on-site field reviews by DNRC hydrologist/soil scientist. For the purposes of this analysis, minor soils of 5% or less of the area were grouped based on slope, soil properties and interpretations. Field reviews were conducted to verify the soil properties and current conditions to assess past and predicted effects based on DNRC soil monitoring results on previous harvest operations. The soil analysis considered soil

interpretations and the physical effects to soils from the area and degree of harvest disturbance associated with skidding and roads. The analysis for soil nutrients considers the area of disturbed surface and the fine litter and coarse woody debris available to supply organic materials to the soil.

The analysis area for geology and soil resources includes the proposed harvest units and locations of new and temporary road construction within the following sections:

Sections 6, 7 & 18 T15N, R13W	Sections 1, 12, 13,14 T15N R14W ,
Sections 31, 32 T16N R13W	Sections 35, 36 T16N R14W

Existing Conditions-Geology and Soils

The proposed harvest areas are located on the glacial and alluvial footslopes of the lower west side of the Cottonwood Creek valley that is west of Ovando, Montana. The area is characterized by low sloping glacial outwash and alluvial fans with silty glacial till and cobbly outwash deposits forming rolling hills and knobs. The glacial and alluvial deposits are underlain by older clayey tertiary age deposits that are exposed in localized areas and material types change within a short distance from mainly coarse gravels to included areas of clayey soils. Wetlands and areas of seasonal high water tables occur adjacent to streams in the area as well as small "Kettle" pothole wetlands that may seasonally dry out in sections 31, 32, 6, & 7. Kettles were formed when blocks of glacial ice were buried or deposited in glacial till and outwash, and then melted out to leave a depression. Somewhat poorly drained soils (aquolls, aquents) also occur around wetlands and within the riparian areas of Cottonwood Creek and support mainly a complex of riparian shrubs, aspen, cottonwood, deep sod grasslands with sedges and some spruce. These soils require wetland management zone delineation (WMZ) and site specific review for operations adjacent to the wetlands. Potholes occur on the alluvial valley floor and on moderate footslopes. Spring snowmelt from higher elevations raises the water table in the coarse textured alluvial and outwash materials near Cottonwood Creek for a short duration in the spring.

The mountain footslopes and sideslopes have soils forming in glacial till and from colluvium. Bedrock outcrops are few in these footslope areas. No especially unusual or unique geologic features occur and no areas of slope instability were identified on the project parcels. Good quality gravel sources are available from developed gravel pits in the area on the Woodworth road and Cottonwood road, and local borrow sites in the outwash deposits.

Within the proposed harvest area, the mountain footslopes and sideslopes are mainly Yourame deep gravelly loams on 4-30% slopes that occur on (38% of the area).Yourame soils are well-drained, moderate productivity soils and support mainly Douglas-fir, larch, lodgepole pine and Ponderosa pine. North and east aspects and more moist areas support larch. Yourame soils have a gravelly silt loam surface over deep gravelly clay loam subsoils (refer to soil table ST-1 and soil map SM-1 in project file). Yourame soils are well drained, yet are subject to rutting and compaction if operated on in the spring when wet. Erosion risk is low on these gentle slopes. Vegetative competition is moderate and may limit larch establishment unless scarified or prescribed burned. These materials are poor to good for road construction depending on the location, and the amount of subsurface clay materials can change within a short distance.

Soil Interpretations Table S1 Good Shepherd Project Timber Sale
The following represent the major soil types of the project area.
Minor and included soil descriptions are referenced to the County Soil Surveys & considered in analysis

	Mapping Unit Name	Soil Description	Erosion Potential	Displacement hazard	Compaction Hazard	Notes
6, 26, 735	**Wet Sites,, Meadows Aquents-aquolls complex, 0 to 4 percent slopes**	WetlandsDeep, Poorly drained soils	Low	Avoid, Subject to rutting. Site specific winter operations may be feasible.	Avoid, Subject to rutting. Site specific winter operations may be feasible.	Locate Wetland Management Zones WMZ, around wetland perimeter, Site specific reviews required
137	**Yourame Gravelly Loams, 4-35 percent slopes Glacial till & colluvium Forest**	Well drained, Thick Gr. Loam surface over deep Gravelly clay loam subsoils	Moderate K .24,	Moderate	Prone to rutting and compaction if operated on when wet	Productive soils suited to Ponderosa Pine, Douglas fir, Larch. Check soil moisture prior to operations
271 C/E	**Rumblecreek Gravelly loams C = 4-30% slopes & includes isolated wetlands (Kettle potholes). E= 15-35% slopes Glacial till & alluvium Forest**	Well drained, Thick Gr. Loam surface over deep Gr. & cobbly clay loam subsoils Includes poorly drained soils under pothole wetlands	Moderate K .20	Moderate	Moderate Prone to rutting and compaction if operated on when wet,	Productive soils suited to Ponderosa Pine, Douglas fir and Lodgepole Locate Wetland Management Zones WMZ, around wetland perimeter
124, 125, 130, 371 C,	**Wildgen-Winkler gravelly loams on 4-30% slopes**	Well drained, Thick Gr. Loam surface over deep Gr. & cobbly clay loam subsoils	Moderate K .20	Moderate	Moderate Prone to rutting and compaction if operated on when wet,	Productive soils suited to Ponderosa Pine, Douglas fir and Lodgepole
54	**Hollandlake-Bata complex, 4 to 30 percent slopes**	Well drained, Thick Gr. Loam surface over deep Gr. & cobbly clay loam subsoils	Moderate K .20	Moderate	Moderate Prone to rutting and compaction if operated on when wet,	Productive soils suited to Ponderosa Pine, Douglas fir and Lodgepole
39, 55, 86F 102	**Soil units with slopes of 30-60 less than 3% of area**	Well drained, Deep Gr. loams and Gr. Silt loams	Moderate K .02-.2 Increases on steeper slopes	Moderate High on slopes> 45%	Moderate Generally short period of wet conditions,	Productive soils. Limit ground skidding to slopes < 45%

Erosion Factor **K** indicates the susceptibility of a soil to sheet and rill erosion and considers rock fragments. K of .02 is low and .69 is highest

Soils on the flat to gently rolling terrain of the Cottonwood Creek valley floor are a complex of deep glacial outwash, glacial till and alluvium with occasional potholes and wetlands. Dominant soils (35% of harvest area) on the forested areas in the proposed harvest units are Rumblecreek gravelly loams on 4-30 slopes. These are moderate productivity soils that support mixed species of Douglas-fir, lodgepole pine and Ponderosa pine. Rumblecreek soils have a gravelly loam surface over deep gravelly and stony clay loam subsoils.

Rumblecreek soils are well to somewhat excessively drained and tend to be droughty, which is in part why there is little surface runoff and some stream reaches and ditches dry up and go subsurface. There is also a Rumble Creek/ Water complex map unit that includes some potholes and wetlands where the water table rises in the spring and potholes and low spots may fill with spring waters before subsiding in July. These soils are subject to rutting and compaction if operated on in the spring when wet. This limitation can be overcome by limiting operations to dry summer periods or winter conditions. Erosion risk is low on these gentle slopes.

Wildgen and Winkler deep gravelly loams and extremely stony loams occur on 28% of the forested upland sites. These soils are well drained and tend to be droughty with a long season of use, which is in part why there is little surface runoff. Material quality is good for road construction, but high cobble content can lead to rough roads. These soils are subject to rutting and compaction if operated on in the spring when wet. This limitation can be overcome by limiting operations to dry summer periods or winter conditions. Erosion risk is moderate on slopes up to 45%. No high erosion potential soils were identified. Excessive soil disturbance can lead to overstocking.

Other included and minor soils are mapping units with slopes of 30- 60%, that affects less than 3% of the project area (refer to project file). These soils are mainly complexes of deep gravelly loams and silt loams, with some areas of clay rich subsoils. These groups of soils are moderate productivity and support Douglas-fir, lodgepole pine and ponderosa pine and western larch. Erosion risk is moderate on slopes less than 45% and the terrain is well suited to ground based operations on slopes up to 45%. Steeper slopes over 45% have high displacement and erosion risks that can be overcome by cable logging or winch line skidding.

The existing DNRC forest access road cross segments of clay rich soils that will limit access during spring thaw up to approximately mid-June. Season of use is limited to relatively dry summer/fall months or frozen ground on included areas of clay-rich soils.

Previous Harvest Effects on Soil Resources
Previous harvest has occurred historically at varied levels in all sections with most recent harvest in the 1980's and some historic selection harvest (hand fell/crosscut) occurred over 80 years ago. Historic harvest effects have largely recovered with forest vegetation and trees established in secondary trails. A few major skid trails and landing sites are still apparent and harvest effects are estimated to be less than 10% of the proposed harvest units. Field assessment found that the previous soil effects have ameliorated in the last 25 years and the parcels are well regenerated to conifers and minor erosion problems were noted. There are apparent growth reductions still on some of the old landing sites that would likely be used again.

There are moderate levels of existing downed coarse woody debris across the proposed harvest areas that is within the range of woody debris levels similar to historic conditions established by Graham et al. (1994). The tree mortality from insects has resulted in many trees shedding their needles, which helps return organic matter and nutrients to the soil. Retaining vegetative litter and woody debris helps to control erosion on disturbed sites and provide media for healthy soil fungi and conservation of soil nutrients important to tree growth. It is desirable to maintain old and new coarse woody debris (>3" dia.) at ~10-15 tons/acre on the harvest units.

<u>Predicted Effects on Soil Resources</u>
Direct and Indirect Effects of the No- Action Alternative on Soils
The No-action alternative would be similar to existing conditions and have little effect on soil resources. Existing access roads with inadequate drainage would continue to erode without maintenance.

Direct and Indirect, Effects of the Action Alternative on Soils
The primary risks to long term soil productivity and hydrologic function are excessive impacts to soil properties caused by rutting, compaction and displacement of surface soils by equipment operation and road construction and the combined effects are summarized in table S-2. Most sensitive soils are wet sites and small areas of steep slopes which will be avoided or protected with mitigation measures (refer to Mitigation Section attached). All wetlands will be flagged on the ground.

For the proposed harvest, BMP's and mitigations would be implemented to minimize the area and degree of detrimental soil impacts (displacement, erosion, and compaction). Mitigations include general skid trail planning, limit tractors to moderate slopes, avoiding wetlands and controlling soil disturbance to meet silvicultural goals to reduce competition and improve growth of retained trees. The proposed pre-commercial and commercial thinning would mainly use historic, existing trails and landings which will reduce the area of potential impacts and would improve growth of retained trees due to reduced competition for soil nutrients and moisture. Controlling the area of excessive disturbance, through administration would limit the area of soil impacts.

Based on DNRC soil monitoring on comparable sites, implementation of BMP's and the recommended mitigation measures, has been shown to effectively limit soil impacts to less than 20% of the harvest units. Harvest operations present low to moderate risk of detrimental impacts to soil resources if impacts are restricted to ~20% of the proposed harvest areas. We expect that by protecting at least ~80% of a harvest area in non-detrimental soil impacts, soil properties important to soil productivity will be maintained. The estimates of existing impacts are approximately 10% and additional impacts are expected to add no more than 5% = 15% projected.

Table S-2 Predicted Harvest Effects on Soil Resources from the Proposed Action including Commercial Harvest, Pre-commercial thinning and New roads/Relocation			
Project Harvest Areas	Treatment Acres within 4,899 acre Project area	Operation	Estimated max. acres impacted,* with the Proposed Operations
Pre-commercial Thinning	1,600 ac	Ground equipment & hand felling	<15% / acre = Up to 220 ac. Includes Use of existing trails
Commercial Harvest/Thinning	3,200 ac	Tractor Sanitation/Salvage	<15% / acre = Up to 514 ac. Includes Use of existing trails
Wetland Management Zones Aspen Restoration	Up to 40 ac. Combined Wetland treatments	Tractor/excavator, Ground Based on snow	<5% / acre= 4 acres
Roads	4 ac. New Road 2ac. Abandon	New Road ~ 1 mi. Abandon ~ ½ mi.	Net 2 ac. New road Relocations
Totals	Roads 1.2 acres net Up to 4899 Ac. Combined harvest & thinning		Up to 740 ac. Total impacts (~ 15.% of total)

* Estimates of harvest impacts on soils based DNRC Soil Monitoring and comparison to similar treatments

All wetlands will be protected by marking WMZ boundaries, maintaining adequate vegetation on perimeters and minimizing disturbance and no impacts are expected in wetlands where no operations occur. An alternative practice would be applied for ground based operations on selected wetland sites to promote aspen regeneration. Aspen restoration activities are planned on up to 40 acres of wetlands mainly in the NE corner of the project area depending on site approval. Aspen restoration activities would occur on site specific locations within wetlands where significant improvements in aspen health and density may be achieved. A combined effort by specialists from the MTFWP as well as the MT DNRC will prioritize which wetlands in the project area should be treated as an alternative practice. The aspen restoration would selectively remove a portion of encroaching conifers and implement all requirements of an alternative practice to minimize disturbance to met goals and promote regrowth of aspen. Similar aspen treatments have had a beneficial effect on aspen regrowth with minor soil effects of less than 5% of area based on project design and administration.

DNRC focused road design and location efforts to minimize the extent of new road construction, stream crossings and construction costs and includes temporary use roads where feasible. Temporary use roads would be located for minimal construction and stabilized after use. Clay rich soils occur in portions of the project area, and will require season of use limits to avoid rutting, erosion and maintain drainage features.

An inventory of existing access roads requiring repairs, improvements and maintenance needs was completed in 2011 and reviewed in 2012. Road drainage improvements to existing roads will allow seasonal access to the area and reduce current erosion on inadequately drained roads. Up to 1 mile of temporary new road will be constructed. Use of temporary roads could result in some rutting and compaction, but impacts would be largely restored with ripping the soils surface to break-up compaction and restore infiltration. Following use, temporary roads will be closed, stabilized with long-term drainage features installed, and reseeding with site adapted grass to control erosion and compete with noxious weeds.

Sale administrators will monitor on-going harvest and road construction activities to meet contract requirements, BMP'S for soil and water protection and silvicultural objectives. For all of these reasons the proposed harvest operations and mitigation measures are expected to maintain soil properties important to plant growth and hydrologic function and present low to moderate direct and indirect detrimental impacts to soils.

Cumulative effects of the No-Action Alternative to Soils

Cumulative effects to soils can occur from repeated ground skidding entries into the harvest area and additional road construction, depending on area and degree of detrimental impacts. Minimal timber harvests have

occurred in the last 25 years and previous harvest effects have largely recovered with 10% or fewer impacts based on site. No operations would occur and no change in cumulative effects would occur compared to existing conditions.

Cumulative effects of the Action Alternative to Soils

There is low risk of cumulative effects to soils with the proposed harvest based on use of existing roads, skid trail planning using existing trails where feasible and implementation of mitigation measures to limit the area impacted. We expect that effects would be less than 15% of the harvest area based on; modifications to harvest since BMP inception in 1989, implementation of mitigation measures that include season of use limits, skid trail planning to use existing trails where feasible and site specific measures near wetlands. Road drainage would be improved on existing roads throughout the area. Proposed new temporary roads would impact less than 1% of the project parcels

Considering nutrient cycling, the high level of tree mortality of pine has already caused many needles and fine litter to fall to the forest floor. Most needles and fine foliage that have not already fallen would be expected to break off during logging operations. Large woody debris would be maintained on the site with a goal of 5-15 tons/acre (Graham 1994). Coarse wood would be well distributed throughout the units and trampled. The combination of fine litter and coarse woody debris would maintain surface organic matter that provides media for healthy soil fungi and conserves soil nutrients important to tree growth. Improved tree spacing will reduce competition for nutrients and soil moisture, enhance growth of retained trees, and promote regeneration of conifers and aspen on selected sites.

CHAPTER 5 Water Resources, Analysis Methods & Area

The primary issues relating to water resources within the analysis area are potential impacts to water quality from sediment sources and potential increases in water yield that may affect channel stability. Sediment sources are roads and forest sites that can deliver to stream channels as well as sources within the stream channels. Timber harvest reduces forest cover and can lead to increased water yields. Excessive increases in water yield can reduce stream channel stability. In order to address these issues the following are analyzed for each alternative:

- ◊ Miles of new road construction and road improvements
- ◊ Potential for sediment delivery to streams
- ◊ Potential for water yield increase impacts to stream channel stability

A watershed analysis was completed by a DNRC hydrologist for the proposed sale area to determine direct, indirect and cumulative effects to water quality. The water quality evaluation included a review of existing inventories for water resources (NRIS 2012), the 2005 Upper Blackfoot Restoration Plan (BFC 2005) and reference to previous DNRC projects. Aerial photos of the project area were compared and combined with GIS analysis to estimate the area of past timber harvest and vegetative recovery. Field reviews were completed for the proposed harvest units, access roads and associated streams, then the observations, information and data were integrated into the watershed analysis and design of project mitigations.

Sediment delivery

The analysis for direct, indirect and cumulative effects to sediment delivery considers the area of harvest units and the roads used for hauling and will focus on the streams described as affected watersheds. The sediment delivery analysis includes in-channel and upland sources of sediment that could result from this project. In-channel areas include the stream channels adjacent to and directly downstream of harvest areas and will be analyzed qualitatively. Upland sources include harvest units, roads and stream crossings that may contribute sediment delivery as a result of this project.

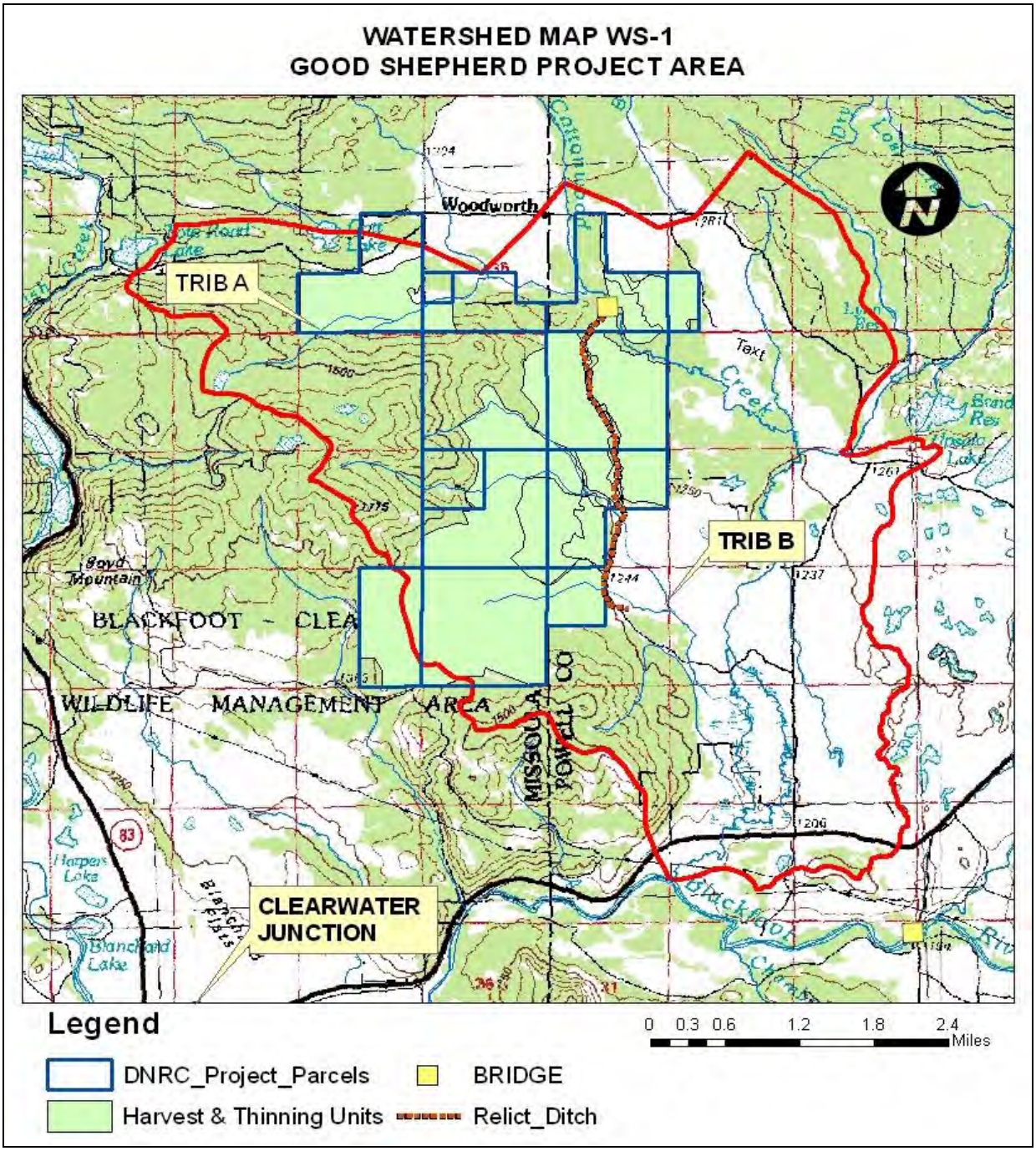
Water Yield

The analysis for direct, indirect and cumulative effects to water yield considers the area of harvest units and roads within the project drainages described as the affected watersheds. A DNRC hydrologist completed a coarse filter qualitative assessment of watershed conditions and cumulative effects as outlined in the Forest Management Rules (ARM 36.11.423) and the commitments described in the HCP concerning watershed management. Based on past logging in the area, an assessment of sediment sources and stream channel conditions was also completed. The potential for increases in surface runoff water yield and affects to stream channels will be discussed qualitatively considering the distribution and timing of runoff.

Water Resources, Affected Watersheds

The proposed timber harvest project is located within the Cottonwood Creek (HUC 170102030909,) drainage that is 35,883 acres in size and is tributary to the Middle Blackfoot River. Precipitation ranges from 14”/year near the Blackfoot River to 60 inches /year near Morrell Mountain and is mainly received as snow.

The water resource analysis for water quality, water yield and cumulative effects focused on the lower ½ of the Cottonwood Creek drainage that is south of the Woodworth Road and includes two sub-drainages that are unnamed tributaries (Trib. A & Trib. B) to Cottonwood Creek (refer to affected watersheds in the Watershed Analysis Map WS-1). The Lower Cottonwood drainage is 14339 acres in size as mapped and precipitation ranges from 14-22 inches / year that is over 50% snow.



The analysis area includes the proposed harvest units and locations of new and temporary road construction within the following sections:

Sections 6, 7 & 18 T15N,R13W	Sections 1, 12, 13,14 T15N,R14W ,
Sections 31,32, T16N,R13W	Sections 35, 36 T16N,R14W

The Lolo National Forest is the primary owner in the headwaters of Cottonwood Creek and manages approximately 50% of land in the drainage. Montana State Trust lands, managed by DNRC are 19% of the drainage, mainly in lower Cottonwood, combined with Montana Fish, Wildlife & Parks Clearwater Game Range that is 14% of drainage. Private ownership is about 14% of the drainage, mainly located on the valley bottom in lower to mid Cottonwood. Other small ownerships (<5 %) include Montana University System, The Nature Conservancy and US BLM.

Project Area Dismissed from Further Analysis- Clearwater Sperry Mountain

The proposed forest management activities located within the east ½ of section 14, T15N, R14W are part of the Bear Creek drainage (HUC 170102031102, that is 12,724 acres) and includes lands on both sides of the Blackfoot River. The proposed harvest and thinning on parts of section 14, that are west of the Sperry Mountain divide in the Bear Creek HUC will be dismissed from further water resource and fisheries analysis due to low risks of direct, in-direct or cumulative effects based on the following. The proposed forest management and road use are located north of the Blackfoot River upslope of a dry, rocky draw with no surface flow to the Blackfoot. Topographic maps show intermittent streams, but the segments are short and not connected downslope. There are no streams located within the proposed harvest and thinning unit and there is very low risk of off-site runoff or sediment delivery from the proposed harvest units. Within the section 14 parcel there is 250 acres of combined thinning and low to moderate intensity shelterwood/sanitation harvest with low potential for runoff. Rocky soils are common and infiltration generally exceeds precipitation. The proposed haul route would access section 14 from the east up over the dry ridge to the Cottonwood Creek drainage side using existing roads and less than ¼ mile of temporary road construction and there are no sites with potential for direct sediment delivery from roads to surface waters. There are isolated wetland sites in the parcel that would be protected by marking wetland management zones to protect wetlands consistent with rule requirements. The proposed operations in section 14 have low risk of direct, in-direct or cumulative effects to water resources.

Regulations, Laws, Rules and Agreements

Montana Surface Water Quality Regulations

All the watershed areas listed in this report are classified as B-1 in the Montana Surface Water Quality Standards. The water quality standards for protecting beneficial uses in B-1 classified watersheds are described in ARM 17.30.623. The B-1 classification is for multiple use waters suitable for; domestic use after conventional treatment, growth and propagation of cold-water fisheries, associated aquatic life and wildlife, agricultural, and industrial uses. Other criteria for B-1 waters include; no increases are allowed above naturally occurring concentrations of sediment, which will prove detrimental to fish or wildlife and a maximum 1 degree Fahrenheit increase above naturally occurring water temperature is allowed within the range of 32 to 66 degrees Fahrenheit. Naturally occurring includes conditions or materials present from runoff or percolation on developed land, where all reasonable land, soil, and water conservation practices have been applied. Reasonable conservation practices include methods, measures, or practices that protect present and reasonably anticipated beneficial uses. The State has adopted Forestry Best Management Practices through its Non-point Source Management Plan as the principle means of controlling non-point source pollution from silvicultural activities. Stream temperatures are discussed in the fisheries section. DNRC provides further protection of water quality and sensitive fish through implementation of the Streamside Management Zone (SMZ) Laws and Forest Management Rules.

Water Quality Limited Waterbodies and Beneficial Uses

Cottonwood Creek (Waterbody ID MT76F004_040) is approximately 12 sq. miles in area and the lower 10 miles were listed as impaired for partially supporting aquatic life, due to siltation and sedimentation on the 2010 Montana 303(d) list. The lower stream reaches of Cottonwood Creek has reduced flows from irrigation diversions and natural flow loss to cobbly substrates that can affect summer fishery connectivity. In 1999

Cottonwood Creek was reported as transitional from perennial to intermittent flow due to dewatering about 4 miles above the mouth near Shanley Creek that is below the project parcels. There is perennial flow through the project parcels.

A Total Max Daily Load (TMDL) analysis and restoration plan has been completed for the Middle Blackfoot watershed (DEQ 2004). TMDL listed mitigations include improving fish passage, and reducing sedimentation through implementation of Best Management Practices (BMPs) on land management projects. Cottonwood Creek was prioritized for restoration and several restoration projects have been implemented to improve irrigation diversions including screening irrigation canals, lining canals and leasing of water to maintain in-stream flows as noted in the MTDEQ 2012 Water Quality Standards Attainment Record (DEQ2012_CWAICweb). Stream conditions and sustained flow are on an improving trend in the last 4 years.

Beneficial Uses-The downslope beneficial uses in the project area include: domestic surface water rights, recreation, cold-water fisheries, agriculture, irrigation, wildlife and livestock watering. The drainage is not part of a municipal watershed.

Water Rights-There is a historic irrigation ditch near the Cottonwood Creek bridge in section 31, T16N, R13W that diverts flow to old hayfields that are now part of the Clearwater Game Range. The ditch has not been maintained and apparently is not in use. The ditch does intercept spring flows that subsides and dewaters by summer in most years and the ditch does not reconnect to Cottonwood Creek. There are also a number of old secondary ditches, and flume remnants, especially in the NE corner of the project in section 31, T16N, R13W and section 6, T15N,R13W. These relict ditches have not been maintained and do not appear to be use. A few segments flow water in spring, but are no longer diverted and no segments with return flow were identified.

Montana Streamside Management Zone (SMZ) Law
All rules and regulations pertaining to the SMZ Law will be followed. An SMZ width of 100 feet is required on Class I and II streams when the slope is greater than 35%. An SMZ width of 50 feet is required when the slope is less than 35%.

DNRC Forest Management Rules and Habitat Conservation Plan
All applicable State Forest Land Management rules and regulations regarding watershed and fisheries management will be followed. This includes, but is not limited to rules listed for water quality (ARM 36.11.422), cumulative effects (36.11.423) Riparian Management Zones RMZ (ARM 36.11.425), Fisheries (ARM 36.11.427) and Conservation Strategies outlined in the DNRC Habitat Conservation Plan (HCP 2011). As part of ARM 36.11.427(3)(a)(i) and (iv) and ARM 36.11.436, DNRC is committed to designing forest management activities to protect and maintain bull trout, westslope cutthroat trout and all other sensitive fish and aquatic species as noted in the fisheries assessment. Cottonwood Creek is a Class 1 fish bearing stream and DNRC would provide protection of these streams with 50 foot no-harvest buffers and RMZ's.

Clearwater Game Range Conservation Easement
When lands within the Clearwater Game Range were acquired by DNRC, a conservation agreement was completed that required specific mitigations for water resources and fisheries that include no harvest within 50 ft. of Cottonwood Creek. The conservation agreement is similar to requirements of the HCP and ARM's, but in all cases the more conservative mitigations will be implemented with this project.

<u>Existing Conditions - Water Quality/Sediment Delivery & Quantity/Water Yield</u>
Past management activities in the proposed project area include timber harvest, grazing, road construction, fire suppression and recreation. Sedimentation sources identified in the area are, road-fill segments adjacent to stream channels, stream crossings with inadequate road surface drainage prior to the crossing sites, historic riparian harvest and dispersed grazing that includes a high level of elk use. Sediment inventories were completed for roads and crossing sites within the project area for lower Cottonwood Creek and tributaries A & B as outlined on watershed map WS-1.Streams were reviewed for channel stability and sediment sources.

Cottonwood Creek flows through the project area from stream mile 9, below the Woodworth road downstream to stream mile 7.3, through DNRC parcels in Section 31, T16N, R13W, Section 6, T15N,R13W (refer to map WS-1). Cottonwood Creek periodically overflows its banks yet remains within its floodplain and has a Type 1 channel migration zone CMZ across the project parcels. A CMZ is defined as the width of the floodprone area at an

elevation twice the maximum bankfull depth. A CMZ is established in compliance with the DNRC HCP, when harvest activities are immediately adjacent to streams supporting HCP fish species, where channel migration processes occur. In this case the CMZ width is within the width of the RMZ and adequate protection of the riparian zone will be provided for. Cottonwood Creek stream banks and riparian areas are well vegetated, with occasional undercut banks typical of Rosgen C channel valley bottoms streams across the project parcels. The main creek channel has good channel stability that improves as it flows southeast to the confluence with the Blackfoot River. There is an undercut bank just upstream of the Cottonwood road bridge that is a sediment source in section 31, T16N, R13W at an old bridge crossing site and irrigation ditch location. Cottonwood Creek, Tributaries A & B have had historic impacts of sediment from roads, channel alteration for irrigation and grazing prior to state ownership. Recent grazing inspections found lands to be in good overall condition.

There are several irrigation diversions on Cottonwood Creek, both above and below the DNRC project parcel. There is an old irrigation diversion of the Boyd ditch system (relict headgate) about 150 ft upstream of the Cottonwood Creek bridge. This relict ditch parallels Cottonwood Creek and is at risk of being breached at high flow. Channel stability was impacted at the site of the diversion when constructed over 40 years ago, but has revegetated. The ditch flows only during high flow events and for a short period in the spring and is not currently used for hay production. The ditch flows south and intercepts stream flow from unnamed tributary B and ends in a field in Section 7, T15N, R13W (refer to WS-1 map). There are also several ditches in the NE of the project area that are not in use and appear have been built in the early 1900's. The coarse material common on the alluvial valley floor has rapid infiltration and ditches need lining to prevent water loss.

Unnamed tributary A is a second order stream of approximately 1839 acres that drains the northeast face of Boyd Mountain and has a 18-20" range of annual precipitation in the project area. This tributary has segments of perennial and intermittent flow, but does not have continuous flow to the extent indicated on topography maps. Tributary A originates as a short perennial reach that flows through a broad meadow and wetlands in sections 35, and 36 T16N R14W and then to a confluence with Cottonwood Creek in section 31, T16N, R13W as noted on map WS-1. The stream is shallow and narrow above the wetlands and has intermittent flow segments with good stability and well vegetated. There is an approximate 1 mile segment of class 1 flow from the wetlands across private grassland to the confluence with Cottonwood Creek. This is a small stream that was channelized, likely for irrigation, but is well vegetated and banks are stable.

Unnamed Tributary B is a second order class 2 stream of approximately 2670 acres that drains the east face of Boyd Mountain and northeast side of Sperry Mountain and has a 16-20" range of annual precipitation in the project area. This tributary has segments of perennial and intermittent flow, but does not have continuous flow as indicated on topography maps and does not support fish or connect to Cottonwood Creek. This tributary stream, flows downslope to a road crossing in section 18, T15N, R14W, where it is intercepted by a relict ditch and then onto a broad grassland where it loses flow to infiltration. Within the tributary B drainage there are several segments of poor road drainage and intermittent stream crossings that require drainage improvements and maintenance to meet BMP's. Stream channel segments conditions are generally in good condition and vegetated where there is discernible flow. The lowest reach of the stream has a road crossing near the property line with the Clearwater Game Range, and the outlet is trampled by grazing animals including wildlife. The stream is ditched below the culvert and flows a short distance before infiltrating in the soil.

The area has numerous small pothole wetlands and larger wetlands adjacent to Cottonwood Creek and on the broad alluvial fans (refer to watershed analysis area map WS-1). In the NE corner of the project area there are several large wetlands and potholes. The wetland margins are suitable for equipment operations if operated on when relatively dry or frozen. The potholes are well defined and require delineation of Wetland Management Zones or Streamside Management Zones around the perimeters, depending on size. Implementing BMP's and standard road drainage can control erosion and avoid excessive impacts.

Water Yield

Tree canopy reduction by timber harvest activities, tree mortality or wildfire can affect the timing of runoff, increase peak flows and increase the total annual water yield of a particular drainage, principally in areas with 30 or more of annual precipitation. Moderate to high increases in water yield can increase stream channel scour and in-stream sediments that impact water quality and fish habitat, so we assess stream channel conditions as part of the project analysis. Water yield can also decline based on forest canopy regrowth that increases precipitation interception and transpiration, that reduces runoff. Paired watershed studies in snow

dominated areas of Wyoming and Colorado indicate that in a drainage with mean annual precipitation of 30 inches, a removal of 100% of forest canopy would result in an approximate 8 " (about 90%) increase in water yield. By comparison an area of 21" mean annual precipitation with 100% canopy removal would have only 1", or an 18% increase in water yield. Yet, in low annual precipitation zones of 16-20 inches/ year there is unlikely to be a statistically measurable change in water yield (Romme et. al.2006) even from extensive canopy removal.

Considering the distribution and timing of snowmelt runoff in the Cottonwood basin, approximately 85% of water yield occurs in the upper Cottonwood drainage (60% of total drainage area) and snowmelt runoff typically peaks in early May. The DNRC project is located in the lower Cottonwood drainage area (40% of total drainage area) that has considerably lower runoff and produces only 15% of the water yield from all of the Cottonwood drainage. Snowmelt in the lower Cottonwood project area typically occurs in early spring of March and April and prior to peak runoff in May from snowmelt in the upper Cottonwood basin.

The lower Cottonwood project area has low to moderate annual precipitation range of 16-20", with about 50% as snow based on precipitation records at nearby Ovando, Montana and precipitation records. Soil infiltration rates generally exceed 6 inches/ hour and even in rapid snowmelt, surface runoff carries only a short distance before infiltrating into the soil. This low potential for runoff is reinforced by estimates of Relative Effective Annual Precipitation (REAP) developed by the Montana Natural Resources Conservation Service (NRCS web reference 2012). REAP is an indicator of the amount of moisture available at a location, taking into account precipitation, slope, aspect and soil properties and is displayed as a map layer (in project file). The REAP data and climate summary for the project area indicates that effective precipitation is at a deficit, and transpiration exceeds precipitation. The moisture deficit begins in summer and the effective precipitation is lowest on droughty grasslands/sage sites, and limited on southerly aspects and moderate on north and easterly forest sites. Areas of overstocked trees increase competition for limited soil moisture late in the summer.

Currently, older lodgepole pine and a portion of ponderosa pine that are dead, dying and at risk of mountain pine beetle mortality comprise less than 20% of overall stand volume in proposed DNRC harvest areas. Pine mortality is greater in the NE corner of the project on the flat alluvial valley floor, and insect mortality may have a minor increase in available water, but is very unlikely be measurable, increase surface runoff or water yield and would be within the range of natural conditions expected. Historically, tree cover comprised about 75-80% of forest stands in combination with natural openings and areas in various successional stages after fires, as noted in the vegetation section description.

Cumulative effects of timber harvest, agricultural use, roads and irrigation has occurred in the project area drainages since the late 1800's and some lower elevation sites were converted to hayfields. Based on aerial photos and site reviews, recent harvest has been low to moderate on adjacent ownerships. There has been considerable regrowth and vegetative recovery in the project area and most of the proposed harvest areas are overstocked. Channel Stability has been affected by historic riparian harvest and irrigation diversions, and reductions in stream flow that began in the late 1800's and 1900's. Channel stability is good through the DNRC parcels in part due to vegetative recovery on channel banks and past harvests are over 25 years ago. Restoration activities in the drainage over the last 4 years are improving irrigation diversions and restoring flows to Cottonwood Creek.

Direct and Indirect Effects of the No- Action Alternative on Water Quality and Quantity

No direct or indirect effects to water quality or quantity would be expected to result other than those described under Existing Conditions. Sedimentation on existing roads with inadequate surface drainage would continue to impact water quality unless mitigations or remedial actions are taken. Continued insect mortality or wildfire may increase runoff and water yield relative to increasing canopy loss.

Direct and Indirect Effects of the Action Alternative on Water Quality and Quantity

The proposed project would treat up to 4,899 acres that includes salvage harvest, commercial and pre-commercial thinning, dispersed across DNRC parcel areas that are located within the Lower Cottonwood Creek drainage and parts of Tributary A & B as noted on watershed map WS-1.

The proposed action is mainly low to moderate harvest of trees that are overstocked, dead or in poor condition. The SMZ width for all sites is mainly 50ft based on the shallow slopes with some short reaches of 100 ft SMZ, where short steep slopes exceed 35% adjacent to streams. No SMZ harvest is proposed consistent with

DNRC's conservation agreement in this area. No harvest would occur within 50 feet of Class I streams, principally Cottonwood Creek and tributary A, and no ground based equipment would be operated in these SMZ's consistent with the conservation agreement and rules.

Sediment Delivery
Under the action alternative, the primary haul routes would use the existing roads. Maintenance work would be completed on all existing DNRC roads to improve drainage adequate to meet BMP's. Up to 1 mile of relocated and new roads would be constructed and 1/3 mile of road near Cottonwood Creek would be stabilized and abandoned. Road drainage would be maintained during use. There would be no increase in open road density. Following use, temporary roads will be closed, stabilized with long-term drainage features installed, and reseeding with site adapted grass to control erosion and compete with noxious weeds.

The primary risk to water quality is sediment delivery at crossings, since plans are to maintain adequate stream buffers form harvest. The existing 22 ft log bridge on Cottonwood Creek would be replaced with a 30 ft steel bridge to improve flows and stabilize an undercut bank and ditch adjacent to the crossing. All requirements of the 124 permit and erosion control measures would be implemented, at the proposed bridge/bank stabilization site to minimize erosion. One undersized crossing would be replaced on a tributary B stream segment to improve flow and reduce sedimentation. There would be a temporary increase in sediment when flows return to the stream channels, but sediment is expected to be low, short term and less than the current conditions with no-action. All harvest operations are designed to minimize surface disturbance and potential for erosion and sediment delivery by implementing adequate stream and wetland buffers.

A 50 ft no cut buffer will be implemented along Cottonwood Creek where harvest is proposed adjacent to the riparian zone. A RMZ will be designated that incorporates a CMZ to provide protection for fish and water quality consistent with HCP commitments. Selection harvest would occur within the RMZ of 50-90 feet from Cottonwood Creek where slopes are less than 10%. Within the RMZ the spatial distribution of retention trees will be feathered to favor greater retention as one moves closer to the 50 ft. no-harvest boundary adjacent to the stream. The riparian management zones have gentle slopes and well established vegetative buffers and there is low risk of sedimentation to surface waters from harvest operations. Sediment trapping research (Lakel et. al.) on the effectiveness of stream buffers, found that > 97% of watershed erosion was trapped by vegetation prior to entering streams for SMZ's of 25ft or more.

All requirements of the SMZ laws, Forest management rules, BMP's, 124 and associated stream permits and DNRC Habitat Conservation Plan (HCP) and conservation easement will be implemented. Based on implementation of Best Management Practices, site specific mitigations, and all rules and agreements, the proposed timber harvest and road construction is expected to result in low overall short term direct or in-direct water quality impacts due to erosion and sediment delivery.

Water Yield
The proposed harvest and thinning would occur on up to 4899 acres, which represents less than 14% of the 35,866 acre Cottonwood Creek drainage. The proposed treatments are located in the drier valley floor and footslopes of the drainage. There is low potential for surface runoff or measurable water yield increases from the proposed partial harvest, compared to no-action. For the following reasons; Removal of dead and dying trees would not measurably contribute to interception or transpiration that is proposed on approximately 20% of the harvest area.The project areas include multi-story forest stands that are generally well regenerated and overstocked with young trees. The proposed selective and group harvest would remove stagnant trees and promote codominant and understory trees that use water more efficiently. These are low precipitation sites of 16-20" annual precipitation, where evaportranspiration and soil infiltration rates exceed precipitation levels and surface runoff is unlikely, even during storm events. The lower Cottonwood Creek area is estimated to provide only 15% of total runoff, and the project harvest area is less than 19% of lower Cottonwood or roughly accounts for about 4% of runoff. Research has shown that water yield is not likely detectable (MacDonald & Stednick. 2003, Romme et.al.2006) for these low precipitation levels of less than 20" annually, even with aggressive harvests, and the proposal is low to moderate selective harvest over a broad area, using existing roads.

The proposed precommercial thinning would thin overstocked trees of up to 1000 stems/acre to a spacing of 200-300/acre. Thinning would also reduce competition and promote faster growth and improved water efficiency

by retained trees. For all these reasons there is low risk of direct or in-direct effects of increased water yield or potential change in stream channel forms or flow regimes.

Cumulative Watershed Effects of No-Action Alternative:
Cumulative watershed effects can be characterized as impacts on water quality and quantity that result from the interaction of past, current or foreseeable future disturbances, both human-caused and natural such as wildfires and mortality. The analysis areas for watershed cumulative effects include the watersheds that wholly surround the DNRC project sections and the access roads to those sections. Past, current, and future planned activities within each analysis area have been taken into account for the cumulative effects analysis. Past management activities in the proposed project areas include timber harvest, grazing, road construction, irrigation diversions, agriculture, gravel pits, fire suppression and recreation. Recent timber harvest projects in the general area include: the Kinda Kozy Salvage Permit, Deadman Salvage near Ovando , and Elbow Lake Salvage near Clearwater Junction. A programmatic, BMP audit was completed on Elbow Lake Salvage to monitor administration and mitigations, and operations were found to be in compliance with all BMP's and SMZ rules. Under the no-action alternative, cumulative effects would remain the same as described in existing conditions.

Cumulative Watershed Effects of the Action Alternative:
There would be low risk of adverse cumulative impacts from the proposed action, to water quality and beneficial uses based on implementation of BMPs and mitigation measures during timber harvest and road construction operations. Within the cumulative effects analysis area, DNRC has proposed to harvest dead, dying and overstocked trees on about 4,899 acres in the project area, and complete thinning broadly dispersed across the project parcels sections.

The proposed harvest presents a low risk of water yield increase, compared to no-action based on the following. Up to 20% of the proposed harvest, is salvage removal of dead, dying and trees at high risk of insect mortality. The harvest and thinning would retain well stocked advance regeneration of pole and sapling trees and representative forest overstory. The current overstocked stands include units with over 1000 trees/acre that would be thinned to 200 to 300 trees/acre using primarily existing roads and trails that meet BMP's. The low to moderate levels of harvest are not anticipated to result in measurable changes in water yield, peak flows or affect channel conditions as compared to the no-action alternative and natural ranges associated with disturbances such as tree mortality and fire. Rates of soil infiltration and transpiration generally exceed precipitation. For the proposed harvest sites where annual average precipitation, is 16-20"/year, the potential for increased water yield is unlikely to be detectable (MacDonald & Stednick. 2003, Romme et.al.2006).

The proposed ground based timber harvest and use of existing roads is expected to result in low risk of erosion and sediment delivery to streams. Class 1 streams would be protected by implementation of the SMZ law and RMZ requirements consistent with rules and HCP requirements. Wetlands would be protected and an alternative practice would be implemented to restore and improve aspen growth. A bridge crossing of Cottonwood Creek would be replaced with a longer bridge span to prevent flow constriction and an eroding ditch/stream bank would be stabilized. The replacement of the Cottonwood Creek Bridge in section 31 would improve flow, channel stability and reduce sedimentation at the crossing site. Road drainage improvements, crossing replacements and improved road maintenance would reduce current sediments and maintain or improve water quality. For all these reasons there would be low risk of cumulative effects to water quality, quantity or beneficial uses.

Fisheries Analysis methods, and area
Timber harvest and road construction can impact fish habitat primarily by accelerating sediment delivery to local stream channels and by decreasing large woody debris recruitment through the removal of trees near the stream channel. Road crossings may affect habitat connectivity. The effects to fish and their habitat will be evaluated by analyzing the anticipated effects of sediment delivery on fish habitat in the project area and the potential reduction in available woody debris and shading to streams due to timber harvest activities. Analysis methods will consider fisheries populations as absent or presence, and the fish habitat effects of; sediment, flow regimes (refer to water resources section), connectivity, large woody debris and the affect of stream shading on stream temperature. Expected effects to fisheries habitat will be addressed qualitatively using the current condition as a baseline and disclosing the expected changes due to the proposed alternatives.

The analysis areas to evaluate existing and potential impacts to fisheries are the general watershed areas of Lower Cottonwood Creek as described in the water quality and quantity section and noted on Watershed map WS-1.The initial fisheries analysis area was chosen as the watershed of known or potential fish-bearing streams and the proposed harvest units and associated roads that could have measurable or detectable impacts to those fish-bearing streams.

Project Area Dismissed from Further Analysis- Unnamed Tributary B
The proposed harvest within Unnamed Tributary B will be dismissed from fisheries analysis based on the following: 1) the short perennial stream reach does not support fish and 2) tributary B is intercepted by a ditch and ends in field without connectivity to Cottonwood Creek.

Connectivity dismissed from Further Analysis
Initially, fish habitat connectivity was raised as a possible concern, but will be dismissed since there are no obstructions to fish connectivity on the DNRC ownership in the project area. There is one bridge existing crossing of Cottonwood Creek that does not obstruct fish passage. The old log bridge will be replaced by a wider span steel bridge, but there would be no measurable change in connectivity.

Sediment Delivery
The analysis area for sediment delivery is limited to the harvest units and roads used for hauling. This includes in-channel and upland sources of sediment that could result from this project. The analysis methods for sediment delivery will follow those used in the Hydrology portion of this report.

Woody Debris Recruitment
The analysis area for woody debris is the portions of the DNRC parcels that are adjacent to fish-bearing streams. The analysis method for woody debris recruitment will evaluate the potential reduction in available woody debris due to timber harvest activities.

Shading and stream temperature
The analysis area for vegetative shading and stream temperature is the portions of the DNRC parcels that are adjacent to fish-bearing streams. The analysis method will evaluate the potential reduction in vegetative shading due to timber harvest activities and the anticipated effects to stream temperatures.

Cumulative Effects
The cumulative effects analysis area for sediment delivery is limited to the harvest units and roads used for hauling. The cumulative effects analysis area for woody debris recruitment and stream temperature is the portion of the DNRC parcels that are adjacent to a fish-bearing stream.

Existing Condition-Fisheries
Cottonwood Creek supports the fisheries as listed in Table F-1. Fish presence is based on surveys and extrapolated based on professional judgment (NRIS, FWP-MFISH 2012 and biologist review). Cottonwood Creek flows through the project sections at 7.25 stream mile to about 9.5 stream miles from the confluence with the Blackfoot River. A FWP survey (Pierce 1999) of the 5 to 10 mile stream reach of Cottonwood Creek found high numbers of non-native brook and brown trout. Impacts to fisheries species resources likely include the competition or partial displacement of native westslope cutthroat trout from the drainage by eastern brook trout. There were low numbers of westslope cutthroat trout and no bull trout were found in this segment at time of survey, yet this segment provides connectivity between the Blackfoot River and the headwaters of Cottonwood Creek. Juvenile bull trout were found in upper Cottonwood Creek at stream mile 12 on Lolo National Forest lands (MFISH 2012). Bull trout are listed as endangered species and westslope cutthroat trout are considered sensitive species by DNRC (ARM 36.11.436).

Unnamed tributary A likely supports fish from the confluence with Cottonwood Creek, up to the wetland in the west ½ of section 36, T16N, R14W. This is a fairly warm water reach about 1 mile in length, across grasslands with very little shade. Above the wetlands, stream flow is shallow, narrow and intermittent and unlikely to support fish.

Table F1 Fisheries Presence In Cottonwood Creek from mouth to 10 stream miles					
	Fish Species	**Cottonwood Creek 0-4 stream miles**		**Cottonwood Creek 5-10 stream miles**	
Native Species		Fish Abundance	Data Rating	Fish Abundance	Data Rating
	Bull trout	Not Found, Rare	2	Not Found, Rare	2
	Westslope cutthroat trout	Rare	1	Rare	1
	sculpin spp	Common	1	Common	1
Non-native Species	eastern brook trout	Abundant	1	Abundant	1
	brown trout	Abundant	1	Abundant	1

MFISH 2012. (1)Sample confirmed (2) Species presumed to occur in analysis area, presence extrapolated or single survey

Sediment delivery
Potential sediment sources from roads, stream crossings and in-channel sources were identified during field reconnaissance. In-stream flows have increased channel scour at an old crossing site and irrigation diversion that is just upstream of the Cottonwood Creek bridge crossing. Sedimentation was noted at a road crossing site of a large wetland in SE corner of section 35 T16N, R14W. All potential sediment sources identified as part of the existing condition are discussed in the Water Resources Analysis portion of this EA.

Large Woody Debris Recruitment
In-stream levels of large woody debris appear are moderate on Cottonwood Creek. Historic harvest in the 1900's removed some of the largest riparian trees, but retained large conifers, cottonwoods and intermediate conifers. Channel form appears to be complex with some undercut banks and considerable large woody debris. There is an expected near term increase in large woody debris from tree mortality as retained dead pines fall towards streams.

Shading and stream temperature
The riparian stands on the DNRC lands along Cottonwood Creek are shaded by cottonwood, Douglas-fir, ponderosa pine, lodgepole pine, and spruce and areas with some open grassland sage adjacent to the streams. Heavy bank-edge shrubs of dogwood and willows are common through the project parcels. Cottonwood Creek is not identified as temperature limited.

The lower reaches of tributary A to Cottonwood Creek crosses a drier alluvial terrace and the vegetation transitions to historic grasslands and sage, with few overstory trees of ponderosa pine and lodgepole pine. This is a fairly warm water reach across grasslands with no appreciable shade. Many of the pine are dead or dying and shade is declining as needles fall and the effects of stream shading are marginal.

Direct and Indirect Effects of the No- Action Alternative on Fish Habitat
With no action, no road construction or planned timber harvest would occur and road maintenance would be limited. Effects would be the same as existing conditions. The loss of shading from scattered dying trees or fire has historically influenced available shade and stream temperatures on perennial streams and would be expected to be similar to historic conditions.

Direct and Indirect effects, of the Action Alternative on Fish Habitat
Sediment delivery
The proposed ground based timber harvest and use of existing roads is expected to result in overall low risk of erosion and sediment delivery to streams as disclosed in the water resources section. With the proposed action, road drainage would be improved to meet BMP's and control erosion and sedimentation. The Cottonwood Creek Bridge would be replaced and the eroding bank at the old crossing/ditch site would be stabilized. Site

specific erosion control measures would be implemented. Replacement of the bridge and bank stabilization would have a short term increase in sediment during operations, but would quickly subside in less than a day, based on comparison to similar DNRC projects. Replacement of the bridge and bank stabilization would be done in the summer during low flows and the minor and short term sediments have low potential to impact fish habitat. Road drainage maintenance and replacement of the Cottonwood Bridge and bank stabilization in section 31 T16N, R13W would reduce current sediments and maintain or improve water quality.

The net result of the combined project actions, would be improved channel stability and reduced long term sedimentation. Water yield is unlikely to be measurably changed and would not impact channel form and function compared to existing conditions as discussed in the water resources section.

No harvest would occur within 50 feet of Class I streams, principally Cottonwood Creek and no ground based equipment would be operated in these SMZ's to maintain protective vegetative buffers, consistent with the conservation and rules. The upland sites have low potential for sediment delivery to streams based on maintaining a vegetative buffer consistent with the SMZ laws and low runoff on flat to moderate slopes as detailed in the Water Resources Section. Harvest of dead trees would be allowed in the RMZ, but equipment would be limited to frozen or dry conditions to avoid excessive disturbance. For these reasons; there would be moderate risk of short term impacts and a low risk of long term impacts to in-stream sediments.

Large Woody Debris Recruitment
With the action alternative, no harvest would occur within the first 50 feet of the SMZ of Cottonwood Creek. On the fish bearing stream segments, RMZ's would be designated as an extended buffer protection zone parallel to and incorporating the full width of the SMZ. A Riparian Management Zone (RMZ) along Cottonwood Creek will be designated as 90 ft., based on site potential tree heights (SPTH) at 100-years as required by ARM 36.11.425. Selective harvest to thin and selectively remove dead, dying and overstocked trees is proposed within the outer 50-90 ft. width of the RMZ for about 1300 lineal feet. All trees would be retained in the SMZ and a within the RMZ from 50to 90 feet from the stream 50% or more of the trees >/= 8 inch diameter would be retained to provide recruitable snags for long term stream channel form, function and complex fish habitat and shading. The HCP analysis (DNRC 2011) found that retaining a 50 ft no harvest boundary with selective harvest in the RMZ would be expected to have negligible effects on large woody debris recruitment. This is expected to have a low risk of low impacts to large woody debris and associated fish habitats.

Shading and stream temperature
The combination of no harvest within 50 feet of Cottonwood Creek and selective harvest in the RMZ would result in low potential for affecting stream temperatures. The HCP analysis (DNRC 2011) found that retaining a 50 ft no harvest boundary with selective harvest in the RMZ would be expected to have negligible effects on shading and, consequently, stream temperature.

Tributary A to Cottonwood Creek crosses a drier alluvial terrace and the vegetation transitions to historic grasslands and sage, with less tree overstory of ponderosa pine, Douglas-fir and lodgepole pine. Many of the pine are dead or dying and shade is declining as needles fall.
No RMZ harvest is proposed along Tributary A.

Summary of Direct/Indirect Effects
In summary, there is moderate risk of low short term impacts of sediment and overall low potential for long-term direct or in-direct impacts to fish and fish habitat. Project design mitigations are expected to ensure protection of fish habitat by reducing sediment from the old crossing site and ditch area, and maintaining recruitable large woody debris and stream shading. The proposed harvest would have low potential for increased water yield or flow alterations to streams in the project area as detailed in the Water Resources Section. There is low potential for changes in flow regime or impacts to stream channel forms that may affect fisheries habitat.

<u>Cumulative Effects to Fish Habitat of the No-Action Alternative</u>
No timber harvest or road construction is associated with this alternative. Existing sediment sources from existing roads, grazing and land uses would continue to contribute sediment to streams in the analysis areas until remedial action were implemented or natural stabilization occurs. Road crossing repairs and restoration measures would not occur until funding was secured.

Cumulative Effects to Fish Habitat of the Action Alternative
There is overall low risk of additional cumulative impacts to fisheries in Cottonwood Creek or tributary A with the proposed timber harvest and road construction due to the following reasons:
1) No harvest will occur within 50 ft. of Class 1 streams including Cottonwood Creek. RMZ boundaries will be established adjacent to Cottonwood Creek and RMZ harvest will be limited to 1300 ft. of RMZ (< 1.2 acres) on the south side of Cottonwood Creek and there would be minor effects to stream shading.
2) Most streamside snags and recruitable trees would be retained to provide adequate levels of long term woody debris recruitment to stream channels.
3) Combined mitigation measures for harvest operations and season of use are all directed at minimizing soil disturbance to prevent erosion and sedimentation,
4) Road surface drainage on the haul route would be improved to comply with BMP's, which would reduce sediment to streams at the two identified existing crossing sites.
5) No new roads would be constructed adjacent to fisheries streams, and one road adjacent to Cottonwood Creek would be stabilized and abandoned.
6) The proposed levels of harvest would have low potential for increased water yield or flow alterations to streams in the project area as detailed in the Water Resources Section.
7) The existing log bridge crossing on Cottonwood Creek in section 31 would be replaced and improved. Sediment would be short term and minor and a long term improvement at the crossing site in compliance with 124 permit requirements.

Section 7 Vegetation- Noxious Weeds- Existing Conditions
Noxious weeds infestations are mainly a combination of spotted knapweed, houndstongue and spots of thistle which occur along portions of the existing access road system, open forest and rangeland sites. Noxious weeds occurring in the project parcels are mostly knapweed (Centaurea maculosa), houndstongue (Cynoglossum officinale L) and spot infestations of thistle (Cirsium arvense) within project sections and on adjacent lands. Knapweed (Centaurea maculosa) was found along roadsides as well as in some forested portions of the project area. Houndstongue was found mostly along roadsides along the access haul route. Historic cattle grazing, timber harvest activities, and recreational uses, are most likely the reasons for the existing rate of spread of noxious weeds and the potential future spread and introduction of noxious weeds. Previous weed management treatments in the area have been limited to reseeding of some roadcuts and treatments on adjacent private lands.

Noxious Weeds- Direct and Indirect Effects of the No- Action Alternative
With no action, noxious weeds will continue to spread along roads and may increase on the drier site habitats. Following disturbance events such as timber harvest activities, fires, or grazing, the establishment and spread of noxious weeds can be more prevalent than in undisturbed areas. DNRC would treat selected sites on DNRC roads based on priorities and funding availability. If new weed invader species are found they would have highest priority for management. The grazing licensees, if any would be required to continue weed control efforts consistent with their use.

Noxious Weeds- Direct and Indirect Effects of the Action Alternative
The action alternative will involve ground-disturbing activities that have the potential to introduce or spread noxious weeds in susceptible habitat types. For the action alternative, an Integrated Weed Management (IWM) approach was considered for treatment of existing and prevention of potential noxious weeds. For this project: prevention, revegetation and weed control measures for spot outbreaks are considered the most effective weed management treatments. Prevention measures would require clean off-road equipment. Roadsides would be sprayed prior to operations and weed control and revegetation would slow noxious weed spread and reduce weed density and occurrence compared to no-action. There would be a potential slight increase in weed infestation with harvest units due to soil disturbance and reduction of tree canopy. The silvicultural prescriptions are designed to control disturbance and scarification to goals needed for sustained forest growth. Control efforts will promote rapid revegetation and emphasize treatment of any new noxious weeds found.

Herbicide application would be completed on segments of DNRC roads along the haul route, to reduce weed spread along roads and promote desired vegetation for weed competition and to reduce sedimentation. Herbicide would be applied according to labeled directions, laws and rules, and would be applied with adequate buffers to prevent herbicide runoff in surface. Implementation of IWM measures listed in the mitigations would reduce existing weeds, limit the possible spread of weeds, and improve current conditions, to promote existing

native vegetation. More weed control would occur compared to the no-action alternative and grass and competitive vegetation would increase along roads.

Noxious Weeds- Cumulative Impacts of No-Action

Impacts of noxious weeds within the project areas are moderate. Weeds have spread through the drainage across ownerships over time and are prone to more dispersal along open roads. Weeds also have spread by multiple uses from wind, traffic, forest management and wildlife. Current weed infestations are mainly limited to roadsides within the project parcel and open forest sites. No control occurs along the main county access road, and this increases the potential for windblown seed. Timber harvest and roads throughout these drainages has increased grass growth and the risk for noxious weeds to spread though ground disturbance. As tree density and vegetation increase, weeds are reduced through vegetative competition.

Noxious Weeds- Cumulative Impacts of the Action Alternative

Impacts of noxious weeds within the project areas are moderate. Weeds have spread through the drainage across ownerships over time mainly along roadsides and open forest sites with multiple uses and by seed dispersal from wind, traffic and wildlife. Timber harvest throughout these drainages has increased grass growth and the risk for noxious weeds to spread though ground disturbance. Within the project area, overall cumulative effects of increased noxious weeds to spread are expected to be low to moderate, based on herbicide treatments of existing weeds along roads and implementing prevention measures to reduce new weeds, by cleaning equipment and planting grass on roads to compete against weeds.

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ATTACHMENT C
WILDLIFE

Good Shepherd Wildlife Analysis

Chapter 1

Issues and Concerns

There is concern that the proposed activities could alter cover, increase access, and reduce secure areas, which could affect grizzly bears by displacing them from important habitats and/or increasing risk to bears of human-caused mortality.

There is concern that the proposed activities could negatively affect Canada lynx by altering lynx summer foraging habitat, winter foraging habitat, and other suitable habitat, rendering it unsuitable for supporting lynx.

There is concern that the proposed activities could negatively affect bald eagles by reducing nesting and perching structures and/or disturbing nesting bald eagles

There is concern that the proposed activities could reduce the amount and/or quality of fisher habitats, which could alter fisher use of the area.

There is concern that the proposed activities may alter flammulated owl habitat by reducing canopy closure and increasing tree spacing, and could remove snags needed by flammulated owls for nesting.

The proposed activities could displace gray wolves from important habitats, particularly denning and rendezvous sites, and/or alter prey availability.

There is concern that the proposed activities could reduce suitable nesting and foraging habitat for pileated woodpeckers, which could alter pileated woodpecker use of the area.

There is concern that the proposed activities could remove forest cover on big game winter range, which could reduce the carrying capacity of the winter range

There is concern that the proposed activities could remove elk security cover, which could affect hunter opportunity and local quality of recreational hunting.

Issues Eliminated from Further Study

The following species were considered but eliminated from detailed study due to lack of habitat present: black-backed woodpecker, Coeur d'Alene salamander, Columbian sharp-tailed grouse, common loon, harlequin duck, mountain plover, northern bog lemming, peregrine falcon, and Townsend's big-eared bat. Thus there would be a low risk of adverse direct, indirect, or cumulative effects as a result of either alternative.

Chapter 2

Suggested Wildlife Mitigations

- A DNRC biologist will be consulted if a threatened or endangered species is encountered to determine if additional mitigations that are consistent with the administrative rules for managing threatened and endangered species (ARM 36.11.428 through 36.11.435) are needed.
- Motorized public access will be restricted at all times on restricted roads that are opened for harvesting activities; motorized public access would revert to existing levels following harvesting. Efforts to discourage additional motorized access (legal and illegal) by reclaiming temporary roads and obstructing skid trails would benefit several wildlife species.
- Snags, snag recruits, and coarse woody debris will be managed according to *ARM 36.11.411* through *36.11.414*, particularly favoring western larch and ponderosa pine. Clumps of existing snags could be maintained where they exist to offset areas without sufficient snags. Coarse woody debris retention would emphasize retention of downed logs of 15-inch diameter or larger.
- Contractors and purchasers conducting contract operations will be prohibited from carrying firearms while working in the project area.
- Food, garbage, and other attractants will be stored in a bear-resistant manner.

- Retention of patches of advanced regeneration of shade-tolerant trees, such as subalpine-fir and Engelmann spruce, in harvest areas #2 and #3 would break-up site distances, provide horizontal cover, and provide forest structural attributes preferred by snowshoe hares and lynx.
- Antler collection would be prohibited when the area is closed to the general public (November 11- May 14).
- Provide connectivity for fisher, Canada lynx, grizzly bears, and a host of other species by maintaining corridors of unharvested and/or lighter harvested areas along riparian areas, ridge tops, and saddles.

Chapter 3: Affected Environment

Description of Relevant Affected Resources

Wildlife

THREATENED AND ENDANGERED SPECIES

Grizzly Bears

Grizzly bears are native generalist omnivores that use a diversity of habitats found in western Montana. Preferred grizzly bear habitats are meadows, riparian zones, avalanche chutes, subalpine forests, and big game winter ranges, all of which provide seasonal food sources. The search for food drives grizzly bear movements, with bears moving from low elevations in spring to higher elevations through the summer and early fall, as fruits ripen throughout the year. Primary threats to grizzly bears are related to human-bear conflicts, habituation to unnatural foods near high-risk areas, and long-term habitat loss associated with human development (Mace and Waller 1997). Forest-management activities may affect grizzly bears by altering cover and/or by increasing human access into secure areas by creating roads (Mace et al. 1997). These actions could lead to the displacement of grizzly bears from preferred areas and/or result in an increased risk of human-caused mortality by bringing humans and bears closer together and/or making bears more detectable, which can increase the risk of bears being illegally shot. Displacing bears from preferred areas may increase their energetic costs, which may, in turn, lower their ability to survive and/or reproduce successfully.

The project area is approximately 4 miles south of the Mor-Dun grizzly bear subunit of the Lander Fork Grizzly Bear Management Unit of the Northern Continental Divide Ecosystem grizzly bear recovery area, which has a sizeable grizzly bear population. The project area is in the 'occupied habitat' area as mapped by grizzly bear researchers and managers to address increased sightings and encounters of grizzly bears in habitats outside of recovery zones (Wittinger 2002). Grizzly bears have been documented in the project area. Grizzly bears generally use different habitats relative to season. The project area primarily provides low elevation forested areas, riparian areas, and big game winter range. Bears are present in the project area throughout the non-denning period; the project area probably receives the most use by bears during the spring period. Summer or autumn habitat values are moderate in the area. The cumulative effects analysis area is approximately 24,439 acres and includes the area bounded by Route 200, the Clearwater River, and the Woodworth Road. DNRC manages approximately 23% (5,627 acres) of the cumulative effects analysis area.

Managing human access is a major factor in management for grizzly bear habitat. There are numerous open roads in the project area, yielding a moderately high (1.5 mi. / sq. mi.) open road density for the project area. Similarly, open road densities are fairly high in the cumulative effects analysis area (1.95 mi. /sq. mi., simple linear calculation). No grizzly bear security habitats exist (blocks ≥ 0.3 miles from roads receiving motorized use and ≥2,500 acres in size) in the project area or cumulative effects analysis area. Hiding cover exists in the forested portions of the project area (roughly 4,265 acres); grizzly bear hiding cover is present on roughly 11,752 acres of forested habitats in the cumulative effects analysis area. Within the cumulative effects analysis area, hiding cover is largely absent from the 12,480 acres of non-forested habitats and is somewhat limited on the other 236 acres of younger forest and sparsely forested habitats in the cumulative effects analysis area.

Canada Lynx

Canada lynx are associated with subalpine forests, generally between 4,000 to 7,000 feet in elevation in western Montana (Ruediger et al. 2000). The proposed project area ranges from approximately 4,080 to 5,200 feet in elevation and is dominated by western larch, Douglas-fir, and ponderosa pine stands. Lynx habitat in western Montana consists primarily of stands that provide habitat for snowshoe hares, either dense, young coniferous stands or dense, mature forested stands. Lynx in western Montana preferred mature, multi-storied

stands with dense horizontal cover year-round; during the summer lynx also selected earlier successional stands with a high horizontal cover (Squires et al. 2010). For denning sites, the primary component appears to be abundant large woody debris, particularly in the form of downed logs, root wads, slash piles, and live trees (Squires et al. 2008). These conditions are found in a variety of climax vegetation habitat types, particularly within the subalpine fir series (Pfister et al. 1977). Historically, high intensity, stand-replacing fires of long fire intervals (150 to 300 years) occurred in continuous dense forests of lodgepole pine, subalpine fir, and Engelmann spruce. These fires created extensive even-aged patches of regenerating forest intermixed with old stands that maintained a mosaic of snowshoe hare and lynx habitat.

Approximately 1,335 acres of lynx habitat occur in the project area, which is comprised of winter foraging (657 acres), other suitable lynx habitats (largely forested lands that provide cover to facilitate movement; 577 acres), summer foraging (14 acres), and temporary non-suitable lynx habitats (87 acres). Connectivity of forested habitats in the project area is only reasonably intact. The cumulative effects analysis area is approximately 24,439 acres and includes the area bounded by Route 200, the Clearwater River, and the Woodworth Road. DNRC manages approximately 23% (5,627 acres) of the cumulative effects analysis area. On DNRC-managed lands within the cumulative effects analysis area, roughly 1,441 acres of potential lynx habitats exist, which are dominated by winter foraging (719 acres) and other suitable lynx habitats (621 acres), with smaller components of summer foraging (14 acres), and temporary non-suitable lynx (87 acres) habitats. On other ownerships, there are roughly 2,423 acres of forested stands dominated by Douglas-fir and western larch with ≥40% canopy closure across the cumulative effects analysis area; a portion of those stands would likely be suitable lynx habitats and probably include some winter foraging habitats. Additionally summer foraging habitats likely exists on a portion of the 4,766 acres of sparsely stocked and young forest on other ownerships; no lynx habitats likely exist on the 11,773 acres of shrubs, herbaceous, and non-forested types on other ownerships in the cumulative effects analysis area.

SENSITIVE SPECIES

Bald Eagle

Bald eagles are diurnal raptors associated with significant bodies of water, such as rivers, lakes, and coastal zones. The bald eagle diet consists primarily of fish and waterfowl, but includes carrion, mammals, and items taken from other birds of prey. In Montana, bald eagles begin the breeding process with courtship behavior and nest building in early February; the young fledge by approximately mid-August, ending the breeding process. Preferred nest-stand characteristics include large emergent trees that are within site distances of lakes and rivers and screened from disturbance by vegetation.
Portions of the project area are within the home ranges associated with the Sperry Grade and Blackfoot Clearwater WMA-Bandy bald eagle territories. These territories have been fairly productive over the last 5 years; the Sperry Grade territory has produced an average of 1.6 chicks annually (with 1 unknown fate year included) and the Blackfoot Clearwater WMA-Bandy territory has produced an average of 0.4 chicks annually (3 years in the range were occupied, but the outcome is unknown) over the last 5 years. Direct, indirect, and cumulative effects were analyzed on the combined area of the 2 home ranges associated with these bald eagle territories. The aquatic habitats associated with these bald eagle territories include Cottonwood Creek, Blackfoot River, Chamberlain Creek, Upsata Lake, Bandy Reservoir, and numerous smaller streams and wetlands. Aquatic and terrestrial prey species are fairly common in the home range. The terrestrial habitat incorporated by the territories is a coniferous/deciduous mixture along the lakeshores and riparian areas, with coniferous forests and grasslands in the upland areas. Within the home ranges, black cottonwood is the deciduous tree of primary importance to bald eagles, while large emergent conifers also provide important nesting, roosting, and perching habitats.

Human disturbance, including timber harvesting, agricultural activities, the Highway 200 corridor, and various forms of recreation are potential sources of disturbance to the nesting territory. Numerous large emergent trees are available across portions of the home range, but logging and other human developments in the last 100 years has likely reduced some of these attributes while others have experienced mortality and are declining in quality.

Fisher

Fishers are a mid-sized forest carnivore whose prey includes small mammals such as voles, squirrels, snowshoe hares, and porcupines, as well as birds (Powell and Zielinski 1994). They also take advantage of carrion and seasonally available fruits and berries (Foresman 2001). Fishers use a variety of successional stages, but are disproportionately found in stands with dense canopies (Powell 1982, Johnson 1984, Jones 1991, Heinemeyer

and Jones 1994) and avoid openings or young forested stands (Buskirk and Powell 1994). However, some use of openings may occur for short hunting forays or if sufficient overhead cover (shrubs, saplings) is present. Fishers appear to be highly selective of stands that contain resting and denning sites and tend to use areas within 150 feet of water (Jones 1991). Resting and denning sites are found in cavities of live trees and snags, downed logs, brush piles, mistletoe brooms, squirrel and raptor nests, and holes in the ground. Forest-management considerations for fisher involve providing for resting and denning habitats near riparian areas while maintaining travel corridors. There are approximately 75 acres of potential riparian fisher habitats and 1,824 acres of upland habitats in the project area. The cumulative effects analysis area is approximately 24,439 acres and includes the area bounded by Route 200, the Clearwater River, and the Woodworth Road. DNRC manages approximately 23% (5,627 acres) of the cumulative effects analysis area; roughly 1,894 acres of upland fisher habitats and 81 acres of riparian habitats exist on DNRC-managed lands in the cumulative effects analysis area, including the habitats found in the project area. On other ownerships, there are roughly 130 acres of riparian and 2,293 acres of upland forested stands dominated by Douglas-fir and western larch with ≥40% canopy closure across the cumulative effects analysis area; some of those stands would likely be suitable fisher habitats. Much of the 16,538 acres of shrubs, herbaceous, and poorly stocked forested stands in the cumulative effects analysis area would not be expected to be suitable fisher habitats for some time, if ever.

Flammulated Owl

Flammulated owls are tiny, migratory, insectivorous forest owls that inhabit old, open stands of warm-dry ponderosa pine and cool-dry Douglas-fir forests in the western United States and are secondary cavity nesters. In general, preferred habitats have open to moderate canopy closure (30-50 percent) with at least 2 canopy layers, and are often near small clearings. They usually nest in cavities excavated by pileated woodpeckers or northern flickers in 12-25" dbh ponderosa pine, Douglas-fir, or aspen. Without disturbance, Douglas-fir encroach upon ponderosa pine stands resulting in increased stand density and decreased habitat quality for flammulated owls. Periodic, low-intensity underburns can increase habitat suitability and sustainability by reducing the density of understory seedlings and saplings, stimulating shrub growth, and by protecting large dominant trees from ladder fuels and competition with other mature trees.

There are approximately 2,911 acres of potential flammulated owl habitats in ponderosa pine and dry Douglas-fir stands across the project area. The cumulative effects analysis area encompasses the project area and lands within a one mile radius. Within the cumulative-effects analysis area, approximately 4,041 acres of potential flammulated owl habitats exist on DNRC-managed lands. Additionally, some suitable habitats likely exist on a portion of the 5,050 acres of open and closed forested habitats on other ownerships in the cumulative effects analysis area. A portion of the cumulative effects analysis area has been harvested in the recent past, potentially improving flammulated owl habitat by creating foraging areas and reversing a portion of the Douglas-fir encroachment and opening up stands of ponderosa pine.

Gray Wolf

Wolves are a wide-ranging, mobile species that occupy a wide variety of habitats that possess adequate prey and minimal human disturbance, especially at den and/or rendezvous sites. Wolves are opportunistic carnivores that frequently take vulnerable prey (including young individuals, older individuals, and individuals in poor condition). In general, wolf densities are positively correlated to prey densities (Fuller et al. 1992, Oakleaf et al. 2006). In Montana, wolves prey primarily on white-tailed deer and elk (Kunkel et al. 1999, Arjo et al. 2002). Thus, reductions in big game populations and/or winter range productivity could indirectly be detrimental to wolf populations.

Wolves typically den during late April in areas with gentle terrain near a water source (valley bottoms), close to meadows or other openings, and near big game wintering areas. When the pups are 8 to 10 weeks old, wolves leave the den site and start leaving their pups at rendezvous sites while hunting. These sites are used throughout the summer and into the fall. Disturbance at den or rendezvous sites could result in avoidance of these areas by the adults or force the adults to move the pups to a less adequate site. In both situations, the risk of pup mortality increases.

Big game species are abundant in the project area much of the year; winter range exists in the project area for deer and elk. Several landscape features commonly associated with denning and rendezvous sites occur in the project area, such as areas with gentle terrain near a water source (valley bottoms), openings, and proximity to big game wintering areas. The project area is not within any known wolf pack areas; however, the Morrell Mountain wolf pack was recently collared in the area. This pack was first documented in 2009 and has not been considered a breeding pair since its discovery. Some use of the project area by wolves is likely for breeding,

hunting, or other life requirements. No known den or rendezvous sites to occur in the project area, but the possibility of den or rendezvous sites occurring in the project area exists.
The cumulative effects analysis area is approximately 24,439 acres and includes the area bounded by Route 200, the Clearwater River, and the Woodworth Road. Within this cumulative-effects analysis area, big game species are fairly abundant and winter range for deer and elk are fairly widespread. Numerous landscape features commonly associated with denning and rendezvous sites, including meadows and other openings near water and in gentle terrain, occur in the cumulative-effects analysis area. Past wildfire activity, timber management, and human developments have altered big game and wolf habitats in the cumulative effects analysis area.

Pileated Woodpecker

Pileated woodpeckers are one of the largest woodpeckers in North America and excavate the largest cavities of any woodpecker. Preferred nest trees are large diameter western larch, ponderosa pine, cottonwood, and quaking aspen trees and snags, usually 20 inches dbh and larger. Pileated woodpeckers primarily eat carpenter ants, which inhabit large downed logs, stumps, and snags. Aney and McClelland (1985) described pileated nesting habitat as "...stands of 50 to 100 contiguous acres, generally below 5,000 feet in elevation with basal areas of 100 to 125 square feet per acre and a relatively closed canopy." The feeding and nesting habitat requirements, including large snags or decayed trees for nesting and downed wood for feeding, closely tie these woodpeckers to mature forests with late-successional characteristics. The density of pileated woodpeckers is positively correlated with the amount of dead and/or dying wood in stands (McClelland 1979).
In the project area, potential pileated woodpecker nesting habitat exists on approximately 811 acres. These nesting habitats are dominated by Douglas-fir, western larch, and ponderosa pine. Additionally, roughly 3,314 acres of sawtimber stands dominated by western larch/Douglas-fir and ponderosa pine exist in the project area, which are potential foraging habitats. Pileated woodpeckers have been seen and/or heard in the project area during field visits and may be nesting on the parcel. The cumulative effects analysis area encompasses the project area and lands within a one mile radius. Within the cumulative-effects analysis area, approximately 1,170 acres of potential pileated woodpecker habitats exist on DNRC-managed lands. Additionally, some suitable habitats likely exist on a portion of the 4,868 acres of reasonably closed forested habitats on other ownerships in the cumulative effects analysis area. Much of the 5,180 acres of open forest, shrubs, herbaceous areas, poorly stocked forested stands, and recently harvested stands on other ownerships in the cumulative effects analysis area is likely too open to be useful to pileated woodpeckers.

BIG GAME

Big Game Winter Range

Winter ranges enable big game survival by minimizing the effects of severe winter weather conditions. Winter ranges tend to be relatively small areas that support large numbers of big game, which are widely distributed during the remainder of the year. These winter ranges have adequate midstory and overstory to reduce wind velocity and intercept snow. The effect is that temperatures are moderated and snow depths are lowered, which enables big game movement and access to forage with less energy expenditure than in areas with deeper snow and colder temperatures. Snow depths differentially affect big game; white-tailed deer are most affected, followed by mule deer, elk, and then moose. Thus, removing cover that is important for wintering big game through forest management activities can increase their energy expenditures and stress in winter, but may increase forage production for use on summer range. Reductions in cover could ultimately result in a reduction in winter range carrying capacity and subsequent increases in winter mortality within local big game herds.

Montana Department of Fish, Wildlife, and Parks identified mule deer (3,302 acres) and elk (4,450 acres) winter range in the project area. These winter ranges are part of larger winter ranges in the area. Mature Douglas-fir, with lesser amounts of ponderosa pine and lodgepole pine stands in the project area are providing attributes facilitating use by wintering big game. Approximately 2,854 acres of the project area appear to be providing snow intercept and thermal cover attributes. Evidence of year round use by deer and elk was noted throughout the project area during field visits.

A variety of stands across the 81,815-acre winter range, used for the cumulative effects analysis area, are presently providing thermal cover and snow intercept for big game. In the recent past, harvesting and wildfires within this area has reduced thermal cover and snow intercept; ongoing harvesting across the winter range could continue altering these attributes while potentially disturbing wintering big game. Portions of the cumulative effects analysis area are in non-forested, herbaceous, or shrub types, which would not be expected to provide thermal cover or snow intercept in the future. Human disturbance within the winter range is

associated with residential development, agricultural clearing, recreational snowmobile use, commercial timber management, and the several roadways.

Elk Security Habitat

Timber harvesting can increase elk vulnerability by changing the size, structure, juxtaposition, and accessibility of areas that provide security during hunting season (Hillis et al. 1991). As visibility and accessibility increase within forested landscapes, elk and deer have a greater probability of being observed and, subsequently, harvested by hunters.

Areas that are within 0.5 mile of an open road do not provide elk security habitat. Two portions of the project area (for a total of 644 acres) are more than 0.5 miles from open roads. Hiding cover, which is the other component of elk security habitats, is fairly abundant in those 2 patches. These 2 patches contribute to the 2 larger patches (802 and 893 acres, respectively) of potential elk security habitats in the cumulative effects analysis area. Hiding cover is abundant in these 2 blocks, and the combination of topography, distance from open roads, and the presence of hiding cover likely provides adequate cover for elk during the hunting season. Moderate levels of motorized hunter access exist in the project area (10.6 mile; 1.5 miles/sq. mile); additional restricted roads (approximately 23 miles; 3.2 miles/sq. mile) facilitate non-motorized access and illegal motorized access. In the 24,439-acre cumulative effects analysis area, access for recreational hunting is widespread, with several open roads (at least 75 miles, 1.96 miles/sq. mile) that facilitate access and numerous restricted roads (at least an additional 57 miles; 1.49 mi./sq. mi.) that could be used for non-motorized use. Current management of the elk population as well as the deer populations in the area, with limited permit opportunities and abbreviated seasons, likely has a greater effect on big game survival than the availability of security habitat and/or the presence of open or closed roads that may facilitate human/hunter access.

Chapter 4: Environmental Consequences

Wildlife

Threatened and Endangered Species

Grizzly Bear

Direct and Indirect Effects of the No-Action Alternative *to Grizzly Bears*

No direct or indirect effects to grizzly bears would be anticipated since: 1) no disturbance or displacement would be expected, 2) no appreciable changes in hiding cover would occur, 3) security habitat would not be altered, and 4) no changes in long-term open-road densities would be anticipated.

Cumulative Effects of the No-Action Alternative to Grizzly Bears

No appreciable changes to existing habitats would be anticipated; advances in succession within those recently harvested stands could improve hiding cover and potentially foraging habitats for grizzly bears. Use of the cumulative effects analysis area by grizzly bears would not be expected to change from present levels. Thus, no further adverse cumulative effects to grizzly bears would be anticipated since: 1) no changes in human disturbance levels would be expected; 2) no changes to open road density would occur; 3) no further modifications to hiding cover would occur; and 4) no changes to security habitats would be expected.

Direct and Indirect Effects of the Action Alternative to Grizzly Bears

Proposed activities might affect grizzly bears directly through increased road traffic, noise, and human activity, and indirectly by altering the amount of hiding cover and forage resources. Activities in grizzly bear habitats reduce grizzly bear security, possibly resulting in increased stress and/or energy expenditure to endure the disturbance or to move from the area. These disturbances would only be present during harvesting operations; therefore, the season of disturbance is important in addressing effects to grizzly bears. Proposed harvesting could occur either between December 1 and March 1 or between July 1 and October 15 when soil conditions are dry or frozen. Thus activities could either occur during the denning or non-denning period for grizzly bears. If activities were to occur during the denning period, no direct effects to grizzly bears would be anticipated. Some disturbance of grizzly bears would be possible with any activities that may occur during the non-denning period, but activities would avoid the spring period when grizzly bears are most likely to be using the area as well as the late fall period prior to den entrance. Overall, the proposed activities would avoid important seasons leading to a negligible potential for disturbance and displacement of grizzly bears.
Hiding cover, defined as vegetation that will hide 90 percent of a grizzly bear at a distance of 200 feet, would be modified and partially reduced on roughly 3,162 acres in the short-term. Some hiding cover in the form of brush,

shrubs, and sub-merchantable trees would persist in several of the units, albeit at a reduced level from the existing condition; hiding cover would increase through time as young trees and shrubs regenerate over the next 5 to 10 years. Security habitat would not be entered or altered with this alternative.
No new roads would be constructed with the proposed activities; no changes in open road density or motorized public access would be anticipated. No appreciable changes in non-motorized human access would occur in the project area. Thus, a minor risk of adverse direct or indirect effects to grizzly bears would be anticipated since: 1) a low potential for disturbance and displacement would be anticipated; 2) hiding cover would be modified in a portion of the project area, but would remain in portions of the project area, and would be expected to recover in the short-term; 3) no changes to security habitats would be expected; and 4) no changes to long-term open road density would be anticipated.

Cumulative Effects of the Action Alternative to Grizzly Bears

Activities associated with the proposed project that would be conducted during the non-dennig period could temporarily increase human disturbance to grizzly bears within a portion of the cumulative effects analysis area. The potential human disturbance would be of short duration (2-4 years) and would largely occur outside of the more sensitive time periods for grizzly bears in the area. Continued use of the cumulative effects analysis area by grizzly bears would be anticipated at levels similar to present levels. Modifications to existing hiding cover would be additive to the reductions from past timber harvesting, recent wildfires, ongoing harvesting, as well as more permanent land-cover changes in the cumulative effects analysis area; however, portions of the cumulative effects analysis area are currently providing hiding cover. No changes in long-term open-road density would be anticipated. Thus, a minor risk of adverse cumulative effects to grizzly bears would be anticipated since: 1) minor increases in human disturbance levels in the short-term would be expected within a small portion of the cumulative effects analysis area; 2) hiding cover would be modified in the short-term on a small portion of the cumulative effects analysis area, but would be expected to recovery fairly rapidly; 3) no changes in long-term open road density would occur, and 4) no changes to security habitats would be expected.

Canada Lynx

Direct and Indirect Effects of the No-Action Alternative to Canada Lynx

In the short-term, no changes in lynx habitat elements would be expected in the project area. In the longer-term, barring any major natural disturbances, natural succession would advance several classes forward, generally improving several classes of lynx habitats; however, summer foraging habitats would continue to be largely absent from the project area. Winter foraging habitats would be expected to remain at similar levels, or increase in the future, as shade-tolerant trees develop in the understory and coarse woody debris accumulates through time due to natural events. Landscape connectivity would not be altered. Thus, a negligible risk of adverse direct and indirect effects to Canada lynx would be expected since: 1) existing winter foraging habitats would persist; 2) summer foraging habitats would continue to be largely absent without disturbance; 3) the amount of temporary non-suitable habitats would not increase; and 4) landscape connectivity would not be altered.

Cumulative Effects of the No-Action Alternative to Canada Lynx

No appreciable change in lynx habitats in the cumulative effects analysis area would occur, except the continued maturation of stands. Winter foraging habitats would be expected to improve in the future as shade-tolerant trees continue to develop in the understory, coarse woody debris accumulates through time due to natural events, and, in general, stands continue maturing out of summer foraging and other suitable habitats. No appreciable changes to landscape connectivity would be anticipated. Thus, a negligible risk of adverse cumulative effects to lynx would be expected since: 1) winter foraging habitats would persist in the cumulative effects analysis area; 2) summer foraging habitats would continue maturing and longer-term availability of summer foraging habitats would likely decline without disturbance; 3) no changes in the amount of temporary non-suitable habitat would occur; and 4) landscape connectivity would not be altered.

Direct and Indirect Effects of the Action Alternative to Canada Lynx

Approximately 1,111 acres (83% of lynx habitats in the project area) of lynx winter foraging (570 acres) and other suitable habitats (541 acres) would be altered with proposed activities. The other suitable habitats would be modified, but would remain in the other suitable habitat category; the winter foraging habitats would be converted to other suitable habitats. Retention of patches of advanced regeneration of shade-tolerant trees, such as Englemann spruce and subalpine-fir, in harvest areas # 2 and #3, would break-up sight distances,

provide horizontal cover, and provide forest structural attributes preferred by snowshoe hares and lynx. The total amount of lynx habitats in the project area in the temporary non-suitable lynx habitat class would not increase. Forested connectivity could be slightly altered with the proposed activities, but overall connectivity would be maintained with several corridors being retained along riparian areas, draws, ridges, and other topographic features. Collectively, a moderate risk of adverse direct and indirect effects to Canada lynx would be expected since: 1) winter foraging habitats would be reduced; 2) summer foraging habitats would continue to be absent from the project area; 3) the amount of the project area in the temporary non-suitable lynx habitat category would not change; and 4) connectivity could be slightly decreased, but connectivity would be maintained.

Cumulative Effects of the Action Alternative to Canada Lynx

Within the cumulative-effects analysis area, lynx habitats would continue to persist. Reductions in winter foraging coupled with the increases in other suitable habitats on the portions of the cumulative effects analysis area managed by DNRC could slightly decrease the quality of the lynx habitats in the cumulative effects analysis area. Within the cumulative effects analysis area, the forested habitats would be expected to continue providing suitable lynx habitats, which likely includes considerable winter foraging habitats. No changes in summer foraging habitats would occur, and through time, this habitat attribute could decrease in abundance as stands continue maturing and advancing in the absence of other disturbance. Likewise, no changes in the amount of the cumulative effects analysis area that is in the temporary non-suitable lynx habitats would occur. Forest connectivity would not be appreciably altered within the cumulative effects analysis area. Thus, a minor risk of adverse cumulative effects to Canada lynx would be expected since: 1) adequate winter foraging habitats would persist; 2) summer foraging habitats would continue decreasing through time and no contributions to future levels would occur; 3) no changes in the amount of the cumulative effects analysis area in the temporary non-suitable habitat category would occur and the majority of the lynx habitats would be in a usable state for lynx; and 4) negligible alterations in landscape connectivity would not prevent lynx movements.

Sensitive Species

Bald Eagle

Direct and Indirect Effects of the No-Action Alternative to Bald Eagles

No direct or indirect effects to bald eagles would be anticipated since: 1) no changes to human disturbance levels would occur; and 2) no changes in the availability of large, emergent trees suitable for perching or nesting would be expected.

Cumulative Effects of the No-Action Alternative to Bald Eagles

No cumulative effects to bald eagles would be anticipated since: 1) no changes to human disturbance levels would occur; and 2) no changes in the availability of large, emergent trees would be expected.

Direct and Indirect Effects of the Action Alternative to Bald Eagles

No activities would occur in the nest area or primary use area associated with either of the territories. Proposed harvesting could occur between December 1 and March 1 or again between July 1 and the middle of October. Should the proposed activities occur during the nesting period (February 1 – August 15), minor disturbance to bald eagles could occur due to the distance from the nests and the other disturbances within the home ranges. Any activities that could occur during the nesting period would either occur during the very initial stages or the later period when chicks are nearing fledging. Conversely, should those activities be conducted during the non-nesting period, no disturbance to bald eagles would be anticipated. Minor reductions in the availability of large snags or emergent trees that could be used as nest or perch trees could occur in the home range. No changes to human access to the home range would occur, thus limiting potential for introducing additional human disturbance to this territory. Thus, a negligible risk of direct and indirect effects to bald eagles would be anticipated since: 1) disturbance could be slightly elevated within the home range during operations, should they occur during the nesting period; 2) no change in human access within the project area would occur; and 3) minor reductions in the availability of large, emergent trees could occur.

Cumulative Effects of the Action Alternative to Bald Eagles

Nesting bald eagles would continue to experience varying levels of disturbance. Any potential disturbance and/or noise from the proposed harvesting would be additive to any of these other forms of disturbance, however no changes in bald eagle behavior would be anticipated. No appreciable changes in emergent trees or

snags would occur. Thus, a negligible risk of cumulative effects to bald eagles would be anticipated since: 1) disturbance would be slightly elevated within the territory during harvesting operations; 2) no changes in human access within the territory would occur; and 3) no appreciable changes in the availability of large, emergent trees would be expected.

Fisher

Direct and Indirect Effects of the No-Action Alternative to Fisher

No direct and indirect effects to fisher would be expected since: 1) no changes to existing habitats would be anticipated; 2) landscape connectivity would not be altered further; 3) no appreciable changes to snags, snag recruits, and coarse woody debris levels would be anticipated; and 4) no changes to human access or the potential for trapping mortality would be anticipated.

Cumulative Effects of the No-Action Alternative to Fisher

No further cumulative effects to fishers would be anticipated since: 1) no changes to existing habitats on DNRC-managed lands would occur; 2) landscape connectivity afforded by the stands on DNRC-managed lands would not change appreciably; 3) no changes to snags, snag recruits, or coarse woody debris levels would be expected; and 4) no changes to human access or the potential for trapping mortality would be anticipated.

Direct and Indirect Effects of the Action Alternative to Fisher

Some riparian habitats associated with isolated wetlands could be altered with this alternative, but habitats associated with Class 1 or 2 streams would not be altered. Approximately 1,267 of the 1,824 acres (69%) of upland fisher habitats in the project area would receive treatments; the majority of those upland fisher habitats would likely retain sufficient canopy closure to be considered fisher habitat following proposed treatments. No changes in open roads would be anticipated, which would not likely alter trapping pressure and the potential for fisher mortality. Negligible reductions in landscape connectivity could occur with the proposed activities, but activities would avoid riparian areas commonly used by fisher. Thus, a minor risk of adverse direct and indirect effects to fisher would be anticipated since: 1) harvesting would largely avoid riparian areas, particularly habitats associated with Class 1 and 2 streams; 2) harvesting would modify upland fisher habitats, but some continued use would be possible; 3) negligible reductions in landscape connectivity would occur, but those areas associated with riparian areas would largely remain unaffected; 4) harvesting would reduce snags and snag-recruitment trees while increasing coarse woody debris levels; however, some of these resources would be retained; and 5) no appreciable changes in motorized human-access levels would be anticipated.

Cumulative Effects of the Action Alternative to Fisher

Since no alterations of riparian habitats associated with Class 1 or 2 streams would occur, no appreciable changes in the amount of the preferred riparian fisher cover types meeting structural requirements for fishers at the cumulative-effects analysis area would occur. Minor reductions in suitable upland fisher habitats in the project area would lead to negligible reductions in the amount of suitable upland fisher habitats in the cumulative effects analysis area. These reductions would be additive to the losses associated with past timber harvesting and recent wildfires in the cumulative-effects analysis area as well as any ongoing and/or proposed harvesting. No appreciable changes to landscape connectivity would be anticipated, and activities would avoid riparian areas commonly used by fisher. No appreciable changes in human disturbance and potential trapping mortality would be anticipated. Thus, a minor risk of adverse cumulative effects to fisher would be anticipated since: 1) harvesting would modify upland fisher habitats, but upland habitats would persist; 2) no appreciable changes in landscape connectivity would be anticipated and connectivity in riparian areas would not be altered; 3) harvesting in a relatively small portion of the cumulative-effects analysis area would partially reduce snags and snag recruits, while increasing the coarse woody debris levels, largely in the smaller-sized pieces; and 4) no appreciable changes to motorized human access would occur.

Flammulated Owl

Direct and Indirect Effects of the No-Action Alternative to Flammulated Owls

Existing flammulated owl habitats in the project area would persist. With advancing succession, stands could continue to become densely stocked and exist at high risk to insects, disease and stand-replacement fire. Therefore, habitat sustainability and quality for flammulated owls would continue to decline. Thus, a negligible risk of adverse direct and indirect effects to flammulated owls would be anticipated since: 1) no harvesting would

occur; 2) no changes to potential nesting habitats would be anticipated; and 3) long-term, succession-related declines in foraging habitats coupled with advancing succession leading to denser stands.

Cumulative Effects of the No-Action Alternative to Flammulated Owls

Existing flammulated owl habitats would persist. Recent timber management and past wildfires in the cumulative effects analysis area has potentially improved flammulated owl habitats by creating foraging habitats and reversing a portion of the Douglas-fir encroachment, however retention of large ponderosa pine and/or Douglas-fir was not necessarily achieved in many of those areas, thereby minimizing the benefits to flammulated owls. Areas exhibiting mature forested conditions would be expected to persist and could provide flammulated owl nesting habitats into the future. Thus, a negligible risk of adverse cumulative effects to flammulated owls would be anticipated since: 1) no harvesting would occur, 2) no changes to potential nesting habitats would be anticipated, and 3) long-term, succession-related declines in foraging habitats coupled with advancing succession leading to denser, less suitable foraging conditions.

Direct and Indirect Effects of the Action Alternative to Flammulated Owls

Flammulated owls are tolerant of human disturbance (McCallum 1994), however the elevated disturbance levels associated with proposed activities could negatively affect flammulated owls should activities occur during the nesting season; harvesting activities would occur during the late nesting season or during the non-nesting period. Proposed timber harvest would open the canopy while favoring western larch, ponderosa pine, and Douglas-fir. Elements of the forest structure important for nesting flammulated owls, including snags, coarse woody debris, numerous leave trees, and snag recruits would be retained in the proposed units. The more open stand conditions, the retention of fire adapted tree species, and the maintenance of snags would move the proposed project area toward historical conditions, which is preferred flammulated owl habitat. Thus, minor positive direct and indirect effects would be expected to flammulated owls since: 1) harvesting would open denser stands up; 2) elements of forest structure used for foraging and nesting by flammulated owl would be retained; and 3) prescriptions would lead to more open stands with scattered mature ponderosa pine.

Cumulative Effects of the Action Alternative to Flammulated Owls

Proposed harvesting would increase the amount of the cumulative-effects analysis area that has been recently harvested, which would add to the amount of potential habitat available, but possibly at the expense of losing snags and large trees important for nesting. Overall a slight improvement in habitat quality at the cumulative-effects analysis level could be realized with this alternative. The portions of the cumulative-effects analysis area not currently providing flammulated owl habitats would not be expected to change any time in the future. Thus, negligible beneficial cumulative effects to flammulated owls would be expected since: 1) harvesting would improve the quality and sustainability of flammulated owl habitat on a portion of the cumulative effects analysis area; and 2) a small increase in the amount of the cumulative-effects analysis area would be anticipated that would be more representative of historic conditions.

Gray Wolf

Direct and Indirect Effects of the No-Action Alternative to Gray Wolves

Disturbance to wolves would not increase. No changes in big game habitat, including no changes to big game winter ranges, would be expected during the short-term; therefore, no changes in wolf prey availability would be anticipated. Thus, no direct and indirect effects would be expected to gray wolves since: 1) no changes in human disturbance levels would occur; and 2) no changes to prey availability would occur.

Cumulative Effects of the No-Action Alternative to Gray Wolves

White-tailed deer and elk winter ranges would not be affected and substantive changes in big game populations, distribution, or habitat use would be not anticipated. Levels of human disturbance would be expected to remain similar to present levels. Past harvesting and any ongoing harvesting may cause shifts in big game use and, subsequently, gray wolf use, of the cumulative-effects analysis area; however, no changes would be anticipated that would alter levels of gray wolf use of the cumulative-effects analysis area. Thus, no further cumulative effects to gray wolves would be expected since: 1) no changes in human disturbance levels would occur, particularly near known wolf den and/or rendezvous sites; and 2) no changes to prey availability would occur.

Direct and Indirect Effects of the Action Alternative to Gray Wolves

Wolves using the area could be disturbed by harvesting activities and are most sensitive at den and rendezvous sites, which are not known to occur in the project area or within 1 mile of the project area. Should either a den

or rendezvous site be identified within 1 mile of the project area, a DNRC biologist would be consulted to determine if additional mitigations would be necessary. After proposed harvesting activities, human disturbance levels would likely revert to pre-harvest levels. Likewise, wolf use of the project area for denning and rendezvous sites would likely revert to pre-harvest levels. In the short-term, the proposed harvesting could lead to slight shifts in big game use, which could lead to a shift in wolf use of the project area. Proposed harvesting on approximately 3,162 acres would alter canopy closure and potential winter use by big game, including roughly 2,085 acres (73% of existing stands) that likely have attributes facilitating considerable winter use by big game. Collectively, the modifications to summer and winter range could alter big game use of the project area, and subsequently alter the use of the project area by wolves. Thus, a low risk of direct and indirect effects would be expected to gray wolves since: 1) minor short-term increases and no long-term changes in human disturbance levels would occur, with no increases near known wolf den and/or rendezvous sites anticipated; and 2) changes to summer and winter big game habitats could alter big game use of the project area, but would not appreciably alter prey availability.

Cumulative Effects of the Action Alternative to Gray Wolves

Reductions in thermal cover and snow intercept capacity on a portion of the winter range in the cumulative effects analysis area could redistribute the big game relying on those habitats, and subsequently shift wolf use of a small portion of the cumulative effects analysis area. Reductions in cover may cause slight decreases in use by deer and elk; however, no appreciable changes would be expected within the cumulative-effects analysis area. These reductions in cover would be additive to losses from past timber-harvesting activities and recent wildfires as well as any ongoing harvesting in the cumulative-effects analysis area. No changes in motorized human access would be anticipated. No substantive change in wolf use of the cumulative-effects analysis area would be expected; wolves could continue to use the area in the long-term. Thus, a low risk of cumulative effects to gray wolves would be expected since: 1) elevated human disturbance levels would be short-lived and negligible changes to long-term disturbance levels would be anticipated with no increases near known wolf den and/or rendezvous sites; and 2) modifications to big game winter range could alter big game distributions, but would not appreciably alter prey availability.

Pileated Woodpecker

Direct and Indirect Effects of the No-Action Alternative to Pileated Woodpeckers

A negligible risk of adverse direct and indirect effects to pileated woodpeckers would be expected since: 1) no harvesting would occur; 2) no changes in the amount of continuously forested habitats would be anticipated; 3) no appreciable changes to existing pileated woodpecker habitats would be anticipated; and 4) long-term, succession-related declines in the abundance of shade-intolerant tree species, which are valuable to pileated woodpeckers, would be anticipated.

Cumulative Effects of the No-Action Alternative to Pileated Woodpeckers

No disturbance of pileated woodpeckers would occur. Continued use of the cumulative-effects analysis area by pileated woodpeckers would be expected at levels similar to the existing condition. Thus, a negligible risk of adverse cumulative effects to pileated woodpeckers would be expected since: 1) no further changes to existing habitats would occur; 2) no further changes to the amount of continuously forested habitats available for pileated woodpeckers would be anticipated; and 3) long-term, succession-related changes in the abundance of shade-intolerant tree species, which are valuable to pileated woodpeckers, would occur.

Direct and Indirect Effects of the Action Alternative to Pileated Woodpeckers

Pileated woodpeckers tend to be tolerant of human activities (Bull and Jackson 1995), but might be temporarily displaced by the proposed harvesting on roughly 3,162 acres, should those activities occur during the nesting season. No appreciable disturbance to pileated woodpeckers would be anticipated should the proposed activities occur during the non-nesting period. Harvesting would alter some of the continuously-forested habitats suitable for pileated woodpeckers in the project area. Roughly 546 acres of the potential nesting habitat and an additional 2,459 acres of potential foraging habitats would be modified. Most of these acres would continue to be dense enough to receive some use by pileated woodpeckers following proposed treatments. Following potential reductions in quality associated with the proposed activities, habitats would gradually improve in quality for pileated woodpeckers over the next 20-50 years, depending on the density of trees retained. Elements of the forest structure important for nesting pileated woodpeckers, including snags, coarse woody debris, numerous leave trees, and snag recruits would be retained in the proposed harvest areas. Since pileated woodpecker density is positively correlated with the amount of dead and/or dying wood in a stand (McClelland

1979), pileated woodpecker densities in the project area would be expected to be reduced with the proposed harvesting. The silvicultural prescriptions would retain healthy western larch, ponderosa pine, and Douglas-fir while promoting the growth and/or regeneration of many of these same species, which would benefit pileated woodpeckers in the future by providing nesting, roosting, and foraging habitats. Thus, a minor risk of adverse direct and indirect effects to pileated woodpeckers would be anticipated since: 1) harvesting would alter the amount of continuous-forested habitats available; 2) potential nesting habitats and potential foraging habitats would be altered, which could alter the suitability of those habitats for pileated woodpeckers; 3) snags and snag recruits would be removed; however, mitigation measures to retain snags and snag recruits would be included, and 4) proposed treatments would promote seral species in the project area.

Cumulative Effects of the Action Alternative to Pileated Woodpeckers

Reductions in pileated woodpecker habitats and further modifications in the amount of continuously forested habitats available in the cumulative effects analysis area would occur. Several snags, coarse woody debris, and potential nesting trees would be retained in the project area; however, future recruitment of these attributes may be reduced in a portion of the area by the proposed activities. Any modifications to pileated woodpecker habitats under this alternative would be additive to modifications associated with past harvesting and wildfires; continued use of the cumulative-effects analysis area would be expected. Continued maturation of stands across the cumulative-effects analysis area is increasing suitable pileated woodpecker habitats. Thus, a minor risk of adverse cumulative effects to pileated woodpeckers would be anticipated since: 1) harvesting would slightly alter the amount of continuous forested habitats available in the cumulative-effects analysis area, but forested habitats would persist; 2) potential nesting and foraging habitats would be modified, but habitats would persist in the cumulative-effects analysis area; 3) snags and snag recruits could be removed; however, mitigation measures would retain some of these attributes; and 4) proposed treatments would promote seral species in a small portion of the cumulative effects analysis area.

BIG GAME

Big Game Winter Range

Direct and Indirect Effects of the No-Action Alternative to Big Game Winter Range

No direct or indirect effects to big game winter range would be anticipated since: 1) subtle changes in thermal cover due to mortality and successional advances increasing canopy densities would be anticipated; 2) the amount of mature forested habitats on the winter range would not change appreciably; and 3) the levels of human disturbance would remain similar.

Cumulative Effects of the No-Action Alternative to Big Game Winter Range

Continued winter use of the larger winter range would be expected. No further changes in thermal cover and snow intercept would be anticipated. Human disturbance levels would be anticipated to continue at similar levels. Thus, minor positive cumulative effects to big game winter range would be anticipated since: 1) subtle changes in thermal cover due to advances in succession that would increase canopy densities would be anticipated over time; 2) the amount of mature forested habitats on the winter range would not change; and 3) the levels of human disturbance would remain similar.

Direct and Indirect Effects of the Action Alternative to Big Game Winter Range

Some disturbance and displacement could be expected if some or all of proposed activities occurred during the winter. However, winter logging provides felled tree tops, limbs, and slash piles that could concentrate feeding deer during nighttime and quiet periods when logging operations are shut down. Increasing short-term forage availability in this manner may partially offset some of the effects associated with temporary displacement caused by logging disturbance. This short-term benefit would not be expected to offset effects associated with reductions in thermal cover over the long-term (several decades). Proposed harvesting would occur on roughly 3,096 acres of elk winter range (69.6%) and 2,469 acres of mule deer winter range (74.8%); proposed activities would alter canopy closure and potential winter use by big game on roughly 2,085 acres (73% of existing stands) that likely have attributes facilitating considerable winter use by big game. Proposed timber harvesting would not prevent big game movement through the project area appreciably in winter and could stimulate browse production in the units. Additionally, to minimize disturbance to big game, antler collection and removal would be prohibited when the area is closed to the general public (November 11- May 14). Thus, a moderate risk of adverse direct or indirect effects to big game winter range would be anticipated since: 1) the relatively short-term that logging activities could create disturbance in this area; 2) harvesting would alter a relatively large

amount of the stands that are providing thermal cover and snow intercept habitats for big game species; and 3) a moderate to high amount of the winter range in the project area would be altered.

Cumulative Effects of the Action Alternative to Big Game Winter Range

Disturbance and displacement associated with this alternative could be additive to any displacement associated with ongoing activities in the cumulative effects analysis area and any other disturbances that may be affecting wintering big game. Similarly, any harvesting that may be occurring on other ownerships in the cumulative effects analysis area could continue altering big game winter range and/or disturbing big game. Modifications to thermal cover and snow intercept in the project area could further alter the amount of the larger winter range providing these attributes for big game. Thus, a minor risk of adverse cumulative effects to big game would be anticipated since 1) the relatively short-term that logging activities would create disturbance in a small portion of the cumulative effects analysis area; 2) a small percentage of the larger winter range would be altered; 3) availability of lower-quality cover in the vicinity that provides some opportunity for big game should they be displaced.

Elk Security Habitat

Direct and Indirect Effects of the No-Action Alternative to Elk Security Habitat

No risk of adverse indirect effects to elk security habitats would be expected since: 1) no changes in existing elk security habitats would be anticipated and continued maturation of forest cover would improve elk security habitats; 2) the level of human access to the project area would not change; and 3) no appreciable changes to big game survival would be anticipated.

Cumulative Effects of the No-Action Alternative to Elk Security Habitat

No changes in elk security habitat would be anticipated. Past harvesting and wildfires have reduced elk security habitats and allowed increased human access; continued maturation in previously harvested stands in the cumulative-effects analysis area would improve hiding cover in those areas. No other changes in disturbance and potential mortality due to hunting would be anticipated. Thus, a minor risk of positive cumulative effects to elk security habitats would be anticipated since: 1) no changes in open roads, motorized access, or human access would be anticipated; 2) no reductions in elk security habitat would occur; and 3) modest levels of security habitat and hiding cover would persist within the cumulative-effects analysis area, and 4) no appreciable changes to big game survival would be anticipated.

Direct and Indirect Effects of the Action Alternative to Elk Security Habitat

No changes in open roads or motorized access for the general public would occur. During all phases of the project, any roads opened with project activities would be restricted to the public and closed after the completion of project activities. Proposed harvesting on roughly 361 acres in the 2 blocks of elk security habitats could reduce some of the hiding cover in the short-term, while slightly increasing sight distances; however hiding cover would improve rapidly as trees and shrubs become reestablished in the openings. The retention of structure and unharvested areas between the various units would reduce the potential effects of the hiding cover reductions. Overall, slight increases in sight distances and the modification of hiding cover may slightly increase elk vulnerability risk in the project area. Additionally, to minimize disturbance to big game, antler collection and removal would be prohibited when the area is closed to the general public (November 11 – May 14). Collectively, a negligible risk of adverse effects to elk security habitats would be anticipated since: 1) no changes in open roads or motorized access for the general public would be anticipated; 2) no changes in non-motorized access would occur that would alter hunter access; 3) modifications to existing hiding cover would reduce the quality of the elk security habitats in the project area; and 4) negligible changes in big game survival would be anticipated.

Cumulative Effects of the Action Alternative to Elk Security Habitat

No changes in public, motorized access or non-motorized access would be expected, which would not affect elk vulnerability in the cumulative effects analysis area. Alterations of cover could reduce the quality of elk security habitats in a small portion of the cumulative effects analysis area. Continued maturation across the cumulative-effects analysis area would improve hiding cover and elk security habitats. Negligible effects to big game survival would be anticipated. Thus, a negligible risk of adverse cumulative effects to elk security would be anticipated since: 1) no changes in open roads or motorized access for the general public would be expected; 2) quality of hiding cover in a small portion of the cumulative effects analysis area would be reduced, which

would reduce the quality of the elk security habitats; 3) security habitat and hiding cover would persist in the cumulative-effects analysis area; and 4) no appreciable changes in big game survival would be anticipated.

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