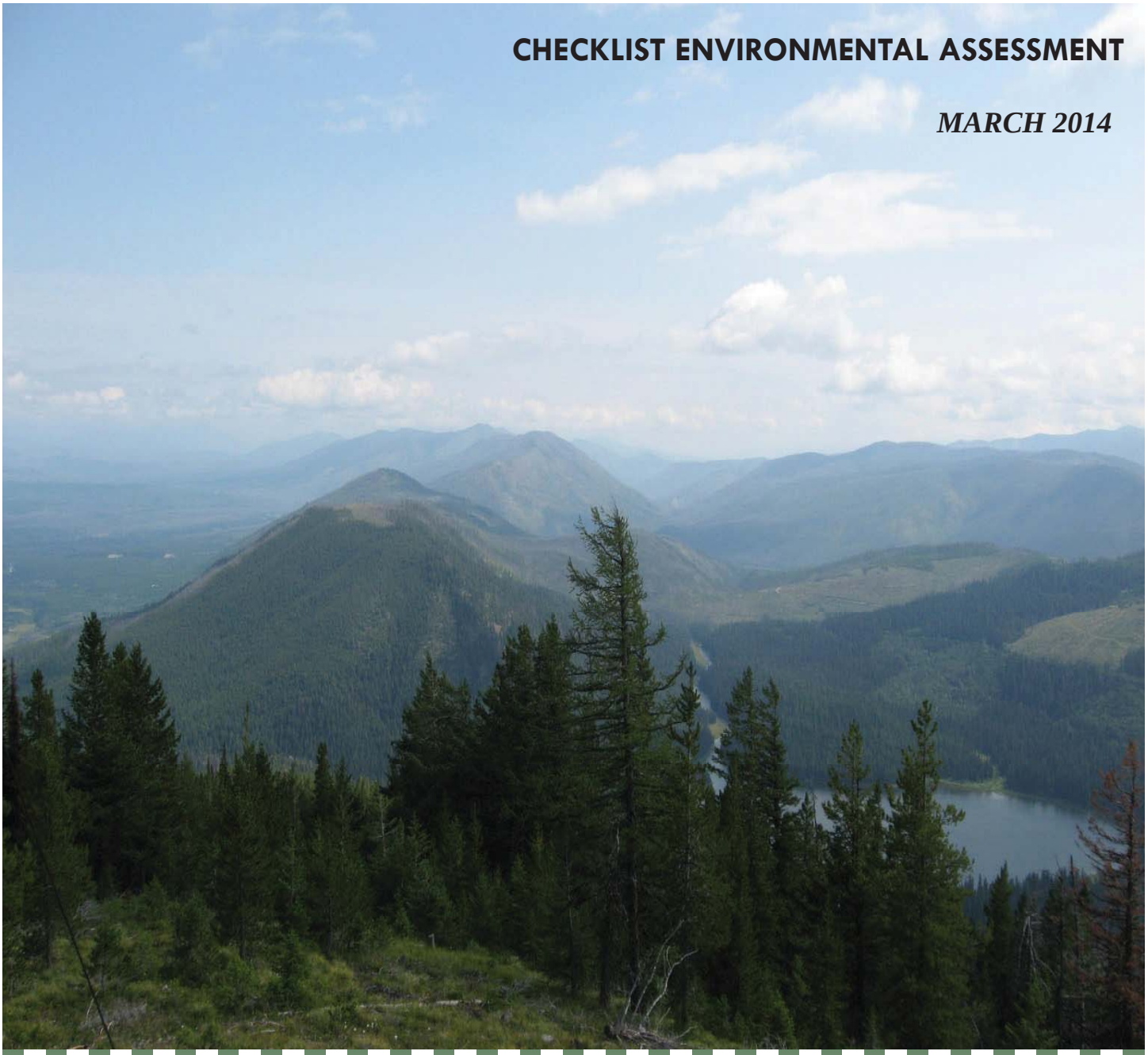
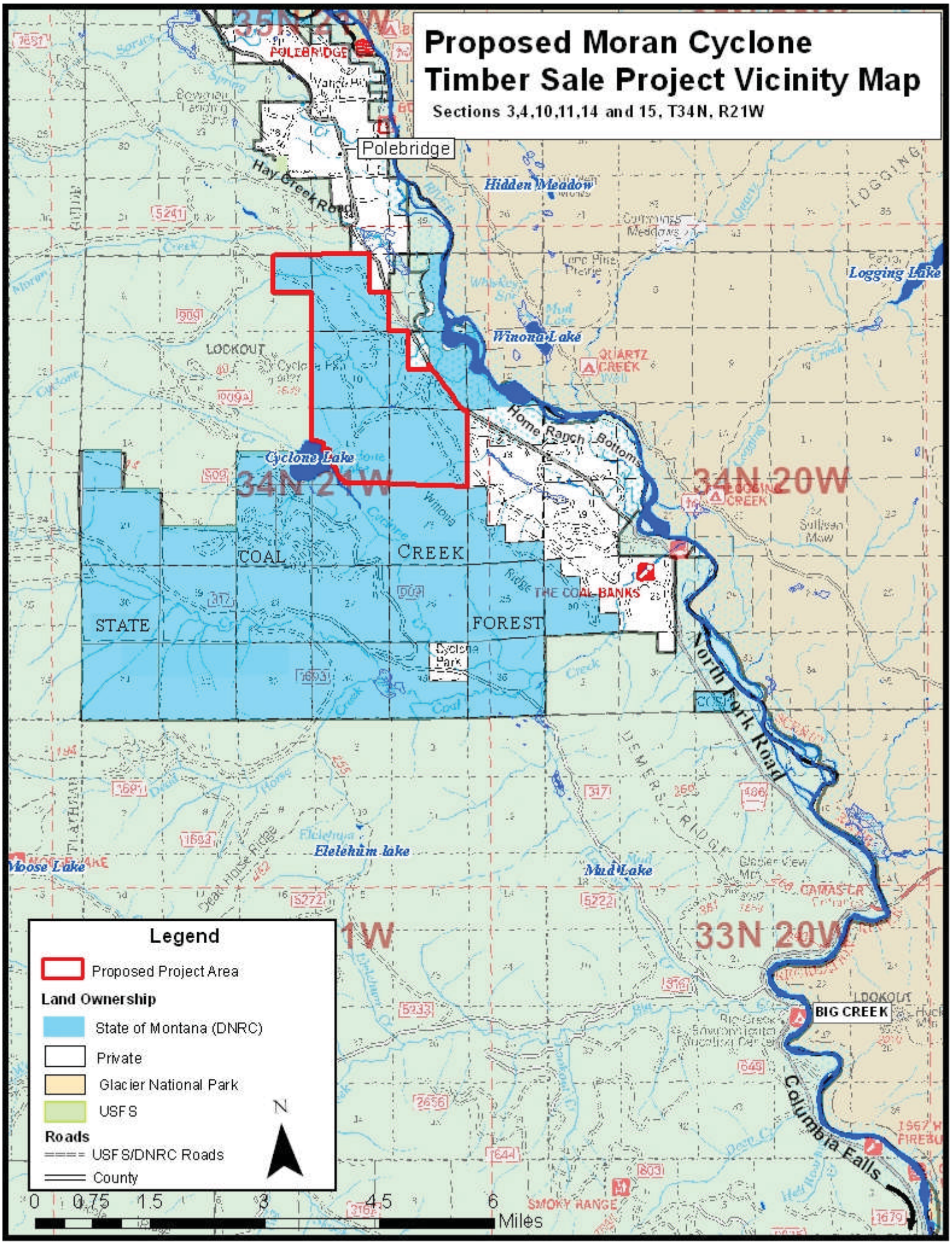
MORAN CYCLONE TIMBER SALE PROJECT



CHECKLIST ENVIRONMENTAL ASSESSMENT

MARCH 2014

Department of Natural Resources and Conservation
Northwestern Land Office— Stillwater Unit


Proposed Moran Cyclone
Timber Sale Project Vicinity Map
Sections 3,4,10,11,14 and 15, T34N, R21W
Polebridge
Hay Creek Road
Hidden Meadow
Logging Lake
Winona Lake
Cyclone Lake
Home Ranch Bottoms
34N 21W
34N 20W
33N 20W
COAL
CREEK
STATE
FOREST
THE COAL BANKS
North Fork Road
Elelehum lake
Moose Lake
Mud Lake
BIG CREEK
Columbia Falls
Legend
Proposed Project Area
Land Ownership
State of Montana (DNRC)
Private
Glacier National Park
USFS
Roads
USFS/DNRC Roads
County
N
0 0.75 1.5 3 4.5 6
Miles

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Acronyms (inside back cover)

CHECKLIST ENVIRONMENTAL ASSESSMENT

Project Name:	Moran Cyclone Timber Sale
Proposed Implementation Date:	Spring 2014
Proponent:	Montana Department of Natural Resources (DNRC), Northwestern Land Office, Stillwater Unit
Location:	Sections 3, 4, 10, 11, 14, & 15; Township 34 North, Range 21 West
County:	Flathead

I. TYPE AND PURPOSE OF ACTION

Montana Department of Natural Resources and Conservation (DNRC), Stillwater Unit, proposes to harvest approximately 5 to 6 million board feet of timber from the Coal Creek State Forest (see *Vicinity Map*). The proposed activities would regenerate new stands of healthy trees while improving the vigor and growth of trees remaining in the forest for the purpose of benefiting future trust actions. This project would produce an estimated $1,121,473 in revenue for the School of Mines, State Normal School, Public Buildings and Montana State University trusts.

The lands in this project are held in trust by the State of Montana for the support of specific beneficiary institutions (*Enabling Act of February 22, 1889; 1972 Montana Constitution, Article X, Section 11*). The Board of Land Commissioners (Land Board) and DNRC are legally required to administer these trust lands to produce the largest measure of reasonable and legitimate long-term revenue return for the trust beneficiaries (*Montana Code Annotated 77-1-202*).

This project was developed in compliance with the State Forest Land Management Plan (SFLMP), the Administrative Rules for Forest Management (Forest Management Rules; ARM 36.11.401 through 471), and Montana DNRC Forested State Trust Lands Habitat Conservation Plan (HCP), 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. List number of individuals contacted, number of responses received, and newspapers in which notices were placed and for how long. Briefly summarize issues received from the public.

In July 2013, DNRC solicited public participation on the Moran Cyclone Timber Sale Project. Scoping notices were placed in the Flathead Beacon newspaper, which services Columbia Falls, Bigfork, Whitefish, and the surrounding area. The Initial Proposal (IP) with maps was sent to neighboring landowners, individuals, agencies, industry representatives, and other organizations that have expressed interest in DNRC's management activities. The Initial Proposal was also placed on the DNRC website and posted at the Olney Post Office for 30 days. This project was discussed twice during the North Fork Interlocal meetings which are meetings where all the government agencies with jurisdiction in the North Fork of the Flathead River and local landowners meet to discuss upcoming projects and issues. The IP was also provided to the North Fork Landowners Association website for posting. The mailing list of parties receiving the Initial Proposal, and the comments received, are located in the project file at the Stillwater Unit Headquarters in Olney, Montana.

The public comment period for the Initial Proposal was open for 30 days, during which DNRC received 2 letters, 2 emails, and 1 phone call. One individual was concerned about existing fuel loads on State lands adjacent to their property, one individual requested that this project maintain old, large larch on state lands adjacent to their property, two comments brought up the possibility of this project utilizing slash for biomass, and the fifth comment was from an adjacent landowner who supports the proposed project.

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

Examples: cost-share agreement with U.S. Forest Service, 124 Permit, 3A Authorization, Air Quality Major Open Burning Permit.

Department of Fish, Wildlife and Parks (DFWP)
A Stream Protection Act Permit (124 Permit) is required from DFWP for activities that may affect the natural shape and form of a stream's channel, banks, or tributaries. Such activities include the installation and/or removal of three stream crossing culverts.

Montana Department of Environmental Quality (DEQ)
DNRC, 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 agrees to 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 removing a native log-sill crossing on a stream would introduce sediment above natural levels into streams, and if Montana Department of Fish, Wildlife and Parks recommends it.

Montana/Idaho Airshed Group
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.

U.S. Fish and Wildlife Service (USFWS)
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, which can be found at http://dnrc.mt.gov/HCP.

3. ALTERNATIVE DEVELOPMENT:

Describe alternatives considered and, if applicable, provide brief description of how the alternatives were developed. List alternatives that were considered but eliminated from further analysis and why.

The No-Action and Action Alternatives are described in this section. The decisionmaker may select a modification or combination of these alternatives.

Alternatives Considered

- ***No-Action Alternative***

Under this alternative, no timber would be harvested and therefore no revenue would be generated for the Trusts at this time. Salvage logging, firewood gathering, recreational use, fire suppression, noxious-weed control, additional requests for permits and easements, and ongoing management requests may still occur. Natural events, such as plant succession, tree mortality due to insects and diseases, windthrow, down fuel accumulation, in-growth of ladder fuels, and wildfires, would continue to occur.

- ***Action Alternative***

Development of the Action Alternative is based on analyses of current forest and resource conditions within the project area and cumulative effects areas.

The following are the main concerns or focal points related to forest and resource conditions in the project area:

- Dwarf mistletoe is found in western larch and lodgepole pine, with the most severe infections found within Units 3 and 5.
- Infections of various root disease such as *H. annosus, P. schweinitzii*, and *Armillaria* are causing mortality within Douglas-fir in Unit 9.
- Indian Paint (*E. tinctorium*) is causing loss of volume in subalpine fir and grand fir within Units 1, 2, 4, and 9.
- Current cover types do not match DNRC's desired future conditions for several stands.
- Overstory tree growth and vigor has diminished due to overcrowding and in-growth of shade-tolerant species.
- Reduction of fuel loads in stands on State lands adjacent to private ground is needed to reduce the potential of high hazard wildland fires.
- There is a need to maintain some connectivity of mature stands for wildlife.
- Location and classification of creeks, including many newly discovered creeks, limits access and management to some areas.
- The transportation planning encountered steep terrain, which limits road construction for access.
- Areas with soils that could be prone to slumping were identified.

As a result, an Action Alternative (including mitigation measures) was developed. A detailed description of mitigation measures can be found in *Attachment III - STIPULATIONS AND SPECIFICATIONS*.

Under this alternative, the DNRC would:

- commercially thin approximately 240 acres (35 acres is post and pole sized material);
- pre-commercially thin approximately 230 acres;
- regenerate new stands of healthy trees on 392 acres through seed tree with reserves treatments and natural regeneration; and
- remove seed trees on approximately 10 acres of successfully regenerated stands, also known as an overstory removal treatment.

The above actions would reduce the potential for a high intensity wildland fire and reduce fuel loads on State lands adjacent to private landowners.

In addition, this alternative would:

- perform road maintenance and Best Management Practices (BMP) improvements on approximately 12.3 miles of existing road; and
- construct 1.75 miles of temporary road which would be reclaimed post harvest.

Detailed descriptions of the harvesting methods and silvicultural prescriptions can be found in *Attachment I – PROJECT MAP and Attachment II – PRESCRIPTION TABLE.*

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 direct, indirect, and cumulative effects to soils.

The following issue statements were compiled from Interdisciplinary Team discussions regarding the effects of the proposed timber harvesting:

- *Timber harvesting activities may adversely affect soil resources due to increased compaction, displacement and erosion.*
- *Removal of both coarse and fine woody material off site during timber harvest operations can reduce nutrient pools required for future forest stands and can affect the long-term productivity of the site.*

EXISTING CONDITIONS

Analysis of landtypes in the proposed project area revealed that there are several landtypes with marginal stability. These conditions include but are not limited to saturation, slope steepness, loss of vegetative cover, and windthrow events. Special operating considerations are often necessary when forest management activities are proposed on these landtypes. Aerial photo interpretation and field review identified areas of past slope instability on highly dissected slopes along Winona Ridge in the southern portion of the proposed project area. Based on the age of trees within these dissections, it appears that these soil movements have not been active within the past 50 years. In addition, one area of recent slope instability was found in Section 11 of the project area. This is an area along an existing road that has formed a small slump within the past 5 years. This area slumped down onto the existing road surface from above the cutslope.

Environmental Effects

- ***Direct, Indirect and Cumulative Effects of the Action Alternative***

Soil Physical Properties

Moderate adverse direct impacts to soil physical properties would be expected on up to 69 of the total 643 acres proposed for harvesting (including 35 acres of post-and-pole harvesting) in the proposed project area. Ground-based site preparation would be done on tractor units, and prescribed fire may be used for site preparation on portions of cable harvest units. These activities would also generate direct impacts to the soil physical properties. Site-preparation disturbance would be intentionally done, and these impacts are considered light and promote reforestation of the site. In addition, BMPs and a combination of mitigation measures would be implemented to limit the area and degree of soil impacts as noted in ARM 36.11.422 and the SFLMP (DNRC, 1996).

Moderate adverse cumulative effects to soil physical properties may occur from repeated entries into a forest stand where additional ground is impacted by equipment operations. Impacts from skidding are estimated to be between 6 and 11 percent within the proposed units. Cumulative impacts to soil physical properties under the Action Alternative would fall below the range analyzed for in the EXPECTED FUTURE CONDITIONS section of the SFLMP and are well within the 20-percent impacted area established as a level of concern in the SFLMP (DNRC, 1996).

Nutrient Cycling

Direct and indirect effects to nutrient cycling may include a slight decrease in coarse woody debris from the Action Alternative by removing standing timber. Some stands where woody debris levels are low may see an increase in large woody debris as a result of the proposed harvesting. In addition, this alternative would lead to

an increase in fine woody material in the form of limbs and tree tops being left after harvest. Through the timber sale contract, approximately 12-24 tons of coarse woody material would be left on the ground following harvesting activities, as well as fine material for nutrient retention. Risk of cumulative effects to nutrient cycling from nutrient pool loss would be low. This alternative would follow research recommendations found in Graham (1994) for retention of coarse and fine woody debris through contract clauses and site-specific mitigation measures.

Slope Stability

Direct and indirect effects to slope stability from the Action Alternative may include a moderate increase in risk of soil mass movement and decreased slope stability. This risk would be measured by the time it would take for the site to revegetate. Approximately 72 of the acres proposed for harvest with this alternative are on landtypes with marginal slope stability. In these areas, silviculture prescriptions and logging systems would be modified based on site-specific criteria to minimize the potential risk of soil mass movements. Examples of modification may include cable logging, directional felling, harvesting individual larger trees that could tip from windthrow and cause weak points on slopes and/or near roads that could lead to erosion, and harvesting during times of low soil moisture. Approximately 0.9 miles of proposed temporary road would be constructed on landtypes with marginal slope stability. This reach of road may be modified based on site-specific conditions to minimize the risk of slope stability problems. Cut slopes may need to be laid back to a gentler angle, and ditch relief would also be evaluated to reduce the risk of raveling and slumping. Risk of cumulative effects to slope stability from the proposed Action Alternative would be low. This alternative would utilize contract clauses and site-specific mitigation measures to minimize risks to slope stability, and would not re-enter any past harvest areas on marginally stable slopes. None of the proposed harvest units or proposed new temporary road construction would be located on a known slope stability problem, so no expansion or increase in existing slope stability problems are expected.

A detailed analysis is contained in Attachment IV: SOILS ANALYSIS.

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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 direct, indirect, and cumulative effects to water resources.

After reviewing the public and internal comments, DNRC developed the following issue statements regarding the potential effects of the proposed timber harvesting:

- *Sediment delivery and subsequent water quality impacts can be affected by timber harvesting and related activities by increasing the production and delivery of fine sediment to streams.*
- *Removal of vegetation near stream channels reduces the sediment-filtering capacity and may reduce channel stability and the amounts of large woody material.*
- *Water yield increases can result from timber harvesting and associated activities, which can affect the timing, distribution, and amount of water yield in a harvested watershed.*

Analysis methods to assess sediment delivery will include qualitative assessments where stream crossings exist within the proposed project area using visual inspection and lineal measurement to determine the road surface area delivering to a stream. Sediment from roads, harvesting activities and vegetative removal will be analyzed qualitatively through data collected during past statewide and DNRC internal BMP field reviews.

Analysis methods to assess water yield increases for the project area streams was determined using field review and aerial photo interpretation. Visual inspection of the runoff patterns and stream channel stability within the Moran Cyclone project area were used to assess the impacts of past management to water yield. All existing activities on all ownership within project area watersheds and proposed activities related to the Moran Cyclone project will be analyzed using methods described above.

Existing Conditions

Sediment Delivery

Sediment delivery in the project area was reviewed by a DNRC hydrologist in 2013. Numerous stream channels were identified in the project area. Moran Creek flows through the northwest portion of the project area and is a perennial Class 1 stream with an approximately 12-foot bankfull width. The stream was classified as a B3/4 channel using a classification system developed by *Rosgen* (*1996*). Moran Creek has several tributary stream channels ranging from 1 to 3 foot bankfull widths. An unnamed Class 1 stream with a 2 to 3 foot bankfull width which flows through Sections 10 and 11 of the proposed project area is a tributary to Hay Creek. In Sections 11 and 14 of the proposed project area, streams are unnamed Class 2 and Class 3 streams, and do not contribute surface water to any downstream waters. These streams have 1 to 3 foot bankfull widths and are classified as B4/5 channels. No areas of unstable or actively down-cut channels were identified during field reconnaissance. Woody material in streams provides traps for sediment storage and gradient breaks to reduce erosive energy and work as flow deflectors to reduce bank erosion. Large woody debris was found in adequate supply to support channel form and function. No evidence of past SMZ harvesting was found. Based on these findings, no in-channel sources of erosion or deposition were identified in Moran Creek or its tributaries.

No sediment delivery from the existing road system was identified on any of the proposed haul routes within or leading to the project area. The existing road system in the proposed project area is low to moderate standard native-surfaced road, and most reaches meet applicable best management practices for surface drainage and erosion control.

Water Yield

No water yield impacts were identified from past activities in and around the proposed project area streams. Past management activities consist of timber management on federal and state land. There have also been several stand replacing fires in and near the proposed project area within the past 20 years. These activities and events have led to reductions in forest canopy cover, and construction of roads.

After evaluating the watershed cumulative effects risks along with the current conditions in the Moran Cyclone project area, by ARM 36.11.423, a detailed watershed analysis is not needed in this project area.

Environmental Effects

Sediment Delivery

Direct and Secondary

There is a low risk of direct or secondary effects to sediment delivery to streams from the timber harvesting activities proposed in the Action Alternative. The SMZ law, Administrative Rules for Forest Management, Riparian Management Zones (RMZ), channel migration zones (CMZ) on fish-bearing Class 1 streams, and applicable BMPs would be applied to all harvesting activities, which would minimize the risk of sediment delivery to draws and streams.

There is a low risk of direct or secondary effects of sediment delivery to streams from the use of existing roads and construction of temporary roads proposed in the Action Alternative. The existing road system meets BMP standards, and no direct sources of sediment were identified.

There is a high risk of low impacts to sediment delivery from construction of approximately 1.75 miles of temporary road. This risk would be elevated due to construction of two new stream crossings on one of the proposed temporary roads, and subsequent removal of the crossings following project completion. This activity would likely release a short-term pulse of fine sediment into the stream during construction. The risk of sediment delivery would remain elevated for 2-3 years after project completion while bare soils are revegetated.

There is a high risk of low impacts of sediment delivery from removal of an existing 24-inch diameter culvert installed in a perennial stream on an old existing road. This activity would likely release a short-term pulse of fine sediment into the stream during construction. The risk of sediment delivery would remain elevated for 2-3 years after project completion while bare soils are revegetated.

Cumulative

Risk of sediment delivery and sediment loading to Hay Creek and waters downstream from the proposed project area would be slightly increased from current levels in the short term and below current levels in the long term. Maintenance and improvement of existing erosion control and surface drainage on the existing road system would yield erosion rates similar to current levels. Removal of the existing 24-inch stream crossing culvert would reduce potential sediment loading to Hay Creek and the North Fork Flathead River by removing a potential sediment source. Overall, there is a high risk of short-term low-level increases in sediment loading for about 2 to 3 years. However, water quality standards are expected to be met and there is a low risk of impacts to beneficial uses.

Water Yield

Direct and Secondary

There is a low risk of very low direct or secondary effects to water yield from harvesting of approximately 608 acres of timber under this alternative within the proposed project area. It is a low risk that this level of harvesting would be sufficient to generate measurable increases in water yield in any stream located within or near the project area or cause channel instability. The stability of channels would be sufficient to handle any anticipated increases without measurable change. In addition to these commercial harvest acres, the project would propose to harvest approximately 35 acres of post- and pole-sized material, and commercially thin an additional 230 acres. The proposed treatment in the post-and-pole unit is to remove approximately 50% of the trees, leaving a 16 to 20 foot spacing, and the pre-commercial thinning would also remove approximately 50% of the live trees (see Attachment II – PRESCRIPTION TABLE for details). These prescriptions are designed to improve the growth and vigor of the remaining trees and do not contribute to increases in water yield due to removal of vegetative competition. As a result, there is a low risk of very low direct or secondary impacts to water yield in project area drainages as a result of the proposed Action Alternative.

Cumulative

There is a low risk of very low cumulative effects to project area drainages and downstream waters in and near the project area as a result of the proposed project. The proposed commercial harvesting combined with the proposed post-and-pole and commercial thin units would leave the Hay Creek watershed with a harvested condition of less than 20%, which would leave the watershed well below even the most stringent water yield thresholds. Therefore potential increases in water yield from harvest activities have a very low risk to affect downstream waters.

A detailed analysis is contained in Attachment V: WATER RESOURCES ANALYSIS.

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6. AIR QUALITY:
What pollutants or particulate would be produced (i.e. particulate matter from road use or harvesting, slash pile burning, prescribed burning, etc)? Identify the Airshed and Impact Zone (if any) according to the Montana/Idaho Airshed Group. Identify direct, indirect, and cumulative effects to air quality.

- ***Direct, Indirect, and Cumulative Effects of the Action Alternative***

The project is located in Airshed 2. Some particulate matter may be introduced into the Airshed from the burning of logging slash. 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 and the Montana/Idaho Airshed Group. The DNRC, as a member of the Montana/Idaho Airshed Group, would burn only on approved days. Thus, 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 effects to the local airshed and the Class I Areas. Thus, cumulative effects to air quality due to slash pile burning associated with the proposed action would also be expected to be minimal.

Cumulative effects to air quality would not exceed the levels defined by State of Montana Cooperative Smoke Management Plan (1988) and managed by the Montana Airshed Group. Prescribed burning by other nearby airshed cooperators (for example the U.S. Forest Service) would have potential to affect air quality. All cooperators currently operate under the same Airshed Group guidelines. The State, as a member, would burn only on approved days. This should decrease the likelihood of additive cumulative effects.

During dry periods of the year, road dust would be created on gravel and dirt (native-surfaced) roads, relative to the amount of use. The log-hauling traffic from this proposed sale may increase by 6 to 12 truckloads per day. Depending on the season of harvest and the weather conditions, road dust may increase. In cases where the Forest Officer considers the dust level as unacceptable, the application of dust abatement, such as magnesium chloride, may be required.

Harvesting operations would be short in duration, and as mentioned, possible dust caused by hauling maybe mitigated using dust abatement. Thus, direct, indirect, and cumulative effects to air quality due to harvesting and hauling associated with the proposed action would be minimal.

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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 direct, indirect, and cumulative effects to vegetation.

Existing Condition

Approximately one-third of the project area burned in 2001 during the Moose Fire. Logging took place in the 1930's and again in the early 1980's and 1990's over much of the area. Fire and past harvesting has created a patchwork of age and size classes and species composition.

Older units are typically 110- to 130-year-old, 110 foot tall mixed conifer or Douglas fir-western larch. These stands contain western larch, spruce, and Douglas-fir in the overstory, and saw-timber sized shade tolerant species of in the understory. Stands with older trees in the overstory have lower crown ratio percentages and show more signs of disease and mortality. Areas designated for post and pole harvesting and commercial thinning are single storied 60- to 80-year-old stands.

The Forest Management Rules direct DNRC to promote biodiversity by taking a coarse-filter approach that favors an appropriate mix of stand structures and composition on state lands (ARM 36.11.404). Cover type refers to the dominant tree species that currently occupy a forested area and is one of the factors DNRC uses to describe biodiversity levels. The four cover types present within the proposed harvest units are: western larch/Douglas-fir (120 acres), mixed conifer (355 acres), lodgepole pine (367 acres), and subalpine fir (31 acres). The desired future cover types identified for these stands are western larch/Douglas-fir (850 acres), and lodgepole pine (23 acres).

Stands where the harvest units are proposed are generally in good condition and currently healthy, although tree growth is beginning to slow due to overstocking. Insect and disease are currently at low levels, but such timber stand health threats are active in most stands. Other issues present are as follows:

- Current cover types do not match DNRC's desired future conditions for some stands.
- Live crown ratios are diminishing, reducing growth potential within some areas on co-dominate trees and leading to mortality in understory trees.
- Dwarf mistletoe is found in western larch and in lodgepole pine, with the most severe infections found within Units 3 and 5.
- Infections of various root disease such as *H. annosus, P. schweinitzii*, and *Armillaria* are causing mortality within Douglas-fir in Unit 9.
- Indian Paint (*E. tinctorium*) is causing sawlog volume loss in alpine fir and grand fir within Units 1, 2, 4, and 9.

In addition:

- Noxious weeds are present along the roads within the project area; these include oxeye daisy, spotted knapweed, orange hawkweed, and St. Johnswort.
- Using the Natural Heritage Program (NHP) database, no sensitive, threatened, or endangered plant species have been documented within the project area.

Stillwater and Coal Creek State Forest currently have 10.3% of the forest classified as old growth. There are 113 acres of old growth located within the project area. None of these acres would be treated within this proposal.

Environmental Effects

- ***Direct, Indirect and Cumulative Effects of the No-Action Alternative***

Timber harvesting would not occur at this time. Neither cover types nor age class distributions would be directly or indirectly affected. Stocking levels of shade-tolerant trees and downed woody debris would increase within those stands over time. Various factors, such as insects, diseases, and weather events, would eventually cause more snags and fuel concentrations to occupy portions of the stands. This, in turn, would increase the potential and/or severity of a wildfire, and in the event that one was ignited, would make it harder to suppress.

Additional mineral soil would not be exposed, and heavy tree canopies would continue to compete with weeds; therefore the risk of additional establishment of weed populations would not likely increase.

- ***Direct, Indirect, and Cumulative Effects of the Action Alternative***

Under the proposed action:

- Within the areas where treatment is proposed, approximately 392 acres that do not currently meet the desired cover type would be moved toward desired future conditions.
- Unit 10 would receive an overstory removal harvest treatment which would change 10 acres from the 150+ year age class to a 0-39 year age class. All other acres within the project area would remain in the same age class they currently occupy. (DNRC's Stand Level Inventory [SLI] methodologies evaluate age class based on the sawtimber components within stands; stands with greater than 10 percent canopy coverage of sawtimber-size trees are not classified in the "non-stocked" or "0-39 year age class".)

Overall, the variations in harvest treatments would create a mosaic of new stands of timber which would emulate the effects of a mixed severity fire. The seedtree with reserves and overstory removal treatments are regeneration treatments and larger-diameter, full vigor western larch and Douglas-fir would remain scattered across the unit as new regeneration (likely mixed conifer) begins to establish itself. The commercial thin treatments are intermediate treatments, and following treatment the stands would be fully stocked.

Additionally:

- Although the potential for ignition of a wildfire would continue to exist following treatment, fuel treatments following harvest would limit the fire intensity under most circumstances. The proposed treatments would reduce the number of trees, creating a wider spacing and reducing the amounts of understory trees with boughs that extend to the ground and act as ladder fuels which can carry fires into the crowns of the forest. The success of aerial and ground attacks on wildfires would potentially be improved because fires would most likely burn through and remain in the understory, rather than climbing into the overstory and moving through the upper canopy. Cumulatively, natural stand development and past timber sales have created a mosaic in the area. Mosaic patterns are broad landscape patterns of forest patches which vary in age, composition and development. Timber harvest, like stand-replacement fire and blowdown, is a disturbance event that can create open, non-forested patches that over time develop into young, conifer forests. Patch size, age, shape, abundance, and distance to similar patches (connectivity) can be factors influencing wildlife use. Maintaining the mosaic, in conjunction with future fuel-treatment projects, would reduce the potential for high intensity wildfires.

- The proposed activities would result in an increase in ground disturbance. Mechanized equipment and ground disturbance could increase or introduce noxious weeds along roads and throughout forested areas. Mitigation measures to reduce these effects would include washing equipment before entering the site, sowing grass seed on roads after harvesting, and applying herbicide along roadsides and on spots of weed outbreaks. Cumulatively, the roads in the project area receive some traffic from dispersed recreation, timber-management activities, local residents and other uses. These disturbances could increase exposure to weed establishment. The weed management program at Stillwater Unit, including cooperation with the county weed department of Flathead County, has improved over time and more weed control is taking place.

A detailed analysis is contained in the Project File: Vegetation, located at the Stillwater Unit office.

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8. TERRESTRIAL, AVIAN AND AQUATIC LIFE AND HABITATS:
Consider substantial habitat values and use of the area by wildlife, birds or fish. Identify direct, indirect, and cumulative effects to fish and wildlife.

Existing Condition

TERRESTRIAL WILDLIFE

The 2,901-acre project area provides habitat for many species of wildlife found in western Montana. Of 108 mammal species found in Montana, 74 are suspected or known to occur in Flathead County (*Foresman 2001*). The majority of terrestrial vertebrates that were present at the time of European settlement likely still occur in the vicinity of the proposed project area. Six amphibian and seven reptile species have also been documented in Flathead County (*Maxell et al. 2003*), and at least 65 species of birds have been documented in the vicinity in the last 10 years (*Lenard et al. 2003*).

For this project a coarse filter analysis was conducted that addressed potential adverse effects to wildlife associated with habitat connectivity and removal of mature forest cover, and changes in the abundance of snags and coarse woody debris.

AQUATIC LIFE

Four analysis areas are considered in the fisheries resources assessment for the Moran Cyclone Timber Sale. Existing moderate to high cumulative impacts to fisheries resources are occurring across all analysis areas, except in the West Face Drainages area, where existing cumulative impacts are low. The elevated existing cumulative effects are primarily related to the presence and consequent effects from nonnative fish species, although other compounding factors such as forest road sedimentation and connectivity issues may also be contributing variables.

Environmental Effects

Direct, Indirect and Cumulative Effects of the Action Alternative

Mature Forested Habitat and Connectivity

Moderate direct and indirect effects to connectivity and suitability of mature forested habitat would be expected in the project area, as well as minor adverse cumulative effects to mature forested habitat suitability and connectivity for wildlife in the Cumulative Effects Analysis Area (CEAA).

Snags and Coarse Woody Debris

Minor adverse cumulative effects to habitat quality for wildlife requiring snags and coarse woody debris would be anticipated over the next 30-100 years; however minor adverse direct and indirect effects to snags and coarse woody debris would be anticipated that would affect habitat quality of wildlife species requiring these habitat attributes.

Big Game

The project area provides habitat for elk (*Cervus canadensis*), moose (*Alces americanus*), mule deer (*Odocoileus hemionus*), and white-tailed deer (*Odocoileus virginianus*).

Minor to moderate adverse direct and indirect effects to big game security habitat and winter range habitat quality would be expected for the next 40 to 60 years. Minor adverse cumulative effects to big game winter range and elk security habitat would be expected under this alternative.

Fisheries

As a result of implementing the proposed actions, negligible direct and indirect impacts to fisheries resources are expected to occur to in the Cyclone Creek and Hay Creek analysis areas. Low additional direct and indirect impacts to channel forms are anticipated in the Moran Creek analysis area, and low to moderate impacts to channel forms and stream temperature may occur in the West Face Drainages analysis area. Considering all of these impacts collectively:

1) negligible to low additional cumulative effects to fisheries resources would be expected in the Cyclone Creek, Hay Creek and Moran Creek analysis areas;
2) overall cumulative effects in the Cyclone Creek, Hay Creek and Moran Creek analysis areas would remain elevated primarily due to the presence and consequent adverse impacts from nonnative fish species;
3) the elevated cumulative effects in the Cyclone Creek, Hay Creek and Moran Creek analysis areas would be expected to occur regardless of whether or not the Action Alternative is selected; and
4) additional low to moderate cumulative impacts to fisheries resources are expected in the West Face Drainages analysis area.

A detailed analysis is contained in Attachment VI: FISHERIES RESOURCES ASSESSMENT, and Attachment VII: WILDLIFE ANALYSIS.

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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 direct, indirect, and cumulative effects to these species and their habitat.

Existing Condition

Suitable potential habitat for grizzly bear (*Ursus arctos*), Canada lynx (*Felis lynx*), and gray wolf (*Canis lupus*) is present in the project area. All three of these species have been documented in their respective cumulative effects analysis areas in the past.

Habitat assessments were also conducted for the following sensitive species: bald eagle (*Haliaeetus leucocephalus*), black-backed woodpecker (*Picoides arcticus*), Coeur d'Alene salamander (*Plethodon idahoensis*), Columbian sharp-tailed grouse (*Tympanuchus Phasianellus columbianus*), common loon (*Gavia immer*), fisher (*Martes pennanti*), flammulated owl (*Otus flammeolus*), harlequin duck (*Histrionicus histrionicus*), Northern bog lemming (*Synaptomys borealis*), peregrine falcon (*Falco peregrinus*), pileated woodpecker (*Dryocopus pileatus*), Townsend's big-eared bat (*Plecotus townsendii*), and wolverine (*Gulo gulo*).

From this list of sensitive species, it was determined that three species warranted more detailed study due to historical observations and the presence of habitat in the project area: bald eagle, fisher, and pileated woodpecker.

Environmental Effects

Direct, Indirect and Cumulative Effects of the Action Alternative

Grizzly Bear / Canada Lynx / Gray Wolf:
Given the level of disturbance and extent of habitat alteration associated with the proposed action, moderate adverse direct and indirect effects to habitat suitability for grizzly bears and Canada lynx, and minor adverse direct and indirect effects to habitat suitability for gray wolf would be expected under the Action Alternative.

Bald Eagle:
Minor adverse direct, indirect and cumulative effects to nesting bald eagles and bald eagle habitat would be anticipated.

Fisher:
Minor to moderate adverse direct, indirect and cumulative effects would be anticipated that would affect fisher habitat suitability in the project area.

Pileated woodpecker:
Moderate adverse direct and indirect and minor cumulative effects would be anticipated that would affect pileated woodpeckers in the project area.

A detailed analysis is contained in Attachment VI: FISHERIES RESOURCES ASSESSMENT, and Attachment VII: WILDLIFE ANALYSIS.

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

Much of the current area of potential effect was inventoried in 1989 as part of the Winona East Timber Sale. No cultural or paleontological resources were identified. In 2001, DNRC's Archaeologist inventoried areas adjoining the project area that were burned by that summer's wildland fire.

To date only site 24FH0960 (The North Fork Road) has been identified as a cultural resource in or adjacent to the currently proposed project area. This road is the main administrative road into the general project area and is actively used and maintained. It has been determined to be ineligible for listing in the National Register of Historic Places. A segment of the road is situated at the southeast margin of the project area, but will not be modified or disturbed with proposed timber harvest work. Based on a lack of cultural resources in the Coal Creek State Forest, it is unlikely that any State Heritage Properties would be affected with the proposed timber sale.

If previously unknown cultural or paleontological materials are identified during project-related activities, all work would cease until a professional assessment of such resources can be made.

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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 direct, indirect, and cumulative effects to aesthetics.

- ***Direct, Indirect and Cumulative Effects of the No-Action Alternative***

Under this alternative, no timber harvesting or related activities would occur. No changes in visual aesthetics would occur outside of natural events.

- ***Direct, Indirect and Cumulative Effects of the Action Alternative***

The aesthetics impacts were analyzed using air photos, ArcGIS tools, and visiting possible view points.

Visual aesthetic impacts from the proposed project would vary depending on the elevation and location of the vantage point. Viewing the project area from points in Glacier National Park showed the possibility of seeing a small portion of Unit 9 from the road north of Polebridge.

At low elevation, long range vantage points such as Polebridge, or looking from the north along the North Fork Road, visibility of the project area would be limited to a small portion of Unit 9 due to surrounding forest and hills. Unit 6 would be would be visible from the south looking north and west along the North Fork Road. The visual impacts would be minimized through irregular Unit boundaries, retaining visual buffers along the North Fork Road, retaining all of the trees within SMZs in Unit 6 which would help break up openings, irregular spacing of leave trees, and retention of clumps of young trees.

At mid-range vantage points, the variations in spacing of the trees retained in the units, location of units and rolling topography would break up visual sight distance, resulting in minor visual impacts.

At close range, standing within individual harvest units, visual impacts would be the greatest. At this close range, individual scattered trees, stumps and some logging slash would be visible until regeneration has reached a point where sight distance is limited again. Under the Habitat Conservation Plan grizzly bear commitments, DNRC is required to design new seed tree units so that visual sight distance is no greater than 600 feet in at least one direction from any point in the unit. By designing harvest units to limit sight distance to 600 feet or less, impacts to visual aesthetics at close range would be minimized.

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 direct, indirect, and cumulative effects to environmental resources.

No demand for limited environmental resources or other activities demanding limited environmental resources were identified; therefore, no direct, indirect, or cumulative impacts would occur under either alternative.

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.

- USFS Hay-Mor Stewardship Plan, Flathead National Forest (2012)
- Coal Ridge Timber Sale Checklist Environmental Assessment (April 2011)
- Final HCP/EIS (USFWS/DNRC) (September 2010)
- Final Moose Fire Salvage and Reforestation Project Environmental Impact Statement (May 2002)
- Final Moose Fire Salvage and Reforestation Project Environmental Assessment (November 2001)

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.

No unusual safety considerations are associated with the proposed timber sale. Warning signs would be located along Hay Creek Road cautioning recreational and residential traffic of logging activities. Thus, no measurable direct, indirect, and cumulative impacts related to human health and safety would be expected.

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

The proposed timber harvest would provide continued industrial production in the region. However, no measurable direct, indirect, and cumulative impacts would be expected due to the relatively small size of the proposed timber sale project.

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

Due to the relatively small size of the proposed timber sale, there would be no measurable direct, indirect, or cumulative effects to the employment market. However, according to a report issued by the Bureau of Business and Economic Research (2008), an average of 12 jobs per million board feet of timber harvested is maintained in the timber industry.

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

Due to the relatively small size of the proposed timber sale, no measurable direct, indirect, or cumulative impacts to the tax base or tax revenue would be likely from either alternative.

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 direct, indirect, and cumulative effects of this and other projects on government services

Log trucks hauling to the purchasing mill would result in temporary increases in traffic on Hay Creek Road and North Fork Road. This increase is a normal contributor to the activities of the local community and would not be considered a new or increased source of traffic.

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.

No locally adopted environmental plans are associated with the proposed timber sale.

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 direct, indirect, and cumulative effects to recreational and wilderness activities.

The North Fork Road is the main public road that accesses portions of Coal Creek State Forest. The roads within the project area, however, are restricted from general motorized use except between December 1st and March 31st during which the roads are accessible to snowmobiles. Due to the lack of available open roads to the public, the area receives a limited amount of dispersed recreational use such as hunting, fishing, berry picking, horseback riding and snowmobiling.

No appreciable changes would occur to recreational activity in the project area under the No-Action Alternative or the Action Alternative.

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

No measurable direct, indirect, and cumulative impacts related to population and housing would be expected due to the relatively small size of the proposed timber sale project.

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

No direct, indirect, and cumulative impacts related to social structures and mores would be expected under either alternative.

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

No direct, indirect, and cumulative impacts related to cultural uniqueness and diversity 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 direct, indirect, and cumulative economic and social effects likely to occur as a result of the proposed action.

- ***Direct, Indirect and Cumulative Effects of the No-Action Alternative***

No revenue would be generated for the School of Mines, State Normal School, Public Buildings and Montana State University trusts at this time. Small timber permits could yield some additional revenue.

- ***Direct, Indirect and Cumulative Effects of the Action Alternative***

The timber harvest would generate approximately $1,121,473 for the School of Mines, State Normal School, Public Buildings and Montana State University trusts. Approximately $143,517 in Forest Improvement (FI) fees would be collected for FI projects. This is based on a stumpage rate of $31.87 per ton, multiplied by the estimated volume of tons. This stumpage rate was derived by comparing attributes of the proposed timber sale with the attributes and results of other DNRC timber sales recently advertised for bid. Costs related to the administration of the timber sale program are only tracked at the Northwestern Land Office (NWLO) and Statewide level. DNRC does not track project-level costs for individual timber sales. An annual cash flow analysis is conducted on the DNRC forest product sales program. Revenue and costs are calculated Statewide and by Land Office. From 2006 through 2010, revenue-to-cost ratio of the NWLO was 2.51. This means that, on average, for every $1.00 spent in costs, $2.51 in revenue was generated. Costs, revenues, and estimates of return are estimates intended for relative comparison of alternatives. They are not intended to be used as absolute estimates of return.

EA Checklist Prepared By:	**Name:**	Elspeth Pevear, Pete Evans	**Date:**	3/18/2014
	Title:	Management Foresters		

V. FINDING

25. ALTERNATIVE SELECTED:

An Interdisciplinary team (ID Team) has completed the Environmental Analysis Checklist (EAC) for the proposed Moran Cyclone Timber Sale Project. Following a thorough review of the EAC, project file, public correspondence, and Department policies and rules, the decision has been made to select the Action Alternative.

The Action Alternative meets the intent of the project objectives as stated in Section I – *Type and Purpose of Action*. Specifically, the project would:

- Harvest approximately 5 to 6 million board feet of timber from the Coal Creek State Forest to regenerate new stands of healthy trees while improving the vigor and growth of trees remaining in the forest, as well as reducing the amount of forest fuels and density of trees to mitigate potential effects of wildland fire.
- Reduce stocking density on approximately 230 acres of sapling stands, improving the growth, future health and revenue-generating potential of the young timber stands.
- Generate approximately $1,121,473 for the School of Mines, State Normal School, Public Buildings and Montana State University trusts. Approximately $143,517 in Forest Improvement (FI) fees would be collected for FI projects. In addition, approximately $40,000 of road maintenance and reconstruction would be accomplished for a total benefit value to the Trusts of $1,304,990.

DNRC is required by law to administer these Trust Lands to produce the largest measure of reasonable and legitimate return over the long run (*Enabling Act of February 22, 1889; 1972 Montana Constitution, Article X Section 11;* and, *77-1-212 MCA*). The Action Alternative was designed to be in full compliance of State Forest Land Management Plan (SFLMP), the Administrative Rules for Forest Management (Forest Management Rules; ARM 36.11.401 through 471), and conservation commitments contained in the Selected Alternative in the Final EIS of the Montana DNRC Forested State Trust Lands Habitat Conservation Plan (HCP) and associated Record of Decision (ROD), as well as other applicable state and federal laws.

26. SIGNIFICANCE OF POTENTIAL IMPACTS:

The identified resource management concerns have been fully addressed in the environmental analysis that was conducted. Specific project design features and various recommendations of the resource management specialists have been implemented to ensure that this project will fall within the limits of acceptable environmental change. For example, the project is designed to:

- Have irregular-shaped harvest unit boundaries and retain vegetative buffer strips along open roads, reducing visual impacts.
- Perform road maintenance and Best Management Practices (BMP) improvements on approximately 12.3 miles of existing road to reduce the potential for erosion and sediment delivery to streams.
- Retain coarse woody debris to be left on site in amounts recommended by *Graham (1994)* and fine debris as much as practicable, maintaining nutrient cycling in harvest units.
- Require cleaning all tracked and wheeled equipment of noxious weeds prior to beginning project operations.
- Utilize contract clauses and site-specific mitigation measures to minimize risks to slope stability, and not re-enter any past harvest areas on marginally stable slopes.

Taken individually and cumulatively, the proposed activities are common practices, and no project activities will be conducted on important fragile or unique sites. I find there will be no significant impacts to the human environment as a result of implementing the Action Alternative. In summary, I find that the identified adverse impacts will be controlled, mitigated, or avoided by the design of the project to the extent that the impacts are not significant.

27. NEED FOR FURTHER ENVIRONMENTAL ANALYSIS:

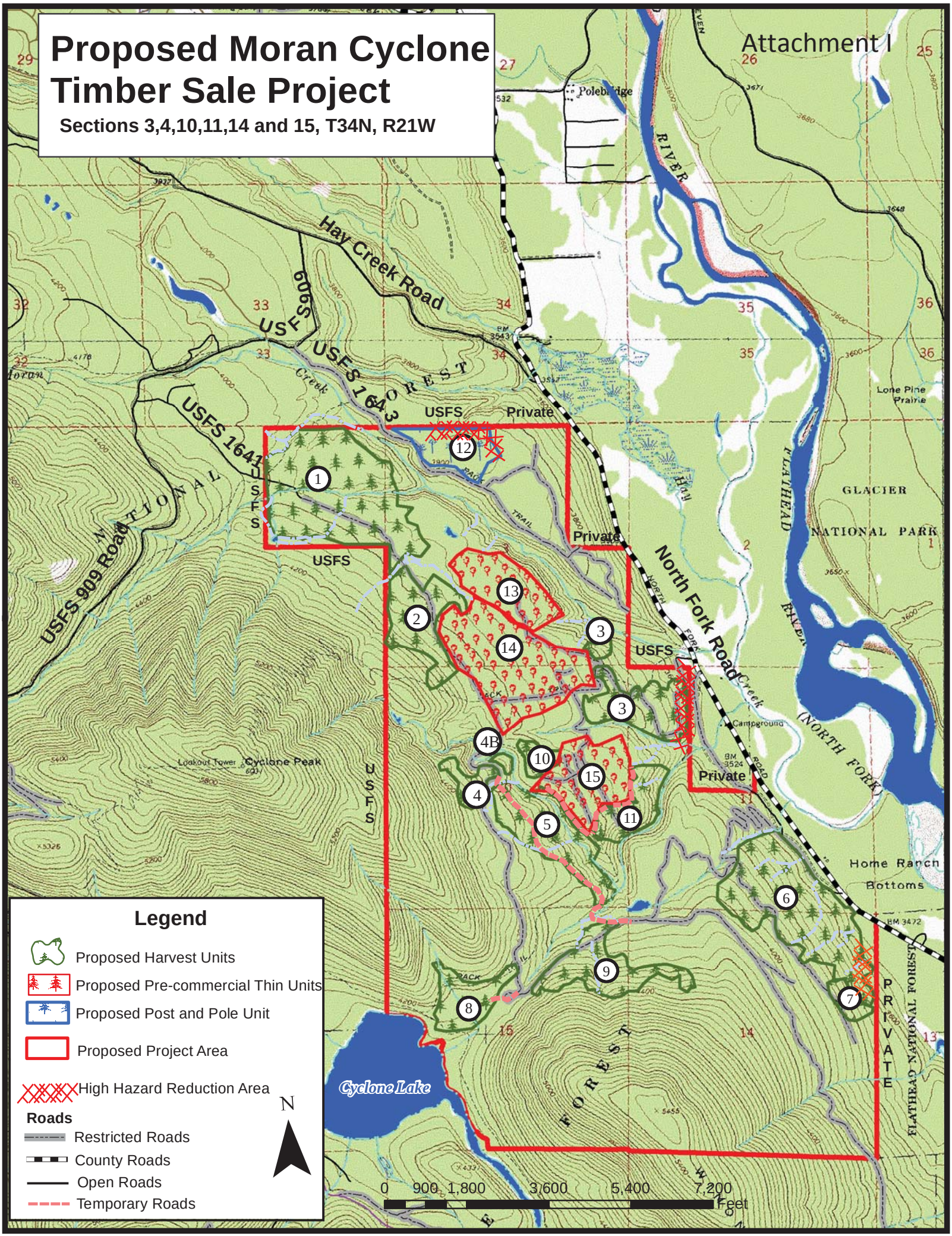
[ ] EIS	[ ] More Detailed EA	[X] No Further Analysis

EA Checklist Approved By:	**Name:**	Brian Manning
	Title:	Unit Manager, DNRC Stillwater Unit
Signature: *\/s\/ Brian Manning*	**Date:**	March 20, 2014

Proposed Moran Cyclone Timber Sale Project

Sections 3,4,10,11,14 and 15, T34N, R21W

Attachment I



Attachment II:

Prescription Table

Unit Number	Est. Acres / Mbf	Prescription	Marking guides	Particulars involved in unit(s)
1	152 acres 650 Mbf	Commercial Thin	- Species designated to cut = ES, AF, and grand fir. - Retain all trees >= 15 inches DBH. - Maintain 30 foot spacing in WL, DF, and LPP, in that order. - Leave trees should have 40% crowns and straight boles.	- Tractor harvest unit - 3 SMZ's (no harvest) - Crevass exclusion - Borders USFS lands
2	53 acres 188 Mbf	Commercial Thin	- Species designated to cut = ES, AF, and grand fir. - Maintain 30 foot spacing in WL, DF, and LPP. - Retain all trees >= 15 inches DBH. - Leave trees should have 40% crowns and straight boles.	- Tractor harvest unit - 1 SMZ - Borders USFS lands
3	52 acres 330 Mbf	Regeneration	- Species designated to cut = ES, LPP, AF - Retain 6-8 DF/WL per acre. - Retain 2 DEAD snags and 2 LIVE snag recruits per acre >21" DBH (100' spacing). *Please refer to Stipulations and Specifications for more details.*	- Northern portion of unit along Moran Creek is cable ground - Tractor portion on southern part of the unit - Machine pile and scarify - Natural regeneration - Harvest within the RMZ (2.3 acres) - Plant WL in skyline portion of unit; 14' x14' spacing - High hazard reduction near private ground
4	14 acres 140 Mbf	Regeneration	- Species designated to cut = ES, LPP, AF - Retain 6-8 DF/WL per acre. - Retain 2 DEAD snags and 2 LIVE snag recruits per acre >21" DBH (100' spacing). *Please refer to Stipulations and Specifications for more details.*	- Tractor unit - Long skid - Machine pile and scarify - Natural regeneration - Plant WL in skyline portion of unit; 14' x14' spacing

Unit Number	Est. Acres / MBF	Prescription	Marking guides	Particulars involved in unit(s)
4B	3 acres 30 Mbf	Regeneration	- Species designated to cut = ES, LPP, AF - Retain 6-8 DF/WL per acre. - Retain 2 DEAD snags and 2 LIVE snag recruits per acre >21" DBH (100' spacing). *Please refer to Stipulations and Specifications for more details*.	- Cable ground - Plant WL in unit; 14' x14' spacing - Whole tree log
5	65 acres 632 Mbf	Regeneration	- Species designated to cut = ES, LPP, AF - Retain 6-8 DF/WL per acre. - Retain 2 DEAD snags and 2 LIVE snag recruits per acre >21" DBH (100' spacing). *Please refer to Stipulations and Specifications for more details*.	- Combination Tractor/Cable harvest unit - Average skid distance: 450 feet (cable) - Areas of 70% slope - Approximately 4,000 feet of temporary road required - Machine pile and scarify - 2 stage yarding may be required - Either a 124 permit or open road from the south - Natural regeneration - Harvest within the RMZ (8.4 acres) - Plant WL in skyline portion of unit; 14' x14' spacing
6	130 acres 1.9 MMbf	Regeneration	- Species designated to cut = ES, LPP, AF - Retain 6-8 DF/WL per acre - Retain 2 DEAD snags and 2 LIVE snag recruits per acre >21" DBH (100' spacing). *Please refer to Stipulations and Specifications for more details*.	- Numerous SMZ's - Tractor harvest unit, winch line or cable required - Average skid distance: 600' - Machine pile and scarify - Natural regeneration - High hazard reduction near private ground
7	10 acres 71 Mbf	Overstory Removal	- Species designated to cut = WL/DF - Retain 2 DEAD snags and 2 LIVE snag recruits per acre >21" DBH (100' spacing). *Please refer to Stipulations and Specifications for more details*.	- Tractor harvest unit - Commercial thinning survey 12 to 15 years
8	34 acres 380 Mbf	Regeneration	- Species designated to cut = ES, LPP, AF - Retain 6-8 DF/WL per acre - Retain 2 DEAD snags and 2 LIVE snag recruits per acre >21" DBH (100' spacing). *Please refer to Stipulations and Specifications for more details*.	- Tractor harvest unit - Short temp road into unit - Small amount of unit long skid (1/4 mile) - Machine pile and scarify - Natural regeneration - Regeneration survey - 5 years following site preparation; plant at that time if necessary - Precommercial thinning survey (TSI Evaluation) 12 to 15 years following site preparation

Unit Number	Est. Acres / MBF	Prescription	Marking guides	Particulars involved in unit(s)
9	53 acres 1.2 MMbf	Regeneration	- Species designated to cut = ES, LPP, AF - Retain 6-8 DF/WL per acre - Retain 2 DEAD snags and 2 LIVE snag recruits per acre >21" DBH (100' spacing). *Please refer to Stipulations and Specifications for more details*.	- Tractor harvest unit - Will need jump-up from road or use old road - Machine pile and scarify - Natural regeneration - Regeneration survey - 5 years following site preparation; plant at that time if necessary -Precommercial thinning survey (TSI Evaluation) 12 to 15 years following site preparation
10	10 acres 56 Mbf	Regeneration	- Species designated to cut = ES, LPP, AF - Retain 6-8 DF/WL per acre - Retain 2 DEAD snags and 2 LIVE snag recruits per acre >21" DBH (100' spacing). *Please refer to Stipulations and Specifications for more details*.	- Tractor harvest unit - Machine pile and scarify - Natural regeneration - Regeneration survey - 5 years following site preparation; plant at that time if necessary - Precommercial thinning survey (TSI Evaluation) 12 to 15 years following site preparation
11	32 acres 220 Mbf	Regeneration	- Species designated to cut = ES, LPP, AF - Retain 6-8 DF/WL per acre - Retain 2 DEAD snags and 2 LIVE snag recruits per acre >21" DBH (100' spacing). *Please refer to Stipulations and Specifications for more details*.	- Combination tractor/cable harvest unit - Machine pile and scarify - Natural regeneration - RMZ harvest in 100-foot SMZ (1.5 acres) - Regeneration survey - 5 years following site preparation; plant at that time if necessary - Precommercial thinning survey (TSI Evaluation) 12 to 15 years following site preparation - Plant WL in skyline portion of Unit. 14' x14' spacing
12	35 acres	Commercial Thin	- Species designated to cut = LPP - Maintain 20 foot spacing in WL, DF, and LPP, in that order.	- Tractor harvest unit - Borders USFS lands
13, 14, 15	230 acres	Pre-Commercial Thin	- Species designated to cut = LPP - Maintain 14 x 14 foot spacing favoring WL, DF, subalpine fir, and LPP in that order (222 TPA).	- Units 13 & 14 currently have approx. 650 TPA - Unit 15 currently has 950 TPA

NOTES:

AF = Alpine fir
BMP = Best Management Practices
DBH = Diameter at Breast Height
DF = Douglas-fir
ERZ = Equipment Restriction Zone
ES = Englemann spruce
LPP=Lodgepole pine
RMZ = Riparian Management Zone
SMZ = Streamside Management Zone
WL=Western Larch

Attachment III:

STIPULATIONS AND SPECIFICATIONS

Stipulations and specifications for the Action Alternative include project design provisions that follow Forest Management Rules, relevant laws and regulations. They also include mitigations that were designed to avoid or reduce potential effects to resources considered in this analysis. In part, stipulations and specifications are a direct result of issue identification and resource concerns. This section is organized by resource.

Stipulations and specifications that apply to operations required by, and occurring during the contract period, would be contained within the Timber Sale Contract. As such, they are binding and enforceable. Project administrators would enforce stipulations and specifications relating to activities such as hazard reduction, site preparation, and planting, that may occur during or after the contract period.

The following stipulations and specifications would be incorporated into the selected Action Alternative to mitigate potential effects of resources.

Aesthetics

- Damaged residual vegetation visible from open roads would be slashed.
- The size and number of landings would be limited.
- In areas where cable logging is required, the width of the cable corridor would be limited, and a minimum distance between corridors would be required to reduce the amount and visibility of corridors in the harvest areas.
- Disturbed soil sites along road right-of-ways would be grass-seeded.
- Leave trees are to be left with both even and clumpy distributions.
- The temporary roads and all jump-ups would be reclaimed after harvesting.
- A higher concentration of trees would be left within 100-foot buffers in units along open roads.

Air Quality

- To minimize cumulative effects during burning operations, burning would be done in compliance with the Montana Airshed Group reporting regulations and any burning restrictions imposed in Airshed 2. This would only allow for burning during conditions of acceptable ventilation and smoke dispersion.

- Dozer, excavator, landing, and roadwork debris would be piled clean to allow ignition during fall and spring when ventilation is good and surrounding fuels are wet. The Forest Officer may require that piles be covered so the fuels are drier, ignite easier, burn hotter, and extinguish sooner.
- In order to reduce smoke production, some large woody debris would be left in the woods to minimize the number of burn piles.
- Dust abatement may be applied on some road segments, depending on the seasonal conditions and level of public traffic.

Archaeology

- If previously unknown cultural or paleontological materials are identified during project-related activities, all work would cease until a professional assessment of such resources can be made.

Fisheries

- Apply all applicable Forestry Best Management Practices (BMPs), including the Streamside Management Zone (SMZ) Law and Rules, HCP commitments, and Forest Management Rules for fisheries, soils, and watershed management (*ARMs 36.11.425* and *36.11.426*).
- Apply the SMZ Law and Rules to all streams and lakes.
- Monitor all road-stream crossings for sedimentation and deterioration of road prism.
- Only allow equipment traffic at road-stream crossings when road prisms have adequate load-bearing capacity, thus reducing the potential for rutting.

Noxious Weed Management

- All tracked and wheeled equipment would be cleaned of noxious weeds prior to beginning project operations.
- Disturbed roadside sites would be promptly revegetated with a native grass seed mix. Roads used and closed as part of this proposal would be reshaped and reseeded.
- The timber sale purchaser would be required to spray weeds on restricted roads that will be used for log hauling in the project area. This would be done prior to harvesting and after sale completion.

Recreation

- Information such as log hauling activity would be disseminated to the public through signage and press releases.

Soils

Soil Compaction and Displacement

- Limit equipment operations to periods when soils are relatively dry (less than 20 percent), frozen, or snow-covered to in order to minimize soil compaction and rutting, and maintain drainage features. Check soil moisture conditions prior to equipment start-up.
- On ground-based units, the logger and sale administrator would agree to a skidding plan prior to equipment operations. Skid-trail planning would identify which main trails to use and how many additional trails are needed. Trails that do not comply with BMPs (i.e. trails in draw bottoms) would not be used unless impacts can be adequately mitigated. Regardless of use, these trails may be closed with additional drainage installed, where needed, or grass-seeded to stabilize the site and control erosion.
- Tractor skidding should be limited to slopes of less than 40 percent unless the operation can be completed without causing excessive displacement or erosion. Based on site review, short, steep slopes may require a combination of mitigation measures, such as adverse skidding to a ridge or winchline, and skidding from more moderate slopes of less than 40 percent.
- Keep skid trails to 20 percent or less of the harvest unit acreage. Provide for drainage in skid trails and roads concurrently with operations.
- Slash disposal: Limit the combination of disturbance and scarification to 30 to 40 percent of the harvest units. No dozer piling on slopes over 35 percent; no excavator piling on slopes over 40 percent, unless the operation can be completed without causing excessive erosion. Consider lopping and scattering or jackpot burning on the steeper slopes. Consider disturbance incurred during skidding operations to, at least partially provide scarification for regeneration.
- Retain 12-24 tons of large woody debris (depending on habitat type) and a feasible majority of all fine litter following harvesting operations. On units where whole tree harvesting is used, implement one of the following mitigations for nutrient cycling: 1) use in-woods processing equipment that leaves slash on site; 2) for whole-tree harvesting, return-skid slash and evenly distribute within the harvest area; or 3) cut tops from every third bundle of logs so that tops are dispersed as skidding progresses.

Erosion

- Roads used by the purchaser would be reshaped and the ditches redefined following use to reduce surface erosion.
- Drain dips and gravel would be installed on roads as needed to improve road drainage and reduce maintenance needs and erosion.
- Some road sections would be repaired to upgrade the roads to design standards that reduce erosion potential and maintenance needs.
- Certified weed-free grass seed and fertilizer would be applied in a prompt and timely manner to all newly constructed road surfaces, cutslopes, and fillslopes. These applications would also be applied to any existing disturbed cutslopes, fillslopes, and landings immediately adjacent to open roads. Seeding to stabilize soils and to reduce or prevent the establishment of noxious weeds would include:
  - Seeding all road cuts and fills concurrent with construction.
  - Applying "quick-cover" seed mix within 1 day of work completion at culvert installation sites involving stream crossings.
  - Seeding all road surfaces and reseeding culvert installation sites when the final blading is completed for each specified road segment.
- Based on ground and weather conditions, water bars, logging-slash barriers and, in some cases, temporary culverts would be installed on skid trails where erosion is anticipated, and as directed by the Forest Officer. These erosion-control features would be periodically inspected and maintained throughout the contract period or extensions thereof.
- Re-route all ditch runoff to the ends of all switch-backs on the Moran Creek Road in Section 11 to prevent runoff from being delivered to the slopes where failure has occurred in the past.

Vegetation

- All harvest areas shall have a minimum of 2 snags and 2 snag-recruits over 21 inches dbh, or the next largest size class available. Additional large-diameter recruitment trees may be left if sufficient large snags are not present. These snags and recruitment trees may be clumped or evenly distributed throughout the harvest units.
- Certain portions of the harvest areas would be left uncut; these areas may include large healthy trees, snag patches, small healthy trees, rocky outcrops, SMZs, small wetlands, etc.

Watershed

- Implement Riparian Management Zones on all Class 1 streams based on site-potential tree heights in the project area.
- Implement BMPs on all new temporary roads and improve BMPs on existing roads where needed.

- Use spot-blading on existing roads to preserve as much of the existing vegetative cover as possible on vegetated road surfaces.
- Planned erosion-control measures include:
  - grade breaks on roads,
  - surface water-diverting mechanisms on roads,
  - slash-filter windrows, and
  - grass seeding.
- Details for these control measures would be included in *ATTACHMENT B* of the *TIMBER SALE CONTRACT*.
- Streamside Management Zones (SMZs) and Riparian Management Zones (RMZs) would be defined along those streams and/or wetlands where they occur within, or adjacent to, harvest areas. This project would meet or exceed SMZ and RMZ rules.
- Brush would be removed from existing road prisms to allow for effective road maintenance. Road maintenance can help reduce sediment delivery.
- The contractor would be responsible for the immediate cleanup of any spills (fuel, oil, dirt, etc.,) that may affect water quality.
- Temporary roads would be reclaimed following the sale.
- The BMP audit process will continue. This project would likely be reviewed in an internal audit, and may be selected at random as a statewide audit site.

Wildlife

- If a threatened or endangered species is encountered, consult a DNRC biologist and develop additional mitigations that are consistent with the administrative rules for managing threatened and endangered species (*ARM 36.11.428* through *36.11.435*).
- Prohibit contractors and purchasers conducting contract operations from carrying firearms while on duty as per GB-PR2 (*USFWS AND DNRC 2010, Vol. II p. 2-5*).
- Contractors will adhere to food storage and sanitation requirements as per GB-PR3 (*USFWS AND DNRC 2010, Vol. II p. 2-6*).
- Design seed tree units to provide topographic breaks in view or to retain visual screening for bears by ensuring that vegetation or topographic breaks be no greater than 600 feet in at least one direction from any point in the unit as per *GB-NR4 (USFWS and DNRC 2010*).
- Retain up to 100 feet of vegetation between open roads and clearcut and seed tree units as per *GB-RZ2* (*USFWS and DNRC 2010*) (applies to proposed Units 6).
- Public access would be restricted at all times on restricted roads that are opened for harvesting activities; signs will be used during active periods and a physical closure (gate, barriers, equipment, etc.) will be used during inactive periods (nights, weekends, etc.).

- Restrict commercial harvest and motorized activities on seasonally restricted roads (refer to Stillwater Block HCP Transportation Plan) to reduce disturbance to grizzly bears from April 1-June 15 during the Spring Period (*GB-NR3, USFWS AND DNRC 2010, Vol. II pp. 2-11, 2-12*).
- Retain 2 large snags and 2 large snag recruitment trees per acre (>21 inches dbh) particularly favoring western larch and Douglas-fir and retain 7 to 24 tons/acre coarse woody debris as consistent with Graham et.al. (*1994*). Emphasize the retention of downed logs ≥15 inches dbh where they occur as per LY-HB2 (*USFWS and DNRC 2010).*
- Use a combination of topography, group retention, and roadside vegetation to reduce sight distances within harvest units where feasible.
- In a portion of harvest units, retain patches of advanced regeneration of shade-tolerant trees as per LY-HB4 (*USFWS AND DNRC 2010, Vol. II pp. 2-50, 2-51*).
- Where available in pre-commercial thinning units, retain some shade-tolerant trees (primarily subalpine fir in these stands) as per LY-HB4 (*USFWS AND DNRC 2010, Vol. II pp. 2-50, 2-51*).
- Prohibit harvest activities in proposed harvest Unit 8 (closest to Cyclone Lake) from February 1 to August 15 to minimize disturbance to nesting bald eagles and common loons.

Attachment IV:

SOILS ANALYSIS

Analysis Prepared By: Tony Nelson
Title: Hydrologist, Northwestern Land Office, Montana DNRC

INTRODUCTION

Landform Description

The landform and parent materials in the project area are generally quartzite and argillite bedrock soils with small areas of glacial till or glacial drift influence. Volcanic ash surface layers are common above 5,000 feet, especially on northern aspects. The majority of the bedrock consists of slightly metamorphosed sedimentary rocks formed from sand, silt, clay, and carbonate materials deposited in an ancient shallow sea during the Precambrian period.

Soil Physical Properties

Analysis of soil physical properties addresses the issue that timber harvesting and associated activities may affect soil conditions in the proposed project area through ground-based and cable yarding activities, and through repeated entries to previously harvested areas. Operation of ground-based machinery can displace fertile layers of topsoil, which can lead to a decrease in vegetation growth. Ground-based machinery can also lead to compaction of the upper layers of soil. Compaction decreases pore space in soil, reduces its ability to absorb and retain water, and can increase runoff and overland flow. These conditions can also lead to a decrease in vegetation growth. Surface erosion can also affect vegetation growth and water quality. Sheet and rill erosion can remove fertile surface layers of soil, and also make revegetation difficult.

Nutrient Cycling

Nutrient cycling, microbial habitat, moisture retention and protection from mineral erosion are provided by coarse and fine woody debris in forested environments (Harmon et al, 1986). Forest management can affect the volumes of fine and coarse woody debris through timber harvesting and result in changes to potentially available nutrients for long-term forest production.

Slope Stability

Slope stability can be affected by timber management activities by removing stabilizing vegetation, concentrating runoff, or by increasing the soil moisture. The primary risk areas for slope stability problems include, but are not limited to, landtypes that are prone to soil mass movement, and soils on steep slopes (generally over 60 percent).

ANALYSIS METHODS

Soil Physical Properties

Impacts to soil physical properties will be analyzed by evaluating the current levels of soil disturbance in the proposed project area based on field review and aerial photo review of existing and proposed harvest units. Percent of area affected is determined through pace transects, measurement, aerial photo interpretation, and GIS to determine skid trail spacing and skid trail width. From this, skid trail density and percent of area impacted are determined. Estimated effects of proposed ground-based and cable yarding activities will be assessed based on findings of DNRC soil monitoring (DNRC, 2011). Soil erosion potential will be measured using the K-value as determined by the NRCS (1996). A description of the K-value and its associated interpretations is found in **Table S-2**.

Nutrient Cycling

Nutrient cycling will be analyzed by disclosing existing levels of coarse woody debris from transects conducted during field reconnaissance. The method for quantifying the coarse woody debris is described in the *Handbook for Inventorying Downed Woody Material* (Brown, 1974). Potential impacts to nutrient cycling will be assessed by evaluating risks to nutrient pools and long-term site productivity from timber sale contract requirements and mitigation measures.

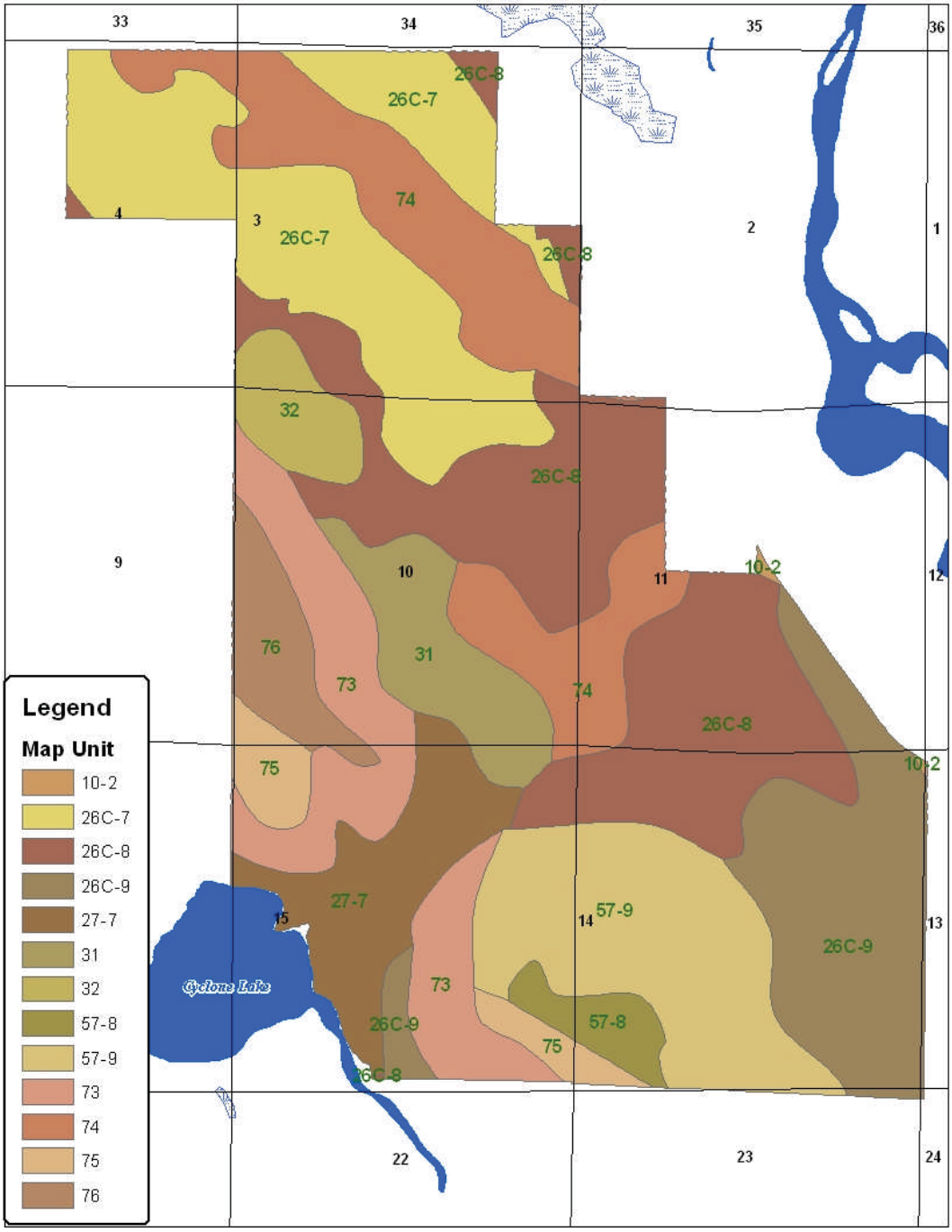
Slope Stability

Slope stability risk factors will be analyzed by reviewing the Web Soil Survey to identify landtypes listed as high risk for mass movement. Field reconnaissance will also be used to identify any slopes greater than 60 percent as an elevated risk for mass movement.

ANALYSIS AREA

The analysis area for evaluating soil physical properties, nutrient cycling will include areas proposed for harvest within the gross project area. Analysis area for existing conditions and slope stability will include DNRC owned land within the Moran Cyclone project area. A map of the Landtypes in the Moran Cyclone project area is found below in **Figure S-1**.

Figure S-1 – Moran Cyclone Landtype Map



EXISTING ENVIRONMENT

Soil Physical Properties

Soil physical properties can be affected through management activities. In the gross project area, DNRC has conducted timber harvesting since the 1960s. Timber sale records dating back to the 1960s indicate most of the proposed project area has been harvested using a combination of ground-based and cable yarding methods. Ground-based yarding can create soil impacts through displacement and compaction of productive surface layers of soil, mainly on heavily used trails. Existing skid trails are spaced at between 60 and 120 feet apart, and none were identified as erosion or sediment sources. Trails are still apparent, but most are well vegetated and past impacts are beginning to ameliorate from freeze-thaw cycles and root penetration. Based on pace transects of trail spacing, knife penetration tests for compaction, and ocular estimates of revegetation, approximately 10% of previously ground-skidded harvest units are in an impacted condition in the proposed project area.

Nutrient Cycling

Nutrient cycling was assessed in the proposed project area by completing 11 transects to estimate the current levels of coarse woody debris. These transects were focused on proposed harvest units. The average coarse woody debris is 19.9 tons/acre, with a range of 1.2 to 58.7 tons/acre and a median of 13.5 tons/acre. These results are generally within the recommended range discussed in *Managing Coarse Woody Debris in Forests of the Rocky Mountains* (Graham et. al., 1994) on similar habitat types. Sub-alpine fir and Douglas-fir habitat types in Montana are recommended to have a range of 12 to 24 tons/acre to maintain forest productivity.

Slope Stability

Slope stability was evaluated in the proposed project area through field review and aerial photo interpretation. Soil types in the project area are primarily moderately steep (40-60%) and steep (>60%) glacially scoured ridges and hillsides. The Web Soil Survey reports the findings in the *Flathead National Forest Area, Montana (MT619)* (NRCS, 1998) soil survey. Analysis of landtypes in the proposed project area revealed that there are several landtypes with marginal stability. Landtypes 31 and 32 may be prone to slope instability if a combination of conditions exist. These conditions include but are not limited to saturation, slope steepness, loss of vegetative cover, or potential windthrow events. Special operating considerations are often necessary when forest management activities are proposed on these landtypes. Aerial photo interpretation and field review identified areas of past slope instability on highly dissected slopes along Winona Ridge in the southern portion of the proposed project area. Based on the age of trees within these dissections, it appears that these soil movements have not been active within the past 50 years. In addition, one area of recent slope instability was found in Section 11 of the project area. This is an area along an existing road that has formed a small slump within the past 5 years. This area slumped down onto the existing road surface from above the cutslope. A list of soil map units found in the Moran Cyclone project area and their associated management implications is found in **Table S-2**.

ENVIRONMENTAL EFFECTS

Soil Physical Properties

DIRECT AND INDIRECT EFFECTS

- ***DIRECT AND INDIRECT EFFECTS OF NO-ACTION ALTERNATIVE TO SOIL PHYSICAL PROPERTIES***

The No-Action Alternative would have no direct or indirect effects on soil physical properties. No ground-based activity would take place under this alternative, which would leave the soil in the project area unchanged from the description in the Existing Conditions portion of this analysis. Current impacts from past management would continue to recover as dictated by natural and pre-existing conditions.

- ***DIRECT AND INDIRECT EFFECTS OF THE ACTION ALTERNATIVE TO SOIL PHYSICAL PROPERTIES***

Based on DNRC soil monitoring on soils and sites similar to those found in the project area, direct impacts to soil physical properties would be expected on up to 69 of the total 643 acres proposed for harvesting (including 35 acres of post-and-pole harvesting) in the proposed project area. Soil monitoring conducted on DNRC lands shows that sites harvested on DNRC lands statewide on similar soils with ground-based machinery had a range of impacts from 0 to 35.5 percent of the acres treated, with an average disturbance rate of 10.8% (DNRC, 2011). These impacts include operations on dry soils in non-winter conditions. Soil monitoring conducted on DNRC lands shows that sites harvested on DNRC lands statewide on similar soils with cable yarding equipment had a range of impacts from 2.3 to 11.4 percent of the acres treated, with an average disturbance rate of 6.2% (DNRC, 2011). As a result, the extent of impacts expected would likely be similar to those reported by DNRC soil monitoring (DNRC, 2011), or approximately 0 to 35.5 percent of ground-based harvested acres, and approximately 2.3 to 11.4 percent of cable harvest acres. The proposal includes 502 acres of ground-based mechanical harvesting. There are also 230 acres of proposed pre-commercial thinning that would be hand felled, and would not create ground-based impacts.

Ground-based site preparation would be done on tractor units, and prescribed fire may be used for site preparation on portions of cable harvest units. These activities would also generate direct impacts to the soil physical properties. Site-preparation disturbance would be intentionally done, and these impacts are considered light and promote reforestation of the site. **Table S-1** summarizes the expected impacts to the soil resource as a result of the Action Alternative. These activities would leave approximately 10.5 percent of the proposed harvest units in an impacted condition. This level is below the range analyzed for in the *EXPECTED FUTURE CONDITIONS* section of the *SFLMP*, and well within the 20-percent impacted area established as a level of concern in the *SFLMP (DNRC 1996)*. This level translates to a low risk of low direct and indirect impacts to soil physical properties. These impacts would likely persist for 20-40 years, depending on site specific conditions. In addition, BMPs and a combination of mitigation measures would be implemented to limit the area and degree of soil impacts as noted in ARM 36.11.422 and the SFLMP (DNRC, 1996).

Table S-1 *– Summary of Direct Effects of Alternatives on Soil Physical Properties*

Description of Parameter	No Action	Action Alternative
Acres of harvest	0	643
Acres of ground based yarding	0	502
Acres of ground based impacts[1]	0	**54**
Acres of skyline yarding	0	141
Acres of skyline impacts[2]	0	**10**
Miles of new temporary roads	0	1.75
Acres of new roads[3]	0	**5.3**
Total estimated acres of impacts	0	**69.3**
Percent of harvest area with impacts	0%	10.5%

1) 10.8% of tractor units based on average impacts found on similar soils and sites by DNRC soil monitoring
2) 6.2% of skyline units affected by corridors
3) Assuming an average width of 25 feet, roads are approximately 3 acres per mile

CUMULATIVE EFFECTS

- ***CUMULATIVE EFFECTS OF THE NO ACTION ALTERNATIVE TO SOIL PHYSICAL PROPERTIES***

This alternative would have no cumulative impacts to soil physical properties in the project area. The impacts of this alternative would be similar to those described in the Existing Conditions portion of this analysis. No soil would be disturbed and no re-entry of past harvest units would occur. All impacts from past management activities would continue to improve or degrade as dictated by natural and pre-existing conditions.

- ***CUMULATIVE EFFECTS OF THE ACTION ALTERNATIVE TO SOIL PHYSICAL PROPERTIES***

Cumulative effects to soil physical properties may occur from repeated entries into a forest stand where additional ground is impacted by equipment operations. With this alternative, approximately 45 of the 643 acres proposed for harvesting have had previous ground-based timber sale operations. Existing skid trails where compaction has begun to ameliorate through freeze-thaw cycles and revegetation would return to a higher level of impact due to this alternative. Additional trails may also be required if existing trails are in undesirable locations. The remaining acres proposed for harvesting have not been previously managed. Cumulative effects to soil physical properties in these areas would be identical to those displayed in the Direct and Indirect Effects section of this analysis. Cumulative impacts to soil physical properties under the Action Alternative would fall below the range analyzed for in the EXPECTED FUTURE CONDITIONS section of the SFLMP and are well within the 20-percent impacted area established as a level of concern in the SFLMP (DNRC, 1996). This level translates to a low risk of low cumulative impacts to soil physical properties. These impacts would likely persist for 20-40 years, depending on site specific conditions.

Nutrient Cycling

DIRECT AND INDIRECT EFFECTS

- *DIRECT AND INDIRECT EFFECTS OF NO-ACTION ALTERNATIVE TO NUTRIENT CYCLING*

The No-Action Alternative would have no direct or indirect effects on nutrient cycling. No harvesting activity would take place under this alternative, which would leave the woody debris levels in the project area unchanged from the description in the Existing Conditions portion of this analysis. Nutrient cycling from coarse woody debris would stay near current levels as dictated by natural and pre-existing conditions.

- *DIRECT AND INDIRECT EFFECTS OF THE ACTION ALTERNATIVE TO NUTRIENT CYCLING*

Direct and indirect effects to nutrient cycling may include a slight decrease in coarse woody debris from the Action Alternative by removing standing timber. This would present a low risk of low direct and indirect effects to nutrient cycling. These effects are estimated to persist for a moderate time duration. Some stands where woody debris levels are low may see an increase in large woody debris as a result of the proposed harvesting. In addition, this alternative would lead to an increase in fine woody material in the form of limbs and tree tops being left after harvest. Through the timber sale contract, approximately 12-24 tons of coarse woody material would be left on the ground following harvesting activities, as well as fine material for nutrient retention.

CUMULATIVE EFFECTS

- *CUMULATIVE EFFECTS OF THE NO-ACTION ALTERNATIVE TO NUTRIENT CYCLING*

This alternative would have no cumulative impacts to nutrient cycling in the project area. The impacts of this alternative would be similar to those described in the Existing Conditions portion of this analysis. Nutrient cycling from coarse woody debris would stay near current levels as dictated by natural and pre-existing conditions.

- *CUMULATIVE EFFECTS OF THE ACTION ALTERNATIVE TO NUTRIENT CYCLING*

Risk of cumulative effects to nutrient cycling from nutrient pool loss would be low. This would present a low risk of low cumulative effects to nutrient cycling. These effects are estimated to persist for a moderate time duration. This alternative would follow research recommendations found in Graham (1994) for retention of coarse and fine woody debris through contract clauses and site-specific mitigation measures.

Slope Stability

DIRECT AND INDIRECT EFFECTS

- *DIRECT AND INDIRECT EFFECTS OF NO-ACTION ALTERNATIVE TO SLOPE STABILITY*

The No-Action Alternative would have no direct or indirect effects on slope stability. No harvesting activity would take place under this alternative, which would leave the vegetative cover and soil conditions in the project area unchanged from the description in the Existing Conditions portion of this analysis. Slope stability would remain similar to current levels as dictated by natural and pre-existing conditions.

- *DIRECT AND INDIRECT EFFECTS OF THE ACTION ALTERNATIVE TO SLOPE STABILITY*

Direct and indirect effects to slope stability from the Action Alternative may include a moderate increase in risk of soil mass movement and decreased slope stability. This risk would persist for approximately 20-30 years until the sites revegetate. Approximately 72 of the acres proposed for harvest with this alternative are on landtypes with marginal slope stability. In these areas, silviculture prescriptions and logging systems would be modified based on site-specific criteria to minimize the potential risk of soil mass movements. Approximately 0.9 miles of proposed temporary road would be constructed on landtypes with marginal slope stability. This reach of road may be modified based on site-specific conditions to minimize the risk of slope stability problems. Cut slopes may need to be laid back to a gentler angle, and ditch relief would also be evaluated to reduce the risk of raveling and slumping.

Direct and indirect effects to slope stability from the Action Alternative on the existing recent slump in Section 11 would be a reduced risk of further mass movement. Through field review, DNRC personnel determined that routing of ditch runoff may be contributing to the plasticity of the soil at this site, making conditions favorable for the site to slump. The Action Alternative would attempt to reduce this saturation by re-routing all ditch runoff to the ends of all switch-backs in this road so no road or ditch runoff would be delivered to the slopes where failure has occurred.

CUMULATIVE EFFECTS

- *CUMULATIVE EFFECTS OF THE NO ACTION ALTERNATIVE TO SLOPE STABILITY*

The No-Action Alternative would have no cumulative effects to slope stability. No harvesting activity would take place under this alternative, which would leave the vegetative cover and soil conditions in the project area unchanged from the description in the Existing Conditions portion of this analysis. Slope stability would remain similar to current levels as dictated by natural and pre-existing conditions.

- *CUMULATIVE EFFECTS OF THE ACTION ALTERNATIVE TO SLOPE STABILITY*

Cumulative effects to slope stability from the Action Alternative may include a moderate increase in risk of soil mass movement and decreased slope stability. This risk would persist for

approximately 20-30 years until the sites revegetate. This alternative would utilize contract clauses and site-specific mitigation measures to minimize risks to slope stability, and would not re-enter any past harvest areas on marginally stable slopes. None of the proposed harvest units or proposed new temporary road construction would be located on a known slope stability problem, so no expansion or increase in existing slope stability problems are expected.

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Table S-2 – Soil Map Unit Descriptions for the Moran Cyclone Project Area

Map Unit	Name	Soil & Vegetation Descriptions	Management Considerations			
			K_w**/erosion potential*	Timber	Roads	Comments
10-2	Stream Bottoms, 0-5%	Soils of this map unit are formed from alluvial deposits. Vegetation is moist mixed forest with forbs/grass understory.	K_w = 0.05-0.15 Erosion risk is low	Potential Prod: High Equipment: Tractor Regen: Frost Pockets	Roads perform well with standard location, construction and maintenance practices. Floods can damage crossings.	Thin surface soil layer is susceptible to displacement, reduced regen.
26C-7	Glacial Moraines, 10-20%	Soils of this map unit are glacial till. Vegetation is a moist mixed forest with forbs/shrub understory.	K_w = 0.20-0.64 Erosion risk is moderate	Potential Prod: High Equipment: Tractor Regen: Can be limited by frost pockets	Roads perform well with standard location, construction and maintenance practices.	Season of use important (compaction & displacement).
26C-8	Glacial Moraines, 20-40%	Soils of this map unit are glacial till. Vegetation is a moist mixed forest with forbs/shrub understory.	K_w = 0.20-0.64 Erosion risk is moderate	Potential Prod: High Equipment: Tractor Regen: Can be limited by frost pockets	Roads perform well with standard location, construction and maintenance practices. Slope steepness may increase cost.	Season of use important (compaction & displacement).
26C-9	Glacial Moraines, 40-60%	Soils of this map unit are glacial till. Vegetation is a moist mixed forest with forbs/shrub understory.	K_w = 0.20-0.64 Erosion risk is moderate	Potential Prod: High Equipment: Cable Regen: None	Roads perform well with standard location, construction and maintenance practices. Cutslopes may ravel.	Season of use important (compaction & displacement).
27-7	Glacial Kames, Kettles or Terraces, 10-20%	Soils of this map unit are glacial till. Vegetation is a moist mixed forest with forbs/shrub understory.	K_w =0.05-0.17 Erosion risk is low	Potential Prod: Moderate Equipment: Tractor Regen: Can be limited by moisture stress	Roads perform well with standard location, construction and maintenance practices.	Season of use important (compaction & displacement).
31	Landslide Deposits, 10-30%	Soils of this map unit are landslide deposits derived from metasedimentary rocks. Vegetation is a moist mixed forest with forbs/shrub understory.	K_w = 0.02-0.10 Erosion risk is low	Potential Prod: High Equipment: Tractor Regen: Can be limited by compaction	Road cuts and fills may be prone to sloughing. Evaluate locations on site-specific basis.	Soil will not dry out enough for summer operation, frozen or snow-covered only
32	Landslide Deposits, 15-65%	Soils of this map unit are landslide deposits derived from metasedimentary rocks. Vegetation is a moist mixed forest with forbs/shrub understory.	K_w = 0.02-0.10 Erosion risk is low	Potential Prod: High Equipment: Tractor/Cable Regen: Can be limited by compaction	Road cuts and fills may be prone to sloughing. Evaluate locations on site-specific basis.	Soil will not dry out enough for summer operation, frozen or snow-covered only
57-8	Glaciated Mountain Ridges, 20-40%	Soils of this map unit are glacially scoured metasedimentary rocks. Vegetation is lower subalpine forest with forbs/shrub understory.	K_w = 0.15-0.49 Erosion risk is moderate	Potential Prod: Moderate Equipment: Tractor Regen: Can be limited by moisture stress	Roads perform well with standard location, construction and maintenance practices.	Season of use important (compaction & displacement).
57-9	Glaciated Mountain Slopes, 40-60%	Soils of this map unit are glacially scoured metasedimentary rocks. Vegetation is lower subalpine forest with forbs/shrub understory.	K_w = 0.15-0.49 Erosion risk is moderate	Potential Prod: Moderate Equipment: Cable Regen: Can be limited by moisture stress	Roads perform well with standard location, construction and maintenance practices.	Cut slopes may ravel.

73	Glacial Trough Wall, 60-90%	Soils of this map unit are glacially scoured metasedimentary rocks. Vegetation is a dry mixed forest with forbs/shrub understory.	K_w = 0.15-0.49 Erosion risk is moderate	Potential Prod: Mod/High Equipment: Cable Regen: Can be limited by moisture stress & competition	Rock may limit excavation, Slope steepness may increase cost.	Cliffs and rock outcropping may affect feasibility of operation.
74	Stream Breaklands, 60-90%	Soils of this map unit are glacial drift derived from metasedimentary rocks. Vegetation is a moist mixed forest with forbs/shrub understory.	K_w = 0.02-0.10 Erosion risk is low	Potential Prod: Moderate Equipment: Cable Regen: Can be limited by moisture stress & competition	Slope steepness may increase cost. Road cuts may ravel. Landslides may damage roads.	Evaluate activities on site-specific basis.
75	Structural Breaklands, 60+%	This map unit is mainly limestone cliffs with talus bases. Vegetation is mostly absent, but may consist of occasional Douglas-fir and grass/shrubs.	K_w is not rated for this map unit	Potential Prod: N/A Equipment: N/A Regen: N/A	Not suited for road construction.	
76	Rock Outcrop/Structural breaklands, 60-90%	This map unit is mainly weathered bedrock derived from metasedimentary rocks Vegetation is high subalpine forest with forbs/shrub understory.	K_w = 0.02-0.10 Erosion risk is low	Potential Prod: Low Equipment: Cable Regen: Can be limited by harsh climate	Slope steepness may increase cost. Blasting of rock outcrops may be necessary.	

** Erosion Potential is based on slope and soil erosion factor K**. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 70 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance. The hazard is described as slight (low), moderate, severe, or very severe. A rating of slight indicates that erosion is unlikely under ordinary climatic conditions; moderate indicates that some erosion is likely and that erosion-control measures may be needed; severe indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and very severe indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion–control measures are costly and generally impractical. (NRCS, 1996)*

***Erosion Factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water. (NRCS, 1998)*

Attachment V:

Water Resources Analysis

Analysis Prepared By: Tony Nelson

Title: Hydrologist, Montana DNRC

Introduction

The following analysis will disclose anticipated effects to water resources within the Moran Cyclone project area. Direct, secondary, and cumulative effects to water resources of both the No-Action and Action alternatives will be analyzed.

Issues and Measurement Criteria

The following issues encompass the specific issues and concerns raised through public comment and scoping of the proposed project. For a specific list of individual comments and concerns, please refer to the project file, located at the DNRC Stillwater Unit office.

Sediment Delivery

Sediment delivery and subsequent water quality impacts can be affected by timber harvesting and related activities (such as road construction), by increasing the production and delivery of fine sediment to streams. Construction of roads, skid trails, and landings can generate and deliver substantial amounts of sediment through the removal of vegetation and exposure of bare soil. In addition, removal of vegetation near stream channels reduces the sediment-filtering capacity and may reduce channel stability and the amounts of large woody material. Large woody debris is a very important component of stream dynamics, creating natural sediment traps and energy dissipaters to reduce the velocity and erosive power of stream flows. Other aspects of sediment analysis can also be found in Attachment VI – FISHERIES RESOURCES ASSESSMENT.

Measurement Criteria: Sediment from roads, harvesting activities and vegetative removal will be analyzed qualitatively through data collected during past statewide and DNRC internal BMP (Best Management Practices) field reviews.

Water Yield

Water yield increases can result from timber harvesting and associated activities, which can affect the timing, distribution, and amount of water yield in a harvested watershed. Water yields increase proportionately to the percentage of canopy removal (*Haupt, 1976*), because removal of live trees reduces the amount of water transpired, leaving more water available for soil saturation and runoff. Canopy removal also decreases interception of rain and snow and alters snowpack distribution and snowmelt, which lead to further water-yield increases. Higher water yields may lead to increases in peak flows and peak-flow duration, which can

result in accelerated streambank erosion and sediment deposition. Vegetation removal can also reduce peak flows by changing the timing of snowmelt. Openings will melt earlier in the spring with solar radiation and have less snow available in late spring when temperatures are warm. This effect can reduce the synchronization of snowmelt runoff and lower peak flows.

Measurement Criteria: The water yield increase for the project area streams was determined using field review and aerial photo interpretation. Visual inspection of the runoff patterns and stream channel stability within the Moran Cyclone project area were used to assess the impacts of past management to water yield. Aerial photo interpretation was used to determine the extent of past management in these watersheds.

Regulatory Framework

The following plans, rules, and practices have guided this projects planning and/or will be implemented during project activities:

Montana Surface Water Quality Standards

According to the Montana Surface Water Quality Standards found in *ARM 17.30.608* (*1*)(*a*), this portion of the North Fork Flathead River drainage, including Moran Creek and Hay Creek, is classified as B-1. Among other criteria for B-1 waters, no increases are allowed above naturally occurring levels of sediment, and minimal increases over natural turbidity. "Naturally occurring," as defined by *ARM 17.30.602* (*19*), includes conditions or materials present during runoff from developed land where all reasonable land, soil, and water conservation practices (commonly called Best Management Practices or BMPs) have been applied. Reasonable practices include methods, measures, or practices that protect present and reasonably anticipated beneficial uses. These practices include, but are not limited to, structural and nonstructural controls and operation and maintenance procedures. Appropriate practices may be applied before, during, or after completion of activities that could create impacts.

Designated beneficial water uses within the project area include cold-water fisheries and recreational use in the streams, wetlands, and lakes in the surrounding area. There are 4 existing surface water rights on an unnamed tributary to Hay Creek for domestic use. Each of these rights are for one common point of diversion. Domestic use refers to water rights assigned to individual property owners for uses such as eating, drinking, laundering, bathing, lawn watering and watering a household garden. All of these surface water rights are located downstream of the proposed project area.

Water-Quality-Limited Waterbodies

None of the streams in the proposed project area are currently listed as water-quality-limited waterbodies in the *2012 Montana 303*(*d*) list (*DEQ, 2012*).

Montana Streamside Management Zone (SMZ) Law

By the definition in *ARM 36.11.312* (*3*), several of the stream reaches in the project area are Class 1 streams. All of these streams and many of their tributaries have flow for more than 6 months each year and contribute flow to downstream waters. The rest of the stream reaches in the project area are classified as Class 2 or 3 based on site-specific conditions. A Class 3 stream is defined as a stream that does not support fish, normally has surface flow during less than 6 months of the year, and rarely contributes surface flow to another stream, lake or other body of water (*ARM 36.11.312* (*5*)). According to ARM 36.11.312 (4), a Class 2 stream is a portion of a stream that is not a Class 1 or Class 3 stream segment. **Figure H-2** displays the stream classes and locations for project area streams.

Figure H-1 *–Hay Creek Watershed*

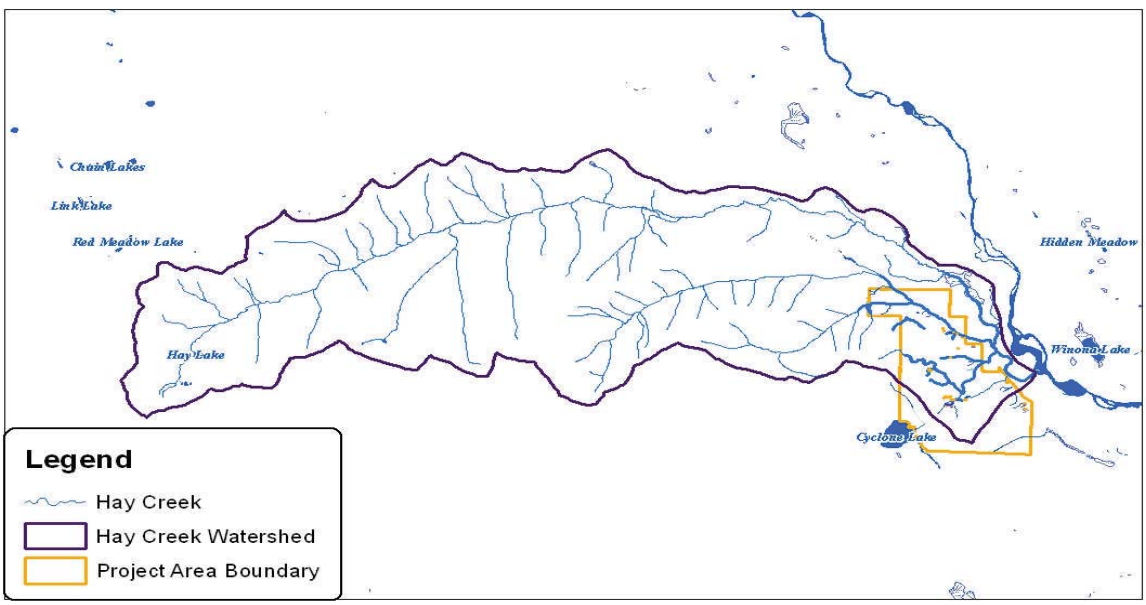
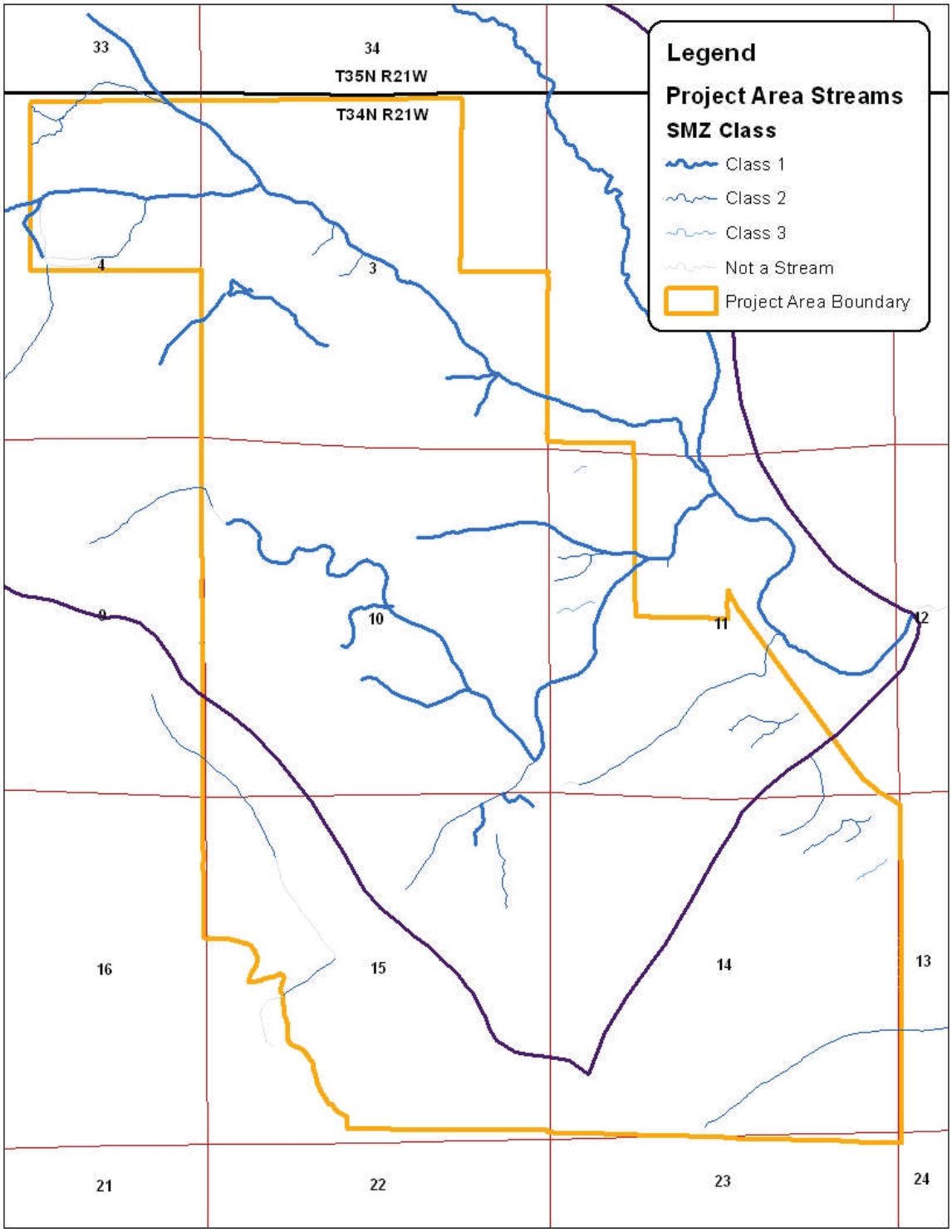


Figure H-2 *– Moran Cyclone Timber Sale Project Area Stream Classifications*



Forest Management Rules

In 2003, DNRC drafted Administrative Rules for Forest Management. The portion of those rules applicable to watershed and hydrology resources include ARM 36.11.422 through 426. All applicable rules will be implemented if they are relevant to activities proposed with this project.

Habitat Conservation Plan

In 2011, DNRC adopted a habitat conservation plan (HCP) in coordination with the United States Fish and Wildlife Service. All applicable HCP riparian timber harvest and aquatic conservation strategies *(DNRC, 2010)* would be implemented if they are relevant to activities proposed with this project.

Analysis Areas

Sediment Delivery

Analysis area for direct, indirect and cumulative effects to sediment delivery will be analyzed on all existing roads in and leading to the proposed project area; and on stream channels for in-channel sources of sediment and harvest unit areas for harvest-related sediment sources. Additional sites on proposed haul routes located outside the project area will be assessed qualitatively for their potential to affect downstream water bodies.

Water Yield

Analysis area for direct, indirect and cumulative effects to water yield will consist of Hay Creek for a coarse filter analysis area, and the stream systems within the project area for a detailed analysis of water yield impacts. A map of the project area and the streams found within the project area is found in ***Figure H-2***. The Hay Creek Watershed and its relationship to the Moran Cyclone project area is shown in ***Figure H-1***. These drainages were chosen as an appropriate scale of analysis, and will effectively display the estimated impacts of proposed activities to water yield.

Analysis Methods

Where risk is assessed in both sediment-delivery and water-yield analyses, the following definitions apply to the level of risk reported:

- low risk means that impacts are unlikely to result from proposed activities,
- moderate risk means that there is approximately a 50 percent chance of impacts resulting from proposed activities, and
- high risk means that impacts are likely to result from proposed activities.

Where levels or degrees of impacts are assessed in this analysis, the following definitions apply to the degree of impacts reported:

- very low impact means that impacts from proposed activities are unlikely to be measurable or detectable and are not likely to be detrimental to the water resource;
- low impact means that impacts from proposed activities would likely be measurable or detectable, but are not likely to be detrimental to the water resource;
- moderate impact means that impacts from proposed activities would likely be measurable or detectable, and may or may not be detrimental to the water resource;
- high impact means that impacts from proposed activities would likely be measurable or detectable, and are likely to have detrimental impacts to the water resource.

Sediment Delivery

Analysis methods to assess sediment delivery will include qualitative assessments where stream crossings exist within the proposed project area using visual inspection and lineal measurement to determine the road surface area delivering to a stream. Sediment from roads, harvesting activities and vegetative removal will be analyzed qualitatively through data collected during past statewide and DNRC internal BMP field reviews.

Water Yield

Analysis methods to assess water yield increases for the project area streams was determined using field review and aerial photo interpretation. Visual inspection of the runoff patterns and stream channel stability within the Moran Cyclone project area were used to assess the impacts of past management to water yield. All existing activities on all ownership within project area watersheds and proposed activities related to the Moran Cyclone project will be analyzed using methods described above.

Existing Conditions

General Description

The following section will describe the existing conditions within the proposed project area and the analysis areas that are relevant to the issues discussed above in this analysis.

Sediment Delivery

Sediment delivery on this parcel was reviewed by a DNRC hydrologist in 2013. Numerous stream channels were identified in the project area. Moran Creek flows through the northwest portion of the project area and is a perennial Class 1 stream with an approximately 12-foot bankfull width. The stream was classified as a B3/4 channel using a classification system developed by *Rosgen* (*1996*). Channel types rated as "B" are typically in the 2- to 4-percent gradient range, and have a moderate degree of meander (sinuosity). Channel-bed materials in B3/4 types are mainly cobble and gravel. Moran Creek has several tributary stream channels ranging from 1 to 3 foot bankfull widths. Some of these channels are perennial and some flow less than 6 months. Most of these streams are B4/5 channels. Channel-bed materials in B4/5

types are mainly gravel and coarse sand. No areas of unstable or actively down-cut channels were identified during field reconnaissance. Large woody debris was found in adequate supply to support channel form and function. Woody material in a stream provides traps for sediment storage and gradient breaks to reduce erosive energy and work as flow deflectors to reduce bank erosion. No evidence of past SMZ harvesting was found. Based on these findings, no in-channel sources of erosion or deposition were identified in Moran Creek or its tributaries.

Sediment delivery from in-channel sources in the middle portion of the project area was reviewed by a DNRC hydrologist in 2013. The primary stream in this area is an unnamed Class 1 tributary to Hay Creek with a 2-3 foot bankfull width that flows through sections 10 and 11 of the proposed project area. The stream and its tributaries was classified as a B4/5 channel using a classification system developed by *Rosgen* (*1996*). Channel types rated as "B" are typically in the 2- to 4-percent gradient range, and have a moderate degree of meander (sinuosity). Channel-bed materials in B4/5 types are mainly gravel and coarse sand. No areas of unstable or actively down-cut channels were identified during field reconnaissance. Large woody debris was found in adequate supply to support channel form and function. Woody material in a stream provides traps for sediment storage and gradient breaks to reduce erosive energy and work as flow deflectors to reduce bank erosion. No evidence of past SMZ harvesting was found. Based on these findings, no in-channel sources of erosion or deposition were identified in this unnamed stream or its tributaries.

Sediment delivery from in-channel sources in the southern portion of the project area was reviewed by a DNRC hydrologist in 2013. The streams in this area are unnamed Class 2 and Class 3, and do not contribute surface water to any downstream waters. These streams have 1 to 3 foot bankfull widths and are found in sections 11 and 14 of the proposed project area. These streams are classified as B4/5 channels using a classification system developed by *Rosgen* (*1996*). Channel types rated as "B" are typically in the 2- to 4-percent gradient range, and have a moderate degree of meander (sinuosity). Channel-bed materials in B4/5 types are mainly gravel and coarse sand. No areas of unstable or actively down-cut channels were identified during field reconnaissance. Large woody debris was found in adequate supply to support channel form and function. Woody material in a stream provides traps for sediment storage and gradient breaks to reduce erosive energy and work as flow deflectors to reduce bank erosion. No evidence of past SMZ harvesting was found. Based on these findings, no in-channel sources of erosion or deposition were identified in this unnamed stream or its tributaries.

No sediment delivery from the existing road system was identified on any of the proposed haul routes within or leading to the project area. The existing road system in the proposed project area is low to moderate standard native-surfaced road, and most reaches meet applicable best management practices for surface drainage and erosion control. Road surfaces are mainly densely vegetated with grass/forbs and are not actively eroding. Improvements to BMPs at specific sites may be required prior to use. Most road grades are generally under 8%. The road system was constructed to access timber harvesting by the USDA Forest Service and Montana DNRC during past entries. Most of the road segments in the project area are not causing active erosion or sediment delivery to streams.

Water Yield

No water yield impacts were identified from past activities in and around the proposed project area streams. Past management activities consist of timber management on federal and state land. There have also been several stand replacing fires in and near the proposed project area within the past 20 years. These activities and events have led to reductions in forest canopy cover, and construction of roads.

Following field reconnaissance of these parcels, it was determined that a detailed water yield analysis would not be necessary for this project. Less than 15% of the Hay Creek watershed has had any harvest activity. In order to reach even the most stringent water yield thresholds, at least 25% of a watershed must be in a clear-cut condition (*Farns, 1978 and Hapt, 1974*). In addition, all stream channels identified within the proposed project area were stable and showing no signs of impacts from water yield increases. After evaluating the watershed cumulative effects risks along with the current conditions in the Moran Cyclone project area, by ARM 36.11.423, a detailed watershed analysis is not needed in this project area.

Environmental Effects

No-Action Alternative: Direct, Secondary, and Cumulative Effects

Sediment Delivery

Direct and Secondary
Under this alternative, no timber harvesting or related activities would occur. Sediment from all sources would continue as described in Existing Conditions.

Cumulative
No additional cumulative impacts from sediment delivery would be expected. Sediment delivery sites from roads on the proposed haul routes would remain unchanged, as would the sediment sources described in Existing Conditions.

Water Yield

Direct and Secondary
No increased risk of increases or reductions in annual water yield or Equivalent Clearcut Acres (ECA) would result from this alternative.

Cumulative
No increase in water yield would be associated with this alternative. As vegetation continues toward a fully forested condition, annual water yields would also be expected to gradually decline.

Action Alternative: Direct, Secondary, and Cumulative Effects

Sediment Delivery

Direct and Secondary

There is a low risk of direct or secondary effects to sediment delivery to streams from the timber harvesting activities proposed in the Action Alternative. The SMZ law, Administrative Rules for Forest Management, Riparian Management Zones (RMZ), channel migration zones (CMZ) on fish-bearing Class 1 streams, and applicable BMPs would be applied to all harvesting activities, which would minimize the risk of sediment delivery to draws and streams. The Montana BMP audit process has been used to evaluate the application and effectiveness of forest-management BMPs since 1990; this process has also been used to evaluate the application and effectiveness of the SMZ Law since 1996. During that time, evaluation of ground-based skidding practices near riparian areas has been rated 92 percent effective, and these same practices have been found effective over 99 percent of the time from 1998 to present (*DNRC 1990 through 2012*). Since 1996, effectiveness of the SMZ width has been rated over 99 percent (*DNRC 1990 through 2012*). As a result, with the application of BMPs and the SMZ Law, proposed activities are expected to have a low risk of low impacts to sediment delivery.

There is a low risk of direct or secondary effects to sediment delivery to streams from the use of existing roads and construction of temporary roads proposed in the Action Alternative. The existing road system meets BMP standards, and no direct sources of sediment were identified. Use of existing closed roads to haul timber would present a low risk of low impacts to sediment delivery due to vegetation loss on existing grassed-in roads.

There is a high risk of low impacts to sediment delivery from construction of approximately 1.75 miles of temporary road. This risk would be elevated due to construction of a new stream crossing on one of the proposed temporary roads, and subsequent removal of this crossing following project completion. This activity would likely release a short-term pulse of fine sediment into the stream during construction. The risk of sediment delivery would remain elevated for 2 to 3 years after project completion while bare soils are revegetated.

There is a high risk of low impacts to sediment delivery from removal of an existing 24-inch diameter culvert installed in a perennial stream on an old existing road. This activity would likely release a short-term pulse of fine sediment into the stream during construction. The risk of sediment delivery would remain elevated for 2 to 3 years after project completion while bare soils are revegetated.

Cumulative

Risk of sediment delivery and sediment loading to Hay Creek and waters downstream from the proposed project area would be slightly increased from current levels in the short term and below current levels in the long term. Maintenance and improvement of existing erosion control and surface drainage on the existing road system would yield erosion rates similar to current levels. Removal of the existing 24-inch stream crossing culvert would reduce potential sediment loading to Hay Creek and the North Fork Flathead River by removing a potential sediment source. Overall, there is a high risk of short-term low-level increases in sediment

loading for about 2 to 3 years. However, water quality standards are expected to be met and there is a low risk of impacts to beneficial uses.

Water Yield

Direct and Secondary

There is a low risk of very low direct or secondary effects to water yield from harvesting of approximately 608 acres of timber under this alternative within the proposed project area. It is a low risk that this level of harvesting would be sufficient to generate measurable increases in water yield in any streams located within or near the project area or cause channel instability. The stability of channels would be sufficient to handle any anticipated increases without measurable change. In addition to these commercial harvest acres, the project would propose to harvest approximately 35 acres of post- and pole-sized material, and commercially thin an additional 230 acres. The proposed treatment in the post-and-pole unit is to remove approximately 50% of the trees, leaving a 16 to 20 foot spacing, and the pre-commercial thinning would also remove approximately 50% of the live trees. These prescriptions are designed to improve the growth and vigor of the remaining trees and do not contribute to increases in water yield due to removal of vegetative competition. As a result, there is a low risk of very low direct or secondary impacts to water yield in project area drainages as a result of the proposed Action Alternative.

Cumulative

There is a low risk of very low cumulative effects to project area drainages and downstream waters in and near the project area as a result of the proposed project. The proposed commercial harvesting combined with the proposed post-and-pole and commercial thin units would leave the Hay Creek watershed with a harvested condition of less than 20%, which would leave the watershed well below even the most stringent water yield thresholds. Therefore potential increases in water yield from harvest activities have a very low risk to affect downstream waters.

Water Resources Mitigations

Hydrologic related resource mitigations that would be implemented with the proposed Action Alternative include:

- implement Riparian Management Zones on all Class 1 streams based on site-potential tree heights in the project area
- implement BMPs on all new temporary roads and improve BMPs on existing roads where needed
- use spot-blading on existing roads to preserve as much of the existing vegetative cover as possible on vegetated road surfaces

Water Resources References

DNRC, 1990-2012. Montana Forestry Best Management Practices Monitoring. Missoula, Montana.

DNRC, 1996. State Forest Land Management Plan. Montana Department of Natural Resources and Conservation. Missoula, Montana.

DNRC, 2010. Montana Department of Natural Resources and Conservation Forested Trust Lands Habitat Conservation Plan Final EIS. September 2010.

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Haupt, H.F., et al. 1974. *Forest Hydrology Part II Hydrologic Effects of Vegetation Manipulation*. USDA Forest Service, Region 1. Missoula, MT.

Montana Department of Environmental Quality. "Clean Water Act Information Center." 30 March, 2010. http://www.cwaic.mt.gov/

Rosgen, David L. 1996. *Applied River Morphology.* Wildland Hydrology, Pagosa Springs, CO.

Attachment VI:

Fisheries Resources Assessment

Assessment Prepared By: Jim Bower

Title: Fisheries Program Specialist, Montana DNRC

Introduction

The following assessment will disclose anticipated effects to fisheries resources within the Moran Cyclone Timber Sale project area. The proposed actions include (1) commercial timber harvest on approximately 608 acres, (2) post and pole timber harvest on approximately 35 acres, and (3) pre-commercial thinning on approximately 230 acres. Approximately 12.3 miles of existing forest road would be utilized for hauling, and approximately 1.8 miles of temporary forest road would also be constructed for hauling and later reclaimed. Two temporary road-stream crossing structures would be constructed, and one existing road-stream structure on a perennial, non-fish-bearing stream would be permanently removed.

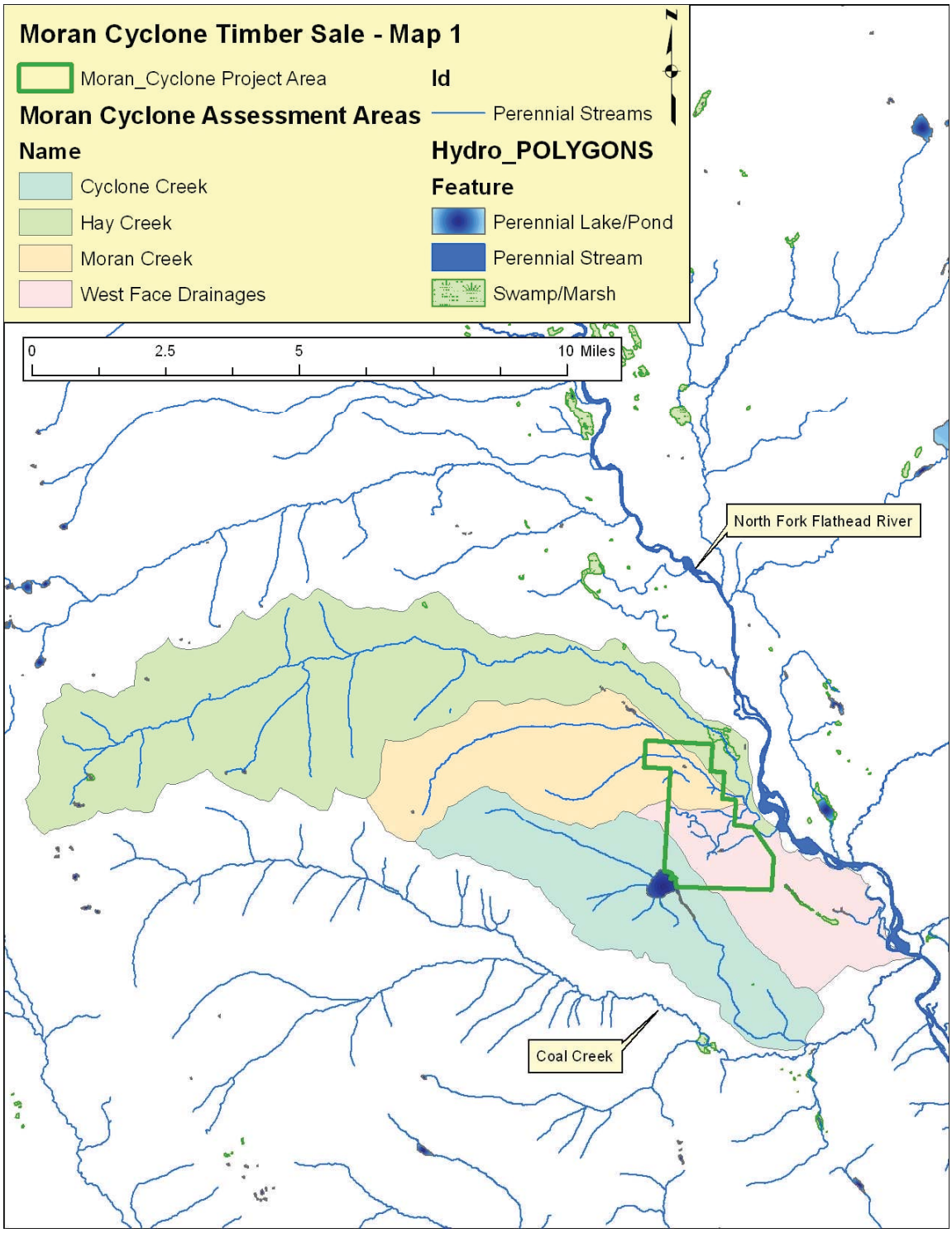
Issues

For the purposes of this environmental assessment, issues will be considered actual or perceived effects, risks, or hazards as a result of the proposed alternatives. Issues, in respect to this environmental assessment, are not specifically defined by either the Montana Environmental Policy Act or the Council on Environmental Quality.

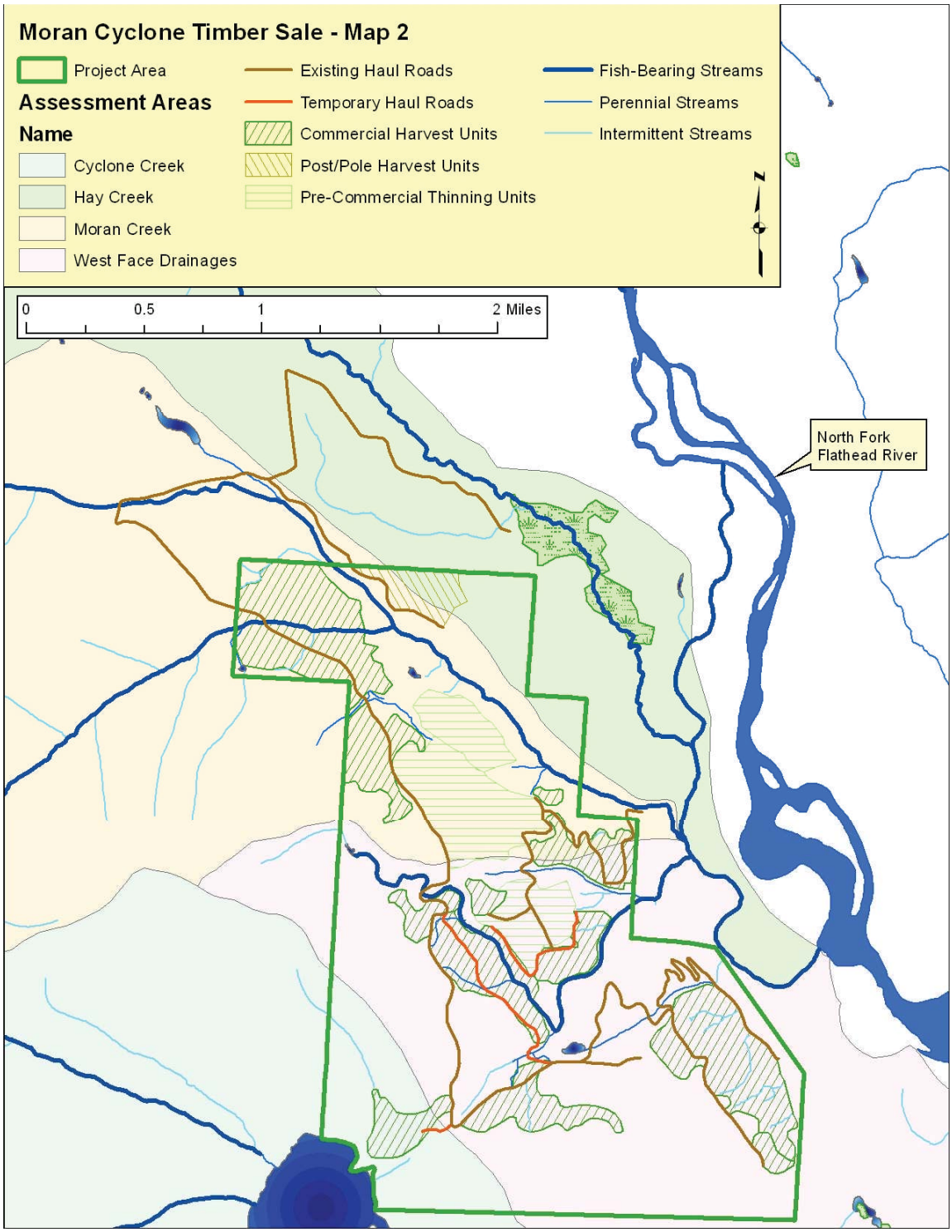
No fisheries resource issues were received during public scoping.

Fisheries resource issues raised internally include: the proposed actions may adversely affect fisheries habitat features, including channel forms and stream temperature.

Map 1 – General project area information.



Map 2 – Detailed project area information.



Regulatory Framework

The US Fish and Wildlife Service has listed bull trout as 'threatened' under the Endangered Species Act. Both bull trout and westslope cutthroat trout are listed as S2 Montana Animal Species of Concern. Species classified as S2 are considered to be at risk due to very limited and/or potentially declining population numbers, range, and/or habitat, making the species vulnerable to global extinction or extirpation in the state (Montana Fish, Wildlife and Parks, Montana Natural Heritage Program, and Montana Chapter American Fisheries Society Rankings). DNRC has also identified bull trout and westslope cutthroat trout as sensitive species (ARM 36.11.436).

DNRC is a cooperator and signatory to the following relevant agreements: Restoration Plan for Bull Trout in the Clark Fork River Basin and the Kootenai River Basin, Montana (2000) and Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout and Yellowstone Cutthroat Trout in Montana (2007). Both agreements contain land management conservation strategies or action items utilized by DNRC as decision-making tools.

Fisheries-specific forest management ARMs (36.11.425 and 36.11.427), the SMZ Law and rules, and other site-specific prescriptions would be implemented as part of any Action Alternative.

All waterbodies contained in the fisheries analysis area(s) are classified as B-1 in the Montana Surface Water Quality Standards (ARM 17.30.608[b][i]). The B-1 classification is for multiple beneficial-use waters, including the growth and propagation of cold-water fisheries and associated aquatic life. Among other criteria for B-1 waters, a 1-degree Fahrenheit maximum increase above naturally occurring water temperature is allowed within the range of 32 to 66 degrees Fahrenheit (0 to 18.9 degrees Celsius), and no increases are allowed above naturally occurring concentrations of sediment or suspended sediment that will harm or prove detrimental to fish or wildlife. In regard to sediment, naturally occurring includes conditions or materials present from runoff or percolation from developed land where all reasonable land, soil, and water conservation practices have been applied (ARM 17.30.603[19]). Reasonable practices include methods, measures, or practices that protect present and reasonably anticipated beneficial uses (ARM 17.30.603[24]). The State has adopted BMPs through its Nonpoint Source Management Plan as the principle means of controlling nonpoint source pollution from silvicultural activities.

Assessment Areas

Assessment areas for direct, indirect and cumulative effects will be used to evaluate the existing and potential impacts to fisheries resources associated with the proposed project. The assessment areas were chosen because they include (1) the watershed of known or potential

fish-bearing streams and (2) the proposed harvest units and haul routes that could have foreseeable, measurable, or detectable impacts to those fisheries resources. The assessment areas are: Cyclone Creek, Hay Creek, Moran Creek, and West Face Drainages (see Maps 1 and 2; General and Detailed information of project area). The Hay Creek assessment area does not include the Moran Creek watershed or West Face drainages downstream of the confluence with Moran Creek. The West Face Drainages assessment area includes all small drainages west of the North Fork Flathead River, south of the Hay Creek and Moran Creek confluence, and north of Big Creek.

Assessment Methods

Assessment methods are a function of the types and quality of data available for analysis, which varies among the different assessment areas. The assessments may either be quantitative or qualitative. The best available data for both species and habitats will be presented for the assessment areas. In order to adequately address the issues raised the existing conditions and foreseeable environmental effects to fisheries resources in the assessment area will be explored using the following outline of issues and sub-issues. Sedimentation will be addressed through an assessment of effects to channel forms.

- Fisheries Habitat – Channel Forms
    - Fisheries Habitat – Sediment
    - Fisheries Habitat – Flow Regimes
    - Fisheries Habitat – Woody Debris
- Fisheries Habitat – Stream Temperature
    - Fisheries Habitat – Stream Shading
- Fisheries Habitat – Cumulative Effects

The descriptions of foreseeable adverse impacts to fisheries resources are described in Table 1 – Descriptions of foreseeable adverse impacts. Positive impacts to fisheries resources will also be described, if applicable, using information on impact extent and duration.

Table 1 – Descriptions of foreseeable adverse impacts.

Impact Description	Probability of Impact	Severity of Impact	Duration of Impact
Negligible	The resource impact is not expected to be detectable or measureable	The impact is not expected to be detrimental to the resource	Not applicable
Low	The resource impact is expected to be detectable or measureable	The impact is not expected to be detrimental to the resource	Short- or long-term

Moderate	The resource impact is expected to be detectable or measureable	The impact is expected to be moderately detrimental to the resource	Short- or long-term
High	The resource impact is expected to be detectable or measureable	The impact is expected to be highly detrimental to the resource	Short- or long-term

Cumulative impacts are those collective impacts on the human environment of the proposed action when considered in conjunction with other past, present, and future actions related to the proposed action by location or generic type (75-1-220, MCA). The potential cumulative impacts to fisheries resources in the assessment areas are determined by evaluating the collective anticipated direct and indirect impacts, other related existing actions, and future actions affecting the fisheries resources.

Existing Conditions

All Assessment Areas – General Existing Conditions

Fish species that occur in the four assessment areas are described in Table 2 – Species Distribution.

Table 2 – Species Distribution.

			ANALYSIS AREAS			
			Cyclone Creek	Hay Creek	Moran Creek	West Face Drainages
SPECIES	native	bull trout	X	X	X	
		westslope cutthroat trout	X	X	X	X
		mountain whitefish	X	X [1]	X	
		slimy sculpin		X	X	
		longnose sucker	X			
	nonnative	rainbow trout	X	X [1]	X [1]	
		westslope cutthroat trout X rainbow trout hybrids	X	X	X [1]	

[1]Recent surveys have not found species present in assessment area; assessment area is presumed to be part of current species' distribution.

The minimum total species extent in the Cyclone Creek assessment area is 7.3 miles for bull trout and 10.6 miles for westslope cutthroat trout; 17.8 miles for both bull and westslope cutthroat trout in the Hay Creek assessment area; 4.5 miles for bull trout and 10.4 miles for westslope cutthroat trout in the Moran Creek assessment area; and, 2.3 miles for westslope cutthroat trout in the West Face Drainages assessment area.

Channel forms comprise the primary spatial component of fisheries habitat and include the frequency and volume of different slow and fast water features. Stream temperature is the primary thermal component of fisheries habitat and typically includes watershed-specific seasonal and daily fluctuations. Although channel forms and stream temperature are a function of numerous environmental processes, the variables of sediment, flow regime, woody debris and stream shading are major contributors that are also potentially affected by the proposed actions. Furthermore, the ranges of conditions of all of these variables throughout a watershed are highly varied, and the mechanisms by which they are naturally affected are also numerous and complex. For the purposes of this environmental assessment, potentially measureable or detectable effect mechanisms to these variables will be used to evaluate existing conditions and the foreseeable effects of the proposed actions. Site-specific surveys within project area lands serve as a resource subsample to extrapolate foreseeable effects across the assessment area.

Road-stream crossings and roads adjacent to stream channels (both perennial and intermittent stream channels) may be major sources of existing direct and indirect effects to the sediment component of fisheries habitats.

Flow regime components include total annual water yield and peak seasonal flow timing, duration and magnitude. In addition to the physical geography of a watershed, this variable is also greatly affected by both natural disturbances and land management activities.

Riparian zone vegetation heavily influences the delivery and in-channel frequency of woody debris, a major component of channel forms. The riparian zone is also a major regulator (shading) of stream temperature, since direct solar radiation is an important driver of stream thermal regimes, especially during peak seasonal periods. Riparian vegetation within a distance generally equivalent to the site potential tree height adjacent to perennial streams in the area is the primary influence on these three fisheries resource variables. The average site-potential-tree-height at 100 years for dominant and co-dominant riparian tree species in all assessment areas is 92 feet.

The Water Resources analysis indicates effects to flow regime by natural disturbances in all assessment areas may be slightly exacerbated by historic land management activities; however, field surveys indicate that the existing conditions of flow regime are expected to be within the historic range of variability. Consequently, existing direct and indirect impacts to flow regime are negligible in all assessment areas.

Cyclone Creek Assessment Area – Specific Existing Conditions

The entire Cyclone Creek watershed defines the boundary of this assessment area. The proposed activities that may affect fisheries resources in the Cyclone Creek assessment area are: (1) upland timber harvest, (2) temporary forest road construction, reclamation and maintenance,

and (3) temporary forest road utilization for timber hauling and equipment transportation. (No riparian harvest would occur adjacent to fish-bearing and non-fish-bearing perennial or intermittent streams in the assessment area.) The fisheries resource variables potentially affected by the proposed actions are channel forms, sediment, and flow regime. Existing effects to flow regime are discussed under General Existing Conditions.

Twenty-four road-stream crossings occur in the assessment area; 1.8 road-stream crossings per square mile occur in the assessment area. The length of all roads within 300 feet of all streams is 5.7 miles. The density of adjacent roads is 0.4 miles per square mile in the assessment area. No road problems exhibiting moderate or high impacts to water or fisheries resources were observed during field work for the project. While the precise level and extent of impact from each individual road-stream crossing or adjacent road is unknown, the expected existing direct and indirect impact to sediment from road sources is low in the assessment area.

Hay Creek Assessment Area – Specific Existing Conditions

The entire Hay Creek watershed defines the boundary of this assessment area, except for the Moran Creek watershed and west face drainages downstream of the confluence with Moran Creek. The proposed activities that may affect fisheries resources in the Hay Creek assessment area are (1) upland timber harvest, (2) existing forest road maintenance, and (3) existing forest road utilization for timber hauling and equipment transportation. (No riparian harvest would occur adjacent to fish-bearing and non-fish-bearing perennial or intermittent streams in the assessment area.) The fisheries resource variables potentially affected by the proposed actions are channel forms, sediment and flow regime. Existing effects to flow regime are discussed under General Existing Conditions.

Thirty-four road-stream crossings occur in the assessment area; 1.2 road-stream crossings per square mile occur in the assessment area. The length of all roads within 300 feet of all streams is 9.6 miles. The density of adjacent roads is 0.3 miles per square mile in the assessment area. No road problems exhibiting moderate or high impacts to water or fisheries resources were observed during field work for the project. While the precise level and extent of impact from each individual road-stream crossing or adjacent road is unknown, the expected existing direct and indirect impact to sediment from road sources is low in the assessment area.

Moran Creek Assessment Area – Specific Existing Conditions

The entire Moran Creek watershed defines the boundary of this assessment area. The proposed activities that may affect fisheries resources in the Moran Creek assessment area are: (1) upland, RMZ and SMZ timber harvest, (2) permanent forest road maintenance, and (3) permanent forest road utilization for timber hauling and equipment transportation. Approximately 2,750 feet of commercial timber harvest would occur up to, but not within, 100 feet of both sides of one perennial, fish-bearing stream, and SMZ timber harvest would occur adjacent to numerous intermittent, Class 2 and 3 streams; however, these proposed activities are not expected to affect woody debris recruitment or stream temperatures during peak seasonal periods in fish-bearing or other perennial, contributing reaches. The fisheries resource variables potentially affected by the proposed actions are channel forms, sediment, flow regime, stream shading, and stream temperature. Existing effects to flow regime are discussed under General Existing Conditions.

Thirty-five road-stream crossings occur in the assessment area; 3.0 road-stream crossings per square mile occur in the assessment area. The length of all roads within 300 feet of all streams is 9.4 miles. The density of adjacent roads is 0.8 miles per square mile in the assessment area. No road problems exhibiting moderate or high impacts to water or fisheries resources were observed during field work for the project. While the precise level and extent of impact from each individual road-stream crossing or adjacent road is unknown, the expected existing direct and indirect impact to sediment from road sources is low in the assessment area.

Riparian vegetation within 92 feet of perennial streams is the primary influence on in-channel frequency of woody debris, stream shading and stream temperature. (The average site-potential-tree-height at 100 years for dominant and co-dominant riparian tree species in the assessment area is 92 feet.) The estimated area within 92 feet of perennial streams that has been affected by all roads and past land management activities is 33 acres. (This value does not include areas affected by natural disturbances.) The percentage of total riparian zone affected within the assessment area is 12 percent. While the level of impact from each affected riparian zone is unknown, the expected existing direct and indirect impact to both woody debris and stream temperature is low in the assessment area.

West Face Drainages Assessment Area – Specific Existing Conditions

The West Face Drainages assessment area defines the boundary of all small drainages west of the North Fork Flathead River, south of the Hay Creek and Moran Creek confluence, and north of Big Creek. The proposed activities that may affect fisheries resources in the West Face Drainages assessment area are: (1) upland, RMZ and SMZ timber harvest, (2) temporary forest road construction, reclamation and maintenance, (3) construction of 2 temporary road-stream crossing structures, (4) permanent forest road maintenance, (5) permanent and temporary forest road utilization for timber hauling and equipment transportation, and (6) one existing road-stream crossing structure removal and associated stream restoration on a perennial, non-fish-bearing stream. The fisheries resource variables potentially affected by the proposed actions are channel forms, sediment, flow regime, stream shading, and stream temperature. Existing effects to flow regime are discussed under General Existing Conditions.

Twenty-six road-stream crossings occur in the assessment area; 3.3 road-stream crossings per square mile occur in the assessment area. The length of all roads within 300 feet of all streams is 7.9 miles. The density of adjacent roads is 1.0 miles per square mile in the assessment area. No road problems exhibiting moderate or high impacts to water or fisheries resources were observed during field work for the project. While the precise level and extent of impact from each individual road-stream crossing or adjacent road is unknown, the expected existing direct and indirect impact to sediment from road sources is low in the assessment area.

Riparian vegetation within 92 feet of perennial streams is the primary influence on in-channel frequency of woody debris, stream shading and stream temperature. (The average site-potential-tree-height at 100 years for dominant and co-dominant riparian tree species in the assessment area is 92 feet.) The estimated area within 92 feet of perennial streams that has been affected by all roads and past land management activities is 30 acres. (This value does not include areas affected by natural disturbances.) The percentage of total riparian zone affected

within the assessment area is 15 percent. While the level of impact from each affected riparian zone is unknown, the expected existing direct and indirect impact to both woody debris and stream temperature is low in the assessment area.

All Assessment Areas – Existing Cumulative Impacts

Other existing impacts to fisheries resources in all of the assessment areas include: (1) moderate to high impacts to native fish species through displacement and hybridization by nonnative species (in all assessment areas except West face Drainages); (2) road-stream crossings that likely affect habitat connectivity; and (3) recreational fishing pressures (in all assessment areas except West face Drainages). Past potential effects from forest management activities performed on all land ownerships are included in the assessment of existing direct and indirect effects. The combination of direct and indirect effects and other existing impacts are expected to have an existing moderate to high cumulative impact to fisheries resources in the Cyclone Creek, Hay Creek and Moran Creek assessment areas; an existing low cumulative impact is expected in the West Face Drainages assessment area. The moderate to high existing cumulative impact is weighted in large part due to the profound impact on the assemblage and biodiversity of native fish species in the Cyclone Creek, Hay Creek and Moran Creek assessment areas. As physical habitat impacts vary in magnitude and scale throughout the watersheds, the existing biological component of fisheries resources has been completely – and likely irreversibly – altered across the entire extent of these three assessment areas.

Environmental Effects

The environmental effects section will compare the existing conditions to the anticipated effects of the proposed No-Action and Action Alternatives to determine the foreseeable impacts to associated fisheries resources.

No-Action Alternative

All Assessment Areas: Direct, Indirect, and Cumulative Effects

As a result of implementing the No-Action Alternative, no additional direct or indirect effects to fisheries resources would be expected to occur within the assessment area beyond those described in the Existing Conditions.

Future-related actions considered part of cumulative impacts include (1) other forest management practices; (2) continued moderate to high impacts to native fish species by nonnative species (in all assessment areas except West face Drainages); (3) a stable to declining number of road-stream crossings that affect habitat connectivity; and (4) stable to increasing recreational fishing pressures. Open, public roads that intersect the analysis areas will continue to be utilized year-round for forest management, recreation and other purposes.

Consequently, foreseeable cumulative impacts to fisheries resources are expected to be similar to those described in Existing Conditions.

Action Alternative

All Assessment Areas: General Direct and Indirect Effects

The proposed actions and affected fisheries resources in all assessment areas are broadly described in the Introduction. Project-specific BMPs and road maintenance would be applied to all segments of the haul routes throughout the assessment areas (see Water Resources analysis). All impact descriptions are short-term unless otherwise noted.

Increased truck traffic can accelerate the mobilization and erosion of roadbed material at road-stream crossings and roads located adjacent to streams. However, through the implementation of project-specific BMPs and road maintenance, the associated road sites would be expected to deliver most mobilized sediment away from the stream and road prism and filter eroded material through roadside vegetation.

Upland harvest on sites with risk of erosion may mobilize material that could be delivered to adjacent stream channels; however, the Water Resources analysis indicates that the anticipated impacts from this action are expected to be negligible to low in all assessment areas. This assessment takes into consideration the implementation of the SMZ Law and Rules and supplemental ARMs for Forest Management.

Cyclone Creek Assessment Area: Specific Direct, Indirect and Cumulative Effects

No road-stream crossings intersect the haul route in the assessment area. No existing roads within 300 feet of any stream would be used, and no road construction within 300 feet of a perennial channel would occur. Project-specific BMPs and road maintenance would be expected to substantially offset the risk of increased sediment delivery due to project-specific vehicle traffic, and negligible impacts to sediment are expected in the assessment area.

As described in the Water Resources analysis, the proposed timber harvest is expected to result in negligible increases in water yield or consequent changes in flow regime.

As part of the consideration of cumulative effects, all direct, indirect and other related impacts described in the Existing Conditions and Environmental Effects for the No-Action Alternative would be expected to continue. Additionally, negligible direct and indirect impacts may occur to channel forms. Considering all of these impacts collectively, moderate to high cumulative impacts to fisheries resources are expected in the assessment area. The foreseeable cumulative effects to fisheries resources as a result of implementing the proposed actions are fundamentally unchanged from the existing conditions. Compared to the No-Action Alternative, (1) negligible additional cumulative effects to fisheries resources would be expected, (2) cumulative effects would remain elevated primarily due to the presence and consequent adverse impacts from nonnative fish species, and (3) the elevated cumulative effects would be expected to occur regardless of whether or not the Action Alternative is selected.

Hay Creek Assessment Area: Specific Direct, Indirect and Cumulative Effects

The number of road-stream crossings intersecting the haul route in the assessment area is 1. The assessment area has an existing road-stream crossing density of 1.2 sites per square mile, and the Action Alternative would utilize 3 percent of all road-stream crossings across the

assessment area. The length of roads that would be used within 300 feet of all streams is 0.1 miles. The percentage of roads that would be used in the assessment area within 300 feet of all streams is 1 percent. No road construction within 300 feet of a perennial channel would occur. Project-specific BMPs and road maintenance would be expected to substantially offset the risk of increased sediment delivery due to project-specific vehicle traffic, and negligible to low impacts to sediment are expected in the assessment area.

As described in the Water Resources analysis, the proposed timber harvest is expected to result in negligible increases in water yield or consequent changes in flow regime.

As part of the consideration of cumulative effects, all direct, indirect and other related impacts described in the Existing Conditions and Environmental Effects for the No-Action Alternative would be expected to continue. Additionally, negligible to low direct and indirect impacts may occur to channel forms. Considering all of these impacts collectively, moderate to high cumulative impacts to fisheries resources are expected in the assessment area. The foreseeable cumulative effects to fisheries resources as a result of implementing the proposed actions are fundamentally unchanged from the existing conditions. Compared to the No-Action Alternative, (1) negligible to low additional cumulative effects to fisheries resources would be expected, (2) cumulative effects would remain elevated primarily due to the presence and consequent adverse impacts from nonnative fish species, and (3) the elevated cumulative effects would be expected to occur regardless of whether or not the Action Alternative is selected.

Moran Creek Assessment Area: Specific Direct, Indirect and Cumulative Effects

The number of road-stream crossings intersecting the haul route in the assessment area is 5. The assessment area has an existing road-stream crossing density of 3.0 sites per square mile, and the Action Alternative would utilize 14 percent of all road-stream crossings across the assessment area. The length of roads that would be used within 300 feet of all streams is 2.1 miles. The percentage of roads that would be used in the assessment area within 300 feet of all streams is 22 percent. No road construction within 300 feet of a perennial channel would occur. Although project-specific BMPs and road maintenance would be expected to substantially offset the risk of increased sediment delivery due to project-specific vehicle traffic, low impacts to sediment are expected in the assessment area.

Approximately 415 acres in the assessment area (6 percent of the watershed) would be harvested. As noted in the Water Resources analysis, this level of harvest may lead to slight increases in water yield or changes in flow regime, which can positively or negatively affect fisheries resources. For instance, while elevated water yields may increase slow and rearing fisheries habitats at base flows and help sustain lower peak seasonal stream temperatures, increases in peak seasonal flows may also exacerbate in-stream sedimentation rates. However, the foreseeable levels of effects to these variables are expected to be negligible and within the range of historic conditions.

Riparian harvest of 50 percent of merchantable trees between 50 and 92 feet away from non-fish-bearing perennial streams would occur in the assessment area. [No riparian harvest would occur within 0 to 50 feet of any non-fish-bearing perennial, Class 1 streams.] An analysis of this same riparian harvest prescription in the Environmental Impact Statement for the Forested State

Trust Lands Habitat Conservation Plan indicates a low risk of impacts to woody debris and stream shading (and stream temperatures affected by direct solar radiation). The proportion of affected riparian area within the assessment area is approximately 1 percent. Due to the very limited magnitude and extent of this management action, a negligible impact to woody debris and stream shading is expected in the assessment area.

Due to the potential effects to riparian shading, a consequent negligible impact to stream temperature is also expected in the assessment area.

As part of the consideration of cumulative effects, all direct, indirect and other related impacts described in the Existing Conditions and Environmental Effects for the No-Action Alternative would be expected to continue. Additionally, low direct and indirect impacts may occur to channel forms. Considering all of these impacts collectively, moderate to high cumulative impacts to fisheries resources are expected in the assessment area. The foreseeable cumulative effects to fisheries resources as a result of implementing the proposed actions are fundamentally unchanged from the existing conditions. Compared to the No-Action Alternative, (1) low additional cumulative effects to fisheries resources would be expected, (2) cumulative effects would remain elevated primarily due to the presence and consequent adverse impacts from nonnative fish species, and (3) the elevated cumulative effects would be expected to occur regardless of whether or not the Action Alternative is selected.

West Face Drainages Assessment Area: Specific Direct, Indirect and Cumulative Effects

The number of road-stream crossings intersecting the haul route in the assessment area is 11 (including 2 new temporary crossings). The assessment area would have a road-stream crossing density of 3.6 sites per square mile, and the Action Alternative would utilize 39 percent of all road-stream crossings across the assessment area. The length of roads that would be used within 300 feet of all streams is 3.9 miles. The percentage of roads that would be used in the assessment area within 300 feet of all streams is 49 percent (including new, temporary road construction). Although project-specific BMPs and road maintenance would be expected to substantially offset the risk of increased sediment delivery due to project-specific vehicle traffic, low to moderate impacts to sediment are expected in the assessment area.

A low impact to fisheries resources would occur from 0.9 miles of temporary road construction within 300 feet of perennial channel fish-bearing and non-fish-bearing streams. Moderate impacts to sediment would occur during the construction and removal phases of 2 temporary road-stream crossings on perennial, non-fish-bearing streams. Moderate impacts to sediment would also occur during the removal of 1 existing road-stream crossing on a separate perennial, non-fish-bearing stream; however, a long-term, positive impact to sediment and related fisheries resources is also expected downstream of the site.

Approximately 429 acres in the assessment area (9 percent of the watershed) would be harvested. As noted in the Water Resources analysis, this level of harvest may lead to slight increases in water yield or changes in flow regime, which can positively or negatively affect fisheries resources. For instance, while elevated water yields may increase slow and rearing fisheries habitats at base flows and help sustain lower peak seasonal stream temperatures, increases in peak seasonal flows may also exacerbate in-stream sedimentation rates. However,

the foreseeable levels of effects to these variables are expected to be negligible and within the range of historic conditions.

Riparian harvest of 50 percent of merchantable trees between 50 and 92 feet away from fish-bearing and non-fish-bearing perennial streams would occur in the assessment area. [No riparian harvest would occur within 0 to 50 feet of any fish-bearing and non-fish-bearing perennial, Class 1 streams.] An analysis of this same riparian harvest prescription in the Environmental Impact Statement for the Forested State Trust Lands Habitat Conservation Plan indicates a low risk of impacts to woody debris and stream shading (and stream temperatures affected by direct solar radiation). The proportion of affected riparian area within the assessment area is 15 percent. Due to the limited magnitude and extent of this management action, a low impact to woody debris and stream shading is expected in the assessment area.

Due to the potential effects to riparian shading, a consequent low impact to stream temperature is also expected in the assessment area.

As part of the consideration of cumulative effects, all direct, indirect and other related impacts described in the Existing Conditions and Environmental Effects for the No-Action Alternative would be expected to continue. Additionally, low to moderate direct and indirect impacts may occur to channel forms, and low direct and indirect impacts may occur to stream temperature as a result of implementing the proposed actions. Considering all of these impacts collectively, additional low to moderate cumulative impacts to fisheries resources are expected in the assessment area.

Fisheries Resource Mitigations

Fisheries-related resource mitigations that would be implemented with the proposed Action Alternative include applying all applicable Forestry BMPs (including the SMZ Law and Rules) and Forest Management Administrative Rules for fisheries, soils, and wetland riparian management zones (ARMs 36.11.425 and 36.11.426).

Attachment VII:

WILDLIFE ANALYSIS

Assessment Prepared By: Chris Forristal
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INTRODUCTION

This analysis discloses the existing condition of relevant wildlife resources, and displays the anticipated effects that may result from each alternative of this proposal. There is a general discussion on the analysis areas and analysis methods employed to disclose the anticipated direct, indirect, and cumulative effects to these wildlife resources in the analysis area from the proposed actions. Past and current activities on all ownerships in each analysis area, as well as known planned future agency actions, have been taken into account for the cumulative effects analysis.

Considerations and concerns raised by DNRC specialists and public comments received during initial scoping for the proposed project led to the following list of issues:

- The proposed activities could decrease forested cover, which may reduce habitat connectivity and suitability for wildlife species associated with mature forest.
- The proposed activities could reduce the abundance of snags and coarse woody debris, which could lower habitat quality for species that depend on these structural attributes.
- The proposed activities could result in the modification of habitat preferred by Canada lynx (*Felis lynx*) and decrease the area's suitability for lynx.
- The proposed activities could alter grizzly bear (*Ursus arctos*) cover, reduce secure areas, and increase human access, which could adversely affect bears by displacing them from important habitats and/or increase risk of human-caused bear mortality.
- The proposed activities could reduce bald eagle nesting and perching habitats and/or disturb nesting bald eagles (*Haliaeetus leucocephalus*).
- The proposed activities could decrease habitat suitability for fishers (*Martes pennanti*) by decreasing canopy cover in mature forest stands, decreasing abundance of snags and coarse woody debris, and by increasing roads, which could elevate risk of trapping mortality.
- The proposed activities could displace gray wolves (*Canis lupus*) from the vicinity of the project area, particularly denning and rendezvous sites, and/or alter big game prey availability, which could adversely affect gray wolves.
- The proposed activities could negatively affect pileated woodpecker (*Dryocopus pileatus*) habitat suitability by removing canopy cover and snags used for foraging and nesting, and by creating disturbance.

- The proposed activities could reduce habitat quality for big game, especially during the fall hunting and winter seasons, by removing forest cover, increasing roads in secure areas, and disturbing animals.

ANALYSIS AREAS

The discussions of existing conditions and environmental effects will focus on two different spatial scales. The first scale will be the "project area," which was used to assess direct and indirect effects to wildlife species and their habitats. The "project area," totaling 2,901 acres, consists of portions of sections 3, 4, 10, 11, 14, and 15 in Township 34 North, Range 21 West. This project area surrounds the proposed timber harvest units and is the area where all proposed new road construction would occur. The project area consists of lands included in DNRC's Habitat Conservation Plan (HCP). Elevation within the project area ranges between 3,480 and 5,440 feet. The proposed project area contains a variety of slope aspects and wildlife habitats.

The second scale is the "cumulative effects analysis area," which refers to the surrounding landscape for assessing cumulative effects to wildlife species and their habitat. Cumulative effects analysis areas (CEAAs) are named according to the size of the area and are summarized in TABLE W-1 –WILDLIFE ANALYSIS AREAS and FIGURE W-1 – WILDLIFE ANALYSIS AREAS. CEAAs include the project area as well as lands managed by other agencies and private landowners. Detailed descriptions of each analysis area are located in the **Existing Environment** section for each issue or wildlife species evaluated. In general, CEAAs were delineated to approximate the size of a focal species' home range or to approximate a surrounding landscape in which the proposed activities could most likely have measureable cumulative effects to wildlife habitat. See FIGURE W-1- WILDLIFE ANALYSIS AREAS for a map showing the project and cumulative effects analysis areas.

TABLE W-1. WILDLIFE ANALYSIS AREAS. *Descriptions of the project area and CEAAs.*

ANALYSIS AREA NAME	DESCRIPTION	TOTAL ACRES	ISSUE(S)/SPECIES ANALYZED
Project Area	DNRC managed lands in sections 3, 4, 10, 11, 14, and 15 in Township 34 North, Range 21 West.	2,901	direct & indirect effects for all issues/species
Small CEAA	The project area and sections surrounding it, bordered by the North Fork Flathead River to the east.	10,897	mature forests and connectivity, snags and coarse woody debris, and pileated woodpeckers
Bald Eagle CEAA	The home range of the Cyclone bald eagle territory.	12,566	bald eagles

Canada Lynx CEAA	The Coal Creek Lynx Management Area (LMA).	15,238	Canada lynx
Large CEAA	The State Coal Cyclone grizzly bear management unit (BMU) subunit and portions of the Hay Creek grizzly bear management unit (BMU) subunit.	52,630	grizzly bears, fishers, gray wolves, and big game

In December 2011, DNRC adopted a Habitat Conservation Plan (HCP) in cooperation with the USFWS to minimize potential impacts of the Forest Management Program to grizzly bears, Canada lynx and three species of fish. As a part of the HCP, DNRC agreed to limit road construction and use for 50 years in a transportation plan developed for blocked forestlands managed by the DNRC Stillwater Unit. This comprehensive access plan is called the Stillwater Block Transportation Plan and includes blocked lands on the Stillwater and Coal Creek State Forests. The effects to wildlife associated with the full transportation plan were analyzed in the DNRC HCP EIS (USFWS and DNRC 2010). This effects assessment tiers to the detailed analyses contained in those documents.

ANALYSIS METHODS

DNRC attempts to promote biodiversity by taking a coarse-filter approach, which favors a mix of stand structures and compositions on state lands (ARM 36.11.404). Appropriate stand structures are based on ecological characteristics (e.g., landtype, habitat type, disturbance regime, unique characteristics). A coarse-filter approach assumes that if landscape patterns and processes are maintained similar to those with which the species evolved, the full complement of species would persist and biodiversity would be maintained. This coarse-filter approach supports diverse wildlife populations by managing for a variety of forest structures and compositions that approximate historic conditions across the landscape. DNRC cannot assure that the coarse-filter approach will adequately address the full range of biodiversity; therefore, DNRC also employs a fine-filter approach for threatened, endangered, and sensitive species (ARM 36.11.406). The fine-filter approach focuses on habitat requirements of several individual species.

To assess the existing condition of the proposed project area and surrounding landscape, a variety of information and techniques were used. Field visits, scientific literature, DNRC's stand level inventory (SLI) data, aerial photographs, USDA Forest Service Geographical Information System (GIS) data, Montana Natural Heritage Program (MNHP) data, and consultations with other professionals provided information for the following discussion and effects analysis. Specialized methodologies are discussed under the species in which they occur. Species were dismissed from further analysis if habitat did not exist in the project area, or the species would not be affected by either alternative.

Cumulative effects analyses account for known past and current activities, as well as planned future agency actions. Ongoing and proposed timber sale projects that could contribute to cumulative effects are summarized in TABLE W-2 RECENT AND PROPOSED PROJECTS.

TABLE W-2. RECENT AND PROPOSED PROJECTS. *Recent and proposed timber harvest projects that could contribute to cumulative effects and the number of harvested acres that occur in each analysis area.*

Sale Name	Agency	Status	Project Area	Bald Eagle CEAA	Canada Lynx CEAA	Large CEAA
Hay-Mor Stewardship Project	USDA Forest Service	Completed 2013	-	-	-	399

Changes to vegetation and forest structure resulting from all DNRC projects have been accounted for in SLI data used for this analysis. The effects of any ongoing projects on wildlife will be discussed in cumulative effects analyses.

RELEVANT AGREEMENTS, LAWS, PLANS, RULES, AND REGULATIONS

Various policy and procedural documents provide the foundation for management criteria pertaining to wildlife and their habitat on state lands. The documents most pertinent to this project include *DNRC Forest Management Rules*, *DNRC Forested Trust Lands Final Environmental Impact Statement and Habitat Conservation Plan* (hereafter HCP), the *Endangered Species Act*, the *Migratory Bird Treaty Act*, and the *Bald and Golden Eagle Protection Act*.

COARSE FILTER WILDLIFE ANALYSIS

MATURE FORESTED HABITAT AND LANDSCAPE CONNECTIVITY

Issue: The proposed activities could decrease forested cover, which may reduce habitat connectivity and suitability for wildlife species associated with mature forest.

Introduction

A variety of wildlife species rely on older, mature forests to meet some or all of their life history requirements. Mature forests, generally characterized by abundant large diameter trees and dense canopy cover, play an important role in providing food, shelter, breeding sites, resting areas, and/or travel corridors for certain animals. Wildlife use of older, mature forests is species-specific; some species use this habitat exclusively, other species only temporarily or seasonally, and some species avoid mature forests altogether. Several species known to be strongly associated with mature and old forests include American marten (*Martes americana*), northern goshawk (*Accipter gentilis*), and winter wrens (*Troglodytes troglodytes*).

Forested landscapes in the western United States were historically shaped by natural disturbance events; primarily wildfire, blowdown, and pest outbreaks. Resulting broad landscape patterns were a mosaic of forest patches varying in age, composition and development. Timber harvest, like stand-replacement fire and blowdown, is a disturbance event that can create open, non-forested patches that over time develop into young, conifer forests. Patch size, age, shape, abundance, and distance to similar patches (connectivity) can be factors influencing wildlife use. The way through which patch characteristics influence wildlife use and distribution are dependent upon the particular species and its habitat requirements. Temporary non-forested openings, patches, and forest edges created by timber harvest and associated roads may be avoided by certain wildlife species adapted to mature, well-stocked forest. In contrast, other wildlife species flourish in early seral habitats created by disturbance. Connectivity under historical fire regimes within forest types found in the vicinity of the project area was likely relatively high as fire differentially burned various habitats across the landscape (Fischer and Bradley 1987).

Analysis Areas

Direct and indirect effects were analyzed on the project area (2,901 acres). Cumulative effects were analyzed on the surrounding sections directly adjacent to the proposed project area sections and east of the North Fork Flathead River (small CEAA = 10,897 acres, see FIGURE W-1 – WILDLIFE ANALYSIS AREAS). This scale of analysis would be large enough to support a diversity of species that use mature forested habitat and/or require connected forested habitats and centers evaluation of cumulative effects on those areas most likely to be affected by the proposed action.

Analysis Methods

Mature forested habitats and landscape connectivity were assessed using field evaluations, DNRC's stand level inventory (SLI) data, aerial-photograph interpretation, USDA Forest Service data (VMap 9.1.1), and GIS analysis. Mature forested habitat was defined as forest stands typically >100 years old with ≥40% canopy cover comprised primarily of trees >9 inches dbh. Forested stands containing trees of at least this size and density were considered adequate for providing minimal conditions necessary to facilitate movements of many wildlife species that benefit from well-connected mature forest conditions across the landscape. Road density was calculated in linear miles per square mile by dividing the number of road miles by the specified analysis area in square miles. Factors considered in the analysis include: 1) availability of mature forested habitats (≥40% canopy cover, >9 inches dbh), 2) average patch size, 3) the degree of timber harvesting, 4) open and restricted road density, and 5) the availability of potential travel corridors.

Existing Environment

The project area currently contains approximately 1,455 acres (50.2% of project area) of Douglas-fir/western larch and mixed-conifer stands that have a reasonably well-developed canopy (≥40% crown closure). Approximately 135 acres (4.7% of project area) consist of mature stands with a more open canopy (<40% crown closure) within the project area. Small scattered clearings,

wetlands, and roads occupy another 17 acres of the project area. The 1,455 acres of well-stocked, mature forest stands are well-connected within the proposed project area, with one 1,450-acre patch and three additional small patches less than 3 acres in size (average patch size = 364 acres, see FIGURE W-2 - MATURE FORESTED HABITAT AND LANDSCAPE CONNECTIVITY CORRIDORS). Approximately 113 acres of old-growth forest, as defined by Green et al. (1992), are present within the proposed project area. Harvesting activities in the late 1970's and early 1980's have resulted in approximately 799 acres (27.5% of project area) of densely stocked, regenerating forest within the project area. Regenerating conifers within these stands are on average 10 to 20 feet tall and crown closure is generally over 60%. Additionally, approximately 368 acres (12.7% of project area) were burned by high-severity wildfire in 2001. The majority of these burned acres contain dense patches of regenerating conifers less than 6 feet tall.

Approximately 15.2 miles (3.4 miles/sq. mile) of roads exist in the project area (see TABLE W-4 – ROAD MANAGEMENT AND CONSTRUCTION). Within the project area, 1.1 miles of road are open to public motorized use and 14.1 miles are currently restricted to non-motorized use by the public. Of the 1.1 miles of open roads, approximately 0.8 miles of primary county road (North Fork Road) passes through the project area. Of the 14.1 miles of restricted road within the project area, over one third are ingrown or sufficiently brushed in as to prevent use by authorized motorized vehicles. Due to abundant mature forest cover and existing road attributes, habitat connectivity for species using older (100+ years), undisturbed forest is fair to good within the project area (see FIGURE W-2 - MATURE FORESTED HABITAT AND LANDSCAPE CONNECTIVITY CORRIDORS).

Abundance and locations of mature, well-stocked forest within the small CEAA is influenced by land ownership patterns, existing cover types past timber harvest, and recent large-scale wildfire. Lands within the small CEAA are comprised of DNRC (54.7%), USDA Forest Service (25.5%), National Park Service (1.2%), and other private owners (18.6%). Presently, 39.1 percent (4,258.3 acres) of the small CEAA contains relatively well-connected mature forest stands possessing ≥40% crown closure. Most of these stands occur on DNRC and Forest Service lands within the small CEAA. Average patch size of mature forest in the small CEAA is 84 acres (51 patches, range 0.6 to 2,766 acres). Landscape connectivity of mature forest stands within the CEAA moderate, with four patches over 100 acres in size accounting for 3,714 acres (87.2%) of these stands throughout the western half of the CEAA. The number and distribution of smaller mature forest patches within the CEAA is primarily a result of growing conditions in the North Fork Flathead River floodplain and recent wildfires, which have burned approximately 2,478 acres (22.7%) of the CEAA since 1988. About 2,026 acres of the CEAA (18.6%) has been harvested with regeneration-type treatments within the last 40 years. These lands consist of young, regenerating forest with few large scattered trees and do not provide suitable habitat for species that utilize well-stocked, mature forests. Cleared home sites, pastures, dry upland meadows, wetland/riparian meadows, and lakes comprise 963 acres (8.8%) of the CEAA.

Approximately 47.7 miles (2.8 miles/sq. mile) of DNRC roads exist within the CEAA. Of these roads, there are 23.9 miles of open roads that equate to a density of 1.4 mile/square mile. These roads are primarily residential access roads, county roads, and lesser amounts of forest roads

used for logging and recreational activities within the surrounding area. Across the CEAA, mature forest habitat and landscape connectivity are low to moderate for species that require and/or prefer these conditions.

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative on Mature Forested Habitat and Connectivity

Under this alternative no timber harvesting activities would occur. This would result in: 1) no changes to existing stands; 2) no appreciable changes to forest age, the distribution of forested cover, or landscape connectivity; and 3) no changes to wildlife use. Thus, no direct or indirect effects to mature forested habitat suitability and connectivity would be expected.

Direct and Indirect Effects of the Action Alternative on Mature Forested Habitat and Connectivity

Under the Action Alternative, approximately 643 acres (22.2% of the project area) would be harvested. Of these acres, 566 acres (19.5% of the project area) of dense, mature forest would undergo harvesting (see TABLE W-3 – MATURE FORESTED HABITAT). Approximately 378 acres of mature forest would receive regeneration harvest treatments that would reduce overstory crown closure from ≥40% to 5-15% and increase mature tree spacing to 55-70 feet. Species that rely on these mature forested habitats would experience a reduction in habitat for 50-80 years. Another 188 acres of mature, well-stocked forest would receive intermediate harvest treatments that would reduce overstory crown closure from ≥40% to 40% and increase mature tree spacing to 30 feet. Stands receiving intermediate treatments would experience a reduction in habitat for approximately 20-30 years. An additional 230 acres of pre-commercial thinning would not affect mature forested habitat. No old-growth forest would be harvested under the Action Alternative. Under the proposed silvicultural prescriptions, residual trees would be healthy seral species (e.g. western larch, Douglas-fir). Existing patches of regenerating conifers would be retained where available and feasible, which would provide a measure of structural complexity to treated stands. Average mature forest patch size would be reduced from 364 acres (4 patches) to 89 acres (10 patches). The largest patch size found within the project area would be reduced from 1,450 acres to 863 acres. Remaining mature forest would continue to be distributed throughout the project area and connectivity would primarily be retained along riparian areas in a linear fashion (see FIGURE W-2 - MATURE FORESTED HABITAT AND LANDSCAPE CONNECTIVITY CORRIDORS). Approximately 889 acres (30.6%) of mature forest in the project area would remain unharvested and could provide suitable habitat for species utilizing smaller patches of well-stocked forest, particularly those associated with riparian areas. The largest remaining unharvested patch would remain connected to a larger 2,200-acre patch of mature forest outside of the project area. After harvesting, the project area would continue to provide a variety of forested habitat conditions for wildlife, but the proportions of these habitats would change. Species preferring larger continuous patches of well-stocked mature forest would likely experience a reduction in habitat quality, as 566 acres would be altered and the amount of edge habitat would increase under the proposed harvesting. After harvest completion, the amount of young, regenerating forest

stands would increase. However, approximately 751 acres of well-stocked, regenerating forest would continue to develop and will likely provide appreciable amounts of mature forest cover within the next 30 to 50 years. In general, under this alternative, habitat conditions would improve for species adapted to more open forest conditions with seral species, while reducing habitat quality for species that prefer dense, mature forest habitats.

TABLE W-3 – MATURE FORESTED HABITAT. *Existing acres, proposed harvest acres, and percentages of mature forested habitat possessing ≥40% canopy closure within the project area and cumulative effects analysis area.*

Analysis Area	Total Acres	Mature Forested Habitat Present (% area)	Proposed Harvest Under Action Alternative (% area)	Mature Forested Habitat Post-Harvest (% area)
Project Area	2,901	1,455.3 (39.1%)	566.0 (19.5%)	889.3 (30.7%)
Small Cumulative Effects Analysis	10,897	4,258.3 (39.1%)	566.0 (5.2%)	3,692.3 (33.9%)

Under the Action Alternative, up to 1.7 miles of new temporary road would be constructed. No new permanent roads would be built under the Action Alternative. During harvest activities, up to 11.8 miles of road (open, restricted and temporary) within the project area could receive use and have elevated traffic levels (see TABLE W-4 – ROAD MANAGEMENT AND CONSTRUCTION). Open road density would increase from 0.3 miles/sq. mile to 2.6 miles/sq. mile during harvest activities. All 14.1 miles of currently restricted road within the project area would remain restricted to public motorized use during and after harvest activities. Temporary roads would be reclaimed and closed to all motorized vehicles following project use. Thus, at the conclusion of the proposed project, the total amount of roads within the project area would remain the same as pre-project levels (see TABLE W-4 – ROAD MANAGEMENT AND CONSTRUCTION).

Thus, moderate direct and indirect effects to connectivity and suitability of mature forested habitat in the project area would be expected since: 1) harvesting would appreciably reduce tree density and existing cover on approximately 566 acres (38.9%) of existing available mature stands; 2) connectivity of mature forest would be altered, with an increase in the number of patches from 4 to 10 and a decrease in average patch size from 364 acres to 89 acres, however the largest existing patch would be reduced from 1,450 acres to 863 acres (a 40.5% change); 3) a measure of connectivity would be maintained on 889 acres (30.7% of project area) of mature forest along riparian areas; and 4) short-term open road density would increase by 2.5 miles/sq. mile for up to three years, but long-term total road density would not change.

TABLE W-4 – ROAD MANAGEMENT AND CONSTRUCTION. *Miles and density (miles/square mile) of existing road and new road that would be used in the project area under the proposed Action Alternative.*

Road Types	Existing Condition Road Miles (mi./sq. mi.)	During Proposed Activities Road Miles (mi./sq. mi.)	After Proposed Activities Road Miles (mi./sq. mi.)
Open	1.1 (0.3)	10.1[a] (2.2)	1.1 (0.3)
Restricted Road	14.1 (3.1)	5.1 (1.1)	14.1 (3.1)
Temporary Road	0 (0)	1.7 (0.4)	0 (0)
Total Roads	15.2 (3.4)	17 (3.7)	15.2 (3.4)

[a] *Of the 11.8 miles of road that would be functionally open during activities, 1.1 miles would be open for public motorized access.*

Cumulative Effects of the No-Action Alternative on Mature Forested Habitat and Connectivity

Under this alternative no timber harvesting activities would occur. Thus: 1) no changes to existing stands would occur, 2) no further changes to the suitability of mature forested cover or connectivity would be anticipated, and 3) no changes to wildlife use would be expected. Past and ongoing forest management projects have affected mature forest wildlife habitat in the CEAA, and other proposed projects could affect mature forest habitat in the future (see TABLE W-2 – RECENT AND PROPOSED PROJECTS). No additional cumulative effects to connectivity and suitability of mature forested habitat are expected to result from the No-Action Alternative that could affect wildlife in the CEAA.

Cumulative Effects of the Action Alternative on Mature Forested Habitat and Connectivity

Proposed harvesting would alter 566 acres (19.5% of the CEAA) of mature forest stands within the CEAA (see TABLE W-3 – MATURE FORESTED HABITAT). This harvest would result in a reduction of 13.3% of the total 4,258 acres of mature forest habitat currently available. Reductions in mature forested habitats associated with this alternative would be additive to losses associated with past harvesting activities, recent wildfire, and any ongoing activities within the CEAA (see TABLE W-2 - RECENT AND PROPOSED PROJECTS). Across the CEAA, 33.9% of mature, forested habitats would remain and landscape connectivity would be altered to a minor degree given the existing condition of the surrounding forested landscape. Existing landscape connectivity would be reduced, however, as the number of mature forest patches would increase from 51 to 57. Average patch size would decrease from 84 acres to 65 acres. The largest mature patch (2,766 acres) within the CEAA would be reduced by 566 acres, but would remain connected to the largest patch within the project area and to mature forest outside of the CEAA. Habitat for species associated with dense, mature stands would be reduced in the CEAA, however, the remaining unharvested stands would be expected to provide adequate habitat for wildlife preferring mature, well-stocked forest. Approximately 1,373 acres (12.6% of the CEAA) of forest harvested in the 1970s and early 1980s would continue to develop and

could provide mature forest habitat within the next 30 to 50 years. Wildlife species using and preferring young forest stands in the CEAA would benefit from increases in habitat within the project area for 10-30 years post-harvest.

In addition to the 11.8 miles of potential road use within the project area, approximately 3.2 miles of open road and 0.5 miles of restricted road could receive appreciable amounts of increased traffic within the CEAA. Thus, a total of 15.5 miles of combined open, restricted and temporary roads would see additional use within the CEAA during project activities. Proposed harvesting and associated activities could temporarily increase (up to 4 years) open road density within the CEAA from 1.4 miles/sq. mile to 2.1 miles/sq. mile. After project completion, open road density would be return to 1.4 miles/sq. mile. Thus, minor adverse cumulative effects to mature forested habitat suitability and connectivity for wildlife would be expected in the CEAA since: 1) harvesting would remove 566 acres (13.3%) of existing mature forest in the CEAA and average patch size would be reduced from 84 acres to 65 acres; 2) current availability of mature, closed canopy habitat would be reduced but connectivity would be altered to a minor degree; 3) mature forest connectivity of the largest patch in the CEAA would be maintained, especially through riparian areas; and 4) no new permanent roads would be built and long-term open road density would not change within the CEAA.

SNAGS AND COARSE WOODY DEBRIS

Issue: The proposed activities could reduce the abundance of snags and coarse woody debris, which could lower habitat quality for species that depend on these structural attributes.

Introduction

Snags and coarse woody debris are important components of forested ecosystems. The following are five primary functions of snags and downed logs in forest ecosystems: 1) increase structural diversity, 2) alter the canopy microenvironment, 3) promote biological diversity, 4) provide important habitat substrate for wildlife, and 5) act as storehouses for nutrient and organic matter recycling agents (Parks and Shaw 1996).

Snags and defective trees (e.g. partially dead, spike top, broken top) are used by a variety of wildlife species for nesting, denning, roosting, feeding, and cover. Snags and defective trees may be the most valuable individual component of Northern Rocky Mountain forests for wildlife species (Hejl and Woods 1991). The quantity, quality, and distribution of snags affect the presence and abundance of many wildlife species relying upon them. Snags provide foraging sites for insectivorous species and provide structures used by primary cavity-nesting species to excavate nests. The cavities created by primary excavators (i.e. woodpeckers) provide habitat for secondary cavity users, including other birds and small to mid-sized mammals. Snags and defective trees can also provide nesting sites for secondary cavity users where cavities are formed by broken tops and fallen limbs. Large, tall snags tend to provide nesting sites, while short snags and stumps tend to provide feeding sites (Bull et al. 1997). Many species that use small-diameter snags will also use large snags; however, the opposite is not true. Typically, old stands will have greater numbers of large snags. The density of snags is

another important indicator of habitat quality for some cavity-nesting species. Species such as the black-backed woodpecker tend to nest and forage in areas where snag densities are high, using one snag for nesting and others nearby for foraging and roosting.

Coarse woody debris provides food sources, areas with stable temperatures and moisture, shelter from the environment, lookout areas, and food-storage sites for several wildlife species. Several mammals rely on downed logs and snags for survival and reproduction. The size, length, decay, and distribution of woody debris affect the capacity of various species to meet their life requisites. Single, scattered downed trees can provide lookout and travel sites for squirrels or access under the snow for small mammals and weasels, while log piles may provide foraging sites for weasels and secure areas for snowshoe hares.

Analysis Areas

Direct and indirect effects were analyzed within the project area (2,901 acres). Cumulative effects were analyzed within the surrounding sections directly adjacent to the proposed project area (10,897 acres, see FIGURE W-1 – WILDLIFE ANALYSIS AREAS). Wildlife species associated with snags and coarse woody debris found in the small CEAA would be those most likely to be influenced by cumulative effects associated with nearby activities and proposed habitat alteration on the project area.

Analysis Methods

The abundance of snags and coarse woody debris were quantitatively estimated in potential harvest stands within proposed project area using 11 randomly placed plots 0.15 acres in size. Factors considered in the analysis included the level of proposed harvesting, past timber harvest, number and species of snags, and abundance of coarse woody debris.

Existing Environment

Analysis of sampling plots and field observations indicated snags within the project area occurred at a density of 10.8 snags per acre (range 0-59). The average diameter of all snags >8″ dbh was 17.4″ dbh (range 8-28″); and snag species varied depending upon the stand with the most prevalent snag species being Douglas-fir. A single snag ≥21″ dbh was documented within project area sampling plots. Snags were generally distributed unevenly; with some areas containing higher densities than others did. The distribution of large, high quality snags can be partially attributed to past harvesting and firewood gathering, as harvest has occurred on approximately 799 acres of the project area in the past. Conversely, snags are likely more abundant on 368 acres of project area recently burned by wildfire. Evidence of snag use for feeding and/or cavity building by wildlife was observed in most snags that were present in the project area. Coarse woody debris levels were also variable across the project area, averaging 19.9 tons per acre (range 1.2-58.7 tons per acre). Downed logs were generally small diameter (5.7″ at transect line, range 3-18″), although some larger logs were observed.

Overall, snags exist at current levels to exceed DNRC's minimum-retention thresholds (*ARM 36.11.411)*. Large diameter (>21″ dbh) snags and snag recruits are present within the project area. Coarse woody debris in the majority of the project area is present in appropriate amounts

for the current existing habitat types (Graham et. al. 1994). Thus, habitat quality for wildlife utilizing snags and/or coarse woody debris is likely moderate within the project area.

Similar to forested landscapes lacking timber harvest, snags and coarse woody debris are not distributed evenly across the project area or CEAA (Harris 1999). Snags and coarse woody debris are frequently collected for firewood near open roads, which are concentrated on Forest Service and private lands within the CEAA. Abundance and distribution of snags and coarse woody debris within the CEAA is likely similar to patterns observed on sampling plots, except within recently harvested stands and areas burned by wildfire. Within the CEAA, past harvesting on 2,026 acres (18.6% of the CEAA) has altered snags, snag recruits, and coarse woody debris levels. On these acres of harvested land within the CEAA, snag and downed wood abundance is likely lower than levels in unharvested areas. Within 2,478 acres burned by wildfire (22.7% of the CEAA), abundance of snags and coarse woody debris is likely higher than recently harvested or mature stands. Overall, habitat quality for wildlife utilizing snags and/or coarse woody debris is likely moderate to good within the CEAA.

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative on Snags and Coarse Woody Debris

No direct changes in the abundance or distribution of snags and downed logs would be expected. Existing snags would continue to provide wildlife habitat, and new snags and coarse woody debris would be recruited as trees die. No direct or indirect effects to habitat quality for wildlife species requiring snags and coarse woody debris would be expected since: 1) no harvesting would occur that would alter present or future snag or coarse woody debris concentrations, and 2) no changes to human access for firewood gathering would occur.

Direct and Indirect Effects of the Action Alternative on Snags and Coarse Woody Debris

Existing snags, live recruitment trees and coarse woody debris would be altered due to timber harvesting on 643 acres (22.2%) in the proposed project area. Coarse woody debris amounts would likely remain similar to existing levels in harvest units. Proposed harvesting would decrease snag abundance and the number of live trees that could be recruited into snags or coarse woody debris. Harvest prescriptions call for retention of 2 snags, and 2 large snag recruits per acre greater than 21 inches dbh where they exist, otherwise the next largest size class would be retained. Additional large-diameter recruitment trees would be left if sufficient large snags are not present. Coarse woody debris would be left in amounts ranging from 12 to 24 tons/acre, depending upon habitat type of the proposed harvest areas (Graham et al. 1994). Although current snags present in the project area are generally small diameter (average 5.7" dbh), ample live trees suitable for future snag recruitment exist within proposed harvest units. Future snag quality in the harvested areas would be enhanced with proposed silvicultural prescriptions. Proposed treatments would be expected to promote increased tree growth, larger tree diameters, and the reestablishment of seral species like western larch and Douglas-fir, which provide high-quality structures important for nesting and foraging. The potential future risk for snag and coarse woody debris loss due to firewood gathering would remain relatively low, as only 1.1 miles of open road are present within the project area. Thus, minor adverse

direct and indirect effects to snags and coarse woody debris would be anticipated that would affect habitat quality of wildlife species requiring these habitat attributes since: 1) harvesting would reduce the density of existing snags and snag recruitment trees on 643 acres (22.2% of project area), 2) coarse woody debris amounts would be retained at similar or greater levels than those existing, 3) levels of snags and coarse woody debris in unharvested areas comprising 50.3% of the project area would remain unaltered, 4) two large snags and two future recruitment trees per acre would be retained in all proposed treatment areas, and 5) open road access used for firewood gathering would remain unchanged.

Cumulative Effects of the No-Action Alternative on Snags and Coarse Woody Debris

Snags and coarse woody debris would not be altered in the project area under this alternative. Past and ongoing forest management projects have affected snag and coarse woody debris in the CEAA (see TABLE W-2 - RECENT AND PROPOSED PROJECTS). No additional cumulative effects to habitat quality for wildlife species that utilize snags and downed woody debris are expected to result from the No-Action Alternative would be anticipated since: 1) no further harvesting would occur that could affect existing snag and coarse woody debris abundance, and 2) no changes to human access for firewood gathering would occur.

Cumulative Effects of the Action Alternative on Snags and Coarse Woody Debris

Wildlife species that rely on snags and coarse woody debris would experience a reduction in habitat quality within 643 acres (5.9% of the CEAA) of harvest units. Some snags would likely be removed from the project area, whereas coarse woody debris material would remain in similar amounts or increase. Lands of various ownerships within the CEAA have been influenced by differing management objectives over time. Thus, snags and coarse woody debris have received different levels of consideration regarding their management and retention. Generally, past harvesting on 2,026 acres across all ownerships (18.6% of the CEAA) has likely reduced these attributes. The reduction of snags associated with this alternative would be additive to the losses associated with past harvesting and any ongoing harvesting within the CEAA (see TABLE W-2 - RECENT AND PROPOSED PROJECTS). However, the project requirements to retain 2 large snags and 2 large snag recruits per acre (greater than 21 inches dbh or next largest size class), and 12 to 24 tons of coarse woody debris per acre (depending upon habitat type) would lessen additional cumulative effects associated with this project. Approximately 4,787 forested acres (43.9%) within the CEAA have not been recently harvested or burned and likely contain moderate levels of snags and coarse woody debris. Under the Action Alternative, long-term open road amounts would not change; the risk of potential loss of snags and coarse woody debris resulting from firewood gathering would remain unaltered. Thus, minor adverse cumulative effects to habitat quality for wildlife requiring snags and coarse woody debris would be anticipated over the next 30-100 years since: 1) 643 acres (5.9%) of the CEAA would be harvested reducing snags and snag-recruit trees while coarse woody debris levels would increase or not appreciably change, 2) approximately 43.9% of the CEAA that has not been recently harvested would continue to provide snags and downed wood habitat attributes, 3) existing habitat quality across the CEAA is moderate to good, 4) long-term motorized public access and associated firewood gathering would not appreciably change, and

5) there would be increased representation of shade-intolerant and seral tree species within harvest units that could become high-quality snags in the long term.

FINE-FILTER WILDLIFE ANALYSIS

In the fine-filter analysis, individual species of concern are evaluated. These species include those listed as threatened or endangered under the Endangered Species Act of 1973, species listed as sensitive by DNRC, and animals managed as big game by Montana DFWP. TABLE W-5 – FINE FILTER summarizes how each species considered was included in detailed subsequent analysis or removed from further consideration, since suitable habitat either did not occur within the project area or proposed activities would not affect their required habitat components.

TABLE W-5 – FINE FILTER. *Species considered in the fine-filter analysis for the Moran Cyclone Timber Sale.*

	SPECIES/HABITAT	DETERMINATION – BASIS
Threatened and Endangered Species	**Canada lynx** (*Felis lynx*) Habitat: Subalpine fir habitat types, dense sapling, old forest, deep snow zones	***Detailed analysis provided below*** – Potential lynx habitat types occur within the project area.
	Grizzly bear (*Ursus arctos*) Habitat: Recovery areas, security from human activity	***Detailed analysis provided below*** – The proposed project area occurs in the State Coal Cyclone and Hay Creek grizzly bear management subunits of the Northern Continental Divide Ecosystem (NCDE) Recovery Area (USFWS 1993).
Sensitive Species	**Bald eagle** (*Haliaeetus leucocephalus*) Habitat: Late-successional forest less than 1 mile from open water	***Detailed analysis provided below*** – The proposed project area occurs within the home range of the Cyclone Lake bald eagle territory.
	Black-backed woodpecker (*Picoides arcticus*) Habitat: Mature to old burned or beetle-infested forest	No burned areas less than 5 years old are in the project area. Thus, negligible direct, indirect, or cumulative effects to black-backed woodpeckers would be expected to occur as a result of either alternative.
	Coeur d'Alene salamander (*Plethodon idahoensis*) Habitat: Waterfall spray zones, talus near cascading streams	No moist talus or streamside talus habitat occurs in the project area. Thus, no direct, indirect, or cumulative effects to Coeur d'Alene salamanders would be expected to occur as a result of either alternative.
	Columbian sharp-tailed grouse (*Tympanuchus Phasianellus columbianus*) Habitat: Grassland, shrubland, riparian, agriculture	No suitable grassland communities occur in the project area. Thus, no direct, indirect, or cumulative effects to Columbian sharp-tailed grouse would be expected to occur as a result of either alternative.

Sensitive Species	**Common loon** (*Gavia immer*) Habitat: Cold mountain lakes, nest in emergent vegetation	A pair of common loons regularly breeds in Cyclone Lake. No harvesting activities would occur within 0.3 miles of Cyclone Lake during the loon nesting season. Proposed harvesting within 500 feet of Cyclone Lake conducted after August 15th would not be expected to appreciably affect loons after the nesting season. Additionally, proposed harvesting is over 300 feet from the shoreline of Cyclone Lake and is over 0.8 miles from the loon nesting area. Thus, negligible direct, indirect or cumulative effects to common loons would be expected to occur as a result of either alternative.
	Fisher (*Martes pennanti*) Habitat: Dense mature to old forest less than 6,000 feet in elevation and riparian	***Detailed analysis provided below*** – Potential fisher habitat occurs within the project area.
	Flammulated owl (*Otus flammeolus*) Habitat: Late-successional ponderosa pine and Douglas-fir forest	The project area contains potentially suitable dry ponderosa pine or Douglas-fir stands, however harvesting would not occur in any of this habitat. Any proposed harvesting that could occur during the flammulated owl breeding season would be over 800 feet away from potentially suitable habitat and be separated by substantial topography (Winona Ridge). Thus, negligible direct, indirect or cumulative effects to flammulated owls would be expected to occur as a result of either alternative.
	Gray Wolf (*Canis lupus*) Habitat Features: Ample big game populations, security from human activities	***Detailed analysis provided below*** – Wolf pack home ranges have encompassed the proposed project area in the past, and future use of the area by wolves is likely.
	Harlequin duck (*Histrionicus histrionicus*) Habitat: White-water streams, boulder and cobble substrates	Moran Creek flows through the project area and contains some potentially suitable whitewater habitat along Moran Creek, however this stream does not have any records of harlequin duck sightings (MNHP 2014). Appreciable amounts of use by harlequin ducks within the project area are not expected. Additionally, no harvesting would occur within 200 feet of Moran Creek. Thus, negligible direct, indirect or cumulative effects to harlequin ducks would be expected to occur as a result of either alternative.
	Northern bog lemming (*Synaptomys borealis*) Habitat: Sphagnum meadows, bogs, fens with thick moss mats	No suitable sphagnum bogs or fens occur in the project area. Thus, no direct, indirect, or cumulative effects to northern bog lemmings would be expected to occur as a result of either alternative.

Sensitive Species	**Peregrine falcon** (*Falco peregrinus*) Habitat: Cliff features near open foraging areas and/or wetlands	Suitable cliffs/rock outcrops for nest sites were not observed in the project area or within 0.5 miles of the project area. Additionally, peregrine eyries have not been documented in the vicinity of the project area (MNHP 2014). Thus, no direct, indirect, or cumulative effects to peregrine falcons would be anticipated as a result of either alternative.
	Pileated woodpecker(*Dryocopus pileatus*) Habitat: Late-successional ponderosa pine and larch-fir forest	***Detailed analysis provided below*** – Potential suitable mature stands exist within the proposed project area.
	Townsend's big-eared bat (*Plecotus townsendii*) Habitat: Caves, caverns, old mines	No suitable caves or mine tunnels are known to occur in the project area. Thus, no direct, indirect or cumulative effects to Townsend's big-eared bats are anticipated as a result of either alternative.
	Wolverine (*Gulo gulo*) Habitat: Alpine tundra and high-elevation boreal and mountain coniferous forests, areas that maintain deep persistent snow into late spring	No potentially suitable wolverine habitat exists within the proposed project area. The project area does not maintain deep snow into late spring and does not contain high-elevation alpine habitat. While a wolverine could pass through the project area during its extensive movements, appreciable use of the area is not expected. Given the large home range area wolverines occupy (average 150+ sq. miles) and long distances wolverines typically cover during their movements, the proposed activities would not be expected to measurably affect use of the area by wolverines. Thus, no direct, indirect or cumulative effects to wolverines would be expected to occur under the proposed action.
Big Game Species	**Elk** (*Cervus canadensis*)	***Detailed analysis provided below*** – Year-round use by deer, elk, and moose is possible. Big game winter range is present within the project area.
	Moose (*Alces americanus*)	
	Mule Deer (*Odocoileus hemionus*)	
	White-tailed Deer (*Odocoileus virginianus*)	

THREATENED AND ENDANGERED SPECIES

CANADA LYNX

Issue: The proposed activities could result in the modification of habitat preferred by Canada lynx and decrease the area's suitability for lynx.

Introduction

Canada lynx are listed as "threatened" under the Endangered Species Act. Canada lynx are associated with subalpine fir forests, generally between 4,000 to 7,000 feet in elevation in western Montana (Ruediger et al. 2000). Lynx abundance and habitat use are strongly associated with snowshoe hare populations; thus activities which decrease habitat quality for snowshoe hares can reduce the availability of prey for lynx. Lynx habitat in western Montana consists primarily of stands that provide habitat for snowshoe hares including dense, young and mature coniferous stands (Squires et al. 2010). Forest type, tree densities, natural disturbance history, and time since harvesting play important roles in shaping the suitability of young foraging habitat for lynx. Mature subalpine fir stands with abundant horizontal cover and coarse woody debris also provide structure important for foraging, denning, travel, and security. These conditions are found in a variety of habitat types (Pfister et al. 1977), particularly within the subalpine fir series. Historically, northwest Montana contained a variety of stand types with differing fire regimes. This variety of stand types combined with patchy elevation and snow-depth gradients preferred by lynx, likely formed a non-continuous mosaic of lynx and non-lynx habitats (Fischer and Bradley 1987, Ruggiero et. al. 1999, Squires et al. 2010). Forest management considerations for lynx include providing a mosaic of young and mature lynx habitats that are well connected across the landscape.

Analysis Areas

Direct and indirect effects were analyzed for activities conducted within the 2,901-acre project area. The cumulative effects analysis area consists of the Coal Creek Lynx Management Area and the project area (15,238 acres, see FIGURE W-1 – WILDLIFE ANALYSIS AREAS), which approximates the home range size of a Canada lynx. Lynx Management Areas (LMAs) are designated portions of DNRC land "where resident lynx populations are known to occur or where there is a high probability of periodic lynx occupancy over time," (USFWS and DNRC 2010, Vol. II, p. 2-46). Thus, this defined area provides a reasonable analysis area for Canada lynx that could be influenced by project-related activities.

Analysis Methods

Analysis methods include field evaluations, aerial photograph interpretation, and GIS analysis of SLI data and suitable lynx habitats. Suitable lynx habitat was subdivided into the following lynx habitat types: 1) winter foraging, 2) summer foraging, 3) other suitable, and 4) temporary non-habitat. Classification occurred according to DNRC HCP lynx habitat mapping protocols (DNRC 2010) based upon a variety of vegetation characteristics important to lynx and snowshoe hares (i.e., forest habitat type, canopy cover, stand age class, stems/acre, and coarse

woody debris). Other suitable lynx habitat is defined as habitat that has the potential to provide connectivity and lower quality foraging habitat. The temporary non-habitat category consists of non-forest and open forested stands that are not expected to be used appreciably by lynx until adequate horizontal and vertical cover develops. Factors considered in the analysis include: 1) the abundance of lynx habitat types, 2) landscape connectivity of potential and suitable lynx habitat, and 3) the level of harvesting.

Existing Environment

Approximately 2,776 acres (95.7%) of potential lynx habitat occurs in the 2,901 acre project area. Of this potential habitat, approximately 2,546 acres (87.8%) are currently providing suitable habitat (TABLE W-6 – LYNX HABITAT). Suitable lynx habitat within the project area is defined as the sum of the summer foraging, winter foraging, and "other suitable" lynx habitat categories. In the project area, winter foraging habitat is the most abundant type of suitable habitat (TABLE W-6 – LYNX HABITAT). Amounts of coarse woody debris were quantitatively assessed within the project area and found to be appropriate for the habitat types present (see SNAGS AND COARSE WOODY DEBRIS section of this analysis for further detail). Additionally, ridges and riparian areas are present within the proposed project area that provide a number of potential travel corridors for lynx, should lynx be present in the area. Past harvesting of 799 acres (27.5%) within the proposed project area has altered lynx habitat, however all of these acres have regenerated enough to provide suitable habitat for lynx. The 229 acres of temporary non-suitable habitat within the project area is a result of a wildfire in 2001 and will likely be suitable for use by lynx within the next 5 to 10 years as densely-stocked regenerating conifers become tall enough (over 6 feet) to support lynx and lynx prey. Throughout the project area, habitat and connectivity conditions are favorable for potential use by lynx and use of the area by Canada lynx is likely.

Canada lynx have been documented within the CEAA in the past (DNRC unpublished data, and MNHP 2013). DNRC manages 100% of the CEAA. Habitat types preferred by lynx are abundant within the CEAA (TABLE W-6 – LYNX HABITAT). The distribution of the various lynx habitat elements within the CEAA is the result, primarily, of environmental factors affecting vegetation growth at higher elevations, past timber harvesting, and recent large-scale wildfire. Stand-replacement wildfires have burned approximately 6,958 acres (45.7%) of the CEAA since 1988, resulting in large blocks of temporary non-suitable habitat. Conifer regeneration in a large proportion of these areas is nearing levels suitable for lynx use and will likely be suitable within the next 5 to 10 years. Within unburned areas of the CEAA, suitable habitat is well connected, particularly along ridges and in riparian areas. Timber harvesting on 2,468 acres (16.2%) within the CEAA in the last 40 years has altered lynx habitat, however those harvest units older than 20 years are now providing suitable summer foraging or other suitable habitat. Overall, habitat suitability and connectivity for lynx within the CEAA is moderate to high.

TABLE W-6 – LYNX HABITAT. *Estimates of existing lynx habitat and habitat that would persist post-harvest on DNRC lands in the project area and cumulative effects analysis area. Percent refers to the percent of the lynx habitat category of the total potential habitat present on DNRC-managed lands.*

LYNX HABITAT CATEGORY	**Acres of lynx habitat (percent of DNRC lynx habitat)**			
	Project Area		**Cumulative Effects Analysis Area**	
	Existing	Post-Harvest	Existing	Post-Harvest
OTHER SUITABLE	528.9 (19.1%)	735.8 (26.5%)	1,079.7 (8.2%)	1,286.6 (9.8%)
SUMMER FORAGE	528.9 (19.1%)	493.0 (17.8%)	2,307.2 (17.5%)	2,271.3 (17.2%)
TEMP NONSUITABLE	229.5 (8.3%)	623.1 (22.4%)	3,372.1 (25.6%)	3,765.7 (28.6%)
WINTER FORAGE	1,488.4 (53.6%)	923.9 (33.3%)	6,409.3 (48.7%)	5,844.8 (44.4%)
Grand Total: Suitable Lynx Habitat	2,546.3 (91.7%)	2,152.6 (77.6%)	9,796.2 (74.4%)	9,402.6 (71.4%)

[a] *Total potential lynx habitat is a habitat category that describes all areas that are providing suitable lynx habitat now, or those likely to provide suitable habitat at some time in the future. Total potential lynx habitat is the sum of the other suitable, summer forage, temporary non-suitable, and winter forage habitat categories.*

Environmental Effects

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

Under this alternative, no changes in lynx habitat elements would be expected in the project area and landscape connectivity would not be altered. Thus, no direct or indirect effects influencing lynx habitat suitability would be expected to occur in the project area.

Direct and Indirect Effects of the Action Alternative on Canada Lynx

Approximately 643 acres (22.2% of project area) of suitable lynx habitat would be subject to harvesting with this alternative. Pre-commercial thinning on an additional 230 acres would also alter suitable lynx habitat. Proposed harvest prescriptions on 394 acres would decrease mature tree abundance to 6-8 trees per acre and reduce overstory crown closure to <15%. These acres of suitable lynx habitats would be converted to temporary non-suitable habitat (TABLE W-6 – LYNX HABITAT) for the next 15-20 years. Harvest prescriptions on an additional 249 acres would alter lynx habitat but would retain enough total crown closure (≥40%) to remain suitable for use by lynx after harvesting (TABLE W-6 – LYNX HABITAT). Where operationally feasible, existing patches of shade-tolerant sub-merchantable conifers would be retained in all harvest units. The total area of these patches would not be expected to comprise more than 15% of the acres proposed for harvest. Growth of retained mature trees and patches of sapling to pole-

sized conifers, combined with post-harvest conifer regeneration following harvest, would lessen the time logged stands would be temporarily unsuitable for lynx. Within 230 acres of pre-commercial thinning units, lynx habitat would remain suitable following treatment and thinning prescriptions would retain up to 10% of shade-intolerant species (primarily subalpine fir) within these stands. Activities associated with active logging and thinning operations could temporarily displace any lynx using the area for 1-4 years, especially if carried out concurrently. Following proposed logging, 2,153 acres (74.2% of project area) of suitable lynx habitat would remain within the project area. Suitable lynx habitat would be largely retained along streams and ridges in the project area, although some of these potential travel corridors are less than 300 feet wide and could be less effective for lynx movement. Vegetation retention along important travel features could facilitate lynx movement in the project area, although appreciable use by lynx within harvest unit boundaries would not be expected for 15 to 20 years. In the proposed harvest units, 12 to 24 tons/acre of coarse woody debris would be retained that would provide horizontal cover and security structure for lynx and lynx prey once harvest units regenerated into suitable habitat in 15-20 years. Overall, moderate adverse direct and indirect effects to habitat suitability for Canada lynx would be expected since: 1) the amount of existing suitable lynx habitat in the project area would be reduced by 14.1% (TABLE W-6– LYNX HABITAT), 2) combined harvesting and thinning activities would alter 34.3% of suitable lynx habitat in the project area, 3) suitable lynx habitat would likely develop on 217 acres of burned habitat during the next 5 to 10 years within the project area, 4) moderate levels of landscape connectivity would persist along important travel features despite a minor overall reduction in landscape connectivity, and 5) coarse woody debris and small shade-tolerant conifers would be retained to promote forest structural complexity in harvest units, expediting their growth back into suitable lynx habitat.

Cumulative Effects of the No-Action Alternative on Canada Lynx

No appreciable change in lynx habitats would occur under the No-Action Alternative, and no further changes in landscape connectivity would be anticipated. Past forest management projects not associated with the proposed Moran Cyclone Timber Sale have affected lynx habitat in the CEAA, and ongoing and proposed projects could alter lynx habitat in the future (see TABLE W-2 – RECENT AND PROPOSED PROJECTS). Activities on non-DNRC lands could continue altering lynx habitat and create disturbance within the CEAA. Thus, no additional cumulative effects to suitable lynx habitat are expected to result from the No-Action Alternative that could affect lynx habitat suitability in the CEAA.

Cumulative Effects of the Action Alternative on Canada Lynx

Under the Action Alternative, approximately 643 acres (4.2%) of the 15,238-acre CEAA would be altered by harvesting. Of these acres, harvesting would affect 643 acres (6.6%) of currently suitable lynx habitat. Additionally, pre-commercial thinning would alter 230 acres (1.5%) of suitable lynx habitat within the CEAA. Following proposed harvesting, DNRC lands within the CEAA would contain 9,402.6 acres (71.4%) of suitable lynx habitat (TABLE W-6 – LYNX HABITAT). The proposed harvesting would alter approximately 4.8% of the 9,796 acres of potentially suitable habitat present within the CEAA. Expected reductions in suitable lynx habitat and increases in temporary nonsuitable habitat in the proposed harvest units would not

be expected to appreciably alter lynx use of the CEAA, particularly given that habitat suitability is relatively high and likely increasing in the surrounding landscape. Following harvest treatments, connectivity of suitable lynx habitat would also be maintained along riparian areas and features frequently used by lynx during daily movements (i.e. drainages, ridges etc.) throughout the majority of the CEAA. Suitable lynx habitat within the CEAA has been altered by past timber sales (see TABLE W-2 – RECENT AND PROPOSED PROJECTS) and large-scale wildfire. Increased levels of motorized activities associated with the Action Alternative would be additive to current and proposed timber sales, which could temporarily displace lynx should they be present near the proposed project area and associated roads. Thus, minor to moderate adverse cumulative effects to lynx and the suitability of lynx habitat would be expected as a result of proposed activities since: 1) overall baseline habitat suitability would remain moderate to high with 71.4% of the CEAA in suitable habitat; 2) existing suitable lynx habitat within the CEAA would be reduced by 3.0% and those areas would remain unsuitable for at least 15 years, 3) stands converted to temporary non-suitable habitat in old logging units and burned areas would continue maturing and developing into suitable habitat within the CEAA in the absence of natural disturbance, 4) habitat connectivity within the CEAA would be minimally affected by proposed activities, 5) lynx habitat subject to pre-commercial thinning would remain suitable for lynx use after activities, and 6) lynx could be temporarily displaced by logging and thinning activities in the portion of CEAA overlapping the project area.

GRIZZLY BEAR

Issue: The proposed activities could alter grizzly bear cover, reduce secure areas, and increase human access, which could adversely affect bears by displacing them from important habitats and/or increase risk of human-caused bear mortality.

Introduction

Grizzly bears are generalist omnivores that use a diversity of habitats found in western Montana, and they are currently listed as "threatened" under the Endangered Species Act. Preferred grizzly bear habitats are meadows, riparian zones, avalanche chutes, subalpine forests, and big game winter ranges, all of which provide seasonal food sources. Of these, meadows, riparian areas, and avalanche chutes occur in the project area. 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 creating roads, which can increase access for humans in otherwise secure areas (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 developing roads and reducing forest cover, forest management activities can bring humans and bears into closer contact, and make bears more detectable, which can increase their risk of being shot illegally. Displacing bears from preferred areas may increase their energetic costs, potentially lowering their ability to survive, and/or reproduce successfully.

Analysis Areas

Direct and indirect effects were analyzed for activities conducted within the 2,901-acre project area. Cumulative effects were analyzed in a 52,630-acre area (see FIGURE W-1 – WILDLIFE ANALYSIS AREAS) that encompasses the project area and approximates the home range size of a female grizzly bear in northwest Montana (Mace and Roberts 2011). This CEAA contains the entire State Coal Cyclone Grizzly Bear BMU Subunit and portions of the Hay Creek Grizzly Bear BMU Subunit.

Analysis Methods

Field evaluations, aerial photograph interpretation, scientific literature and GIS queries were the basis for this analysis. Grizzly bear hiding cover was considered to be forest vegetation that will hide 90% of a grizzly bear at a distance of 200 feet. Within the CEAA, open road densities were calculated using the simple linear calculation method (road length in miles divided by area in square miles). Factors considered within this CEAA include availability of timbered stands for hiding cover, level of human disturbance, and miles of open, restricted, and temporary roads.

Existing Environment

All 2,901 acres of the proposed project area occurs in the NCDE Recovery Area (USFWS 1993). Grizzly bears have been observed in the vicinity of the project area in the past and continued appreciable use by bears is anticipated. The proposed project area does not contain Class A lands that are managed as "quiet areas" requiring special management under the DNRC HCP (USFWS and DNRC 2010). Approximately 2,515 acres (86.7% of project area) of grizzly bear hiding cover is present within the proposed project area. The abundance of vegetative cover likely contributes to security for bears, and facilitates their ability to move freely within the project area. Stands harvested within the last 40 years (799 acres, 27.5% of project area) within the project area contain dense patches of regenerating conifers that currently break up sight distances and provide hiding cover for grizzly bears. Approximately 368 acres of burned lands within the project area contain dense areas of regenerating conifers that are currently too short to provide hiding cover but will likely provide cover within the next 5-10 years. Preferred riparian and wetland areas are present within the project area. Managing human access is a major factor in management of grizzly bear habitat. Presently, open road density in the proposed project area is 1.1 miles/sq. mile and total road density is 3.4 miles/sq. mile. Most of these open road miles consist of the North Fork Road, a primary access road to the town of Polebridge and the northwest entrance to Glacier National Park. In addition to being blocked by gates or berms, many of the restricted roads within the project area are overgrown with brush and conifers, rendering them impassible to any motorized vehicle use. Due to abundant vegetative cover, low amounts of open roads, and presence of preferred grizzly bear habitat, most of the project area likely provides security for grizzly bears.

The entire 52,630-acre CEAA is within the NCDE Recovery Area (USFWS 1993). The CEAA is a relatively intact, mostly undeveloped forested area with a variety of preferred grizzly bear habitats (avalanche chutes, berry fields, riparian areas). Grizzly bear use of the area is well-

documented and continued use of the CEAA by bears is likely. Approximately 1,451 acres of Class A lands occur within the CEAA (USFWS and DNRC 2010). Forest stands that provide hiding cover persist on over 42.5% of the CEAA (approximately 22,343 acres). Forest habitats across the CEAA are a combination of age classes, ranging from recently harvested and burned stands to mature, old-growth stands. Approximately 9.1% of the CEAA (4,813 acres) has been harvested within the last 40 years and consists of younger stands with regenerating trees. An additional 21,323 acres (40.5%) of the CEAA has burned in wildfires since 1988 and contains varying degrees of grizzly bear hiding cover. Recent timber sale projects within the CEAA (see TABLE W-2 - RECENT AND PROPOSED PROJECTS) have been sources of disturbance and altered grizzly bear habitat. Reductions in vegetative cover and increased disturbances, such as those associated with timber harvest, can lower effective use of habitat by bears and render bears more vulnerable to human-caused mortality (Servheen et. al. 1999). Human disturbance levels are closely tied to road abundance and access. Open road density within the CEAA is approximately 1.1 miles/sq. mile and total road density is approximately 1.6 miles/sq. mile (simple linear calculations). Roads present in the CEAA are primarily used to access privately owned lands along the North Fork Road, but also include roads used for past timber management activities and for access to Forest Service lands. The greatest risk factors for bears within the CEAA are likely associated with homes, pets, and livestock in the vicinity of the North Fork Road along the easternmost portion of the CEAA. Areas where high levels of human recreational use occur are also higher-risk localities for grizzly bears. Unnatural attractants potentially associated with these areas could increase the probability of human-bear conflicts, which can result in bear mortalities.

Environmental Effects

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

None of the proposed forest management activities would occur. No changes to grizzly bear habitat would be expected. Visual screening, existing secure areas, risk of displacement, and open and restricted road density would remain the same. Thus, since: 1) no timber harvesting would alter existing visual screening cover, 2) risk of displacement from important habitat would not increase, 3) no existing secure areas would be affected, and 4) no changes to open or restricted road density would occur, no direct or indirect effects associated with grizzly bear displacement or human-caused bear mortality risk would be anticipated as a result of the No-Action Alternative.

Direct and Indirect Effects of the Action Alternative on Grizzly Bears

Under the Action Alternative, grizzly bear hiding cover would be altered by commercial harvest on approximately 643 acres (22.2%) of the project area. Grizzly bear hiding cover would be removed on approximately 394 acres receiving seed-tree harvest treatments and hiding cover would be altered by intermediate treatments on another 250 acres. Pre-commercial thinning would affect an additional 230 acres of hiding cover. Harvesting associated with the Action Alternative would increase sight distances within all proposed harvest units. While vegetation density would be reduced, hiding cover would be expected to persist within the 250 acres undergoing intermediate treatments and the 230 acres of pre-commercial thinning. Current

levels of patchy cover in the form of sub-merchantable trees would be retained where present and feasible in all harvest units. Existing stands of adjacent dense regenerating conifers, neighboring mature forest patches, and topographic breaks would exist in such a manner that no point in any harvest unit would be greater than 600 feet to screening cover. Existing riparian cover along 11.8 miles of Class 1 and 2 streams would be largely protected and offer movement corridors as well as hiding cover for bears in this preferred habitat. Hiding cover adjacent to open roads within the project area would not be appreciably affected, which lessens the risk of mortality by accidental or intentional shooting. Levels of hiding cover would be expected to recover within 15 to 20 years following proposed seed-tree treatments as shrub and tree regeneration proceeds. Should grizzly bears be present in the area at the time of harvest operations, they could be affected by increased road traffic, noise, and human activity, and by reduced amounts of hiding cover. Proposed activities in grizzly bear habitats would reduce grizzly bear security, possibly resulting in increased stress and/or energy expenditures to endure the disturbance, or causing bears to move away from the area. These potential disturbances would only occur during harvesting operations (1 to 4 years). Continued use of the project area by grizzly bears would be anticipated. No harvest activities would occur within Class A lands, which are not present within the project area. Seasonal restrictions on motorized activity and commercial harvest restrictions would apply to the project area, which would minimize disturbance to bears during the spring period (April 1 – June 15). Additionally, contract requirements would assist in mitigating bear-human conflict risk by specifying that contractors are not permitted to carry firearms on the work site and that unnatural attractants must stored or disposed of in a bear-resistant manner.

Motorized activities associated with the Action Alternative, such as the use of restricted roads and the construction of new temporary roads, could affect grizzly bears by temporarily (1 to 4 years) displacing them from previously secure areas. See TABLE W-4 – ROAD MANAGEMENT AND CONSTRUCTION for road summaries within the project area. No new permanent roads would be built. Up to 1.7 miles of temporary road would be built, and 9.0 miles of existing restricted road could be used under the Action Alternative. The use of 10.7 miles of existing restricted and temporary roads would contribute to open road density in the short term (1-4 years); increasing potential for disturbance to grizzly bears during the non-denning season. All restricted roads that would be used temporarily for 1 to 4 years to complete proposed project activities would remain restricted from public motorized access during and after harvesting activities. All temporary roads would be reclaimed and closed to all motorized vehicles. Including temporary roads, functionally open road amounts could increase temporarily from 1.1 miles (density 0.3 mi./sq. mi.) up to 11.8 miles (density 2.6 mi./sq. mi.) during project operations. At the conclusion of the proposed project, the total amount of roads within the project area would remain the same as pre-project levels (see TABLE W-4 – ROAD MANAGEMENT AND CONSTRUCTION).

Thus, moderate adverse direct or indirect effects to grizzly bears associated with displacement and mortality risk would be expected since: 1) moderate levels of temporary (1-4 years) disturbance and displacement would be anticipated; 2) hiding cover would be removed on 394 acres (13.6%) and reduced on 479 acres (16.5%) of the project area, but would be expected to

recover in 15-20 years; 3) hiding cover would remain on approximately 2,121 acres (73.1%) of the project area; 4) reductions in hiding cover would be mitigated through vegetation retention patches within and between harvest units, vegetation retention along riparian corridors, and reduced sight distances associated with varied topography; 5) Class A lands would be unaffected; 6) commercial harvest and public motorized activities would be restricted during the spring period; and 7) short-term increases in functional open road densities from 0.5 mi/sq. mi. to 2.6 miles/sq. mi. would be anticipated but long-term open road density would not change.

Cumulative Effects of the No-Action Alternative on Grizzly Bears

Under the No-Action Alternative, no proposed project activities would occur. No additional cumulative changes to the level of disturbance to grizzly bears or secure areas would be anticipated. Also, no additional cumulative changes in open-road densities or hiding cover from the existing conditions would be anticipated. Past and ongoing forest management projects not associated with the proposed Moran Cyclone Timber Sale have affected grizzly bear habitat in the project area, and other ongoing projects (see TABLE W-2 – RECENT AND PROPOSED PROJECTS) could continue to alter grizzly bear habitat and/or disturb bears in the future. Thus, since no additional changes in available habitats or level of human disturbance would be anticipated as a result of the No-Action Alternative, no cumulative effects to grizzly bear displacement or effects involving mortality risk would be anticipated.

Cumulative Effects of the Action Alternative on Grizzly Bears

Approximately 873 acres (1.7% of the CEAA) of grizzly bear hiding cover would be altered within the CEAA. Of these acres, 394 acres (0.7% of the CEAA) would receive regeneration treatments that would remove hiding cover. Reductions in hiding cover on 873 acres and anticipated elevated disturbance levels would be additive to past timber harvesting and wildfire that has affected approximately 26,136 acres (49.7% of the CEAA), as well as current harvest projects (see TABLE W-2 – RECENT AND PROPOSED PROJECTS). Harvesting and road building within the last 40 years in the CEAA has altered grizzly bear cover and habitat connectivity, however 41.7% (21,949 acres) of the CEAA would remain suitable hiding cover for grizzly bears. Additionally, approximately 18,522 acres (35.2% of the CEAA) harvested or burned over 10 years ago will likely provide additional hiding cover within the next 5-10 years. Mature stands and young, fully stocked stands that likely provide hiding cover would make up approximately 21,949 acres (41.7%) of the CEAA. Vegetation adjacent to preferred riparian areas would remain unaltered by harvesting. Continued use of the CEAA by grizzly bears would be anticipated during and after proposed activities. Early successional stages of vegetation occurring in harvest units and recently burned stands could provide foraging opportunities that do not exist in some mature stands across the CEAA.

Collectively, short-term (1 to 4 years) increases in human disturbance would be anticipated in the CEAA, but contract requirements would lessen risk of human-bear conflicts during active harvest operations (e.g., proper storage/disposal of unnatural attractants, prohibit possession of firearms etc.). The increased use of road systems during the proposed project would temporarily increase human disturbance and displacement risk for grizzly bears within a

portion of the CEAA. A short-term increase in open road density would occur, increasing from 1.1 mi/sq. mi. to 1.2 miles/sq. mile in the CEAA. Timing restrictions on road use would minimize risk of disturbing grizzly bears during the spring period. Density of all permanent roads within the CEAA would not change. Disturbance associated with temporarily accessed roads would be additive to that occurring on roads used for other ongoing forest management projects (see TABLE W-2 – RECENT AND PROPOSED PROJECTS). Within the CEAA, high-risk factors for bears associated with human developments would continue to be present. Thus, minor adverse cumulative effects to grizzly bears associated with displacement or effects involving mortality risk would be expected in the short term (1 to 4 years) and long term (15 to 20 years) since: 1) short-duration (1 to 4 year) increases in human disturbance levels would be expected within the CEAA, 2) hiding cover would be removed in the short-term (~15 to 20 years) on a relatively small portion (0.7%) of the CEAA, 3) approximately 41.7% of the CEAA would continue to provide hiding cover, and 4) short-term increases in functional open road densities from 1.1 mi/sq. mi. to 1.2 miles/sq. mi. would be anticipated and long-term open road density would not change.

SENSITIVE SPECIES

When conducting forest-management activities, the *SFLMP* directs DNRC to give special consideration to sensitive species. These species may be sensitive to human activities, have special habitat requirements, are associated with habitats that may be altered by timber management, and/or, could become listed under the *Federal Endangered Species Act* if management activities result in continued adverse impacts. Because sensitive species usually have specific habitat requirements, consideration of their needs serves as a useful 'fine filter' for ensuring that the primary goal of maintaining healthy and diverse forests is met. A search of the *Montana Natural Heritage Database* was used to locate historical records of sensitive species (as shown in TABLE W-5 – FINE FILTER) in the vicinity of the project area.

BALD EAGLE

Issue: The proposed activities could reduce bald eagle nesting and perching habitat and/or disturb nesting bald eagles.

Introduction

Bald eagles are diurnal raptors associated with significant bodies of water, such as rivers, lakes, and coastal zones. The diet of bald eagles consists primarily of fish and waterfowl, but includes carrion, mammals, and items taken from other birds of prey. In northwestern Montana, bald eagles begin breeding with courtship behavior and nest building in early February. The young fledge by approximately mid-August, ending the breeding process. Important habitat attributes found in nesting stands include large, emergent trees screened from disturbance by vegetation that are within sight distances of lakes and rivers.

Analysis Areas

Direct and indirect effects were analyzed for activities conducted within the 2,901-acre project area. Cumulative effects were analyzed on the Cyclone Lake bald eagle home range, which is a 2.5-mile radius circle (12,566 acres) extending out from the last known nest site (see FIGURE W-1 – WILDLIFE ANALYSIS AREAS). This CEAA encompasses a portion of the project area and likely includes the areas used by the pair of eagles occupying the territory.

Analysis Methods

Effects were analyzed using a combination of field evaluations and aerial photograph interpretation within the bald eagle home range. Factors considered within this analysis included evaluating the potential for disturbance to nesting birds and availability of mature, well- stocked stands containing large, emergent trees with stout horizontal limbs for nests and perches.

Existing Conditions

Observations of eagles occupying the vicinity of the proposed project area have been recorded since 1987 (MNHP 2013). The proposed project area contains approximately 2,833 acres (97.7% of the project area) of the Cyclone Lake bald eagle home range and roughly 0.9 miles of shoreline habitat along Cyclone Lake. Approximately 26 acres of the primary use area occurs within the project area, however the last known nest site area does not. DNRC is not aware of any records of past nest sites within the project area. The aquatic habitats associated with this bald eagle territory are primarily Cyclone Lake and surrounding perennial tributaries to it, as well as Cyclone Creek. The Cyclone Lake bald eagle territory contains a mix of coniferous forest, small clearings, and swamp. Within the present home range, large emergent conifers such as western larch and Douglas-fir provide suitable nesting, roosting, and perching sites. The majority of the project area consists of well-stocked, mature or regenerating forest and does not likely receive appreciable use by foraging bald eagles.

Bald eagle habitat is managed at three spatial scales: the nest area (area within a 0.25-mile radius of the active nest tree or trees that have been active within five years), the primary use area (an area 0.25-0.50-miles from the nest tree), and the home range (area within 2.5 miles of all nest sites that have been active within five years). Approximately 36 acres of DNRC-managed lands occur within the nest site area, 162 acres in the primary use area, and 7,760 acres within the bald eagle home range.

Human disturbance, including timber harvesting and various forms of recreation are potential sources of disturbance to the nesting territory. Recreational activities, traffic along open roads, and timber harvesting likely serve as the primary sources of disturbance in this eagle territory. DNRC and Forest Service lands are within the primary use area. Eagles using the Cyclone Lake territory are likely habituated to a minor level of disturbance, given the minor amount of open roads and recreational use in the area. Many large, emergent trees are available across portions of the home range and are relatively abundant around Cyclone Lake.

Environmental Effects

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

Under the No-Action Alternative, no proposed activities would occur. Human disturbance would continue at approximately the same levels. No changes in available nest sites or forest structure would occur. Thus, since: 1) no increases in human disturbance levels would occur; and 2) no changes in the availability of large, emergent trees would be expected; negligible direct and indirect effects would be expected to affect bald eagles using the Cyclone Lake territory.

Direct and Indirect Effects of the Action Alternative on Bald Eagles

The proposed project area contains approximately 2,833 acres (97.7% of the project area) of the Cyclone Lake bald eagle home range. Approximately 26 acres of the primary use area occurs within the project area, however the nest site area does not. Proposed harvesting in the project area would be carried out on approximately 643 acres (22.2% of the project area) of coniferous forest occurring within the home range of the Cyclone Lake territory, and would be potentially usable by that pair. The proposed harvest units are outside of the last known nest site and primary use areas. Additionally, no harvesting would occur within 0.4 miles of Cyclone Lake during the bald eagle breeding season (Feb. 1 – Aug. 15). After August 15th, harvesting would occur on 34 acres within sight distance of Cyclone Lake but would not alter vegetation within 300 feet of the lake. The potential for temporary displacement would only be expected to affect eagles during the physical harvest activities and not beyond. Within harvest units, prescriptions call for the retention of large seral snag species and emergent trees that could be used in the future as nest or perch trees as the stands develop around these resources. Public motorized access within the project area would not appreciably change. Thus, minor direct and indirect effects to nesting bald eagles and bald eagle habitat would be anticipated since: 1) disturbance could be elevated within 2,833 acres of the territory during operations, but harvest-related disturbance would not occur within the eagle nest site or primary use areas; 2) harvesting within sight distance of Cyclone Lake would occur outside of the eagle breeding season and prescriptions would retain large emergent trees; 3) long-term motorized access within the project area would not change; 4) most harvesting would occur in areas not likely used by eagles, and shoreline habitat (within 300 feet) would not be affected; and 5) negligible changes in the availability of large, emergent trees near Cyclone Lake would be expected.

Cumulative Effects of the No-Action Alternative on Bald Eagles

No harvesting would occur under the No-Action Alternative. Thus, no additional cumulative effects to bald eagles would be expected since: 1) no changes to human disturbance levels would occur; and 2) no changes in the availability of large, emergent trees would be expected. Past forest management projects not associated with the proposed Moran Cyclone Timber Sale have affected bald eagle habitat in the CEAA, and ongoing and proposed projects could alter bald eagle habitat in the future (see TABLE W-2 – RECENT AND PROPOSED PROJECTS).

Cumulative Effects of the Action Alternative on Bald Eagles

Proposed harvesting would be carried out on approximately 643 acres of mature coniferous forest occurring within the CEAA that would be potentially usable by the Cyclone Lake pair. The acreage that would be affected comprises 5.1% of the CEAA. None of the proposed harvest activities would occur within the last known nest site or primary use areas. Nesting bald eagles would continue to experience varying levels of disturbance from ongoing recreational use of the CEAA, as well as disturbance associated with forest management activities on surrounding lands. Timber harvesting that may be occurring on other ownerships in the home range could continue disturbing bald eagles or modifying their habitats. Any potential disturbance and/or noise from the proposed harvesting would be additive to any of these other forms of disturbance, however no appreciable changes in bald eagle behavior would be anticipated as a result of the Action Alternative. Emergent trees exist across ownerships in the home range and would be expected to persist at adequate levels. Thus, minor cumulative effects to nesting bald eagles and bald eagle habitat would be anticipated since: 1) disturbance would be elevated within the territory during harvesting operations, but harvest-related disturbance would not occur within the nest site or primary use areas; 2) no changes in long-term human access within the territory would occur; 3) negligible changes in the availability of large, emergent trees near water within the CEAA would be expected; and 4) harvesting within sight distance of Cyclone Lake would not occur the bald eagle breeding season (Feb. 1 – Aug. 15).

FISHER

Issue: The proposed activities could decrease habitat suitability for fishers by decreasing canopy cover and snag/coarse woody abundance, and by increasing risk of trapping mortality through greater road access.

Introduction

Fishers are generalist predators that prey upon a variety of small mammals and birds, as well as snowshoe hares and porcupines. They also eat carrion and seasonally available fruits and berries (Foresman 2012). Fishers use a variety of forest successional stages, but are disproportionately found in low to mid elevation mature stands with dense canopies (Powell 1982, Johnson 1984, Jones 1991, Heinemeyer and Jones 1994). They generally avoid openings or young forested stands (Buskirk and Powell 1994). However, some use of openings does occur for 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 containing large snags, trees, and logs (Raley et. al. 2012). 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 maintaining large snags, retaining abundant coarse woody debris, providing habitat suitable for resting and denning, and maintaining travel corridors.

Analysis Areas

Direct and indirect effects were analyzed for activities conducted within the 2,901-acre project area. The proposed project area ranges from 3,480 to 5,440 feet in elevation. Cumulative effects for fisher habitat were analyzed on the State Coal Cyclone grizzly bear BMU subunit and portions of the Hay Creek grizzly bear BMU subunit surrounding the project area (52,630 acres, see FIGURE W-1 – WILDLIFE ANALYSIS AREAS). This CEAA encompasses all DNRC-managed lands within the two grizzly bear BMU subunits surrounding the project area. The large CEAA is defined according to geographic features (i.e. ridgelines, major rivers), which are likely to influence movements of fisher in the vicinity of the project area. Thus, this defined area provides a reasonable analysis area for fisher that could be influenced by project-related activities.

Analysis Methods

Analysis methods include field evaluations, aerial photograph interpretation, and GIS analysis of travel corridors, preferred fisher cover types (*ARM 36.11.403(60)*), and habitat structure. To assess potential fisher habitat and travel cover on DNRC managed lands, sawtimber size class stands (≥9 inches dbh average) within preferred fisher cover types below 6,000 feet in elevation with 40 percent or greater overstory canopy closure were considered potential habitat suitable for use by fishers (*ARM 36.11.403(60)*). Fisher habitat was further divided into upland and riparian-associated areas depending upon the proximity to Class 1 and Class 2 streams (*ARM 36.11.403(15)* and *(16)*). DNRC manages preferred fisher cover types within 100 feet of Class 1 and 50 feet of Class 2 streams so that at least 75 percent of the acreage (Trust Lands only) remains in the sawtimber size class in moderate to well-stocked density (*ARM 36.11.440(1)(b)(i)*). Effects were analyzed using field evaluations, GIS analysis of SLI stand data to estimate potential habitat, and aerial photograph interpretation to evaluate habitat conditions on non-DNRC lands. On non-DNRC lands, mature forest below 6,000 feet in elevation with ≥40% crown closure was considered to be potentially suitable habitat for fishers. Snags and coarse woody debris were assessed using plot data (described in the snag and coarse woody debris analysis subsection above), site visits, and by reviewing past DNRC harvesting information. Factors considered in this analysis include the level of harvesting, number of snags, relative amounts of coarse woody debris, and risk level of firewood harvesting and trapping mortality.

Existing Environment

The proposed project area contains 1,066 acres (36.7% of project area) of suitable fisher habitat (TABLE W-7 – FISHER HABITAT). Riparian fisher habitat within the project area is comprised of approximately 167 acres of preferred fisher cover types, of which 165 acres (98.8% of preferred cover types) of riparian habitat are currently suitable for use by fishers. Snags and coarse woody debris (CWD) were quantified at sampling plots within proposed harvest units and were generally found to be within levels recommended by Graham et al. (1994) for the habitat types present (see SNAGS AND COARSE WOODY DEBRIS). Suitable fisher habitat that provides good habitat connectivity occurs along most of the perennial streams in the project area below 6,000 feet. Existing suitable stands are providing the mature forest conditions (≥40 crown closure) necessary for use as fisher travel habitat in upland areas. Across

the project area, suitable fisher habitat is well-connected but overall amounts are limited by the presence of non-preferred cover types. Approximately 799 acres of harvesting and 368 acres of recent wildfire have potentially altered suitable fisher habitat in the past. Open roads facilitate firewood gathering, which can affect the abundance of snags and CWD used by fishers. Additionally, roads near streams can also offer trappers convenient access to forested riparian areas, which increase trapping risk to fishers should they be using the area. There are 1.1 miles of open roads along the eastern edge of the project area and firewood gathering is minimal. The lack of convenient vehicle access to the project area and moderate amounts of winter snow likely limit some trapper presence and associated mortality risk for fisher. Overall, fisher habitat suitability and connectivity within the project area is moderate and risk factors are low.

Historical records of fisher occurring in the CEAA within the last 50 years are generally lacking with only one recorded sighting, however fishers have been documented in Flathead County (MNHP 2012, Foresman 2012) and fishers potentially use the CEAA. Within the CEAA, there are 14,882 acres (28.3% of the CEAA) of potentially suitable fisher habitat (TABLE W-7 – FISHER HABITAT). Riparian fisher habitat within the CEAA consists of approximately 610 acres of preferred fisher cover types on DNRC lands, of which 502 acres (82.4% of preferred fisher cover types) are currently suitable for use by fishers. Abundance and connectivity of suitable riparian habitat is influenced by wet meadows, swamps, natural openings, and recent large-scale wildfire within the CEAA. Approximately 502 acres adjacent to Class 1 and 2 streams within the CEAA (below 6,000 feet elevation) have accompanying riparian vegetation that would facilitate fisher travel, and contribute to habitat suitability and connectivity. Suitable upland habitat is somewhat scattered within the CEAA, having been shaped by many of the same factors affecting riparian habitat. Within the CEAA, past harvesting has modified mature crown closure, snags and coarse woody debris levels on about 5,404 acres (10.3% of the CEAA). Additionally, wildfires have burned approximately 21,323 acres (40.5%) of the CEAA since 1988 and reduced/fragmented the amount of dense, mature stands available for use by fishers. The CEAA contains a network of existing open roads (density = 1.1 mi/sq. mile) that facilitate trapper access, although most are not plowed, which limits some motorized vehicle use during typical winter conditions. Collectively, habitat suitability for fishers within the CEAA is low to moderate and risk factors are low.

Environmental Effects

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

No change to the stands providing fisher denning and foraging habitats would be expected as no timber harvesting activities would occur under this alternative. Thus, since: 1) no changes to existing habitats would be anticipated; 2) landscape connectivity would not be altered; 3) no appreciable changes to canopy cover, snags, snag recruits, and coarse woody debris levels would be anticipated; and 4) no changes to human access or potential for trapping mortality would be anticipated, no direct or indirect effects associated with fisher habitat suitability would be expected in the project area.

Direct and Indirect Effects of the Action Alternative on Fishers

Approximately 384 acres of the 1,066 acres (36.0%) of suitable fisher habitat in the project area would be harvested under the Action Alternative (TABLE W-7 – Fisher HABITAT). Approximately 338 acres of upland fisher habitat within the project area harvest units would receive harvest treatments that would likely yield stands too sparsely forested for appreciable use by fishers for 40-80 years. An additional 33 acres of upland fisher habitat would receive harvest treatments that would reduce tree densities but retain adequate overstory crown closure (≥40%) for use by fishers. Up to 13 acres of suitable riparian habitat (7.9%) between 50 to 100 feet of Class 1 streams could undergo selective harvesting that would leave adequate overstory crown closure (≥40%) suitable for use by fishers after treatment, however habitat quality would be lower within these acres. No harvesting would occur within 50 feet Class 2 streams. Approximately 98.8% (165 acres) of preferred fisher cover types in riparian areas would remain suitable for use by fishers. After harvest activities, remaining suitable fisher habitat and habitat connectivity would be primarily associated with riparian areas running through the project area. In all areas, harvest prescriptions call for retention of 2 snags and 2 snag recruits per acre (≥21 in. dbh) where they exist, otherwise the next largest size class. In addition, 12 to 24 tons of coarse woody debris per acre would be planned for retention within harvest units. While the proposed harvest may reduce density of snags and their recruits in the near future, the sustainability and development of snags in the area would be maintained by retention of appreciable numbers of large snags and snag recruitment trees. These large snags and trees could be a source for fisher denning and resting sites in the future when intensively harvested stands regenerate and develop mature stand characteristics (40 to 80 years). Approximately 119 acres of riparian and upland preferred fisher covertypes that currently do not provide ample structural attributes found in suitable fisher habitat would continue maturing and could provide suitable habitat in the next 20 to 40 years. Long-term open road density would not change under the Action Alternative. Because roads would remain restricted during the trapping season, fisher mortality risk due to trapping would be expected to remain the same. The potential future risk for snag and coarse woody debris loss due to firewood gathering would be expected to remain the same, as no new permanent roads would be built. Appreciable loss of snags or coarse woody debris due to firewood gathering would not be expected. Thus, minor to moderate adverse direct and indirect effects would be anticipated that would affect fisher habitat suitability in the project area since: 1) existing baseline suitability and connectivity of fisher habitat within the project area is low to moderate, 2) harvesting would remove 37.5% and modify 3.6% of suitable upland fisher habitat in the project area, 3) reductions in upland habitat connectivity would occur but existing levels of riparian fisher habitat would be maintained, 4) some large snags and snag recruits would be retained, and 5) overall risk factors associated with motorized human access levels would not appreciably change.

Cumulative Effects of the No-Action Alternative on Fishers

No additional effects to riparian or upland fisher habitats on DNRC-managed lands would be expected, as no timber harvesting activities would occur under the No-Action Alternative. Thus, no further cumulative effects to fisher habitat suitability would be anticipated in the

cumulative effects analysis area since: 1) no changes to existing habitats on DNRC ownership would occur; 2) landscape connectivity afforded by the stands on DNRC ownership would not change; 3) no changes to canopy cover, snags, snag recruits, or coarse woody debris levels would be expected; and 4) no changes to human access or potential for trapping mortality would be anticipated. Ongoing forest management projects not associated with the proposed Moran Cyclone Timber Sale have affected fisher habitat in the CEAA and other proposed projects could alter fisher habitat suitability in the future (see TABLE W-2 – RECENT AND PROPOSED PROJECTS).

Cumulative Effects of the Action Alternative on Fishers

Approximately 384 acres (2.3%) of 16,451 acres of potentially suitable fisher habitat in the CEAA would be harvested. Of these proposed acres, 371 acres would be upland fisher habitat and 12 acres would be riparian habitat. Riparian fisher habitat would receive harvest treatments that would reduce tree densities but retain adequate overstory crown closure (≥40%) suitable for use by fishers. Of the approximately 610 acres of preferred fisher cover types associated with Class 1 and 2 streams on DNRC lands, 502 acres (82.4% of preferred fisher cover types) would remain suitable for use by fishers (*ARM 36.11.440(1)(b)(i)*). Reductions in upland fisher habitat would be additive to the changes associated with past and current timber harvesting in the CEAA (see TABLE W-2 – RECENT AND PROPOSED PROJECTS), as well as wildfires within the last 40 years. Approximately 14,543 acres of the 52,630-acre cumulative effects analysis area (27.6%) would remain as suitable fisher habitat (TABLE W-7 – Fisher HABITAT). Reductions in landscape connectivity of suitable upland fisher habitat within the CEAA would occur; however suitable forest stands along riparian areas would persist and appreciable affects on fisher use of the CEAA would not be expected. The potential future risk for snag and coarse woody debris loss due to firewood gathering would not be expected to change, as no new permanent roads would be built and all existing restricted roads would remain restricted. Appreciable loss of snags or coarse woody debris due to firewood gathering would not be expected. Potential trapping mortality would be minimally influenced, as there would be no change in public access. Thus, minor adverse cumulative effects would be anticipated that would affect fisher habitat suitability within the CEAA since: 1) harvesting would alter tree density, snags, and stand structure in 2.3% of suitable fisher habitat within the CEAA, 2) negligible changes to fisher habitat associated with riparian areas in the CEAA would be anticipated and 82.4% of the total preferred cover type acreage would remain moderately to well-stocked, 3) suitable fisher habitat would remain connected within riparian areas, and 4) minimal risk of snag/coarse woody debris loss and trapping mortality would be expected.

TABLE W-7– Fisher HABITAT. *Estimates of existing and post-harvest acreages of suitable fisher habitat within the project area and CEAA for the Moran Cyclone Timber Sale. Values in parentheses refer to the percentage of the fisher habitat in a category of the total area within the corresponding analysis area.*

Fisher Habitat Category	Project Area (2,901 acres)		Cumulative Effects Analysis Area (52,630 acres)	
	Existing	Post-Harvest	Existing	Post-Harvest
Suitable Upland Fisher Habitat (DNRC)	901.1 (31.1%)	562.8 (19.4%)	3,874.9 (7.4%)	3,536.6 (6.7%)
Upland Fisher Habitat (non-DNRC)	0.0 (0%)	0.0 (0%)	9,585.3 (18.2%)	9,585.3 (18.2%)
Riparian Fisher Habitat (DNRC)	165.0 (5.7%)	165.0 (5.7%)	502.2 (1%)	502.2 (1%)
Riparian Fisher Habitat (non-DNRC)	0.0 (0%)	0.0 (0%)	919.4 (1.7%)	919.4 (1.7%)
Total Suitable Fisher Habitat (DNRC)	1,066.0 (36.7%)	727.7 (25.1%)	4,377.1 (8.3%)	4,038.8 (7.7%)
Total Suitable Fisher Habitat (DNRC lands & non-DNRC lands)	1,066.0 (36.7%)	727.7 (25.1%)	14,881.8 (28.3%)	14,543.5 (27.6%)

GRAY WOLF

Issue: The proposed activities could displace gray wolves from the vicinity of the project area, particularly denning and rendezvous sites, and/or alter big game prey availability, which could adversely affect gray wolves.

Introduction

In April 2011, gray wolves were removed from the federal list of threatened and endangered species in Montana, Idaho and parts of Washington, Oregon, and Utah. DNRC currently considers them as a sensitive species for the purpose of analyzing impacts associated with forest management activities.

Wolves are wide-ranging opportunistic carnivores that prey primarily on white-tailed deer, and, to a lesser extent, elk and moose, in northwest Montana (Kunkel et al. 2004). In general, wolf densities are positively correlated to prey densities (Oakleaf et al. 2006, Fuller et al. 1992). Some studies have shown that wolves may prey upon elk more frequently during certain portions of the year (particularly winter) or in areas where elk numbers are higher (Arjo et al. 2002, Kunkel et al. 2004, Garrott et al. 2006). Thus, reductions in big game numbers and/or winter range productivity could indirectly be unfavorable to wolves.

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 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.

Analysis Areas

Direct and indirect effects were analyzed for activities conducted within the 2,901-acre project area. Cumulative effects were analyzed on a 52,630-acre CEAA around the project area (see FIGURE W-1 – WILDLIFE ANALYSIS AREAS). This scale approximates an area large enough to support a wolf pack in northwest Montana (based upon DFWP wolf pack home range data, 2010-2013).

Analysis Methods

Since changes in big game distribution could have an effect on availability of prey for wolves, portions of this analysis tier to the big game winter range section below. Direct, indirect, and cumulative effects were analyzed using field evaluations, DFWP wildlife data, aerial photograph interpretation, and a GIS analysis of habitat components. Factors considered in the analysis include the amount of big game winter range modified and level of human disturbance in relation to any known wolf dens or rendezvous sites.

Existing Conditions

The proposed project area is periodically within the annual home range of the Dutch wolf pack. No denning or rendezvous sites are known or have been recorded in the project area (Kent Laudon, DFWP, personal comm. 2013). However, landscape features commonly associated with denning and rendezvous sites, including meadows and other openings near water and in gentle terrain, are present within the project area. Thus, current or future presence of wolves in the vicinity of the project area is likely.

In northwest Montana, wolves and habitats they use generally mirror those of their ungulate prey - primarily white-tailed deer, moose, and elk. The proposed project area contains summer habitat for the aforementioned prey species, as well as winter range habitat for white-tailed deer, elk, and moose (see WILDLIFE – BIG GAME HABITAT). Signs of use by deer, elk, and moose in the summer were observed during field visits. The proposed project area contains 1.1 miles of open roads and 14.1 miles of restricted roads (total road density 7.3 miles/sq mile) that could serve as a source of disturbance and mortality for both wolves and big game (see TABLE W-4– ROAD MANAGEMENT AND CONSTRUCTION).

Within the larger CEAA, winter range for moose (100.0% of CEAA) and elk (72.3%) is relatively abundant, while white-tailed (34.0%) and mule deer (41.4%) winter range is more limited. Landscape features commonly associated with denning and rendezvous sites, including meadows, openings near water, and gentle terrain, occur within the CEAA. Past harvesting on all ownerships in the CEAA has altered forest cover on 4,813 acres (9.1% of CEAA). Additionally, large-scale wildfires within the last 30 years on 21,323 acres (40.5% of the CEAA)

have reduced forest cover. These combined reductions in forest cover likely influence use of the area by big game. Harvesting and wildfire have also reduced the amount of mature forest within the CEAA, reducing the amount of thermal cover and snow intercept available to big game during the winter months. Current and proposed harvesting (see TABLE W-2 – RECENT AND PROPOSED PROJECTS) could continue to alter big game habitat and indirectly influence wolves. However, the CEAA contains 17,740 acres (33.7%) of mature forest that likely provides cover for big game and important thermal cover/snow intercept characteristics where it overlaps with winter range. The CEAA contains a minor network of restricted and open roads (total road density 1.7 miles/sq mile), which has increased human access and the potential for wolf-human interactions. Increasing access through roads can elevate risk of wolf/human encounters and elevate the vulnerability of their ungulate prey, especially during the hunting and trapping seasons. A moderate number of human dwellings mainly situated near the North Fork Road pose additional risk for wolves. Livestock operations on private lands likely pose the greatest risk to wolves within the CEAA due to the heightened potential for associated conflicts and resulting management actions. Big game habitat within CEAA remains largely intact and undeveloped; thus, continued wolf use of the area is expected.

Environmental Effects

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

No timber harvesting or associated activities would occur under the No-Action Alternative. Thus, since: 1) no additional changes in human disturbance levels would occur; and 2) no changes to the vegetation on big game winter ranges would occur, no direct and indirect effects would be expected to affect gray wolf displacement risk, or big game prey availability that could subsequently affect wolves.

Direct and Indirect Effects of the Action Alternative on Gray Wolves

Wolves using the area could be temporarily disturbed by harvesting activities; however, they are most sensitive at den and rendezvous sites, which are not known to occur within the project area. In the short term (approximately 1-4 years), activities associated with the proposed harvest could displace wolves and big game, should they be present in the area. Additionally, the resulting open stand conditions could increase the probability of a wolf or big game animal being observed and harvested during future hunting seasons. Existing scattered, dense patches of regenerating trees 5 to 25 feet tall would be retained where feasible, which would reduce sight distances for hunters looking for wolves or big game. Approximately 9.0 miles of restricted roads would be used for harvest activities for no more than three consecutive years. During this period, a total of 11.8 miles of open, temporary and restricted roads would be used to conduct project activities. Following harvest, all restricted roads would remain closed to motorized use by the public. Temporary roads would be reclaimed following use associated with the project. After timber harvesting, motorized disturbance levels would expected to be return to pre-harvest levels (see TABLE W-4– ROAD MANAGEMENT AND CONSTRUCTION). Potential for any use of the project area by wolves for denning and rendezvous sites would likely revert to pre-harvest levels following operations. Harvest would

result in the reduction of thermal cover on 643 acres (94.4% of project area) of big game winter range within the project area. These reductions in cover on big game winter range could result in minor shifts in prey availability for wolves. Additional impacts to big game winter range are discussed in more detail in the WILDLIFE – BIG GAME HABITAT section of this wildlife analysis. Thus, minor adverse direct and indirect effects to wolf prey availability and minor adverse direct and indirect effects associated with gray wolf displacement risk would be expected since: 1) no known wolf den and/or rendezvous sites are within one mile of the project area, 2) there would be reductions in habitat quality of big game winter range that could alter wolf prey availability in the immediate area by a minor degree, and 3) there would be short-term increases in motorized disturbance but long-term public motorized use of the project area would not change.

Cumulative Effects of the No-Action Alternative on Gray Wolves

No additional disturbance of gray wolves, their prey, or their habitat would occur under this alternative as no timber harvesting activities would occur. Past and ongoing forest management projects not associated with the proposed Moran Cyclone Timber Sale have affected wolf prey availability in the CEAA (see TABLE W-2 – RECENT AND PROPOSED PROJECTS), and other proposed projects could displace wolves and/or alter wolf prey availability in the future. Activities occurring on non-DNRC lands could continue altering big game winter range habitat and create disturbance within the CEAA. No additional cumulative effects to wolves associated with displacement or prey availability would be expected to result from the No-Action Alternative within the CEAA.

Cumulative Effects of the Action Alternative on Gray Wolves

In the CEAA, temporary displacement of big game and wolves is possible, should they occur in the area within close proximity to proposed timber harvest and hauling activities. Disturbance associated with the Action Alternative would be additive to ongoing and proposed forest management activities within the CEAA (see TABLE W-2 – RECENT AND PROPOSED PROJECTS), as well as land management activities on private lands. Reductions in cover may cause moderate decreases in use by deer, moose, and elk in the immediate area; however, appreciative changes in deer and elk distribution or abundance would not be expected at the scale of the CEAA (see WILDLIFE – BIG GAME HABITAT). Cover would be reduced on 643 acres (1.2% of CEAA) of big game winter range within the CEAA. Reductions in cover would be additive to 4,813 acres (9.1% of CEAA) of past timber-harvesting activities and 21,323 acres (40.5% of the CEAA) affected by wildfire within the last 40 years in the CEAA. The reductions that would occur under this alternative to big game winter range would not be expected to affect the overall potential for use of the CEAA by wolves. In addition to the 11.8 miles of potential road use within the project area, approximately 3.2 miles of open road and 0.5 miles of restricted road could receive appreciable amounts of increased traffic within the CEAA. Under this alternative, motorized disturbance associated with harvest activities would increase for up to 4 years, however public motorized use would remain restricted on existing restricted roads during harvesting. All temporary roads would be closed to motorized public use during harvest and following completion of harvest activities. Other risk factors within the CEAA,

such as livestock grazing, would continue to pose risks to wolves in this area because of the potential for conflicts and resulting management actions. No substantive change in long-term potential for wolf use of the CEAA would be expected. Thus, minor adverse cumulative effects to gray wolf displacement risk and changes to big game prey availability would be expected under the Action Alternative since: 1) localized, temporary disturbance and displacement could occur due to logging activities in the area for up to 4 years; 2) winter range habitat quality would be reduced on 1.2% of the CEAA, however the proposed activities are not expected to adversely affect overall prey availability for wolves; and 3) there would be a long-term decrease in public motorized access.

PILEATED WOODPECKER

Issue: The proposed activities could negatively affect pileated woodpecker habitat suitability by removing canopy cover and snags used for foraging and nesting, and by creating disturbance.

Introduction

Pileated woodpeckers play an important ecological role by excavating cavities that are used in subsequent years by many other species of birds and mammals. Pileated woodpeckers excavate the largest cavities of any woodpecker. Preferred nest trees are western larch, ponderosa pine, cottonwood, and quaking aspen, usually 20 inches dbh and larger. Pileated woodpeckers primarily eat carpenter ants, which inhabit large downed logs, stumps, and snags (Bull et al. 1997). 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." Necessary feeding and nesting habitat attributes include large snags, large decayed trees, and downed wood, which 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 a stand (McClelland 1979).

Analysis Areas

Direct and indirect effects were analyzed for activities conducted within the 2,901-acre project area. For cumulative effects, the project area and sections immediately surrounding the project area were used to define the small CEAA, which comprises 10,897 total acres of DNRC and non-DNRC lands (see TABLE W-1 – WILDLIFE ANALYSIS AREAS and FIGURE W-1 – WILDLIFE ANALYSIS AREAS). This scale includes sufficient area to support multiple pairs of pileated woodpeckers if enough suitable habitat is present (Bull and Jackson 1995).

Analysis Methods

Analysis methods include field evaluation, aerial photograph interpretation, and GIS analysis of available habitats. SLI data were used to identify preferred pileated woodpecker habitat (ARM 36.11.403(58)). Direct and indirect effects as well as cumulative effects were analyzed using a combination of field evaluation, aerial photograph interpretation, and mapped potential habitat. For this analysis on DNRC-managed lands in the CEAA, sawtimber stands ≥100 years

old within preferred pileated cover types (ARM 36.11.403(58)) with 40 percent or greater canopy closure were considered potential pileated woodpecker habitat. Cumulative effects were analyzed using field evaluations, GIS analysis of potential habitat, and aerial photograph interpretation of potential habitat on all other lands within the CEAA. Potential suitable pileated woodpecker habitat on non-DNRC lands was considered to be mature forest with ≥40% crown closure. Factors considered include the amount of potential pileated woodpecker habitat, degree of harvesting, and the amount of continuous mature forested habitat suitable for use by pileated woodpeckers.

Existing Conditions

In the project area, there are approximately 783 acres (27.0% of project area) of suitable pileated woodpecker habitat. Current potential pileated habitat within the project area consists of mature Douglas-fir/western larch and mixed conifer stands in five patches (average 157 acres, range 28-465 acres). Four of these patches are part of larger potentially suitable patches of mature forest outside of the project area. Mature forest with ≥40% crown closure connects many of these patches together and may provide an additional measure of connectivity for pileated woodpeckers. Disturbance, primarily in the form of timber harvest and wildfire, has resulted in some stands and cover types currently unsuitable for pileated woodpeckers. Snags and coarse woody debris within the proposed project area are at adequate levels appropriate for the existing habitat types (see SNAGS AND COARSE WOODY DEBRIS). Large snags (>15" dbh) are present in many stands and pileated woodpecker foraging evidence was observed during field visits. Past harvesting and wildfire has altered mature stands, snags, and coarse woody debris on approximately 1,149 acres (39.6%) of the project area. Firewood gathering, which can result in a reduction of snags and downed logs valuable as woodpecker nesting and foraging substrates, is minimal within the project area due to the lack of open roads and surrounding private land. Given these observed existing habitat conditions, pileated woodpecker habitat suitability is currently low to moderate within the project area.

The small CEAA contains approximately 1,066 acres (9.7% of the CEAA) of potential pileated woodpecker habitat on DNRC-managed lands. Another 1,736 acres (15.9% of the CEAA) of additional mature forest within the CEAA provides potentially suitable habitat conditions for pileated woodpeckers. Together, these 2,802 acres (25.7% of CEAA) are distributed among 49 patches and average patch size is 57 acres (range 1-905 acres). Three of the five pileated habitat patches within the project area are part of patches greater than 150 acres within the CEAA. Presently, 8.8 percent (963 acres) of the CEAA not forested and is not suitable for use by pileated woodpeckers. These non-forested areas include meadows, lakes, and roads. Most of the remaining 7,132 acres (65.4%) within the CEAA consist of young, forested stands or less preferred cover types that are not likely providing suitable habitat for pileated woodpeckers. Wildfire and timber harvesting within the last 40 years have affected approximately 4,399 acres (40.4% of the CEAA) that are not currently suitable pileated habitat. Firewood gathering is active along 23.9 miles of open road within the CEAA. Thus, habitat quality and availability for pileated woodpeckers within the CEAA is currently low to moderate.

Environmental Effects

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

No timber harvesting activities would occur under this alternative. Thus, no adverse direct and indirect effects associated with disturbance levels or habitat suitability for pileated woodpeckers in the project area would be expected since: 1) no changes in the amount of continuously forested habitat would be anticipated, 2) no changes to existing pileated woodpecker habitat would be anticipated, and 3) no additional disturbance would take place.

Direct and Indirect Effects of the Action Alternative on Pileated Woodpeckers

Approximately 270 acres (34.5%) of available pileated woodpecker habitat in the project area would be altered by proposed harvesting. Approximately 246 acres of habitat would undergo regeneration-type treatments and would likely be too open to be suitable pileated woodpecker habitat following logging. In these stands proposed for treatment, suitable pileated habitat would be removed for 50-80 years. Harvesting on these 246 acres of suitable pileated woodpecker habitat would reduce forested habitat for pileated woodpeckers and create younger-aged stands with widely scattered mature trees. An additional 24 acres of suitable pileated habitat would receive intermediate harvest treatments that would reduce tree densities but retain adequate crown closure (≥40%) and stocking to remain suitable habitat. Approximately 796 acres (27.4%) of currently suitable pileated habitat would remain unharvested within the project area. Snags important for nesting pileated woodpeckers would be retained in the proposed harvest areas (see SNAGS AND COARSE WOODY DEBRIS), however the abundance of snags and snag recruitment trees would be reduced. Since pileated woodpecker density is positively correlated with the amount of dead and/or dying wood in a stand (McClelland 1979), pileated woodpecker habitat quality in the project area would be expected to be reduced on 270 acres. Overall patch size of contiguous pileated habitat in the project area would decrease from 157 acres to an average of 76 acres (range 2-149 acres). The number of pileated habitat patches within the project area would increase from five to seven. Silvicultural prescriptions in regeneration harvest units would retain healthy western larch and Douglas-fir trees in low densities (6-8 trees per acre), while promoting the regeneration of many of these same species, which would benefit pileated woodpeckers in the future by providing high-quality nesting, roosting, and foraging habitat. Low-quality habitat associated with shade-tolerant tree species would likely be converted to a more desirable forest type, although it would take about 50-80 years to mature into pileated habitat. Pileated woodpeckers tend to be tolerant of human-caused disturbance (Bull and Jackson 1995), but they could be temporarily displaced by the noise and activity associated with the proposed harvesting. Long-term open road density and associated firewood gathering risk would not change. Thus, moderate adverse direct and indirect effects would be anticipated that would affect pileated woodpeckers in the project area since: 1) 34.5% of available suitable habitat within the project area would be harvested; 2) the amount of contiguous suitable pileated woodpecker habitat would be reduced by 246 acres; 3) baseline habitat suitability appears to be low to moderate for pileated woodpeckers due to past harvesting and wildfire; 4) some snags and snag recruits would be removed, however, mitigation measures to retain a minimum of 2 snags per acre and 2 snag

recruits per acre (of the largest size classes available) in harvest areas would be included; 5) harvest prescriptions would retain and promote seral tree species in all proposed harvest areas; and 6) temporary levels of potential disturbance would increase over a 1-3 year period, but long-term disturbance would not change.

Cumulative Effects of the No-Action Alternative on Pileated Woodpeckers

No timber harvesting activities would occur under this alternative. Past and ongoing forest management projects not associated with the proposed Moran Cyclone Timber Sale have affected pileated woodpecker habitat in the project area, and other proposed projects could disturb pileated woodpecker and/or alter habitat suitability in the future (TABLE W-2 – RECENT AND PROPOSED PROJECTS). No additional cumulative effects to pileated woodpeckers associated with disturbance risk or habitat suitability are expected to result from the No-Action Alternative that could affect pileated woodpeckers in the CEAA since: 1) no changes in the amount of continuously forested habitat would be anticipated, 2) no changes to existing pileated woodpecker habitat would be anticipated, and 3) no additional disturbance would take place.

Cumulative Effects of the Action Alternative on Pileated Woodpeckers

Under this alternative, pileated woodpecker habitat would be reduced on 270 acres (9.6%) of the 2,802 acres of potentially suitable habitat in the CEAA. Forest canopy on 246 acres of treated area would likely be too open for appreciable use by pileated woodpeckers, and would be more similar to other recently harvested or burned stands that comprise 4,399 acres (40.4% of the CEAA). The number of habitat patches would increase from 49 to 51 acres and average patch size would decrease from 57 to 50 acres (range 1-905 acres). Harvesting would not affect the largest existing 905-acre patch in the CEAA (8.3% of the CEAA). Snags, coarse woody debris, and potential nesting trees would be retained in the project area according to forest management *ARM 36.11.41*; however, snags and snag recruitment trees would be reduced from existing levels in all of the proposed harvest units. Recent harvesting and wildfire in the CEAA has altered the quality and abundance of pileated woodpecker habitat; reductions associated with this Action Alternative would be additive to those reductions. Overall habitat suitability of the CEAA for pileated woodpeckers would be expected to decrease for 30-50 years until harvested stands from the last 20-30 years mature. Firewood gathering along 23.9 miles of open roads would continue to affect the abundance of snags and woody debris within areas of the CEAA. In the long term, maturation of stands across the CEAA would increase suitable pileated woodpecker habitats through time. Thus, minor cumulative effects to habitat suitability for pileated woodpeckers would be anticipated since: 1) 9.6% of potentially suitable habitat currently present within the CEAA would be altered; 2) the existing baseline level of pileated woodpecker habitat suitability is low to moderate; 3) average patch size of suitable habitat would be reduced by 7 acres; 4) some snags and snag recruits per acre would be removed in the proposed harvest areas for operational and human safety purposes, however, mitigation measures would retain at least 2 large snags and 2 large recruitment trees in

harvested areas; and 5) disturbance and firewood gathering would be unchanged in the long-term.

BIG GAME HABITAT

Issue: The proposed activities could reduce habitat quality for big game, especially during the fall hunting and winter seasons, by removing forest cover, disturbing animals, and increasing roads in secure areas.

Introduction

Timber harvesting can affect big game and habitat quality through disturbance during harvest activities, removal of forest crown closure, and by creating openings in the forest used for foraging. Forested habitat on winter ranges enables big game survival by ameliorating the effects of severe winter weather conditions. Winter ranges tend to be areas found at lower elevations that support concentrations of big game, which are widely distributed during the remainder of the year. Suitable winter ranges have adequate midstory and overstory cover that reduces wind velocity and intercepts snow, while moderating ambient temperatures. Besides providing a moderated climate, the snow-intercept capacity effectively lowers snow depths, which enables big game movement and access to forage. Snow depths differentially affect big game; deer are most affected, followed by elk, then moose.

Timber harvesting can increase big game (e.g. elk) vulnerability by changing the size, structure, juxtaposition, and accessibility of areas that provide security during times of hunting pressure (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. Because the female segments of the elk and deer populations are normally regulated carefully during hunting seasons, primary concerns are related to a substantial reduction of the male segment and resulting decrease in hunter opportunity.

Analysis Areas

Direct and indirect effects were analyzed for activities conducted within the 2,901-acre project area. Cumulative effects were analyzed on 52,630-acre large CEAA (see FIGURE W-1 – WILDLIFE ANALYSIS AREAS). This scale of analysis is defined according to geographic features including watershed boundaries (i.e. ridgelines, wildfire boundaries), which provides a reasonable biological analysis unit for big game animals that could be influenced by project-related activities.

Analysis Methods

To assess big game habitat on the project area, SLI data were used to identify stands with cover types and forest structure (≥40 crown closure) that could provide thermal and/or hiding cover for big game species. Cumulative effects were analyzed using field evaluations, GIS analysis of potential habitat, and aerial photograph interpretation of potential habitat on all other lands

within the CEAA. Potential thermal and/or hiding cover habitat on non-DNRC lands was considered to be mature forest with ≥40% crown closure. Montana Department of Fish, Wildlife, and Parks provided maps of big game winter range in the area (DFWP 2008). Direct, indirect, and cumulative effects were analyzed using a combination of field evaluation, aerial photograph interpretation, and a GIS analysis of available habitats. Factors considered in the analysis include the amount of big game winter range habitat available, the extent of past and proposed harvesting, and level of human access for recreational hunting.

Existing Environment

Portions of the proposed project area have been identified by DFWP as white-tailed deer, mule deer, moose and elk winter range. Evidence of summer/fall deer, moose, and elk use was observed during field visits to the project area. The project area contains approximately 1,455 acres (50.2%) of habitat that is currently providing year-round cover and visual screening for big game. These acres also provide moderate to high amounts of thermal cover and snow intercept for wintering big game. An additional 135 acres (4.6%) of the project area have forested stands that contain a more open overstory canopy (<40% canopy cover) than what would be considered high-quality thermal cover or cover that would provide appreciable snow intercept. Approximately 927 acres (31.9% of the project area) are comprised of densely-stocked pole-sized stands that are likely providing visual screening but only low to moderate amounts of thermal cover and snow intercept. Moderate levels of hunter access exist in the project area, as there are 1.1 miles of open roads and 14.1 miles of restricted road spread throughout the area. The density of open roads in the project area is 0.3 miles/sq. mile. The project area likely receives its highest amount of use during the fall hunting season.

White-tailed deer and mule deer winter range occupy approximately 987 acres (34.0%) and 1,201 acres (41.4%) of the CEAA, respectively. Approximately 2,901 (100.0%) and 2,096 acres (72.3%) of the CEAA were identified as moose and elk winter range, respectively. White-tailed deer winter range within the CEAA is connected to a larger winter range area (26,931 acres) extending along the flood plain of the North Fork Flathead River. Mule deer winter range within the CEAA is connected to a larger 17,720-acre area extending south along Winona Ridge. These larger winter ranges do not include lands inside Glacier National Park, which were not mapped by DFWP. Presently, approximately 17,740 acres (33.7%) within the CEAA are providing usable thermal cover and snow intercept for big game. These forest patches are currently distributed primarily on DNRC and Forest Service lands within the CEAA, as past harvesting and extensive wildfire on private industrial timberlands has reduced these attributes. Growing conditions on the North Fork Flathead River floodplain, which favor open meadows and deciduous trees, also limit the distribution of coniferous forest cover within big game winter range. Recent harvests and wildfire have reduced the quality and quantity of usable cover on winter range within the area, but they may have increased forage quality and quantity by opening up the forest overstory canopy. However, forage occurring in forest openings is often not available to wintering animals during appreciable portions of the winter due to deep, crusted snow conditions. Encroachment of noxious weeds into recently logged

areas has also likely offset some of the potential gain in forage production. Ongoing and future harvesting (see TABLE W-2 – RECENT AND PROPOSED PROJECTS) could continue to reduce cover attributes on winter range and temporarily displace big game within the CEAA. The CEAA also likely receives moderate levels of hunter access, especially in areas where roads, both open and restricted, are more numerous. Open road density within the CEAA is relatively low at 1.1 miles/sq. mile and total road density is 1.7 miles/sq. mile.

Environmental Effects

Direct and Indirect Effects of the No-Action Alternative on Big Game Habitat

No changes in big game habitat would be expected as no timber harvesting activities would occur. Existing cover would continue to contribute to winter range quality and security habitat would not be altered. Thus, no direct or indirect effects to big game habitat in the project area would be anticipated since: 1) no changes to existing thermal cover would be anticipated and continued maturation of forest cover would improve thermal cover and snow intercept, and 2) the level of human access would remain unchanged.

Direct and Indirect Effects of the Action Alternative on Big Game Habitat

Under the Action Alternative, approximately 643 acres (22.2% of project area) of big game habitat and winter range would be commercially harvested on the project area. Of these acres, roughly 566 acres of mature canopy forest currently providing thermal cover would be harvested. Harvest prescriptions in 378 acres of harvest units would result in areas too open to effectively function as thermal cover or snow intercept. Retention of scattered, dense patches of regenerating conifers in these units could provide marginal levels of thermal cover/snow intercept. Forest vegetation capable of providing these big game habitat attributes would require 40-60 years for suitable sized trees (>40 ft. tall) to develop in harvested stands. Another 188 acres of mature canopy would undergo intermediate harvesting that would provide some visual screening and moderate levels of thermal cover/snow intercept. Pre-commercial thinning on an additional 230 acres of densely-stocked, pole-sized stands would reduce some visual screening and cover, however these treated stands would still provide appreciable amounts of cover that would limit risk of hunting mortality.

Proposed tree removal would increase sight distances in commercial harvest units and could increase risk of hunting mortality for 10-20 years. Rolling topography and the retention of scattered patches of regenerating conifers 5-20 feet tall within harvest units would help mitigate some loss of big game security. Some short-term (1-4 years) displacement of big game would be expected as a result of the proposed motorized logging disturbance. Road density and use within the project area would see a temporary increase (TABLE W-4 – ROAD MANAGEMENT AND CONSTRUCTION). During all phases of the project, any restricted roads and new road construction opened with project activities would be restricted from motorized use by the general public and closed after completion of project activities. Long-term open road density would not change under the proposed Action Alternative.

Thus, minor to moderate adverse direct and indirect effects to big game security habitat and winter range habitat quality would be expected for the next 40 to 60 years since: 1) 38.9% of available effective thermal cover/snow intercept in the project area would be altered; 2) 889 acres (30.6% of project area) of unaltered mature cover would remain; 3) sight distances would increase on 643 acres, which could increase big game vulnerability and associated hunting mortality risk; 4) limited motorized hunter access, rolling topography, and retained patches of regenerating conifers would mitigate some of the adverse effects of mature cover removal; 5) relatively short-term logging activities would create disturbance in this area; and 6) long-term open road density would not change.

Cumulative Effects of the No-Action Alternative on Big Game Habitat

No additional changes in big game habitat would be expected as no timber harvesting activities would occur. Existing levels of cover would persist. Past and ongoing forest management projects not associated with the proposed Moran Cyclone Timber Sale (see TABLE W-2 – RECENT AND PROPOSED PROJECTS) have affected big game habitat in the project area, and other proposed projects could disturb big game species and/or alter habitat quality in the future. Activities occurring on non-DNRC lands could continue altering big game winter range habitat and create disturbance within the CEAA. No additional cumulative effects to big game habitat quality are expected to result from the No-Action Alternative that could affect big game species in the CEAA since: 1) no big game habitat would be altered and continued maturation of forest cover would improve thermal cover and snow intercept, and 2) the level of human access would remain unchanged.

Cumulative Effects of the Action Alternative on Big Game Habitat

Proposed harvesting would alter 643 acres (1.2%) of big game habitat. Pre-commercial thinning would remove some pole and sapling-sized trees on an additional 230 acres (0.4% of CEAA). Forest stands providing suitable thermal cover and snow intercept would be removed from approximately 378 acres (1.1%) and altered on 188 acres (0.4%) within the CEAA (52,630 acres). This reduction thermal cover and snow intercept would be additive to past reductions within the CEAA due to forest management and wildfire. A minor decrease in big game habitat quality on winter range within the CEAA would be expected. Reductions in cover may cause minor decreases in use by deer, moose, and elk in the immediate area; however, appreciative long-term changes in deer and elk distribution or abundance would not be expected at the scale of the CEAA. Continued maturation of previously harvested or burned stands within the CEAA would improve thermal cover/snow intercept and partially offset these current losses within 20 to 40 years.

Harvesting and motorized disturbance within the CEAA associated with the proposed project could displace wintering big game and reduce available winter range habitats. Displacement associated with this alternative would be additive to any displacement associated with ongoing timber harvesting (see TABLE W-2 – RECENT AND PROPOSED PROJECTS). Under the Action Alternative, use of existing restricted roads and new temporary roads constructed for

completing harvesting activities could temporarily increase access and disturbance on 11.2 miles and result in a temporary increase in open road density from 1.1 miles/sq. mile to 1.2 miles/sq. mile. After harvesting, open road density would remain at current levels in the CEAA and continue to facilitate moderate amounts of hunter access.

Thus, minor adverse cumulative effects to big game winter range and elk security habitat would be expected since: 1) harvesting would reduce overall levels of cover on 616 acres (1.1%) of winter range within the CEAA; 2) existing thermal cover and snow intercept on winter range in the CEAA would be altered, but approximately 17,362 acres (33.0% of the CEAA) of these attributes would remain; 3) overall habitat quality within the larger winter range would not be appreciably altered; 4) logging activities would create disturbance on approximately 5% of the CEAA; and 7) no new permanent roads would be built and long-term open road densities would not change.

Wildlife Mitigations associated with the Action Alternative

- If a threatened or endangered species is encountered, consult a DNRC biologist and develop additional mitigations that are consistent with the administrative rules for managing threatened and endangered species (*ARM 36.11.428* through *36.11.435*).
- Prohibit contractors and purchasers conducting contract operations from carrying firearms while on duty as per *ARM 36.11.444(2)* and GB-PR2 (*USFWS AND DNRC 2010, Vol. II p. 2-5*).
- Contractors will adhere to food storage and sanitation requirements as per GB-PR3 (*USFWS AND DNRC 2010, Vol. II p. 2-6*).
- Public access would be restricted at all times on restricted roads that are opened for harvesting activities; signs will be used during active periods and a physical closure (gate, barriers, equipment, etc.) will be used during inactive periods (nights, weekends, etc.).
- In a portion of harvest units, retain patches of advanced regeneration of shade-tolerant trees as per LY-HB4 (*USFWS AND DNRC 2010, Vol. II pp. 2-50, 2-51*).
- Where available in pre-commercial thinning units, retain some shade-tolerant trees (primarily subalpine fir in these stands) as per LY-HB4 (*USFWS AND DNRC 2010, Vol. II pp. 2-50, 2-51*).
- Retain at least 2 snags per acre and 12-24 tons of coarse woody debris per acre. Emphasize the retention of downed logs ≥15 inches dbh where they occur as per LY-HB2(1) and (2) (*USFWS AND DNRC 2010, Vol. II p. 2-48).* Favor western larch and Douglas-fir for snag retention and recruitment.

- Prohibit harvest activities in proposed harvest unit #8 (closest to Cyclone Lake) from February 1 to August 15 to minimize disturbance to nesting bald eagles and common loons.
- Close roads and trails to the extent possible following the proposed activities to reduce the potential for unauthorized motor vehicle use and/or loss of snags due to firewood gathering.

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FIGURE W-1 – WILDLIFE ANALYSIS AREAS. *Areas used to assess effects of the Action and No-Action Alternatives on wildlife and wildlife habitat for the proposed DNRC Moran Cyclone Timber Sale.*

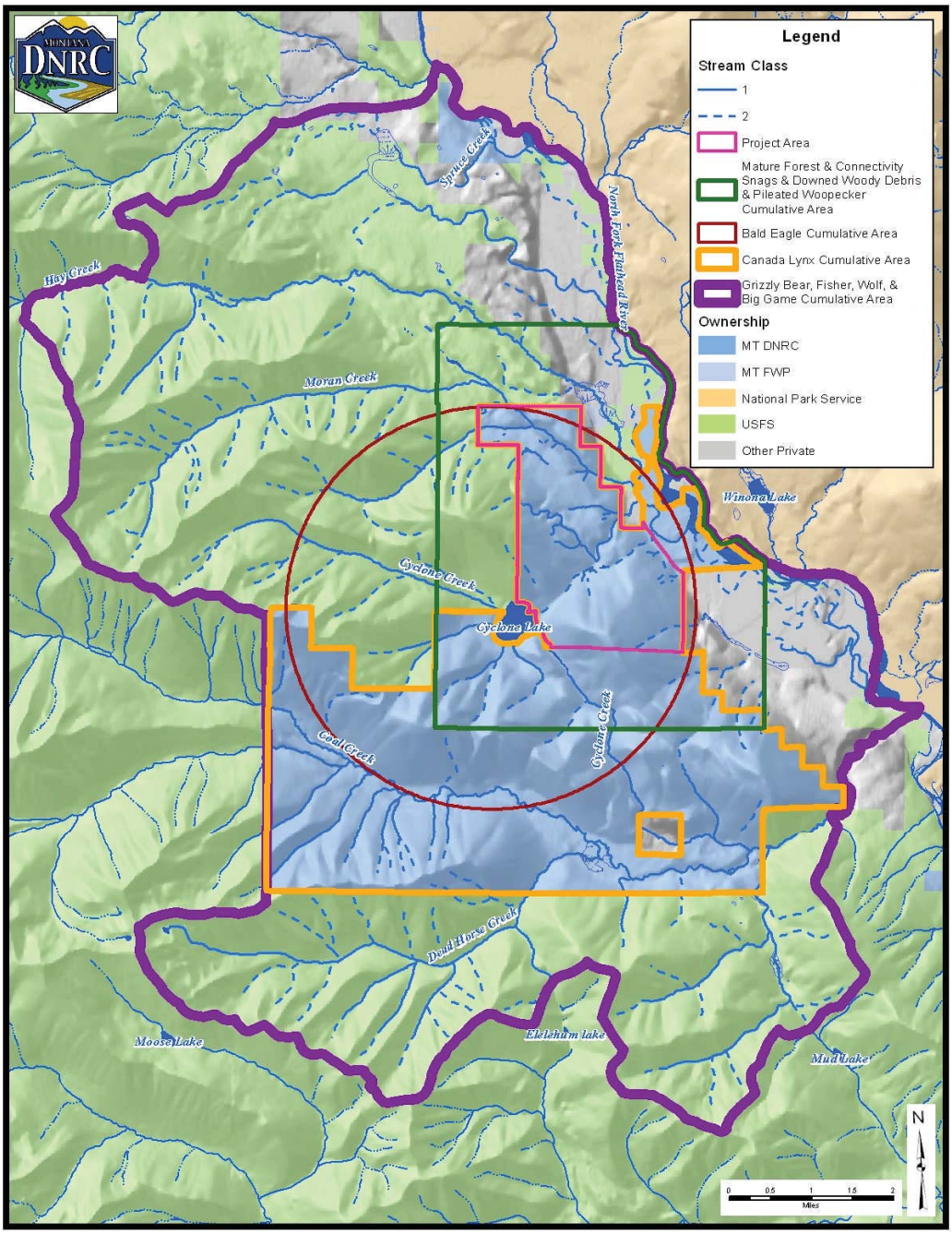
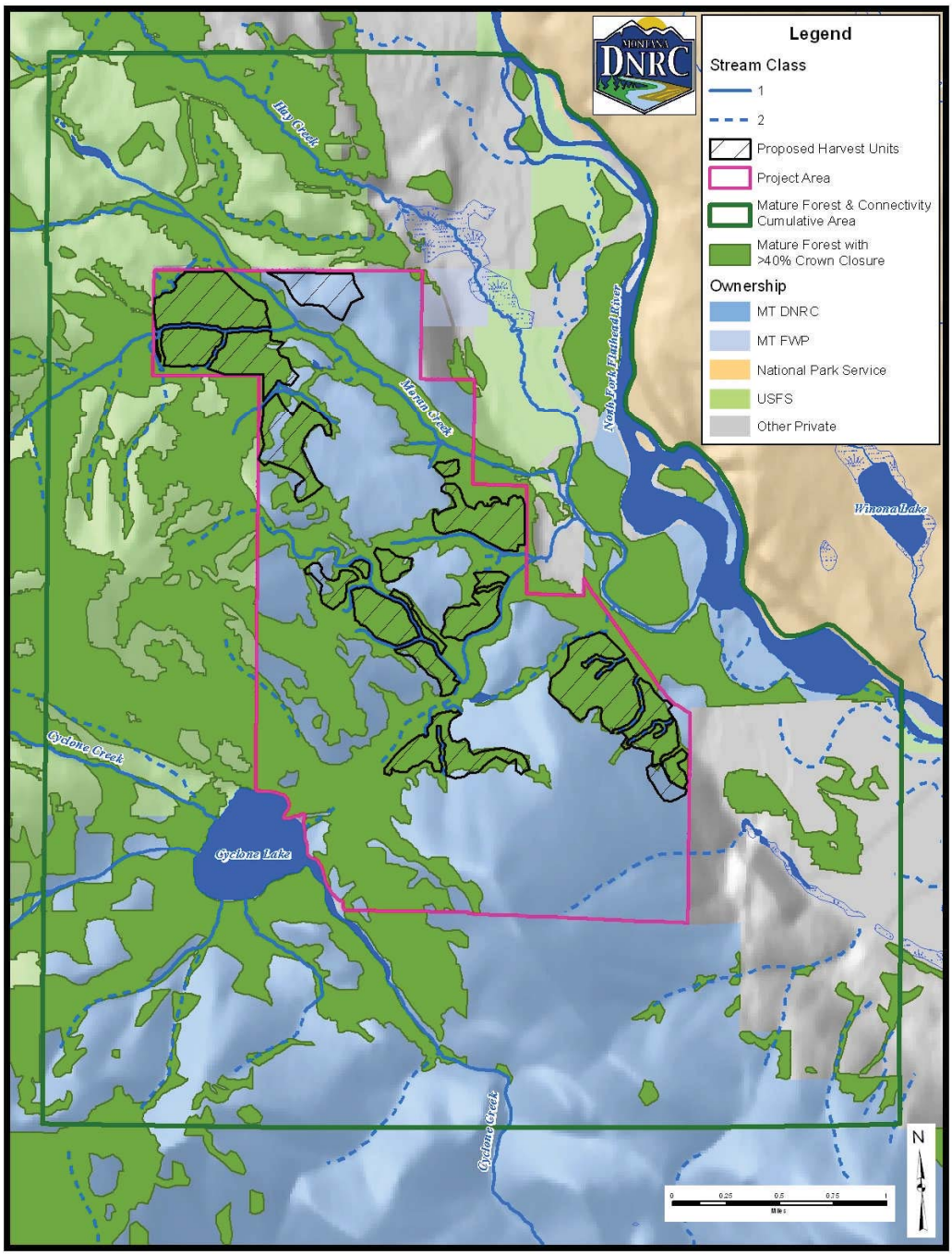


FIGURE W-2 – MATURE FORESTED HABITAT AND LANDSCAPE CONNECTIVITY. *Relationship of the project area and proposed units to mature forested stands and potential connectivity for the DNRC Moran Cyclone Timber Sale.*



Attachment VIII:

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Attachment IX:

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Attachment X:

Glossary

Administrative road use: Road use that is restricted to DNRC personnel and contractors or for purposes such as monitoring, forest improvement, fire control, hazard reduction, etc.

Airshed: An area defined by a certain set of air conditions; typically, a mountain valley in which air movement is constrained by natural conditions such as topography.

Basal area: A measure of the number of square feet of space occupied by the stem of a tree.

Best Management Practices: A practice or combination of land use management practices that are used to achieve sediment control and protect soil productivity and prevent or reduce non-point pollution to a level compatible with water quality goals. The practices must be technically and economically feasible and socially acceptable.

Biodiversity: The variety of life and its processes. It includes the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.

Board foot: A unit for measuring wood volumes. One board foot is a piece of wood 1 foot long, 1 foot wide, and 1 inch thick (144 cubic inches). This measurement is commonly used to express the amount of wood in a tree, saw log, or individual piece of lumber.

Canopy: The upper level of a forest consisting of branches and leaves of the taller trees.

Canopy closure: The percentage of a given area covered by the crowns, or canopies, of trees.

Cavity: A hollow excavated in trees by birds or other animals. Cavities are used for roosting and reproduction by many birds and mammals.

Coarse down woody material: Dead trees within a forest stand that have fallen and begun decomposing on the forest floor; generally larger than 3 inches in diameter.

Coarse-filter: An approach to maintaining biodiversity as described in the State Forest Land Management Plan (DNRC 1996) that involves maintaining a diversity of structures and species composition within stands and a diversity of ecosystems across the landscape.

Co-dominant tree: A tree that extends its crown into the canopy, receiving direct sunlight from above and limited sunlight on its sides. One or more sides are crowded by the crowns of other trees.

Compaction: Increased soil density caused by force exerted at the soil surface, modifying aeration and nutrient availability.

Connectivity: The quality, extent, or state of being joined; unity; the opposite of fragmentation.

Connectivity (fish): The capability of different life stages of HCP fish species to move among the accessible habitats within normally occupied stream segments.

Connectivity (lynx): Stand conditions where sapling, pole or sawtimber stands possess at least 40% crown canopy closure, in a patch greater than 300 feet wide.

Cover: See *Hiding cover* and/or *Thermal cover*.

Covertype: A classification of timber stands based on the percentage of tree species composition.

Crown cover or crown closure: The percentage of the ground surface covered by vertical projection of tree crowns.

Cull: A tree of such poor quality that it has no merchantable value in terms of the product being cut.

Cutting units: Areas of timber proposed for harvesting.

Cumulative effect: The impact on the environment that results from the incremental impact of the action when added to other

actions. Cumulative impacts can also result from individually minor actions, but collectively they may compound the effect of the actions.

Desired future conditions: The land or resource conditions that will exist if goals and objectives are fully achieved. It is considered synonymous with appropriate conditions.

Direct effect: Effects on the environment that occur at the same time and place as the initial cause or action.

Ditch relief: A method of draining water from roads using ditches and corrugated metal pipe. The pipe is placed just under the surface of the road.

Dominant tree: Those trees within a forest stand that extend their crowns above surrounding trees and capture sunlight from above and around the crown.

Drain dip: A graded depression built into a road to divert water and prevent soil erosion.

Ecosystem: An interacting system of living organisms and the land and water that make up their environment; the home place of all living things, including humans.

Edge: The border between two or more habitats such as a wetland and mature forest.

Equivalent clearcut acres (ECA): This method equates the area harvested and the percent of crown removed with an equivalent amount of clearcut area.

- *Allowable ECA* - The estimated number of acres that can be clearcut before stream channel stability is affected.
- *Existing ECA* - The number of acres that have been previously harvested, taking into account the degree of hydrologic recovery that has occurred due to revegetation.
- *Remaining ECA* - The calculated amount of harvesting that may occur without substantially increasing the risk of causing detrimental effects to the stability of the stream channel.

Excavator piling: The piling of logging residue using an excavator.

Fire regimes: Describes the frequency, type, and severity of wildfires. Examples include: frequent nonlethal underburns; mixed-severity fires; and stand-replacement or lethal burns.

Forage: All browse and nonwoody plants available and acceptable to grazing animals or that may be harvested for feeding purposes.

Forest improvement: The establishment and growing of trees after a site has been harvested. Associated activities include:

- site preparation,
- planting,
- survival checks,
- regeneration surveys, and
- stand thinnings.

Fragmentation (forest): A reduction of connectivity and an increase in sharp stand edges resulting when large contiguous areas of forest with similar age and structural character are interrupted through disturbance (stand-replacement fire, timber harvesting, etc.).

Habitat: The place where a plant or animal naturally or normally lives and grows.

Habitat type: Forest vegetation types that follow the habitat type climax vegetation classification system developed by Pfister et al. (1977).

Hazard reduction: The reduction of fire hazard by processing logging residue with methods such as separation, removal, scattering, lopping, crushing, piling and burning, broadcast burning, burying, and chipping.

Hiding cover: Vegetation capable of hiding some specified portion of a standing adult mammal from human view, at a distance of 200 feet.

Historical forest condition: The condition of the forest prior to settlement by Europeans.

Homogeneous: Of uniform structure or composition throughout.

Indirect Effects: Secondary effects that occur in locations other than the initial action or significantly later in time.

Interdisciplinary team (ID Team): A team of resource specialists brought together to analyze the effects of a

project on the environment.

Intermediate trees: A characteristic of certain tree species that allows them to survive in relatively low light conditions, although they may not thrive.

Landscape: An area of land with interacting ecosystems.

Live Crown Ratio: The percentage of the length of tree having live limbs divided by the tree's height.

Meter: A measurement equaling 39.37 inches.

Mitigation measure: An action or policy designed to reduce or prevent detrimental effects.

Multistoried stands: Timber stands with 3 or more distinct stories.

Nest-site area (bald eagle): The area in which human activity or development may stimulate abandonment of the breeding area, affect successful completion of the nesting cycle, or reduce productivity. This area is either mapped for a specific nest based on field data, or, if that is impossible, is defined as the area within a quarter-mile radius of all nest sites in the breeding area that have been active within 5 years.

No-action alternative: The option of maintaining the status quo and continuing present management activities; the proposed project would not be implemented.

Nonforested area: A naturally occurring area where trees do not establish over the long term, such as bogs, natural meadows, avalanche chutes, and alpine areas.

Old growth: For this analysis, old growth is defined as stands that meet the minimum criteria (number of trees per acre that have a minimum dbh and a minimum age) for a given site (old-growth group from habitat type). These minimums can be found in the *Green et al* *Old Growth Forest Types of the Northern Region* (see *REFERENCES).*

Old growth maintenance: Silviculture treatments in old growth stands designed to retain old growth attributes, including large live trees, snags and CWD, but that would remove encroaching shade-tolerant species, create small canopy gaps generally less than one acre in size, and encourage regeneration of shade-intolerant species. This type of treatment is applicable on sites that historically would be characterized by mixed severity fire regimes, either relatively frequent or infrequent. ARM 36.11.403 (49)

Open-Road Densities: Percent of the grizzly bear subunit exceeding a density of 1 mile per square mile of open roads.

Overstory: The level of the forest canopy including the crowns of dominant, codominant, and intermediate trees.

Patch: A discrete area of forest connected to other discrete forest areas by relatively narrow corridors; an ecosystem element (such as vegetation) that is relatively homogeneous internally, but differs from what surrounds it.

Phloem: The living tissue of the tree.

Project file: A public record of the analysis process, including all documents that form the basis for the project analysis. The project file for the Mystery Fish Timber Sale is located at the Stillwater State Forest office near Olney, Montana.

Redds: The spawning ground or nest of various fish species.

Regeneration: The replacement of one forest stand by another as a result of natural seeding, sprouting, planting, or other methods.

Restricted road: A road that is managed to limit the manner in which motorized vehicles may be used. Restricted roads have a physical barrier that restricts the general use of motorized vehicles. Restriction s may be man-made or naturally occurring.

Residual stand: Trees that remain standing following any harvesting operation.

Road: Any created or evolved access route that is greater than 500 feet long and is reasonably and prudently drivable with a conventional two-wheel-drive passenger car or two-wheel-drive pickup.

Road-construction activities: In general, the term 'road construction activities' refers to all

the activities conducted while building new roads, reconstructing existing roads, and obliterating roads. The activities may include any or all of the following:

- road construction;
- right-of-way clearing;
- excavation of cut/fill material;
- installation of road surface and ditch drainage features;
- installation of culverts at stream crossings;
- burning right-of-way slash;
- hauling and installation of borrow material; and
- blading and shaping road surfaces.

Road improvements: Construction projects on an existing road to improve ease of travel, safety, drainage, and water quality.

Saplings: Trees 1 to 4 inches in diameter at breast height.

Sawtimber trees: Trees with a minimum dbh of 9 inches.

Scarification: The mechanized gouging and ripping of surface vegetation and litter to expose mineral soil and enhance the establishment of natural regeneration.

Scoping: The process of determining the extent of the environmental assessment task. Scoping includes public involvement to learn which issues and concerns should be addressed and the depth of assessment that will be required. It also includes a review of other factors, such as laws, policies, actions by other landowners, and jurisdictions of other agencies that may affect the extent of assessment needed.

Security: For wild animals, the freedom from the likelihood of displacement or mortality due to human disturbance or confrontation.

Seedlings: Live trees less that 1 inch dbh.

Sediment: In bodies of water, solid material, mineral or organic, that is suspended and transported or deposited.

Sediment yield: The amount of sediment that is carried to streams.

Seral: Refers to a biotic community that is in a developmental, transitional stage in ecological succession.

Shade intolerant: Describes the tree species that generally can only reproduce and grow in the open or where the overstory is broken and allows sufficient sunlight to penetrate. Often these are seral species that get replaced by more shade-tolerant species during succession. In Stillwater State Forest, shade-intolerant species generally include ponderosa pine, western larch, Douglas-fir, western white pine, and lodgepole pine.

Shade tolerant: Describes tree species that can reproduce and grow under the canopy in poor sunlight conditions. These species replace less shade-tolerant species during succession. In Stillwater State Forest, shade-tolerant species generally include subalpine fir, grand fir, Engelmann spruce, and western red cedar.

Sight distance: The distance at which 90% of an animal is hidden from view. On forested trust lands, this is approximately 100 feet, but may be more or less depending on specific vegetative and topographic conditions.

Siltation: The process of very fine particles of soil (silt) settling. This may occur in streams or from runoff. An example would be the silt build-up left after a puddle evaporates.

Silviculture: The art and science of managing the establishment, composition, and growth of forests to accomplish specific objectives.

Site preparation: A hand or mechanized manipulation of a harvested site to enhance the success of regeneration. Treatments are intended to modify the soil, litter, and vegetation to create microclimate conditions conducive to the establishment and growth of desired species.

Slash: Branches, tree tops, and cull trees left on the ground following a harvest.

Snag: A standing dead tree or the portion of a broken-off tree. Snags may provide feeding and/or nesting sites for wildlife.

Snow intercept: The action of trees and other plants in catching falling snow and preventing it from reaching the ground.

Spur roads: Low-standard roads constructed to meet minimum requirements for harvest-related

traffic.

Stand: An aggregation of trees occupying a specific area and sufficiently uniform in composition, age arrangement, and condition so as to be distinguishable from the adjoining forest.

Stand density: Number of trees per acre.

Stocking: The degree of occupancy of land by trees as measured by basal area or number of trees, and as compared to a stocking standard (which is an estimate of either the basal area) or the number of trees per acre required to fully use the growth potential of the land.

Stream gradient: The slope of a stream along its course, usually expressed in percentage indicating the amount of drop per 100 feet.

Stumpage: The value of standing trees in the forest; sometimes used to mean the commercial value of standing trees.

Succession: The natural series of replacement of one plant (and animal) community by another over time in the absence of disturbance.

Suppressed: The condition of a tree characterized by a low growth rate and low vigor due to competition.

Temporary road: Roads built to the minimal standards necessary to prevent impacts to water quality and provide a safe and efficient route to remove logs from the timber sale area. Following logging operations or site preparations, the road would no longer function as an open road, restricted road or trail. DNRC would assure that they no longer could be accessed for commercial, administrative or public motorized use.

- Segments near the beginning of the new temporary road systems may be reshaped to near-natural contours and reclaimed for approximately 200 feet by grass seeding and strewing slash and debris.

- The reclamation of the remaining road would include a combination of ripping or mechanically loosening the surface soils on segments of the road, removing culverts or bridges that were installed, spreading forest debris along portions of the road, and allowing the surface to revegetate naturally.

Texture: A term used in visual assessments indicating distinctive or identifying features of the landscape depending on distance.

Thermal cover: For white-tailed deer, thermal cover has 70 percent or more coniferous canopy closure at least 20 feet above the ground, generally requiring trees to be 40 feet or taller.

For elk and mule deer, thermal cover has 50 percent or more coniferous canopy closure at least 20 feet above the ground, generally requiring trees to be 40 feet or taller.

Timber-harvesting activities: In general, the term timber-harvesting activities refers to all the activities conducted to facilitate timber removal before, during, and after the timber is removed. These activities may include any or all of the following:

- felling and bucking standing trees into logs;
- skidding logs to a landing;
- processing, sorting, and loading logs onto trucks at the landing;
- hauling logs by truck to a mill;
- slashing and sanitizing residual vegetation damaged during logging;
- machine piling logging slash;
- burning logging slash;
- scarifying and preparing the site for planting; and
- planting trees.

Total Road Densities: Percent of grizzly bear subunit with more than 2 miles per square mile of total road.

Understory: The trees and other woody species growing under a, more or less, continuous cover of branches and foliage formed collectively by the overstory of adjacent trees and other woody growth.

Uneven-aged stand: Various ages and sizes of trees growing together on a uniform site.

Ungulates: Hoofed animals, such as mule deer, white-tailed deer, elk, and moose, that are mostly herbivorous; many are horned or antlered.

Vigor: The degree of health and growth of a tree or stand of trees.

Visual screening: Vegetation and/or topography providing visual obstruction capable of hiding a grizzly bear from view. The distance or patch size and configuration required to provide effective visual screening depends on the topography and/or type and density of cover available.

Watershed: The region or area drained by a river or other body of water.

Water yield: The average annual runoff for a particular watershed expressed in acre-feet.

Water-yield increase: Due to forest canopy removal, an increase in the average annual runoff over natural conditions.

Windthrow: A tree pushed over by wind. Windthrows (blowdowns) are common among shallow-rooted species and in areas where cutting or natural disturbances have reduced the density of a stand so individual trees remain unprotected from the force of the wind.

Acronyms

ARM .....*Administrative Rules of Montana*

BMP .....*Best Management Practices*

BMU.....*Bear Management Unit*

CEAA.....*Cumulative Effects Analysis Area*

cmp .....*corrugated metal pipe*

CWD.....*Coarse Woody Debris*

dbh .....*diameter at breast height*

DEQ .....*Department of Environmental Quality*

DFWP .....*Montana Department of Fish, Wildlife, and Parks*

DNRC.....*Department of Natural Resources and Conservation*

EA .....*Environmental Assessment*

ECA.....*Equivalent Clearcut Acres*

EIS.....*Environmental Impact Statement*

FIA .....*Forest Inventory and Analysis group*

FI .....*Forest Improvement*

FNF .....*Flathead National Forest*

FRTA.....*Federal Roads and Trails Act*

FOGI .....*Full Old-Growth Index*

GBS……*Grizzly Bear Subunit*

GIS.....*Geographic Information System*

HCP .....*Habitat Conservation Plan*

ID Team....*Interdisciplinary Team*

MCA .....*Montana Codes Annotated*

MEPA .....*Montana Environmental Policy Act*

Mbf.....*Thousand Board Feet*

MMbf.....*Million Board Feet*

MNHP .....*Montana Natural Heritage Program*

NCDE .....*Northern Continental Divide Ecosystem*

NWLO .....*Northwestern Land Office*

RL.....*Random Lengths*

RMZ.....*Riparian Management Zone*

SFLMP .....*State Forest Land Management Plan*

SLI .....*Stand Level Inventory*

SMZ .....*Streamside Management Zone*

STW .....*Stillwater Unit*

TLMD .....*Trust Land Management Division*

TMDL .....*Total Maximum Daily Load*

USFS .....*United States Forest Service*

USFWS.....*United States Fish and Wildlife Service*

WFP .....*Washington Forest Practices Board*

WMZ.....*Wetland Management Zone*

WYI .....*Water Yield Increases*

124 Permit: *Stream Protection Act Permit*

318 Authorization: *A Short-Term Exemption from Montana's Surface Water Quality and Standards*