

North Meadow & Upper Indian Creek Timber Sales Environmental Assessment



Plains Unit
Northwest Land Office
Montana Department of Natural Resources and Conservation
March 2016



North Meadow & Upper Indian Creek Timber Sales

Environmental Assessment

Table of Contents

Objectives Memo	2
Type and Purpose of Action.....	2
Project Development	4
Impacts on the Physical Environment.....	6
Impacts on the Human Population	9
Finding.....	14
Attachment A - Maps	15
Attachment B – Prescriptions	21
Attachment C – Vegetation Analysis	32
Attachment D – Water Shed and Fisheries Analysis	43
Attachment E – Soils Analysis	53
Attachment F – Wildlife Analysis	64

MEMORANDUM

To: Tyrell Colombo, Plains Unit Management Forester
Dale Peters, Plains Unit Forest Management Supervisor

From: David Olsen, Plains Unit Resource Program Manager

Date: April, 2015

RE: North Meadow and Upper Indian Creek Timber Sale Objectives

Primary Objective

The primary objective of the North Meadow Timber Sale is to generate income for the Common Schools (CS) Trust. The land parcels involved in this proposed projects are located in Section 28, Township 25 North, Range 27 West (North Meadow) and Section 4, Township 25 North, Range 27 West (Upper Indian Creek). This project would provide an estimated 2.0 MMBF of merchantable timber toward the Northwestern Land Office s FY 2016 timber sale program targeted volume goal.

Secondary Objectives

Minimize losses in timber volume from mortality due to insect and disease conditions present within the sale area.

Promote the continued presence and/or reestablishment of historically appropriate timber types on Trust land included in this project.

Reduce fire hazard and associated risks of loss to State of Montana and privately owned lands in the area.

Management Directives

In planning and preparing this project requirements and specific actions as designated in the DNRC HCP shall be addressed, management direction of the State Forest Land Management Plan and associated Administrative Rules shall followed. All applicable Streamside Management Zone rules and regulations will be met. Montana Best Management Practices will be applied in all instances.

Environmental Assessment

Project Name: North Meadow & Upper Indian Creek Timber Sales
Proposed Implementation Date: May 2016
Proponent: Plains Unit, Northwest Land Office, Montana DNRC
County: Sanders

Type and Purpose of Action

Description of Proposed Action:

The Plains Unit of the Montana Department of Natural Resources and Conservation (DNRC) is proposing two timber sales: North Meadow and Upper Indian Creek Timber Sales. The projects are located approximately 12 air miles south of Happy’s Inn(refer to vicinity map Attachment A-1 and project map A-2) and includes the following sections:

Beneficiary	Legal Description	Total Acres	Treated Acres
Common Schools	S4 T25N R27W S28 T25N R27W	120 160	120 160
Public Buildings			
MSU 2 nd Grant			
MSU Morrill			
Eastern College-MSU/Western College-U of M			
Montana Tech			
University of Montana			
School for the Deaf and Blind			
Pine Hills School			
Veterans Home			
Public Land Trust			
Acquired Land			

Objectives of the project include:

- Generate revenue for the Common Schools Trust Fund.
- Harvest approximately 2-3MMBF.
- Harvest trees that are infested or susceptible to Douglas-fir beetle.
- Bring portions of the project area closer to the Desired Future Conditions.

Proposed activities include:

Action	Quantity
Proposed Harvest Activities	
Clearcut	
Seed Tree	250
Shelterwood	18
Selection	12
Commercial Thinning	
Salvage	
Total Treatment Acres	280
Proposed Forest Improvement Treatment	
Pre-commercial Thinning	
Planting	
Proposed Road Activities	
New permanent road construction	2.18 mi
New temporary road construction	
Road maintenance	25.61 mi
Road reconstruction	0.37 mi
Road abandoned	
Road reclaimed	
Other Activities	

Duration of Activities:	3 Years
Implementation Period:	05/01/16 to 12/31/18

The lands involved in this proposed project are held in trust by the State of Montana. (Enabling Act of February 22, 1889; 1972 Montana Constitution, Article X, Section 11). The Board of Land Commissioners and the DNRC are required by law to administer these trust lands to produce the largest measure of reasonable and legitimate return over the long run for the beneficiary institutions (Section 77-1-202, MCA).

The DNRC would manage lands involved in this project in accordance with:

- The State Forest Land Management Plan (DNRC 1996),
- Administrative Rules for Forest Management (ARM 36.11.401 through 471),
- The Montana DNRC Forested State Trust Lands Habitat Conservation Plan (HCP) (DNRC 2010)
- And all other applicable state and federal laws.

Project Development

SCOPING: NORTH MEADOW

- DATE:
 - August 13, 2015 → September 13, 2015
- PUBLIC SCOPE:
 - The scoping notice was posted on the DNRC Website:
<http://dnrc.mt.gov/PublicInterest/Notices/Default.asp>
 - Adjacent landowners, statewide scoping list, other interested parties.
 - A notice was also published in the *Clark Fork Valley Press*, the *Sanders County Ledger* and the *Missoulian*
- AGENCIES SCOPE:
 - Montana Fish Wildlife & Parks, Montana tribal organizations, US Forest Service, US Fish & Wildlife Service, State of Montana
- COMMENTS RECEIVED:
 - How many: 3
 - Concerns: Cultural resources and culvert installations.
 - Results: If cultural resources are found operations will stop and the DNRC archeologist will be notified. There are no culverts being installed.

Internal and external issues and concerns were incorporated into project planning and design and will be implemented in associated contracts.

SCOPING: UPPER INDIAN CREEK

- DATE:
 - August 4, 2015 → September 10, 2015
- PUBLIC SCOPE:
 - The scoping notice was posted on the DNRC Website:
<http://dnrc.mt.gov/PublicInterest/Notices/Default.asp>
 - Adjacent landowners, statewide scoping list, other interested parties.
 - A notice was also published in the *Clark Fork Valley Press*, the *Sanders County Ledger* and the *Missoulian*
- AGENCIES SCOPE:
 - Montana Fish Wildlife & Parks, Montana tribal organizations, US Forest Service, US Fish & Wildlife Service, State of Montana
- COMMENTS RECEIVED:
 - How many: 3
 - Concerns: Cultural resources and Streamside Management Zone Laws (SMZ). Support for timber management to generate revenue, reduce fire danger, improve wildlife habitat, and implementation of weed control.
 - Results: If cultural resources are found operations will stop and the DNRC archeologist will be notified. All SMZ laws would be implemented.
 - Internal and external issues and concerns were incorporated into project planning and design and will be implemented in associated contracts.

INTERDISCIPLINARY TEAM (ID):

- Project Leaders: Ty Colombo and Dale Peters
- Archeologist: Patrick Rennie
- Wildlife Biologist: Chris Forristal
- Hydrologist/Soil Scientist: Tony Nelson
- Economist: Sarah Lyngholm
- Silviculturist: Ty Colombo and Dale Peters

OTHER GOVERNMENTAL AGENCIES WITH JURISDICTION, LIST OF PERMITS

NEEDED: (*Conservation Easements, Army Corps of Engineers, road use permits, etc.*)

- **United States Fish & Wildlife Service-** DNRC is managing the habitats of threatened and endangered species on this project by implementing the Montana DNRC Forested Trust Lands Habitat Conservation Plan (HCP) and the associated Incidental Take Permit that was issued by the United States Fish & Wildlife Service (USFWS) in February of 2012 under Section 10 of the Endangered Species Act. The HCP identifies specific conservation strategies for managing the habitats of grizzly bear, Canada lynx, and three fish species: bull trout, westslope cutthroat trout, and Columbia redband trout. This project complies with the HCP. The HCP can be found at www.dnrc.mt.gov/HCP
- **Montana Department of Environmental Quality (DEQ)** - DNRC is classified as a major open burner by DEQ and 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.
- **Montana/Idaho Airshed Group-** The DNRC is a member of the Montana/Idaho Airshed Group which was formed to minimize or prevent smoke impacts while using fire to accomplish land management objectives and/or fuel hazard reduction (Montana/Idaho Airshed Group 2006). The Group determines the delineation of airsheds and impact zones throughout Idaho and Montana. Airsheds describe those geographical areas that have similar atmospheric conditions, while impact zones describe any area in Montana or Idaho that the Group deems smoke sensitive and/or having an existing air quality problem (Montana/Idaho Airshed Group 2006). As a member of the Airshed Group, DNRC agrees to burn only on days approved for good smoke dispersion as determined by the Smoke Management Unit.

ALTERNATIVES CONSIDERED:

No-Action: Under this alternative, no timber would be harvested and therefore no revenue would be generated from the project area for the Common Schools Trust at this time. Mortality in live trees would continue and the DF Beetle would continue to spread in epidemic proportions. Trust would continue to lose stumpage value within the stand

Action Alternative (Provide a description of all proposed activities):

Two commercial timber harvests would take place to remove between 2 and 3 million board feet of timber. Timber would be harvested using ground-based and skyline methods on 280 acres.

Removal of the majority of the Douglas-fir may mitigate the spread of the Douglas-fir beetle to surrounding stand while capturing the value of the timber before it is lost due to mortality.

This action would also call for mechanical and/or controlled burning for site preparation on harvested areas to promote natural regeneration.

Impacts on the Physical Environment

VEGETATION:

Issues and Concerns- The following issue statements were developed during scoping regarding the effects of the proposed action to vegetation:

- Forest health.
- Minimize losses in timber volume from mortality due to insect and disease conditions present within the sale area; specifically Douglas-fir Beetle, *Dendroctonus pseudotsugae* Hopkins.
- Promote the continued presence and/or reestablishment of historically appropriate timber types on Trust Land included in this project.
- Reduce fire hazard and associated risks of loss to State of Montana.
- Maintenance of existing old growth stands.
- Disturbance may lead to an increased presence of noxious weeds.

Recommended Mitigation Measures for Vegetation- The analysis and levels of effects to vegetation resources are based on implementation of the following mitigation measures.

- Harvest prescriptions have been developed to remove diseased and insect infested timber, maintain 9 acres of existing old growth, and reduce fuel loading.
- Tree removal would cause changes in the vegetative structure of the project area. Silvicultural prescriptions have been developed to keep stands moving towards desired future conditions, while maintaining good tree growth and vigor. The proposed action alternative would promote the continued development of the desired future cover types of Ponderosa pine, Western larch/Douglas-fir, and Douglas-fir.
- Monitor and treat weed populations through the use of chemical herbicides, vehicle washing, and by grass-seeding roads immediately following harvest.

FOR COMPLETE VEGETATION ANALYSIS SEE ATTACHMENTS B and C.

SOILS:

Issues and Concerns- The following issue statements were developed during scoping regarding the effects of the proposed action to soils:

- Soil Physical Properties: Disturbance from ground-based and cable harvesting can displace fertile topsoil effecting vegetation growth and water quality.
- Nutrient Recycling: 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.
- Slope Stability: Timber harvesting will remove some of the vegetation that stabilizes the slopes.

Recommended Mitigation Measures for Soils- The analysis and levels of effects to soils resources are based on implementation of the following mitigation measures.

- Limit disturbance by spacing skid trails and limiting equipment to slopes less than 40%.
- Retain down woody debris to minimize erosion and allow for nutrient recycling.

FOR COMPLETE SOILS ANALYSIS SEE ATTACHMENT E.

WATER RESOURCES:

Issues and Concerns- The following issue statements were developed during scoping regarding the effects of the proposed action to water resources:

- Sediment delivery and subsequent water quality impacts can be affected by timber harvest activities.
- Water yield increases can result from timber harvesting activities.

Recommended Mitigation Measures for Water Resources- The analysis and levels of effects to water resources are based on implementation of the following mitigation measures.

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

- implement BMPs on all new road construction and improve BMPs on existing roads on state land where needed
- use spot-blading on existing roads to preserve as much of the existing vegetative cover as possible on vegetated road surfaces

FOR COMPLETE WATER RESOURCES ANALYSIS SEE ATTACHMENT D.

WILDLIFE: *(terrestrial & avian including unique, federally listed as threatened or endangered, sensitive, and/or species of special concern):*

Issues and Concerns- The following issue statements were developed during scoping regarding the effects of the proposed action to wildlife:

- Mature forest cover, old growth and connectivity. The proposed activities could decrease forested cover, which may reduce habitat connectivity and suitability for wildlife species associated with mature and old-growth forest.
- Canada lynx. The proposed activities could result in the modification of habitat preferred by Canada lynx (*Felis lynx*) and decrease the area's suitability for lynx.
- Fishers. 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.
- Flammulated owls. The proposed activities could alter the structure of flammulated owl (*Otus flammeolus*) preferred habitat types, which could reduce habitat suitability for flammulated owls.
- Pileated woodpeckers. The proposed activities could reduce tree density and alter the structure of mature forest stands, which could reduce habitat suitability for pileated woodpeckers (*Dryocopus pileatus*).
- Big game. 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.

Recommended Mitigation Measures for Wildlife- The analysis and levels of effects to wildlife are based on implementation of the following mitigation measures.

- If a threatened or endangered species is encountered, consult a DNRC biologist immediately. Similarly, if undocumented nesting raptors or wolf dens are encountered within ½ mile of the Project Area contact a DNRC biologist.
- 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)*.
- Contractors will adhere to food storage and sanitation requirements as described in the timber sale contract. Ensure that all attractants such as food, garbage, and petroleum products are stored in a bear-resistant manner.
- Restrict public access at all times on restricted roads that are opened for harvesting activities. Effectively close all restricted roads following harvest completion.
- Close roads and trails to the maximum extent possible following the proposed activities to reduce the potential for unauthorized motor vehicle use and/or loss of snags to firewood gathering.
- Retain patches of advanced regeneration of shade-tolerant trees within harvest units as per *LY-HB4 (USFWS and DNRC 2010)*.
- Retain visual screening along roads where possible to increase security for wildlife.
- Retain at least 2 snags and 2 snag recruits per acre, particularly favoring western larch, ponderosa pine and Douglas-fir for retention. Increase snag retention within the old-growth maintenance unit to the extent practicable. If designated snags are cut for safety concerns, leave them in the harvest unit. Retain coarse-woody debris as described in the Forest Management ARMs and *SOILS ANALYSIS* in this document.

FOR COMPLETE WILDLIFE ANALYSIS SEE ATTACHMENT F.

AESTHETICS:

Any change to the scenery in the area from these alternatives would be in addition to past activity within the project area. This analysis includes all past and present effects.

Issues and Concerns- The following issue statements were developed during scoping regarding the effects of the proposed action to aesthetics:

- There are no issues due to the fact that the project area is not visible from a main road and is surrounded by heavily managed forest lands.

HISTORICAL AND ARCHEOLOGICAL SITES:

The DNRC archeologist was contacted and there are no cultural resources identified within the project area. If culture resources are found, operation will be stopped and the DNRC archeologist will be notified.

DEMANDS ON ENVIRONMENTAL RESOURCES OF LAND, WATER, AIR, AND ENERGY:

There will be no measurable direct, secondary, and cumulative impacts related to environmental resources of land, water, air, and energy due to the relatively small size of the timber sale project.

OTHER ENVIRONMENTAL DOCUMENTS PERTINENT TO THE AREA:

- Whitney Springs EA 2000
- Richard's Peak EA 2002
- Thompson Face EA 2010
- Skookum Draft EA (Scoped) 2016

Impacts on the Human Population

HUMAN HEALTH AND SAFETY:

Air Quality

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

The project area is located within Montana Airshed 2, which encompasses portions of Sanders, Flathead, Lake, and Mineral Counties. Currently, this Airshed does/does not contain any impact zones.

Issues and Concerns- The following issue statements were developed during scoping regarding the effects of the proposed action to air quality:

- Smoke will be produced during pile burning.
- Dust will be produced during harvesting and hauling activities.

Recommended Mitigation Measures for Air Quality- The analysis and levels of effects to air quality are based on implementation of the following mitigation measures:

- Only burn on days approved by the Montana/Idaho Airshed group and DEQ.
- Conduct test burn to verify good dispersal.
- Dust abatement may be used as necessary.
- Slower speed limits may be included in contracts as necessary to reduce dust.

-SLASH BURNING

No Action Alternative:

No slash would be burned within the project areas. Thus, there would be no effects to air quality within the local vicinity and throughout Airshed 2.

Action Alternative:

Direct and Secondary Effects

Slash consisting of tree limbs and tops and other vegetative debris would be piled throughout the project area during harvesting. Slash would ultimately be burned after harvesting operations have been completed. Burning would introduce particulate matter into the local airshed, temporarily affecting local air quality. Over 70% of emissions emitted from prescribed burning are less than 2.5 microns (National Ambient Air Quality PM 2.5). High, short-term levels of PM 2.5 may be hazardous. Within the typical column of biomass burning, the chemical toxics are: Formaldehyde, Acrolein, Acetaldehyde, 1,4 Butadiene, and Polycyclic Organic Matter. Burning within the project area would be short in duration and would be conducted when conditions favor good to excellent ventilation and smoke dispersion as determined by the Montana Department of Environmental Quality 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 secondary effects to air quality due to slash burning associated with the proposed action would be minimal.

Cumulative Effects

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/Idaho 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. Thus, cumulative effects to air quality due to slash burning associated with the proposed action would also be expected to be minimal.

-DUST

No Action Alternative:

No increased dust would be produced as a result of the proposed timber sale. Current levels of dust would be produced in the area.

Action Alternative:

Direct, Secondary, and Cumulative Effects

Harvesting operations would be short in duration. Dust may be created from log hauling on portions of native surface roads during summer and fall months. Contract clauses would provide for the use of dust abatement or require trucks to reduce speed if necessary to reduce dust near any affected residences.

Thus, direct, secondary, and cumulative effects to air quality due to harvesting and hauling associated with the proposed action would be minimal.

RECREATION: (including access to and quality of recreational and wilderness activities):

The area is used for hiking, hunting, cross-country skiing, snowmobiling and general recreating. Currently, roads through the area are closed to motorized use and used only for administrative purposes. There would be no change in road closure status and the selection of either alternative would not affect the ability of people to recreate on this parcel.

There will be no change from existing conditions. Therefore, there would be no measurable direct, secondary, or cumulative impacts on recreation from this proposed action.

Will the No-Action or Action Alternatives result in potential impacts to:	Impact												Can Impact Be Mitigated?	Comment Number
	Direct				Secondary				Cumulative					
	No	Low	Mod	High	No	Low	Mod	High	No	Low	Mod	High		
<i>No-Action</i>														
Health and Human Safety	X				X				X					
Industrial, Commercial, and Agricultural Activities and Production	X				X				X					
Quantity and Distribution of Employment	X				X				X					
Local Tax Base and Tax Revenues	X				X				X					
Demand for Government Services	X				X				X					
Density and Distribution of Population and Housing	X				X				X					
Social Structures and Mores	X				X				X					
Cultural Uniqueness and Diversity	X				X				X					
<i>Action</i>														

Will the No-Action or Action Alternatives result in potential impacts to:	Impact												Can Impact Be Mitigated?	Comment Number	
	Direct				Secondary				Cumulative						
	No	Low	Mod	High	No	Low	Mod	High	No	Low	Mod	High			
Health and Human Safety	X				X				X						
Industrial, Commercial, and Agricultural Activities and Production	X				X				X						
Quantity and Distribution of Employment		X				X				X				No	1
Local Tax Base and Tax Revenues	X				X				X						
Demand for Government Services	X				X				X						
Density and Distribution of Population and Housing	X				X				X						
Social Structures and Mores	X				X				X						
Cultural Uniqueness and Diversity	X				X				X						

Comment Number 1:

Impact

According to the Montana Bureau of Business and Economic Research a general rule of thumb is that for every million board feet of sawtimber harvested in Montana, ten person years of employment occur in the forest products industry. This harvest is viewed as a continuation of a sustained yield and as such would not create any new jobs but rather sustain approximately 20 person years of employment in the forest products industry. A few short-term jobs would also be created/sustained by issuing contracts following harvest. Additionally, local businesses, such as hotels, grocery stores, and gas stations would likely receive additional revenues from personnel working on the proposed project. This would be a positive low impact to quantity and distribution of employment in the area.

Mitigations:

- This impact would be positive and mitigations would not be necessary.*

LOCALLY ADOPTED ENVIRONMENTAL PLANS AND GOALS: *(includes local MOUs, management plans, conservation easements, etc):*

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

OTHER APPROPRIATE SOCIAL AND ECONOMIC CIRCUMSTANCES:

The proposed action has a projected harvest volume between 2 and 3 MMBF. This volume is worth approximately \$350/MBF delivered to a forest products manufacture site at current market prices. Delivered to market, the proposed action has a total revenue value of an estimated \$875,000. Removing the timber sale purchaser's contracted operations and DNRC's development, administration, and operation expenses, the trust beneficiaries net between an

estimated 15 and 35 percent of total delivered sawlog market value. Therefore, the proposed action may generate net income for trust beneficiaries between \$131,250 and \$306,250. Costs related to the administration of the timber sale program are only tracked at the Land Office 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 by land office and statewide. These revenue-to-cost ratios are a measure of economic efficiency. A recent revenue-to-cost ratio of the Northwestern Land Office was 2.6. This means that, on average, for every \$1.00 spent in costs, \$2.60 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.

Mills in Montana need 351 MMBF per year to maintain current production levels and industry infrastructure. Currently the Sustained yield and target harvest from Trust Lands is 57.6 MMBF, which represents approximately 16.4% of timber harvested in the state of Montana. This project would provide approximately 2.5 MBF of timber towards the sustained yield target thus helping sustain current mill capacity.

Environmental Assessment Checklist Prepared By:

Name: Ty Colombo & Dale Peters

Title: Management Forester & Forest Management Supervisor

Date: March 9, 2016

Finding

Alternative Selected

The Action Alternative meets the project objectives and is selected for implementation. The No Action Alternative fails to meet the stated objectives concerning this project.

Significance of Potential Impacts

No significant impacts have been identified to occur as a result of the implementation of the Action Alternative.

Need for Further Environmental Analysis

EIS

More Detailed EA

No Further Analysis

Environmental Assessment Checklist Approved By:

Name: David M. Olsen

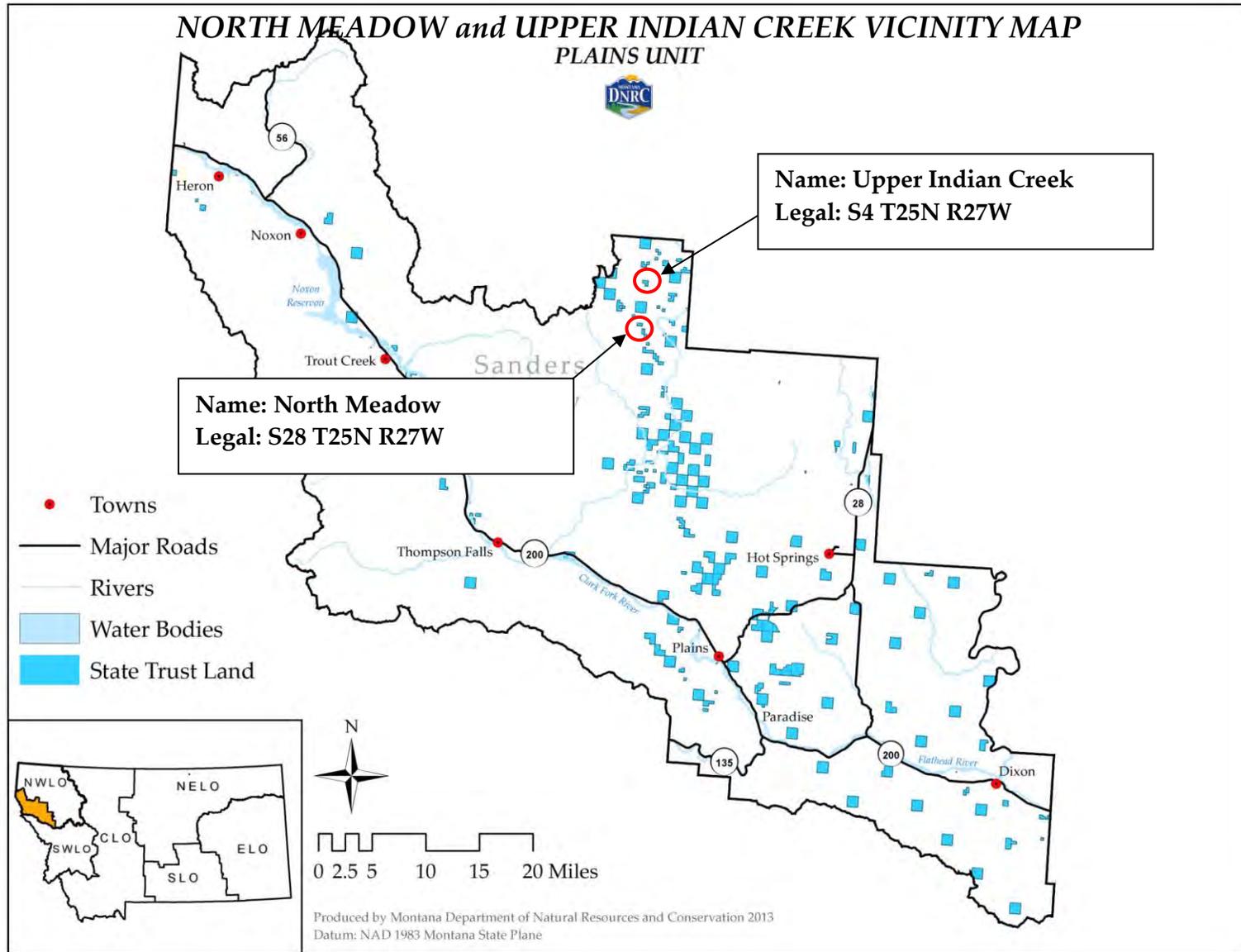
Title: Plains Unit Program Manager

Date: 4/10/2016

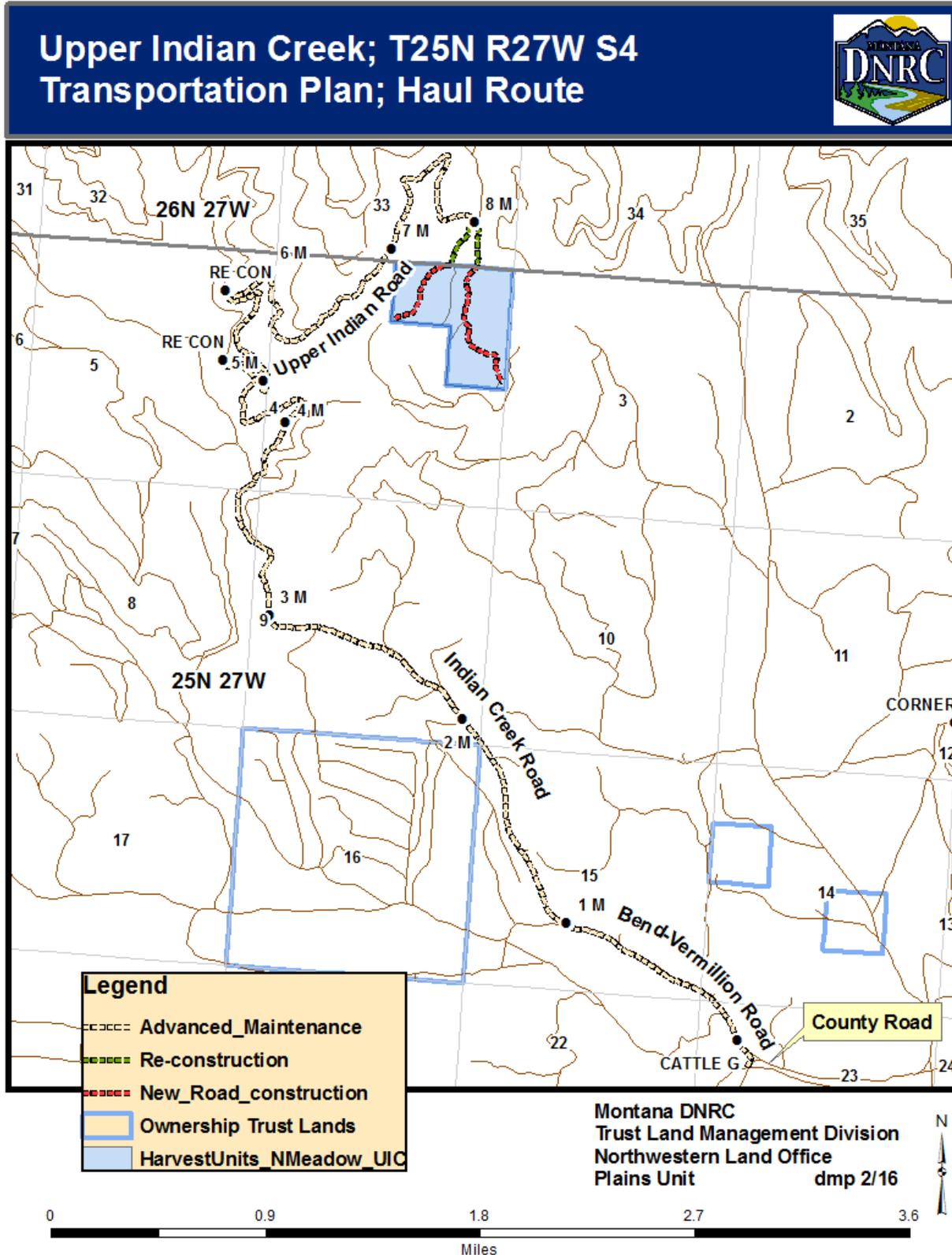
Signature: /s/ *David M. Olsen*

Attachment A - Maps

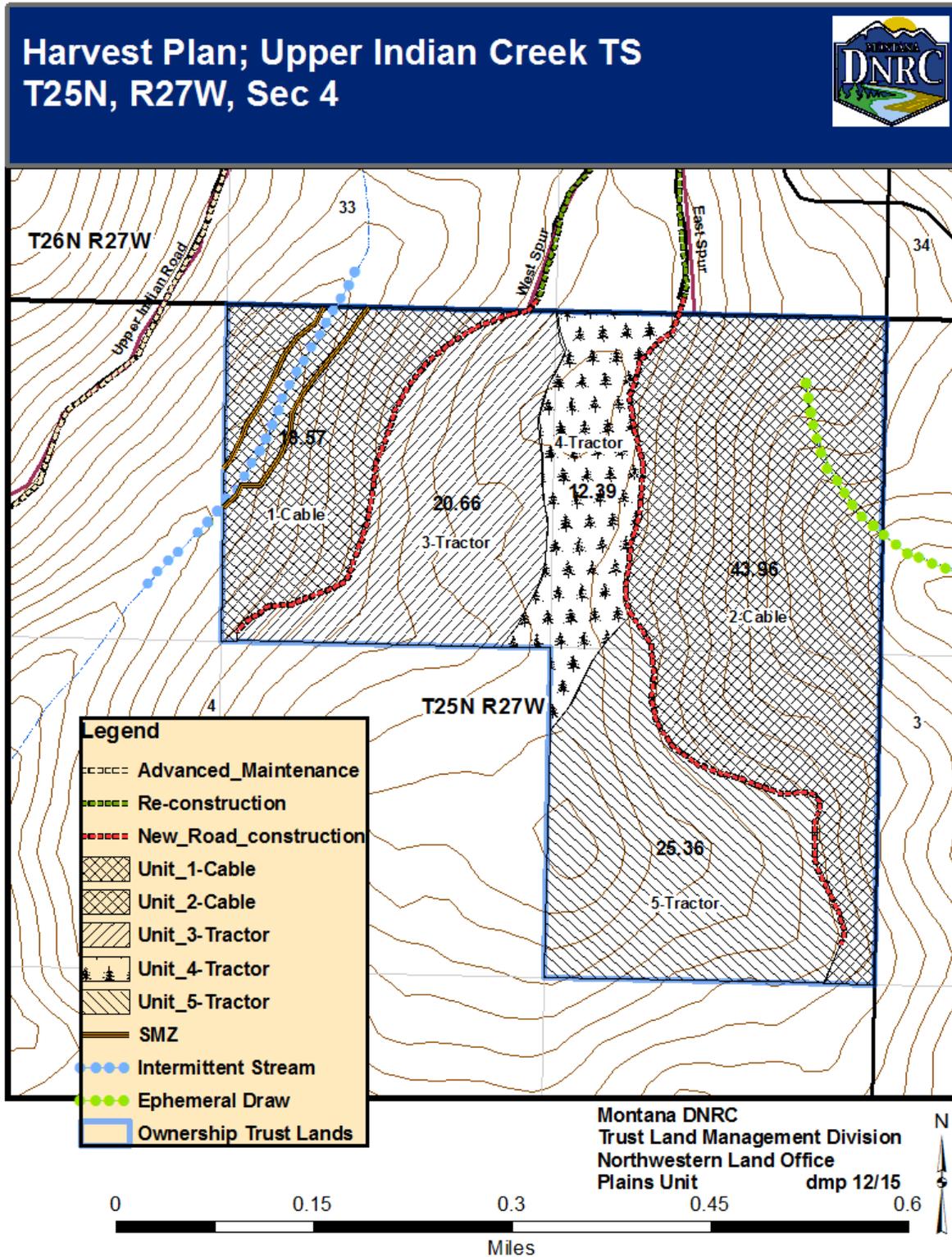
A-1: North Meadow Timber Sale Vicinity Map



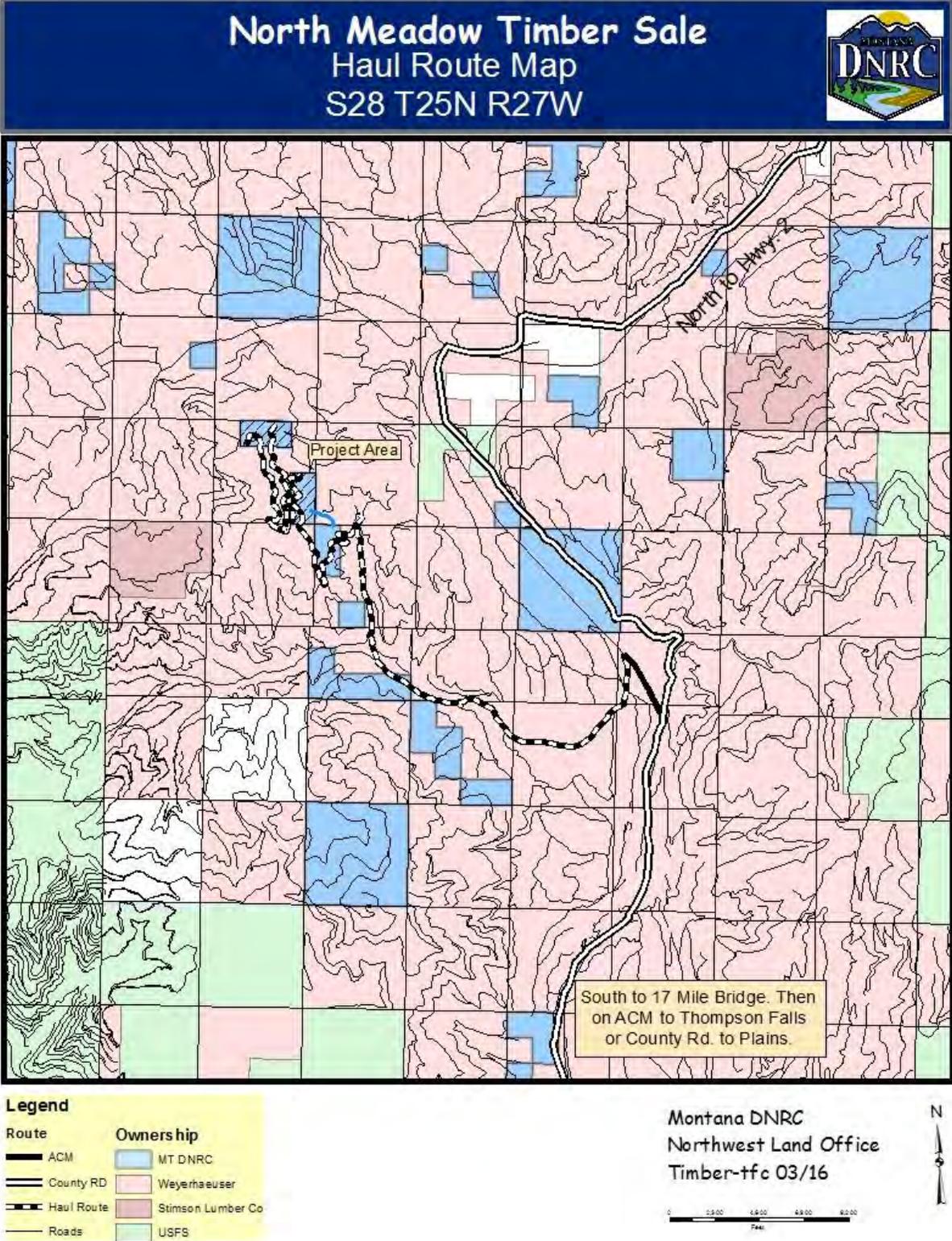
A-2: Upper Indian Creek – Transportation Plan



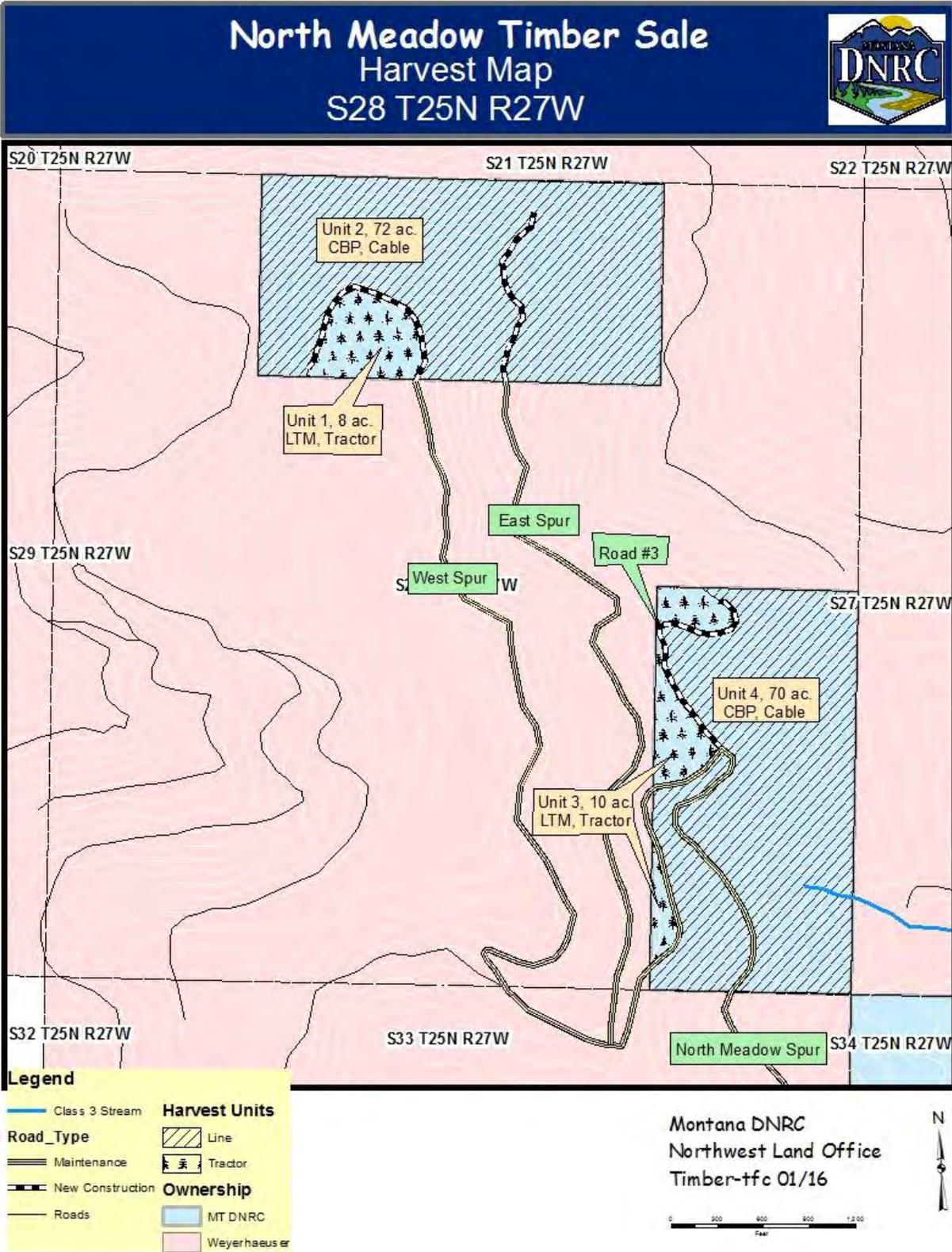
A-3: Upper Indian Creek - Timber Sale Harvest Units



A-4: North Meadow – Transportation Plan



A-5: North Meadow - Timber Sale Harvest Units



Attachment B – HARVEST PRESCRIPTIONS

Harvest Unit Prescriptions; Upper Indian Creek Timber Sale; T25N R27W S4

Harvest Unit: 1-Cable	Elevation: 4280' – 4600'	Slope: 10 - 55%
Acres: 18	Location: NW 1/4 NE 1/4	Aspect(s): Mostly west
Habitat type(s):	PSME/LIBO-VAGL ABGR/LIBO-LIBO ABGR/LIBO-XETE	9 acres 6 acres 3 acres
Current Cover Type(s):	Douglas-fir Mixed Conifer Western larch/Douglas-fir	9 acres 6 acres 3 acres
Desired Future Condition(s):	Ponderosa Pine	18 acres
Soil Type(s):	Holloway gravelly ashy silt loam; 35 to 60 percent slopes	78%
	Mitten-Tevis complex; 35 to 60 percent slopes	22%

Current Stand Conditions:		Saw timber; Medium stocked		
Harvest Unit:				
1-Cable		Upper Canopy %	Middle Canopy %	Lower Canopy %
1 st spp	DF = 70-80	DF = 70-80	GF = 60-70	
2 nd spp	GF = 5-10	GF = 10-20	DF = 20-30	
3 rd spp	WL = 5-10	LP = 0-5	WL = 0-5	
4 th spp	PP = 0-5	WL = 0-5	LP = 0-5	
Ave DBH	13"	5"	1"	
Height	70'	55'	6'	
Age	115	80	40	
Vigor	Good to Average	Below ave to Poor	Good to Average	

Treatment Objectives:

- Remove unhealthy trees, as well as those with poor vigor to promote long term forest health, growth and vitality.
- Move this unit toward the desired future condition classifications of Ponderosa Pine.
- Retention and spacing of the desirable species.
- Prepare an available seedbed to promote natural regeneration, particularly Ponderosa Pine.

Prescribed Treatment:

- Seed Tree harvest. Leave healthy vigorous trees with good crown and bark characteristics; Variable spacing of 90-100 feet, leaving 4-5 trees per acre.
- Full retention within the 3 acre SMZ with the exception of the cable corridors.
- Favor leaving dominant and co-dominant Ponderosa Pine, Western larch, Douglas-fir, that are wind firm and that have the bark characteristics that would withstand a low intensity prescribed broadcast burn.
- Retain a minimum of two snags per acre, 21" DBH & greater (or largest available size class), and two snag recruits per acre, where present, if they are not a safety hazard. Snags felled for safety reasons should be retained inside the harvest unit.

Harvest Method:

- Cable skidding operations are applicable to this unit. Full suspension would be required over the class 2 stream channel and stream banks.

- Leave trees **are not** marked; the prescription would be by description.
- Tree length skidding and or skidding of tops required.

Hazard Reduction:

- Slashing of all sub-merchantable material in that portion of the unit lying east of the SMZ.
- Create a 100%, 50 foot fuel break along the SMZ and property lines.
- Construction of a mechanical fire line along the SMZ and property lines.
- Landing piles to be burned following harvest.
- Low intensity prescribed broadcast burn in that portion of the unit lying east of the SMZ; following the burning of the landing piles.

Site Preparation and Regeneration:

- Low intensity prescribed broadcast burn to provide for a mineral seedbed.
- Leave trees to provide seed source for natural regeneration.
- As a second alternative, planting would be considered should the prescribed broadcast burn not take place.

Anticipated Future Treatments:

- Natural regeneration should be evaluated approximately five years from time of site preparation, and the need for supplemental planting determined.
- Stand conditions would be monitored for future thinning and/or salvage opportunities related to insect and disease outbreaks, severe weather events, fire or other unanticipated circumstances on a case-by-case basis.

Harvest Unit: 2-Cable	Elevation: 4200' – 4620'	Slope: 5 - 60%
Acres: 44	Location: E 1/2 NE 1/4	Aspect(s): Mostly east
Habitat type(s):	ABGR/CLUM-CLUM	17 acres
	ABGR/LIBO-LIBO	16 acres
	ABGR/LIBO-XETE	11 acres
Current Cover Type(s):	Mixed Conifer	28 acres
	Western larch/Douglas-fir	13 acres
	Ponderosa Pine	3 acres
Desired Future Condition(s):	Western larch/Douglas-fir	41 acres
	Ponderosa Pine	3 acres
Soil Type(s):	Mitten-Tevis complex, 35 to 60 percent slopes	65%
	Mitten gravelly ashy silt loam, 15 to 35 percent slopes	27%
	Glaciercreek gravelly ashy silt loam, cool, 8 to 30 percent slopes	8%

Current Stand Conditions:		Saw timber; Well stocked		
Harvest Unit:		Upper Canopy %	Middle Canopy %	Lower Canopy %
2-Cable				
1 st spp	DF = 50-60	GF = 60-70	GF = 70-80	
2 nd spp	WL = 20-30	DF = 20-30	DF = 10-20	
3 rd spp	GF = 20-30	LP = 0-5	WL = 0-5	
4 th spp	PP = 0-5	WL = 0-5	LP = 0-5	
Ave DBH	13"	6"	2"	
Height	80'	55'	8'	
Age	130	80	65	
Vigor	Good to Average	Good to Average	Below Average	

Treatment Objectives:

- Remove unhealthy trees, as well as those with poor vigor to promote long term forest health, growth and vitality.
- Move this unit toward the desired future condition classifications primarily Western larch/Douglas-fir
- Retention and spacing of the desirable species.
- Prepare an available seedbed to promote natural regeneration, particularly Western larch/Douglas-fir.

Prescribed Treatment:

- Seed Tree harvest. Leave healthy vigorous trees with good crown and bark characteristics; Variable spacing of 90-100 feet, leaving 4-5 trees per acre.
- Favor leaving dominant and co-dominant, Western larch, Ponderosa Pine, Douglas-fir, that are wind firm and that have the bark characteristics that would withstand a low intensity prescribed broadcast burn.
- Retain a minimum of two snags per acre, 21" DBH & greater (or largest available size class), and two snag recruits per acre, where present, if they are not a safety hazard. Snags felled for safety reasons should be retained inside the harvest unit.

Harvest Method:

- Cable skidding operations are applicable to this unit.
- Leave trees **are not** marked; the prescription would be by description.
- Tree length skidding and or skidding of tops required.

Hazard Reduction:

- Slashing of all sub-merchantable material.
- Create a 100%, 50 foot fuel break along the property lines.
- Construction of a mechanical fire line along the property lines.
- Landing piles to be burned following harvest.
- Low intensity prescribed broadcast burn; following the burning of the landing piles.

Site Preparation and Regeneration:

- Low intensity prescribed broadcast burn to provide for a mineral seedbed.
- Leave trees to provide seed source for natural regeneration.
- As a second alternative, planting would be considered should the prescribed broadcast burn not take place.

Anticipated Future Treatments:

- Natural regeneration should be evaluated approximately five years from time of site preparation, and the need for supplemental planting determined.
- Stand conditions would be monitored for future thinning and/or salvage opportunities related to insect and disease outbreaks, severe weather events, fire or other unanticipated circumstances on a case-by-case basis.

Harvest Unit: 3-Tractor	Elevation: 4400' – 4620'	Slope: 15 - 45%
Acres: 21	Location: NW 1/4 NE 1/4	Aspect(s): West
Habitat type(s):	ABGR/LIBO-XETE PSME/LIBO-VAGL	16 acres 5 acres
Current Cover Type(s):	Western larch/Douglas-fir Douglas-fir	11 acres 10 acres
Desired Future Condition(s):	Ponderosa Pine	21 acres
Soil Type(s):	Holloway gravelly ashy silt loam, 35 to 60 percent slopes	69%
	Mitten gravelly ashy silt loam, 15 to 35 percent slopes	31%

Current Stand Conditions:		Saw timber; Medium - Poor stocked		
Harvest Unit:				
3-Tractor	Upper Canopy %	Middle Canopy %	Lower Canopy %	
1 st spp	DF = 60-70	DF = 60-70	DF = 60-70	
2 nd spp	GF = 20-30	GF = 30-40	GF = 30-40	
3 rd spp	PP = 10-20	LP = 5-10	WL = 0-5	
4 th spp	WL = 10-20	AF = 0-5	LP = 0-5	
Ave DBH	12"	6"	2"	
Height	70'	45'	6'	
Age	115	80	45	
Vigor	Below Average	Below Average-Good	Below Average-Good	

Treatment Objectives:

- Remove unhealthy trees, as well as those with poor vigor to promote long term forest health, growth and vitality.
- Move this unit toward the desired future condition classifications of Ponderosa Pine.
- Retention and spacing of the desirable species.
- Prepare an available seedbed to promote natural regeneration, particularly Ponderosa Pine.

Prescribed Treatment:

- Seed Tree harvest. Leave healthy vigorous trees with good crown and bark characteristics; Variable spacing of 90-100 feet, leaving 4-5 trees per acre.
- Favor leaving dominant and co-dominant, Ponderosa Pine, Western larch, Douglas-fir, that are wind firm and that have the bark characteristics that would withstand a low intensity prescribed broadcast burn.
- Retain a minimum of two snags per acre, 21" DBH & greater (or largest available size class), and two snag recruits per acre, where present, if they are not a safety hazard. Snags felled for safety reasons should be retained inside the harvest unit.

Harvest Method:

- Ground based harvesting with conventional, mechanical, or cut-to-length operations on dry, frozen or snow covered ground are applicable to this unit.
- Leave trees **are not** marked; the prescription would be by description.

Hazard Reduction:

- Landing piles to be burned at landings following harvest.
- Residual sub-merchantable material would be slashed, piled and burned.

Site Preparation and Regeneration:

- Thinning of the desirable undamaged regeneration.
- Mechanical scarification of those areas void of established regeneration, to a minimum of 35% exposed mineral seedbed for natural regeneration.
- Leave trees to provide seed source for natural regeneration.

Anticipated Future Treatments:

- Natural regeneration should be evaluated approximately five years from time of site preparation, and the need for supplemental planting determined.
- Stand conditions would be monitored for future thinning and/or salvage opportunities related to insect and disease outbreaks, severe weather events, fire or other unanticipated circumstances on a case-by-case basis.

Harvest Unit: 4-Tractor	Elevation: 4600' – 4640'	Slope: 10 - 45%
Acres: 12	Location: NE 1/4 NE 1/4	Aspect(s): Mostly flat on ridge

Habitat type(s):	ABGR/LIBO-XETE ABGR/LIBO-LIBO	10 acres 2 acres
Current Cover Type(s):	Ponderosa Pine Western larch/Douglas-fir Douglas-fir	6 acres 3 acres 3 acres
Desired Future Condition(s):	Ponderosa Pine Western larch/Douglas-fir	11 acres 1 acres
Soil Type(s):	Mitten gravelly ashy silt loam, 15 to 35 percent slopes	100%

Current Stand Conditions:		Saw timber; Well stocked		
Harvest Unit:				
4-Tractor	Upper Canopy %	Middle Canopy %	Lower Canopy %	
1 st spp	DF = 50-60	GF = 50-60	GF = 70-80	
2 nd spp	GF = 20-30	DF = 30-40	DF = 10-20	
3 rd spp	PP = 10-20	LP = 5-10	LP = 5-10	
4 th spp	WL = 10-20	AF = 0-5	AF = 0-5	
Ave DBH	14"	7"	2"	
Height	80'	45'	6'	
Age	155	80	55	
Vigor	Good - Average	Good - Average	Average-Below Ave	

Treatment Objectives:

- Remove unhealthy trees, as well as those with poor vigor to promote long term forest health, growth and vitality.
- Move this unit toward the desired future condition classifications of Ponderosa Pine.
- Retention and spacing of the desirable species.
- Maintain the Old Growth characteristics of the existing Old Growth component.
- Provide for a Lynx corridor maintaining a minimum of 40% canopy cover.

Prescribed Treatment:

- Old Growth Maintenance. Leave healthy vigorous trees with good crown and bark characteristics; Variable spacing, of 55-65 feet, maintaining **a minimum** 10 trees per acre, 17" DBH and greater; and a minimum Basal Area of 80.
- Favor leaving dominant and co-dominant, Ponderosa Pine, Western larch, Douglas-fir, that are wind firm and that have the bark characteristics that would withstand a low intensity prescribed broadcast burn.
- Retain a minimum of two snags per acre, 21" DBH & greater (or largest available size class), and two snag recruits per acre, where present, if they are not a safety hazard. Snags felled for safety reasons should be retained inside the harvest unit.

Harvest Method:

- Ground based harvesting with conventional, mechanical, or cut-to-length operations on dry, frozen or snow covered ground are applicable to this unit.
- Trees would be **marked to cut**.

Hazard Reduction:

- Landing piles to be burned at landings following harvest.

Site Preparation and Regeneration:

- Slashing of the damaged sub-merchantable material.

- Leave trees to provide seed source for natural regeneration.

Anticipated Future Treatments:

- Stand conditions would be monitored for future thinning and/or salvage opportunities related to insect and disease outbreaks, severe weather events, fire or other unanticipated circumstances on a case-by-case basis.

Harvest Unit: 5-Tractor	Elevation: 4400' – 4640'	Slope: 10 - 45%
Acres: 25	Location: SE 1/4 NE 1/4	Aspect(s): East
Habitat type(s):	ABGR/LIBO-LIBO ABGR/CLUM-CLUM	22 acres 3 acres
Current Cover Type(s):	Douglas-fir Western larch/Douglas-fir Mixed Conifer	11 acres 9 acres 5 acres
Desired Future Condition(s):	Western larch/Douglas-fir	25 acres
Soil Type(s):	Mitten gravelly ashy silt loam, 15 to 35 percent slopes Mitten-Tevis complex, 35 to 60 percent slopes	99% 1%

Current Stand Conditions:	Saw timber; Well stocked		
Harvest Unit:	Upper Canopy %	Middle Canopy %	Lower Canopy %
5-Tractor			
1 st spp	DF = 40-50	DF = 50-60	GF = 50-60
2 nd spp	WL = 40-50	GF = 30-40	DF = 30-40
3 rd spp	GF = 10-20	WL = 5-10	WL = 5-10
4 th spp	PP = 10-20	PP = 0-5	PP = 0-5
Ave DBH	13"	7"	2"
Height	80'	45'	6'
Age	135	85	65
Vigor	Good - Average	Good - Average	Good - Average

Treatment Objectives:

- Remove unhealthy trees, as well as those with poor vigor to promote long term forest health, growth and vitality.
- Move this unit toward the desired future condition classifications of Western larch/Douglas-fir.
- Retention and spacing of the desirable species.
- Prepare an available seedbed to promote natural regeneration, particularly Western larch/Douglas-fir.

Prescribed Treatment:

- Seed Tree harvest. Leave healthy vigorous trees with good crown and bark characteristics; Variable spacing of 90-100 feet, leaving 4-5 trees per acre.
- Favor leaving dominant and co-dominant, Western larch, Ponderosa Pine, Douglas-fir, that are wind firm and that have the bark characteristics that would withstand a low intensity prescribed broadcast burn.
- Retain a minimum of two snags per acre, 21" DBH & greater (or largest available size class), and two snag recruits per acre, where present, if they are not a safety hazard. Snags felled for safety reasons should be retained inside the harvest unit.

Harvest Method:

- Ground based harvesting with conventional, mechanical, or cut-to-length operations on dry, frozen or snow covered ground are applicable to this unit.

- Leave trees ***are not*** marked; the prescription would be by description.

Hazard Reduction:

- Landing piles to be burned at landings following harvest.
- Residual sub-merchantable material would be slashed piled and burned.

Site Preparation and Regeneration:

- Thinning of the desirable undamaged regeneration.
- Mechanical scarification of those areas void of established regeneration, to a minimum of 35% exposed mineral seedbed for natural regeneration.
- Leave trees to provide seed source for natural regeneration.

Anticipated Future Treatments:

- Natural regeneration should be evaluated approximately five years from time of site preparation, and the need for supplemental planting determined.
- Stand conditions would be monitored for future thinning and/or salvage opportunities related to insect and disease outbreaks, severe weather events, fire or other unanticipated circumstances on a case-by-case basis.

NORTH MEADOW CREEK TIMBER SALE
STAND PRESCRIPTIONS

Unit Number: 1 **Location:** ¼ NE, ¼ NW S28 T25N R27W **Acres:** 8

Elevation: 4,880 Ft. **Slope:** 10%-25% **Aspect(s):** W-N-E

Habitat type: PSME/CARU-CARU, PSME/CARU-ARUV

Soils: Gravelly Ashy Silt Loam

Description of stands:

- The stand is dominated by Douglas-fir (*Pseudotsuga menziesii*) with ponderosa pine (*Pinus ponderosa*) and western larch (*Larix occidentalis*) present in the overstory.
- The stand is multi-storied with Douglas-fir comprising almost all of the mid-level and understory.
- The stand is well stocked with 110 ft² basal area per acre.
- The stand age is 180 years.
- These stands have a high frequency, low severity disturbance regime of about 10-30 years.
- Douglas-fir beetle (*Dendroctonus pseudotsugae*) has been active in the stand. There has been tree mortality in the last few years as well as new attacks.

Treatment Objectives:

- Move the stands toward the desired future conditions of Douglas-fir and ponderosa pine.
- Remove unhealthy, diseased and insect infested trees, as well as those with poor vigor, from the overstory to promote long-term forest health.
- Create a disturbance to promote natural ponderosa pine and Douglas-fir regeneration.
- Retain logging slash for woody debris recruitment and nutrient cycling of foliage and fine fuels to maintain site productivity.

Prescribed Treatment:

- This unit would be un-even aged management with a shelterwood treatment.
 - Trees would be spaced to about 35-45 ft., leaving approximately 25-35 trees per acre.
 - Favor leaving ponderosa pine, western larch and health vigorous Douglas-fir.
 - Retain at least two snags >20" DBH (or the next largest size class) and two snag recruits per acre.
 - This unit would be tractor logged.
 - Machine scarify if needed after post-harvest evaluation.
 - Monitor success of natural regeneration and plant seedlings if necessary.
-

Unit Number: 2 **Location:** ¼ NW, ¼ NE S28 T25N R27W **Acres:** 72

Elevation: 4,640 Ft. **Slope:** 35%-55% **Aspect(s):** W-N-E

Habitat type: PSME/CARU-CARU, PSME/CARU-ARUV, ABGR/LIBO-LIBO

Soils: Gravelly Ashy Silt Loam

Description of stands:

- The stands are dominated by Douglas-fir with ponderosa pine and western larch present in the overstory.
- The stands are multi-storied with Douglas-fir comprising almost all of the mid-level and understory.
- The stands are well stocked with 130 ft² basal area per acre.
- The stands ages average about 180 years.
- The east and west facing stands have a high frequency, low severity disturbance regime of about 10-30 years. The north aspect has a mixed severity disturbance regime.
- Douglas-fir beetle has been active in the stands. There has been tree mortality in the last few years as well as new attacks.

Treatment Objectives:

- Move the stands toward the desired future conditions of western larch/Douglas-fir and ponderosa pine.
- Remove unhealthy, diseased and insect infested trees, as well as those with poor vigor, from the overstory to promote long-term forest health.
- Create a disturbance to promote natural ponderosa pine and western larch regeneration.
- Retain logging slash for woody debris recruitment and nutrient cycling of foliage and fine fuels to maintain site productivity.

Prescribed Treatment:

- This unit would be even aged management with a seed tree treatment.
- Trees would be spaced to 55-65 ft., leaving approximately 10-15 trees per acre.
- Favor leaving ponderosa pine, western larch and health vigorous Douglas-fir.
- Retain at least two snags >20" DBH (or the next largest size class) and two snag recruits per acre.
- This unit would be line logged.
- Monitor success of natural regeneration. Scalp and plant seedlings if necessary.

Unit Number: 3 **Location:** ½ E, ¼ SW S28 T25N R27W **Acres:** 10

Elevation: 4,600 Ft. **Slope:** 10%-45% **Aspect:** E

Habitat type: PSME/VAGL-ARUV, ABGR/LIBO-XETE

Soils: Gravelly Ashy Silt Loam

Description of stands:

- The stands are comprised of Douglas-fir and western larch with scattered ponderosa pine present in the overstory.
- The stands are multi-storied with Douglas-fir and grand fir (*Abies grandis*) dominating the mid-level and understory.
- The stands are well stocked with 100 ft² basal area per acre.
- The stands ages average about 180 years.
- These stands have a mixed severity disturbance regime.
- Douglas-fir beetle has been active in the stand. There has been tree mortality in the last few years as well as new attacks. There is also dwarf mistletoe (*Arceuthobium laricis*) infecting the western larch.

Treatment Objectives:

- Move the stands toward the desired future conditions of western larch/Douglas-fir and ponderosa pine.

- Remove unhealthy, diseased and insect infested trees, as well as those with poor vigor, from the overstory to promote long-term forest health.
- Create a disturbance to promote natural ponderosa pine and western larch regeneration.
- Retain logging slash for woody debris recruitment and nutrient cycling of foliage and fine fuels to maintain site productivity.

Prescribed Treatment:

- This unit would be un-even aged management with a shelterwood treatment.
- Trees would be spaced to about 35-45 ft., leaving approximately 25-35 trees per acre.
- Favor leaving ponderosa pine, western larch and health vigorous Douglas-fir.
- Retain at least two snags >20" DBH (or the next largest size class) and two snag recruits per acre.
- This unit would be tractor logged.
- Machine scarify if needed after post-harvest evaluation.
- Monitor success of natural regeneration and plant seedlings if necessary.

Unit Number: 4 **Location:** ½ E, ¼ SW S28 T25N R27W **Acres:** 70

Elevation: 4,440 Ft. **Slope:** 35%-55% **Aspect:** E

Habitat type: PSME/VAGL-ARUV, PSME/CARU-AGSP, PSME/CARU-ARUV, ABGR/LIBO-XETE

Soils: Gravelly Ashy Silt Loam

Description of stands:

- The stands are comprised mostly of Douglas-fir with ponderosa pine and western larch present in the overstory.
- The stands are multi-storied with Douglas-fir and grand fir dominating the mid-level and understory.
- The stands are well stocked with 100 ft² basal area per acre.
- The stands ages average about 180 years.
- These stands have a mixed severity disturbance regime.
- Douglas-fir beetle has been active in the stand. There has been tree mortality in the last few years as well as new attacks. There is also dwarf mistletoe infecting the western larch.

Treatment Objectives:

- Move the stands toward the desired future conditions of western larch/Douglas-fir and ponderosa pine.
- Remove unhealthy, diseased and insect infested trees, as well as those with poor vigor, from the overstory to promote long-term forest health.
- Create a disturbance to promote natural ponderosa pine and western larch regeneration.
- Retain logging slash for woody debris recruitment and nutrient cycling of foliage and fine fuels to maintain site productivity.

Prescribed Treatment:

- This unit would be even aged management with a seed tree treatment.
- Trees would be spaced to 55-65 ft., leaving approximately 10-15 trees per acre.
- Favor leaving ponderosa pine, western larch and health vigorous Douglas-fir.
- Retain at least two snags >20" DBH (or the next largest size class) and two snag recruits per acre.
- This unit would be line logged.
- Monitor success of natural regeneration. Scalp and plant seedlings if necessary.

Attachment C – VEGETATION ANALYSIS

Vegetation Analysis - Upper Indian Creek

Analysis Prepared By:

Name: Dale Peters

Title: Forest Management Supervisor, Montana DNRC

Introduction

The vegetation section describes present conditions and components of the forest as well as the anticipated effects of both the No Action and the Action Alternatives.

Issues and Measurement Criteria

- Improve forest health.
 - Minimize losses in timber volume from mortality due to insect and disease conditions present within the sale area; specifically Douglas-fir Beetle, *Dendroctonus pseudotsugae* Hopkins.
 - Promote the continued presence and/or reestablishment of historically appropriate timber types on Trust Land included in this project.
 - Reduce fire hazard and associated risks of loss to State of Montana.
 - Maintenance of existing old growth stands.
-
-

Regulatory Framework

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

State Forest Land Management Plan (SFLMP)

DNRC developed the SFLMP to “provide field personnel with consistent policy, direction, and guidance for the management of state forested lands” (DNRC 1996: Executive Summary). The SFLMP provides the philosophical basis, technical rationale, and direction for DNRC’s forest management program. The SFLMP is premised on the philosophy that the best way to produce long-term income for the trust beneficiaries is to manage intensively for healthy and biologically diverse forests. In the foreseeable future, timber management would continue to be the primary source of revenue and primary tool for achieving biodiversity objectives on DNRC forested state trust lands.

DNRC Forest Management Rules

DNRC Forest Management Rules (*ARM 36.11.401 through 456*) are the specific legal resource management standards and measures under which DNRC implements the SFLMP and subsequently its forest management program. The Forest Management Rules were adopted in March 2003 and provide the legal framework for DNRC project-level decisions and provide field personnel with consistent policy and direction for managing forested state trust lands. Project design considerations and mitigations developed for this project must comply with applicable Forest Management Rules.

Montana Best Management Practices (BMPs) for Forestry

Montana BMPs consist of forest stewardship practices that reduce forest management impacts to water quality and forest soils. The implementation of BMPs by DNRC is required under *ARM 36.11.422*. Key forestry BMP elements include: streamside management; road design and planning; timber harvesting and site preparation; stream crossing design and installation; winter logging; and hazardous substances storage, handling, and application.

Montana DNRC Forested Trust Lands Habitat Conservation Plan (HCP)

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.

Analysis Areas

Direct and Secondary Effects Analysis Area

The proposed project area for direct and secondary effects is 120 acres in Section 4 of T25N R27W. This section is located 36 air miles north of Plains, Montana, in the Indian Creek drainage

Cumulative Effects Analysis Area

The Plains Unit administrative area is a cumulative effects area; State Trust Land that lie within Sanders County.

Existing Conditions

Noxious Weeds

Noxious weeds have not been identified within the existing timber stands.

Noxious weeds currently identified on the road systems leading to the project area are spotted knapweed (*Centaurea maculosa*) and Common St. John's-wort (*Hypericum perforatum*).

Rare Plants

Using the Natural Heritage Program database, no sensitive, threatened, or endangered plant species have been documented within any of the proposed harvest units.

Standard Vegetative Community

- **Stand History/Past Management**

State of Montana section records show that this 120 acre parcel has not been entered or managed to date.

- **Current stand conditions**

Past and current events have changed the forest conditions on the proposed parcels involved in the project area from what would have been present historically according to Losensky's "Historical Vegetation of Montana" (1997). The area was historically characterized by frequent, low-intensity wildfires prior to the early 1900's. Since the early 1900's, fire has been virtually eliminated from the project area. Logging activity has occurred in the past on this section.

The majority of the eastern aspect of this parcel is dominated by an older, mature component of Douglas-fir, and fading to a younger healthy stand of western larch in the south 40 acres. This mature component of Douglas-fir is currently experiencing a heavy concentration of mortality due to an infestation of Douglas-fir Beetle, *Dendroctonus pseudotsugae* Hopkins. The average age of this eastern aspect is 130 years old which have an average height in the 80 foot range.

The western aspect is in the later stages of seral forest evolution, with the shade tolerant species becoming dominant. The average age of this western aspect is 115 years old which have an average height in the 70 foot range.

There is a 9 acre field verified old growth stand on the ridgetop. This old growth stand is currently dominated by ponderosa pine and Douglas-fir with established shade tolerant climax species in the intermediate and lower canopies. The average age of this old growth stand is 155 years old which have an average height in the 70 foot range. The dominate trees 17" dbh and greater are 185 years old and have an average height of 85 feet.

The SLFMP and associated 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. There are two desired future cover types identified for the project area: western larch/Douglas-fir and Ponderosa pine. Currently there are four cover types present within the proposed project area, resulting in only 40% of the parcel with desired future cover types. Therefore, compared to the cumulative Plains Unit's desired future conditions, there is currently a deficiency in the western larch/Douglas-fir cover types (see Table V-1).

Table V-1 – Current and appropriate cover type for the Upper Indian Creek Project Area.

Cover Type	Current Acres	Current Percent of Project Area	Desired Future Condition (DFC)	
			Acres	Percent
Subalpine fir				
Douglas-fir	33	28%		
Lodgepole pine				
Mixed conifer	38	32%		
Ponderosa pine	9	7%	53	44%
Western larch/Douglas-fir	40	33%	67	56%
Western white pine				
Non-stocked				
Non-forest				
Other (specify)				
Total:	120	100%	120	100%

Old Growth

There is a 9 acre old growth stand identified within the project area. Old growth is identified and analyzed using criteria outlined in Green et.al. (1992). Stand Level Inventories (SLI) of the project area were queried to identify potential old growth and old-growth stands. Old-growth plots were taken in these stands to verify classification.

Environmental Effects

No Action Alternative: Direct and Secondary Effects and Cumulative Effects

Under the No Action Alternative, natural processes would continue to have a direct influence on forest conditions. 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 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. Within the project area, stands dominated primarily by white woods would continue to compete with western larch, Douglas-fir, and ponderosa pine of all age classes, further removing the stands from the desired future conditions.

Action Alternative: Direct, Secondary, and Cumulative Effects

Noxious Weeds

Direct and Secondary

The spread of noxious weeds from the use of mechanized equipment and ground disturbance would be minimized, but not completely eliminated, by the washing of equipment before entering the site, and sowing grass seed on roads after road construction and harvesting (ARM 36.11.445).

Cumulative

Cumulatively, weed populations would be monitored and herbicide treatments on haul roads would be scheduled through the Plains Unit's weed management program in an effort to maintain or reduce infestations.

Rare Plants

Direct, Secondary and Cumulative

Using the Natural Heritage Program database, no sensitive, threatened, or endangered plant species have been documented within any of the proposed harvest units. Therefore no direct, indirect, or cumulative impacts would be expected under either alternative.

Standard Vegetative Community

Direct and Secondary

The proposed action alternative would harvest timber on approximately 120 acres. The proposed harvest would be focused on opening the stand to enhance regeneration of preferred seral species, reducing stocking of shade tolerant climax species. Gated road closures would prevent the unauthorized removal of snags and snag recruits. Fuel loadings would be reduced by removal of ladder fuels from the understory and intermediate components of the stand. Growth and vigor of the remaining trees is expected to increase as residual tree spacing would allow full light to crowns and more available water. Noxious weeds would be monitored and addressed through the Plains Unit integrated weed management program.

Cumulative

Across the Plains Unit there would be a slight shift towards Desired Future Conditions as the proposed treatment would alter the Current Vegetation Cover Types. This change would occur on approximately 90 acres. The Plains Unit has 53,151 Classified Forest acres. This results in a change of less than 1% of the total

Classified Forest acres. The project area would be altered with regard to size class distribution and stocking levels. Fuel loading, ladder fuels, insect and disease incidence would be reduced.

Old Growth

Direct and Secondary

The proposed action alternative would construct a new road thru an existing 9 acre old growth stand. This, coupled with designated harvest and site preparation prescriptions, could alter 3 acres of this existing old growth stand. As a mitigation measure, 4 acres of an adjoining stand is being recruited as future old growth. The resulting 10 acre stand would be treated with a maintenance treatment, maintaining a minimum of 10 trees per acre, 17" diameter breast high and greater, with a minimum basal area of 80.

Cumulative

Across the Plains Unit there may be a 1 acre increase towards forested acres classified as old growth. The Plains Unit has 558 forested acres classified as old growth. This results in a change of less than 1% of forested acres classified as old growth.

Vegetation Mitigations

- Wash equipment prior to harvest to limit weed seed dispersal.
- Plant grass on newly disturbed road surfaces to limit the resources available for weeds to establish.
- Old Growth Maintenance of classified Old Growth stands. Leave healthy vigorous trees with good crown and bark characteristics; Variable spacing, of 55-65 feet, maintaining ***a minimum*** 10 trees per acre, 17" DBH and greater; and a minimum Basal Area of 80.
- Silvicultural prescriptions are designed to maintain and improve stand growth and vigor, while maintaining DNRC's commitments to managing for a biologically diverse landscape.

VEGETATION REFERENCES

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North Meadow Vegetation Analysis

Analysis Prepared By

Name: Ty Colombo

Title: Management Forester, Montana DNRC

Introduction

The vegetation section describes present conditions and components of the forest as well as the anticipated effects of both the No Action and the Action Alternatives.

Issues and Measurement Criteria

- Forest Health: There are concerns that endemic populations of diseases and insects are increasing on the site and have the potential to reach epidemic proportions or reduce productivity.
 - Fire Ecology: There is a concern that the exclusion of fire from the landscape has changed the historical stand compositions from the desired conditions.
 - Forest Productivity: There are concerns with the canopy closure and the increased competition between trees which will decrease the productivity of the trees. The increase in competition will also stress the trees which will increase the trees susceptibility for disease and insect outbreaks
-
-

Regulatory Framework

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

State Forest Land Management Plan (SFLMP)

DNRC developed the SFLMP to “provide field personnel with consistent policy, direction, and guidance for the management of state forested lands” (DNRC 1996: Executive Summary). The SFLMP provides the philosophical basis, technical rationale, and direction for DNRC’s forest management program. The SFLMP is premised on the philosophy that the best way to produce long-term income for the trust beneficiaries is to manage intensively for healthy and biologically diverse forests. In the foreseeable future, timber management would continue to be the primary source of revenue and primary tool for achieving biodiversity objectives on DNRC forested state trust lands.

DNRC Forest Management Rules

DNRC Forest Management Rules (*ARM 36.11.401 through 456*) are the specific legal resource management standards and measures under which DNRC implements the SFLMP and subsequently its forest management program. The Forest Management Rules were adopted in March 2003 and provide the legal framework for DNRC project-level decisions and provide field personnel with consistent policy and direction for managing forested state trust lands. Project design considerations and mitigations developed for this project must comply with applicable Forest Management Rules.

Montana Best Management Practices (BMPs) for Forestry

Montana BMPs consist of forest stewardship practices that reduce forest management impacts to water quality and forest soils. The implementation of BMPs by DNRC is required under *ARM 36.11.422*. Key forestry BMP elements include: streamside management; road design and planning; timber harvesting and site preparation; stream crossing design and installation; winter logging; and hazardous substances storage, handling, and application.

Montana DNRC Forested Trust Lands Habitat Conservation Plan (HCP)

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.

Analysis Areas

Direct and Secondary Effects Analysis Area

The proposed project area of 160 acres.

Cumulative Effects Analysis Area

The North Fork of Meadow Creek and the Plains Unit.

Existing Conditions

Noxious Weeds

Spotted knapweed (*Centaurea stoebe*) is the most abundant noxious weed within the project area. It is mainly established along existing roads with some spreading to adjacent grassy openings. Houndstongue (*Cyroglossum officinale*) is also present within the project area. Both are present along existing roads. There is potential for the continued spread of these species from the proposed project but there would be mitigations implemented to try and control their spread.

Rare Plants

Using the Natural Heritage Program database, no sensitive, threatened, or endangered plant species have been documented within any of the proposed harvest units. Therefore no direct, indirect, or cumulative impacts would be expected under either alternative.

Standard Vegetative Community

- **Stand History/Past Management**

These two parcels have never been entered from field observations and according to our section records.

- **Current stand conditions**

The stands within the project area are comprised of mostly mature Douglas-fir with intermittent ponderosa pine on the drier sites and western larch on the wetter sites. Shade tolerant species are established in the mid-level and understory. The stands average age is about 180 years and average heights range from 60-80 feet. The Douglas-fir beetle has been active in the stand. There has been tree mortality in the last few years as well as new attacks. There are also patches of western larch that are infected with dwarf mistletoe.

The southern and western aspects historically had a low severity, high frequency fire regime. The northern and eastern aspects had a mixed fire regime. Since the early 1900's, fire has been excluded from these stands and fuel loading has increased. No past harvest activity has occurred within these stands.

The SLFMP and associated 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. The three cover types present within the proposed project area are: Douglas-fir, Ponderosa pine, and western larch/Douglas-fir. The desired future cover types identified for the project area are: Douglas-fir, Ponderosa pine and western larch/Douglas-fir. Therefore, compared to the cumulative Plains Unit's desired future conditions, there is currently a deficiency in the Ponderosa pine cover types (see Table V-1).

Table V-1 – Current and appropriate cover type for the North Meadow Timber Sale Project Area.

Cover Type	Current Acres	Current Percent of Project Area	Desired Future Condition (DFC)	
			Acres	Percent
Subalpine fir				
Douglas-fir	13	8%	13	8%
Lodgepole pine				
Mixed conifer				
Ponderosa pine	32	20%	75	47%
Western larch/Douglas-fir	115	72%	72	45%
Western white pine				
Non-stocked				
Non-forest				
Other (specify)				
Total:	160	100%	160	100%

Environmental Effects

No Action Alternative: Direct and Secondary Effects and Cumulative Effects

Under the No Action Alternative, natural processes would continue to have a direct influence on forest conditions.

No timber harvest or associated activities would occur under this alternative. Timber types would continue to advance towards climax conditions and away from desired future conditions. Growth and vigor of the trees present in the analysis area would continue to decline as competition for resources increases. Due to the decrease in tree vigor, the populations of Douglas-fir beetle would continue to grow and cause more tree

mortality. Noxious weeds would continue to exist along the roads and move into the forested areas as natural disturbances prepare appropriate seedbeds.

Action Alternative: Direct, Secondary, and Cumulative Effects

Noxious Weeds

Direct and Secondary

Noxious weeds may increase due to the disturbance and the opening in the canopy. However, this would be monitored and addressed through an integrated pest management plan including chemical and biological control methods. The spread of weeds would be controlled by washing of equipment before it is moved on site and with weed treatments along roads.

Cumulative

Due to the small scale of this project no cumulative effects would occur to the overall infestation of noxious weeds on the Plains Unit.

Standard Vegetative Community

Direct and Secondary

The proposed alternative would harvest timber on approximately 160 acres and promote the desired future conditions of ponderosa pine and western larch/Douglas-fir. A shelterwood harvest prescription would be implemented on 18 acres. A seed tree treatment would be used on 142 acres. The harvest would be focused on the removal of those trees affected by or susceptible to insect and disease mortality, as well as shade tolerant tree species. More detailed information for treatment can be obtained in Attachment B, "Harvest Prescriptions". Through harvest and site preparation activities, fuel loadings would be reduced by the removal of ladder fuels from the understory and intermediate components of these stands. Crown spacing in the intermediate and overstory components of treated stands would increase, resulting in decreased fuel continuity. Growth and vigor of residual trees would increase as a result of increased residual tree spacing that would allow full light to crowns and more access to water.

Cumulative

Due to the small scale of the project no cumulative effects would occur to the overall vegetation community of the Plains Unit.

Vegetation Mitigations

- To minimize the potential for the spread of noxious weed, off-road equipment would be cleaned and inspected as required in the timber sale contract to avoid seed migration.
- If any sensitive plant species are observed within the project area, an equipment restriction zone will be made around the specimen and a plant survey will be completed.
- All harvest areas would 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

Vegetation References

Forestry Best Management Practices.

DNRC, 1996. State Forest Management Plan. Montana DNRC, Forest management Bureau. Missoula, MT.

Green, P., J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann. 1992. Old-growth forest types of the Northern Region. USDA Forest Service, Northern region. Missoula, Montana.

Losensky, J. 1997. Historical Vegetation of Montana. Contact #970900. Montana DNRC. Missoula, MT. 109pp.

Montana Natural Heritage Program (MTNHP). 2014. Plant species of concern report. Available online at: <http://mtnhp.org/SpeciesOfConcern/?AorP=p> Last accessed August 19, 2015.

Attachment D – WATER AND FISHERIES ANALYSIS

Upper Indian & North Meadow – Water Resources Analysis

Analysis Prepared By:

Name: Tony Nelson

Title: NWLO Hydrologist, Montana DNRC

Introduction

The following analysis will disclose anticipated effects to water resources within the Upper Indian and North Meadow project areas. Direct, secondary, and cumulative effects to water resources of both the No-Action and Action alternatives will be analyzed.

Issues and Measurement Criteria

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 the fisheries analysis portion of this document.

Measurement Criteria: Sediment delivery 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 Upper Indian and North Meadow project areas 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 17.30.607 (1)(a)*, this portion of the Clark Fork River drainage, including the Thompson River and Indian 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 near the project area include cold-water fisheries and recreational use in the streams in the surrounding area. No surface water rights were found in the proposed project or within 5 miles downstream of the 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 *2014 Montana 303(d)* list (*DEQ, 2014*).

Montana SMZ Law

By the definition in *ARM 36.11.312 (4)*, the stream in the northwest corner of the Upper Indian project area is a Class 2 stream. It flows more than 6 months and does not contribute to a lake, stream or other body of water. 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. By the definition in *ARM 36.11.312 (5)*, the stream in the southeast portion of the North Meadow project area is a Class 3 stream. It flows less than 6 months and does not contribute to a lake, stream or other body of water. No other stream segments were identified in either proposed project area. **Figure H-1** and **Figure H-2** show the streams in the Upper Indian and North Meadow project areas, respectively.

Figure H-1 – Stream Class Map for Upper Indian project area

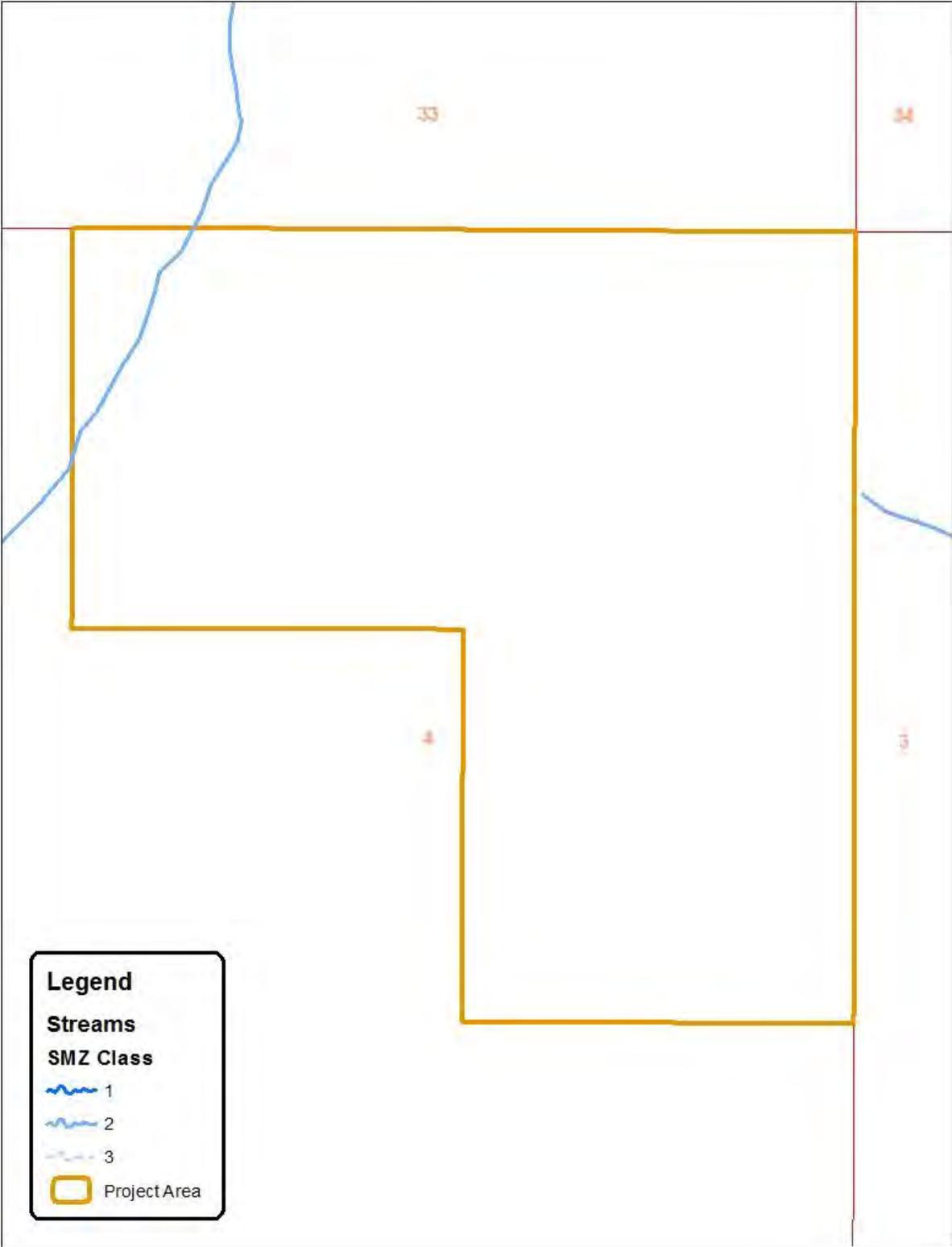
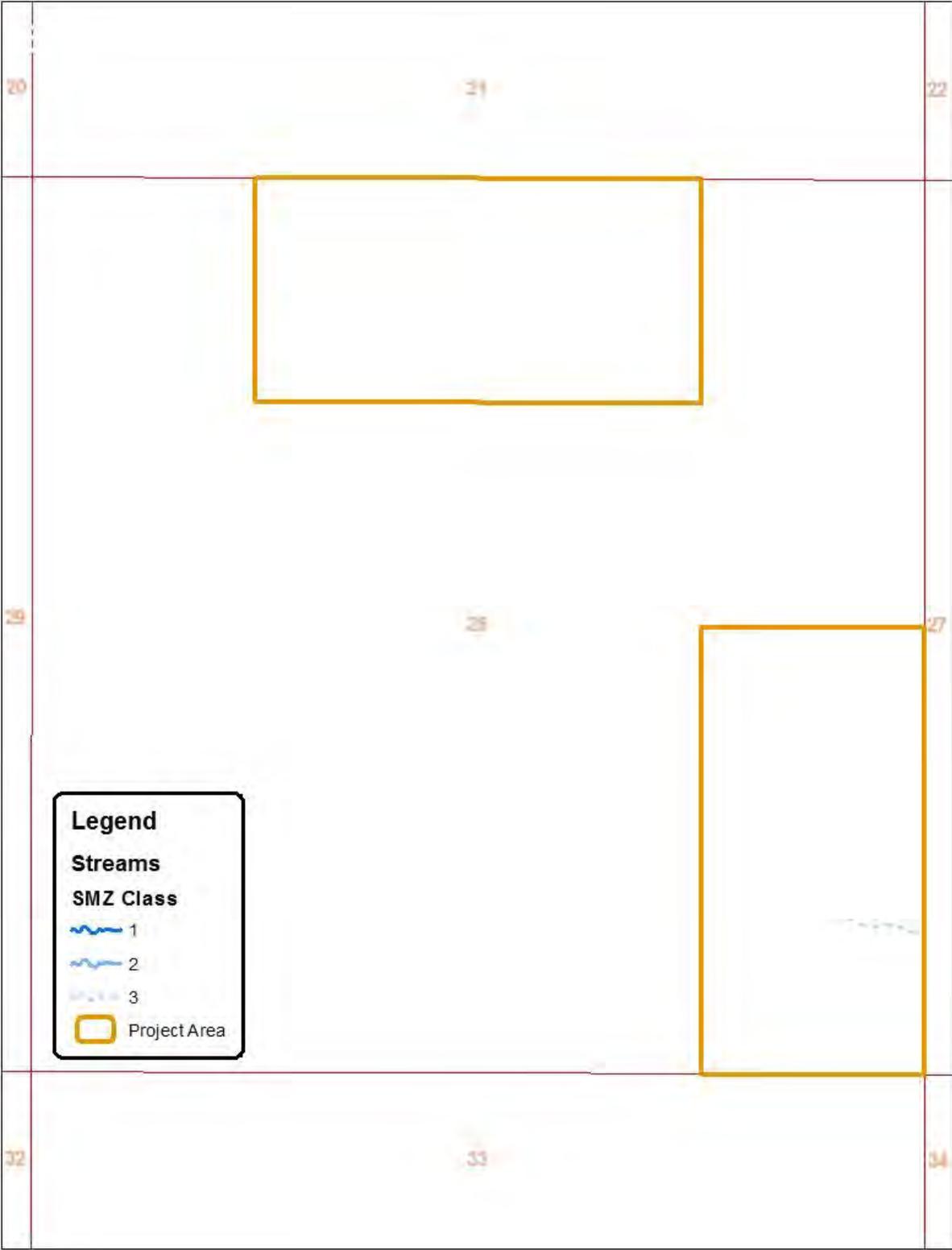


Figure H-2 – Stream Class Map for North Meadow project area



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 (USFWS & 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. Sediment delivery will be analyzed qualitatively 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. Additional sites on proposed haul routes located outside the project area will be assessed qualitatively for their potential to affect downstream water.

Water Yield

Direct, indirect and cumulative effects to water yield will be analyzed in the stream systems within the project area. A map of the project areas and the streams found within the project areas is found in **Figure H-1** and **Figure H-2**. All existing activities on all ownership and proposed activities related to the Upper Indian and North Meadow projects will be analyzed using methods described below. These areas were chosen as an appropriate scale of analysis, and will effectively display the estimated impacts of proposed activities.

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 Upper Indian and North Meadow project areas 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 Upper Indian and North Meadow projects 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 these parcels was reviewed by a DNRC hydrologist in 2015. One stream channel was identified in the Upper Indian project area. An unnamed tributary to Indian Creek flows through the northwest corner of the project area and is a perennial Class 2 stream with an approximately 3-foot bankfull width. The stream 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 sand. The North Meadow project area has one class 3 stream with a 1-2 foot bankfull width. This tributary flows less than 6 months and does not contribute to any downstream water feature when it flows. This stream is a B4/5 channel. Channel-bed materials in B4/5 types are mainly gravel and coarse sand. No areas of unstable or actively down-cut channels were identified in either of these streams 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 any stream in either project area.

No sediment delivery from the existing road system was identified on any of the proposed haul routes within or leading to the Upper Indian or North Meadow project areas. The existing road system leading into each proposed project area is low to moderate standard native-surfaced road. Most reaches of existing road meet applicable best management practices for surface drainage and erosion control, but there are reaches in need of installation of surface drainage features. Most road grades are generally under 8%. The road system was constructed to access timber harvesting by the Plum Creek Timber Company 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 industrial private and state land. These activities and events have led to reductions in forest canopy cover, and construction of roads.

Evidence of water yield increases was not found during field reconnaissance of either proposed project area. As a result, it was determined that a detailed water yield analysis would not be necessary for the proposed project area. None of the broad ephemeral draws within the proposed project area have any evidence of overland flow (channel scour, re-alignment of litter, definable banks). Defined stream channels showed no evidence of instability from water yield increases, and very little scouring effect from annual runoff events. As a result, water yield increases resulting from past activities in the watersheds have not been sufficient to destabilize stream channels, or to scour a channel in any of the broad draws throughout the project area. After evaluating the watershed cumulative effects risks along with the current conditions in the Upper Indian project area and in the North Meadow project area, by ARM 36.11.423, a detailed quantitative watershed analysis is not needed for either proposal.

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 delivery would continue as described in the existing conditions.

Cumulative

No additional cumulative impacts to 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 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 indirect effects to sediment delivery to streams from the timber harvesting activities proposed in the Action Alternative. The proposal includes approximately $\frac{3}{4}$ of an acre of harvesting in the SMZ in the Upper Indian project area. This harvesting would consist mainly of skyline yarding corridors through the SMZ, with the remainder being along the outer edge of the 100-foot SMZ. The SMZ law, Administrative Rules for Forest Management, Riparian Management Zones, DNRC Habitat Conservation Plan, 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 2014*). Since 1996, effectiveness of the SMZ width has been rated over 99 percent (*DNRC 1990 through 2014*). As a result,

with the application of BMPs, HCP conservation strategies and the SMZ Law, proposed activities are expected to have a low risk of low impacts to sediment delivery.

The action alternative would maintain and improve erosion control and surface drainage on all roads proposed for haul. The action alternative proposes to construct approximately 1 mile of new road in the Upper Indian project area, and approximately 0.85 miles of new road in the North Meadow project area. None of the proposed new road construction would involve construction of any new stream crossings. Short-term risk of low levels of erosion and deposition would be increased for approximately 2 to 3 years after completion of road work due to exposure of bare soil during construction, surface drainage improvement and hauling activities. This risk would return to near current levels as road surfaces and cut and fill slopes re-vegetate. Water quality standards are expected to be met and there is a low risk of impacts to downstream beneficial uses.

Cumulative

Risk of sediment delivery and sediment loading to Indian Creek, the Thompson River 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 or below current levels. 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 120 acres of timber in the Upper Indian project area and approximately 160 acres in the North Meadow project area under this alternative. 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. No measurable impacts to water yield are anticipated in this project area from the proposed harvesting for the following reasons: 1) The well-drained to excessively well-drained nature of the soils would absorb additional available moisture and not produce increased surface runoff, and would in turn produce little or no detectable change in water yield from upland sites, 2) Flows in the class 2 stream in the Indian Creek parcel are stable, the channel has not shown increased lateral or vertical erosion that could be attributed to increased flows, 3) The other streams and ephemeral draws within project area parcels are stable and vegetated with a dense mat of grass and forbs vegetation, making them capable of handling potential water yield increases without destabilizing. 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

The proposal is to harvest the stands within the proposed project areas with a shelterwood or seed tree prescription. Cumulative effects to water yield in this parcel are not anticipated for the following reasons: 1) The well-drained to excessively well-drained nature of the soils would absorb additional available and not produce increased surface runoff, and would in turn produce little or no detectable change in water yield from upland sites, 2) Flows in project area streams and draws are stable, channels have not shown increased lateral or vertical erosion that could be attributed to increased flows, so any increases in water yield present a low risk of increased in-channel erosion or other channel adjustments, and 3) The other streams and ephemeral draws within these parcels are stable and vegetated with a dense mat of grass and forbs vegetation

or armored with angular bed materials, making them capable of handling potential water yield increases without destabilizing.

Water Resources Mitigations

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

- implement BMPs on all new 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.

Farns, P. 1978. Hydrology of Mountain Watersheds, Preliminary Report. Soil Conservation Service. Bozeman, MT.

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 E – SOILS ANALYSIS

Upper Indian & North Meadow – Soils Analysis

Analysis Prepared By:

Name: Tony Nelson

Title: Hydrologist, Montana DNRC

Introduction

The following analysis will disclose anticipated effects to soil resources within the Upper Indian and North Meadow project areas. Direct, secondary, and cumulative effects to soil resources of both the No-Action and Action alternatives will be analyzed.

Issues and Measurement Criteria

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.

Measurement Criteria: Soil physical properties will be measured quantitatively by estimating the percentage of harvested ground that would be left in an impacted condition following activity. Estimates will be based on DNRC Soil Monitoring (DNRC, 2011).

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.

Measurement Criteria: Nutrient cycling will be measured by tons of coarse woody material per acre on harvested sites pre- and post-project.

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).

Measurement Criteria: Slope stability risk will be measured based on percentage of slopes steeper than 60% with high risk landtypes.

Analysis Areas

Direct and Secondary Effects Analysis Area

The analysis area for evaluating direct, secondary and cumulative effects to soil physical properties, nutrient cycling and slope stability 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 Upper Indian and North Meadow project areas. A map of the Landtypes in the Upper Indian project area is found below in **Figure S-1**. A map of the Landtypes in the North Meadow project area is found below in **Figure S-2**.

Figure S-1 – *Upper Indian Landtype Map*

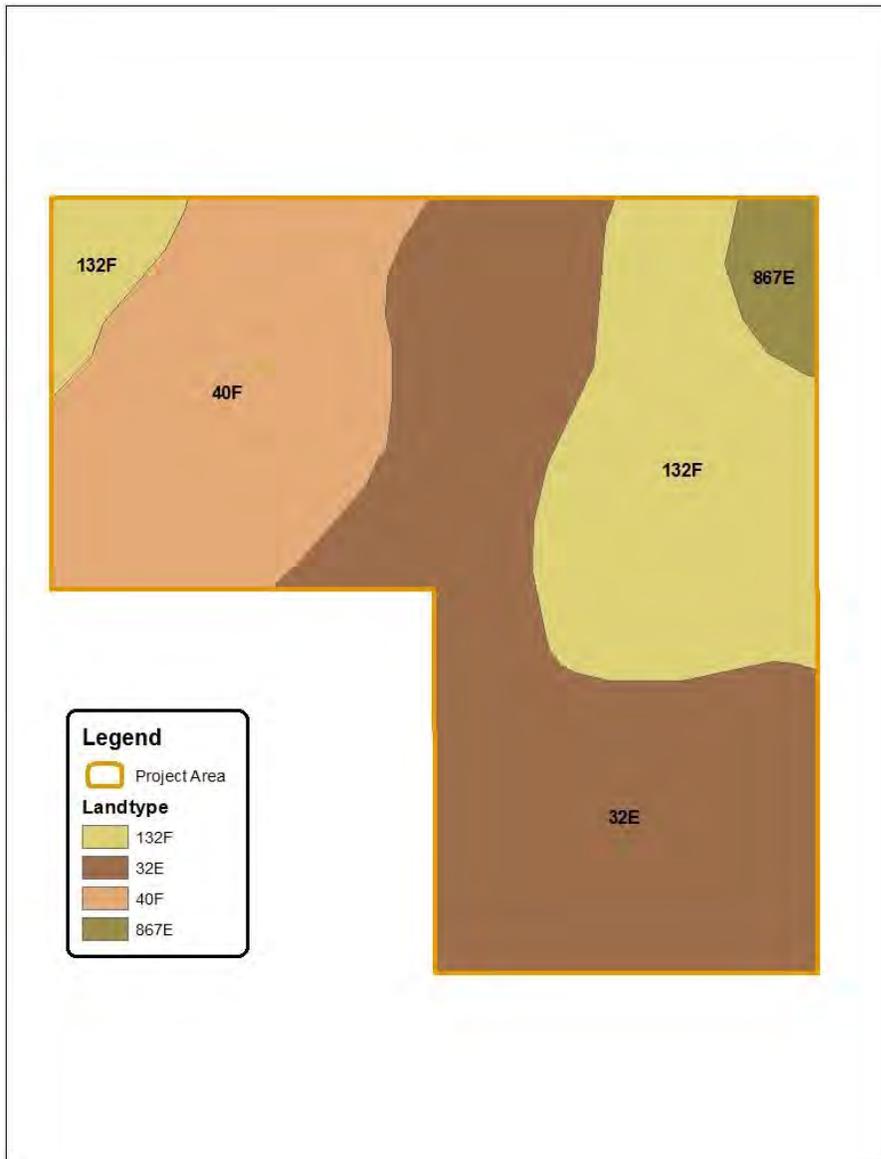
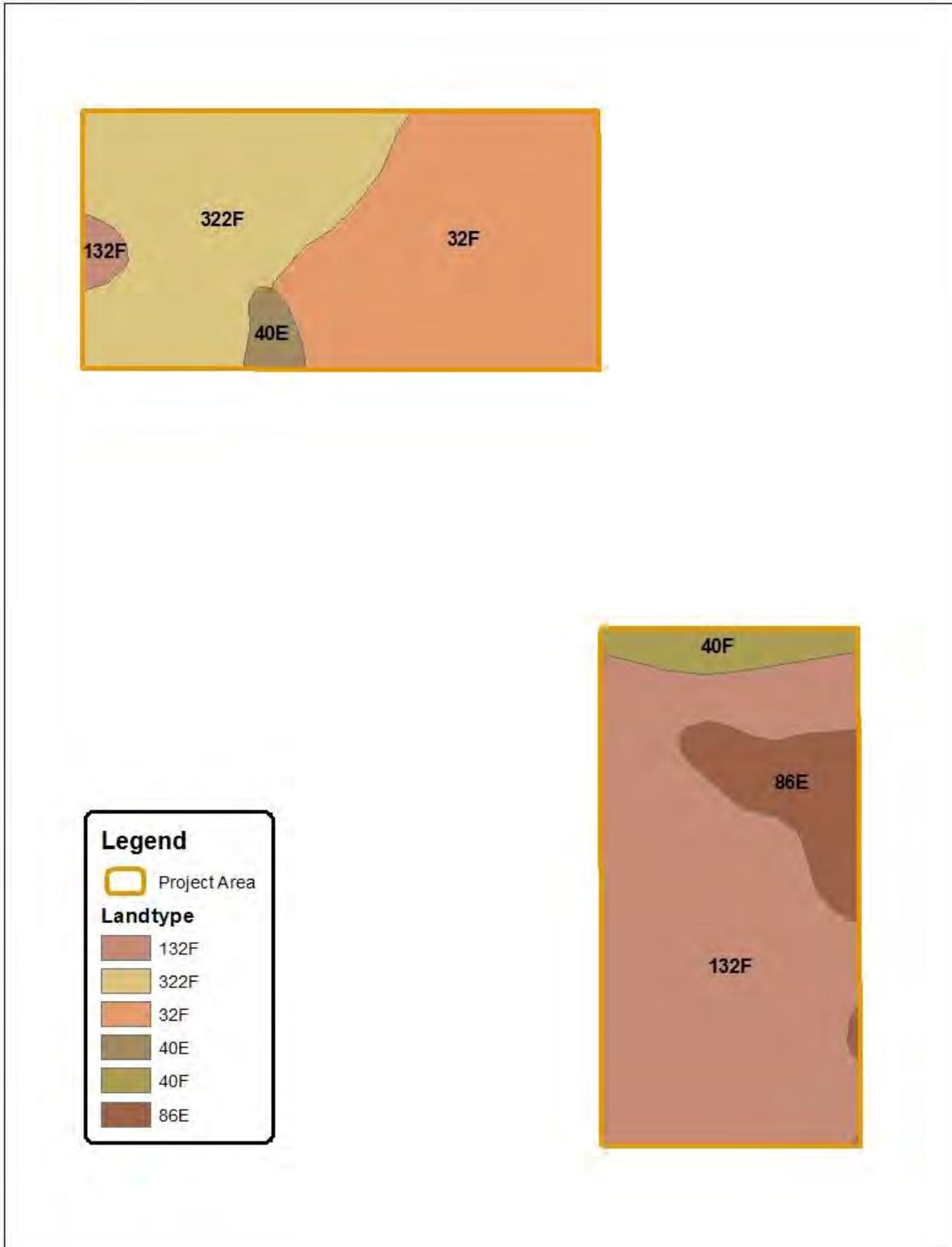


Figure 2 – North Meadow Landtype Map



Analysis Methods

Physical Disturbance (Compaction and Displacement)

Impacts to soil physical disturbance 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 S3**.

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.

Existing Conditions

Geology

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. 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.

Physical Disturbance (Compaction and Displacement)

Soil physical disturbance can be affected through management activities. In the gross project area, DNRC has conducted timber harvesting since the 1940s. Timber sale records dating back to the 1940s 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.

Table S3 – Upper Indian Soil Map Unit Descriptions

Map Unit	Description	Acres	Analysis Area	Landtype Description	Compaction hazard	Erosion Hazard	Displacement Hazard
32E	Mitten gravelly ashy silt loam, 15-35%	55	45.4%	Mountain slopes, volcanic ash over colluvium	M	L	L
40F	Holloway gravelly ashy silt loam, 35-60%	30	24.8%	Mountains, volcanic ash over colluvium derived from argillite or quartzite	M	L	L
132F	Mitten-Tevis complex, 35-60%	33	27.3%	Mountains, Volcanic ash over colluvium	M	L	L
867E	Glaciercreek gravelly ashy silt loam, cool, 8-30%	3	2.5%	Stream terraces, outwash plains; volcanic ash over alluvium or outwash	M	L	L

Table S4 – North Meadow Soil Map Unit Descriptions

Map Unit	Description	Acres	Analysis Area	Landtype Description	Compaction hazard	Erosion Hazard	Displacement Hazard
32F	Mitten gravelly ashy silt loam, 35-60%	41	25.6%	Mountain slopes, volcanic ash over colluvium	M	L	L
40E	Holloway gravelly ashy silt loam, 15-35%	2	1.3%	Mountains, volcanic ash over colluvium derived from argillite or quartzite	M	L	L
40F	Holloway gravelly ashy silt loam, 35-60%	6	3.7%	Mountains, volcanic ash over colluvium derived from argillite or quartzite	M	L	L
86E	Bata gravelly ashy silt loam, 8-30%	11	6.9%	Moraines, volcanic ash over till or drift	M	L	H
132F	Mitten-Tevis complex, 35-60%	65	40.6%	Mountains, Volcanic ash over colluvium	M	L	L
322F	Glaciercreek gravelly ashy silt loam, moist, 35-60%	35	21.9%	Mountains, volcanic ash over colluvium derived from argillite or quartzite	M	L	L

Erosion

No areas of soil erosion were identified during field reconnaissance in 2015 by a DNRC hydrologist. None of the parcels in either project area has been managed in the past, so there

are no current impacts from past harvesting. Erosion from existing road surfaces has been analyzed in the watershed and hydrology analysis.

Nutrient Cycling

Nutrient cycling was assessed in the proposed project area by completing 10 transects, 4 on the Upper Indian project area and 6 in the North Meadow project area, to estimate the current levels of coarse woody debris. These transects were focused on proposed harvest units. The average coarse woody debris in the Upper Indian project area is 33.8 tons/acre, with a range of 20 to 69.1 tons/acre and a median of 23.0 tons/acre. These results are well above the recommended range discussed in *Managing Coarse Woody Debris in Forests of the Rocky Mountains* (Graham et. al., 1994) on similar habitat types. Habitat types found in the Upper Indian project area are recommended to have a range of 4 to 14 tons/acre to maintain forest productivity. The average coarse woody debris in the North Meadow project area is 14.4 tons/acre, with a range of 5.1 to 25.9 tons/acre and a median of 12.0 tons/acre. These results are well within the recommended range discussed in *Managing Coarse Woody Debris in Forests of the Rocky Mountains* (Graham et. al., 1994) on similar habitat types. Habitat types found in the North Meadow project area are recommended to have a range of 7 to 24 tons/acre to maintain forest productivity.

Slope Stability

Soil types in the project area are primarily gentle to moderately sloped (0-60%) residual soils from weathered bedrock found on hilly terrain. The Web Soil Survey reports the findings in the *Sanders and Parts of Lincoln and Flathead Counties, Montana (MT651)* (NRCS, 1996) soil survey. This survey identified no areas of soils at high risk for mass movements in the project area. No slope failures were identified during reconnaissance in the proposed project area. Because none of the slope stability risk factors are present in any parcel of the proposed project area, slope stability will not be evaluated on this project in the remainder of this analysis. A list of soil map units found in the Upper Indian and North Meadow project areas and their associated management implications is found in **Table S-3** and **Table S-4**, respectively.

Environmental Effects

No Action Alternative: Direct, Secondary, and Cumulative Effects

Implementation of the no-action alternative would result in no soil resource impacts in the project area. Soil resource condition would remain similar to those described in the existing conditions sections of this environmental assessment.

Action Alternative: Direct, Secondary, and Cumulative Effects

Geology

Direct and Secondary & Cumulative

The geology would remain similar to those described in the existing conditions sections of this environmental assessment.

Physical Disturbance (Compaction and Displacement)

Direct and Secondary

Based on DNRC soil monitoring on soils and sites similar to those found in the project area, direct impacts to soil physical disturbance would be expected in the Upper Indian project area on up to 11 of the total 120 acres proposed for 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 3 to 21 percent of the acres treated, with an average disturbance rate of 12.1% (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 3 to 8.3 percent of the acres treated, with an average disturbance rate of 5.7% (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 3 to 21 percent of ground-based harvested acres, and approximately 3 to 8.3 percent of cable harvest acres. The proposal includes 58 acres of ground-based mechanical harvesting and 62 acres of cable yarding. These results are summarized in **Table S-5**.

Based on DNRC soil monitoring on soils and sites similar to those found in the project area, direct impacts to soil physical disturbance would be expected in the North Meadow project area on up to 10 of the total 160 acres proposed for 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 3 to 21 percent of the acres treated, with an average disturbance rate of 12.1% (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 3 to 8.3 percent of the acres treated, with an average disturbance rate of 5.7% (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 3 to 21 percent of ground-based harvested acres, and approximately 3 to 8.3 percent of cable harvest acres. The proposal includes 18 acres of ground-based mechanical harvesting and 142 acres of cable yarding. These results are summarized in **Table S-6**.

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 disturbance. Site-preparation disturbance would be intentionally done, and these impacts are considered light and promote reforestation of the site. The combination of these activities would leave approximately 9.2 percent of the proposed harvest units in the Upper Indian project area and approximately 6.3 percent of the proposed North Meadow project area 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 disturbance. 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).

Cumulative

Cumulative effects to soil physical disturbance may occur from repeated entries into a forest stand where additional ground is impacted by equipment operations. With this alternative, none of the 160 acres proposed for harvesting in the Upper Indian project area and none of the 120 acres proposed for harvesting in the North Meadow project area 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. Cumulative effects to soil physical disturbance in these areas not previously managed 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.

Erosion

Direct and Secondary

Direct and secondary effects to erosion from the proposed project would include skid trails in ground based harvest areas, cable yarding corridors in cable areas and new roads. In each of these areas, there is a high risk of low impacts to erosion due to exposure of bare soil. Skid trails and cable yarding corridors would present a short-term risk which would decrease once disturbed areas re-vegetate. New roads would represent a longer term risk due to continued exposure of bare soil on road tread areas. Erosion from roads is addressed in the watershed and hydrology portion of the analysis.

Cumulative

Cumulative effects to erosion would be similar to the values reported for soil disturbance. Approximately 9.2% of the proposed harvest units in the Upper Indian project area and approximately 6.3% of the proposed harvest units in the North Meadow project area would have exposed soil following activity. These areas of disturbance present a low risk of low impacts to erosion and subsequent sediment delivery due to implementation of all applicable BMPs and mitigations listed in this analysis and in the watershed and hydrology analysis.

Table S5 – Detrimental Soil Disturbance for the Upper Indian Action Alternative

Area of Analysis	Total Area (Acres)	Disturbance Rate (%)	Affected Area (Acres)
Harvest Units (including landings)	120	9.2	11
Roads *	3.0	100	3.0

Table S6 – Detrimental Soil Disturbance for the North Meadow Action Alternative

Area of Analysis	Total Area (Acres)	Disturbance Rate (%)	Affected Area (Acres)
Harvest Units (including landings)	160	6.3	10
Roads *	2.6	100	2.6

Nutrient Cycling

Direct and Secondary

Direct and indirect effects to nutrient cycling would include maintenance of coarse woody debris in the 4-14 tons/acre range for the Upper Indian project area and in the 7-24 tons/acre range for the North Meadow project area from the Action Alternative. This would present a low risk of low direct and indirect effects to nutrient cycling. Stands where woody debris levels are low would 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 8-24 tons of coarse woody material would be left on the ground following harvesting activities, as well as fine material for nutrient retention.

Cumulative

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. 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.

Soils Mitigations

- Limit equipment operations to periods when soils are dry (less than 20% oven-dried weight), frozen or snow-covered in order to minimize soil compaction and rutting, and to 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 existing trails to use and how many additional trails are needed.
- Do not use existing trails if they are located in draw bottoms or other unfavorable locations.
- Grass seeding or other erosion control measures may be required to stabilize some trails.
- Limit ground-based operations to slopes less than 40% unless they can be used without causing excessive displacement or erosion.
- Space cable yarding corridors at least 75 feet apart. Clearing width for corridors to accommodate yarding should not exceed 12 feet.
- Keep skid trails to 20 percent or less of the harvest unit acreage. Provide for surface drainage of all roads and skid trails concurrent with operations.
- Slash disposal: Limit the total of disturbance and scarification to 30-40 percent of harvest units.
- Limit dozer piling to slopes less than 35 percent and limit excavator piling to slopes less than 40 percent unless it can be completed without causing excessive erosion.
- Retain between 4 and 24 tons/acre of woody debris 3-inches in diameter or greater (depending on habitat type) and a feasible majority of fine branches and needles 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 fine 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.

Soils References

Brown, J. K. 1974. *Handbook for Inventorying Downed Woody Material*. In: USDA and Forest Service (editors). Ogden, Utah: Intermountain Forest and Range Experiment Station.

DNRC, 2011. DNRC Compiled Soils Monitoring Report on Timber Harvest Projects. Missoula, MT.

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

Graham, R. T., A. E. Harvey, M. F. Jurgensen, T. B. Jain, J. R. Tonn and D. S. Page-Dumroese. 1994. Managing Coarse Woody Debris in Forests of the Rocky Mountains. USDA Forest Service Research Paper. INT-RP-447. 13 pp.

NRCS, 1998. MT619-Soil Survey of Flathead National Forest Area, Montana. United States Department of Agriculture Natural Resources Conservation Service.

Attachment F – WILDLIFE ANALYSIS

North Meadows/Indian Creek Timber Sale(s) – Wildlife Analysis

Analysis Prepared By:

Name: Chris Forristal

Title: Wildlife Biologist, Montana DNRC

Introduction

The following analysis will disclose the anticipated direct, secondary, and cumulative effects to wildlife associated with the No-Action and Action alternatives.

Issues

- Mature forest cover, old growth and connectivity. The proposed activities could decrease forested cover, which may reduce habitat connectivity and suitability for wildlife species associated with mature and old-growth forest.
 - Canada lynx. The proposed activities could result in the modification of habitat preferred by Canada lynx (*Felis lynx*) and decrease the area's suitability for lynx.
 - Fishers. 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.
 - Flammulated owls. The proposed activities could alter the structure of flammulated owl (*Otus flammeolus*) preferred habitat types, which could reduce habitat suitability for flammulated owls.
 - Pileated woodpeckers. The proposed activities could reduce tree density and alter the structure of mature forest stands, which could reduce habitat suitability for pileated woodpeckers (*Dryocopus pileatus*).
 - Big game. 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.
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Regulatory Framework

The following plans, rules, and practices have guided this project's planning and/or will be implemented during project activities: *DNRC Forest Management Rules, DNRC Forested Trust Lands Final Environmental Impact Statement and Habitat Conservation Plan (USFWS and DNRC 2010), the Endangered Species Act, the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act.*

Analysis Areas

Direct and Secondary Effects Analysis Area

The direct and indirect effects of the proposed activities on all species/issues were analyzed within the Project Area (*FIGURE WI-1*), which consists of three parcels totaling 281 acres of DNRC-managed lands in sections 4 and 28 of T25N, R27W. These three parcels consist of one 121-acre parcel and two 80-acre parcels.

Cumulative Effects Analysis Areas

The cumulative effects of the proposed activities on all species/issues were analyzed at a broad surrounding landscape scale that varies according to the issue or wildlife species being discussed. Cumulative effects analysis areas are named according to the relative size of the area and are summarized in *TABLE WI-1* and *FIGURE WI-1*. Cumulative effects 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 **Affected Environment** section for each issue or wildlife species evaluated (e.g., fisher, pileated woodpecker, etc.). 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.

Table WI-1 - Wildlife Analysis Areas. *Descriptions of the areas used to analyze the proposed project's effects on wildlife species/issues.*

Analysis Area Name	Description	Total Acres	Issues/Species Analyzed
Project Area	DNRC managed lands in sections 4 and 28 of T25N, R27W	281	Direct & indirect effects for all issues/species
Small CEAA	The project area and 21 sections surrounding it.	13,301	Mature forest cover, old growth & connectivity, flammulated owls, pileated woodpeckers
Large CEAA	Portions of the Thompson River-Twin Lakes Creek, Lazier Creek, and Meadow Creek HUC12 subwatersheds.	43,187	Canada lynx, fishers, big game

Analysis Methods

Analysis methods are based on the DNRC State Forest Land Management Plan, which is designed to promote biodiversity. The primary basis for this analysis includes information obtained by: field visits, review of scientific literature, Montana Natural Heritage Program (MNHP) data queries, DNRC Stand Level Inventory (SLI) data analysis, USDA Forest Service VMap data, GIS aerial photograph analysis, and consultation with professionals.

The coarse-filter wildlife analysis section includes analyses of the direct, secondary, and cumulative effects of the proposed alternatives on old-growth forest and connectivity of mature forest habitat.

In the fine-filter analysis, individual species of concern are evaluated. These species include wildlife species federally listed under the Endangered Species Act, species listed as sensitive by

DNRC, and species managed as big game by the Montana Department of Fish Wildlife and Parks (DFWP).

Cumulative effects analyses account for known past and current activities, as well as planned future agency actions. Recent timber sale projects (≤5 years) that could contribute to cumulative effects are summarized in the following table.

Table WI-2 RECENT PROJECTS. *Recent projects that could contribute to cumulative effects and the number of harvested acres that occur in each analysis area.*

Sale Name	Agency	Harvest Year	Project Area	Large CEAA
Skookum Point	DNRC	N/A (scoped)	0	409

Coarse Filter Wildlife Analysis

Issue

The proposed activities could decrease forested cover, which may reduce habitat connectivity and suitability for wildlife species associated with mature and old-growth 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, species composition and development. Timber harvest, like wildfire and blowdown, is a disturbance event that often creates open patches of young, early-successional habitat. 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 forests. In contrast, other wildlife species flourish in early seral habitats created by disturbance. Connectivity of forest stands under historical fire regimes 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 Area

The analysis area for direct and indirect effects is the Project Area and the analysis area for cumulative effects is the 13,301-acre Small CEAA as described in *TABLE W-1* and depicted in *FIGURE W-1*. The Small CEAA is large enough to support a diversity of species that use mature forested habitat, old-growth forest and/or require connected forested habitats and centers evaluation of cumulative effects on those areas most likely to be affected by the proposed action.

Measurement Criteria

Mature forested habitat was defined as forest stands with $\geq 40\%$ 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 habitat ($\geq 40\%$ 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.

Affected Environment

The project area currently contains approximately 237 acres (84.5% of project area) of mature forest stands that have a reasonably well-developed canopy ($\geq 40\%$ crown closure). Approximately 32 acres (11.4% of project area) consist of mature stands with a more open canopy ($< 40\%$ crown closure) within the project area. Another 11 acres (3.9% of project area) is comprised of a well-stocked stand containing pole and small sawlog-sized trees. Substantial harvesting has not occurred within the project area in the last 40 years. Old-growth forest, as defined by Green et al. (1992), is present within a single 9-acre stand. Mature forested stands are well represented within the proposed project area; with 3 patches present averaging 79 acres in size (see *TABLE WI-3*). Mature forest stands on all three parcels are undergoing widespread, extensive mortality due to Douglas-fir beetles. Beetles are targeting the larger Douglas-fir trees and live canopy cover is decreasing below 40% in some area as trees continue to die. Approximately 0.7 miles (1.6 miles/sq. mile) of roads exist in the project area, of which 0 miles of road are open to public motorized use and 0.7 miles are currently restricted to non-motorized use by the public. Habitat availability and connectivity for species requiring larger patches of old-growth is limited, although 101 acres of mature forest surrounding this small 9-acre patch could be providing some additional habitat. Due to existing mature forest cover, patch characteristics, scattered DNRC parcels interspersed among private timberland, and existing road densities, habitat connectivity for species using well-stocked mature forest is moderate within the project area.

Abundance and locations of mature, well-stocked forest within the Small CEAA has been influenced by past timber harvesting and dry south-facing slopes with open forest habitat types. Approximately 91% of the Small CEAA is owned by private timber companies and has undergone intensive forest management within the last 30 years. Presently, 6.6 percent (876 acres) of the Small CEAA contains scattered mature forest stands possessing $\geq 40\%$ crown closure. Average patch size of mature forest in the small CEAA is 29.2 acres (30 patches, see *TABLE WI-3 – Mature Forest Attributes*). Other than the 9-acres old-growth stand located within the project area, no other known old-growth stands are located within the CEAA and are unlikely to occur given forest management regimes on surrounding private ownership. Landscape connectivity of mature forest stands within the CEAA is poor, with the majority of mature forest occurring on either small scattered DNRC parcels or in small stringers associated

with streams. Many of these patches contain narrow corridors less than 300 feet that could limit connectivity for some species more sensitive to interior forest conditions. Dry, open slopes are present throughout the CEAA and further limit connectivity of well-stocked stands. About 12,290 acres of the CEAA (92.4%) has been harvested with regeneration-type treatments within the last 40 years. Approximately 11,484 acres (86.3% of CEAA) of private timberlands have likely been harvested within the last 20 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. Given these assessments, landscape connectivity of mature forest stands within the CEAA is low. Approximately 140.0 miles (6.7 miles/sq. mile) of roads exist within the CEAA. Of these roads, there are 22.7 miles of open and seasonally open roads that equate to a density of 1.1 miles/square mile. These roads are primarily forest roads used for logging and recreational activities within the CEAA and surrounding area. Across the CEAA, mature forest and old-growth forest habitat and landscape connectivity are low for species that require and/or prefer these conditions.

Table WI-3 – Mature Forest Attributes. *Acreages and patch size metrics of mature forested habitat (≥40% canopy cover, ≥9 inches dbh) pre- and post-harvest in the Project Area and Small CEAA for the North Meadows/Upper Indian Creek Timber Sale(s). Percent of the total corresponding analysis area is in parentheses.*

Mature Forest Attribute	Project Area		Small CEAA	
	Existing	Post-Harvest	Existing	Post-Harvest
Acres of Mature Forest	237.5 (84.5%)	12.6 (4.5%)	875.8 (6.6%)	650.9 (4.9%)
Number of Patches	3	2	30	34
Average Patch Size	79.0	6.3	29.2	19.0
Minimum Patch Size	56.7	2.0	0.8	0.8
Maximum Patch Size	109.8	10.6	137.6	137.6

Environmental Effects – Mature Forest Cover and Connectivity

No Action Alternative: Direct and Secondary Effects

None of the proposed forest management 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.

No Action Alternative: Cumulative Effects

None of the proposed forest management 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 WI-2). 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.

Action Alternative: Direct and Secondary Effects

Under the Action Alternative, approximately 281 acres (100.0% of the project area) would be harvested. Of these acres, 225 acres (80.0% of the project area) of dense, mature forest would

undergo harvesting. Approximately 225 acres of mature forest would receive harvest treatments that would reduce overstory crown closure from $\geq 40\%$ to 5-15% and increase mature tree spacing to 45-80 feet. Harvesting on another 11 acres of mature forest would reduce tree densities, however overstory crown closure in these treated stands would remain above 40% postharvest and provide suitable habitat for some species. Average patch size of mature forest would be reduced by 72.7 acres and the number of patches would decrease by 1 (TABLE WI-3). Harvesting would remove approximately 3 acres of the existing 9-acre patch of old-growth forest within the project area. The remaining 6 acres of old growth would receive a maintenance harvest treatment that would reduce tree and snag densities, but would retain the number of large live trees required to qualify as old-growth. An additional 2 acres of mature forest adjacent to this stand would undergo a similar harvest prescription and could recruit into old growth in the future faster than the surrounding treated stands within the project area.

Remaining mature forest and connectivity in the west half of the project area would be located within the area receiving an old-growth maintenance treatment (11 acres) and a narrow corridor adjacent to a Class 2 stream (2 acres). Approximately 12.6 acres (4.5%) of mature forest in the project area with $\geq 40\%$ overstory crown closure would remain after harvesting and could provide suitable habitat for species utilizing small patches of mature forest. Under the Action Alternative, 1.8 miles of new restricted roads would be built. These new restricted roads would be gated or bermed after project completion. After harvest, covertsypes and habitat conditions would likely more closely resemble historical conditions in this area; with widely spaced large-diameter seral species (Losensky 1997). Wildlife species preferring larger continuous patches of well-stocked mature forest would likely find the project area unsuitable for 50-80 years. After harvest completion, the project area would appear more similar to adjacent private industrial forestland surrounding the project area, and patch size of young, regenerating forest stands would increase. Thus, high adverse direct and secondary 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 237.5 acres (100.0%) of existing available mature stands, 2) connectivity of mature forest would be altered with a decrease in average patch size from 79.0 to 6.3 acres, 3) a measure of habitat availability and connectivity would be maintained on 12.6 acres (4.5% of project area), harvesting would remove , and 4) existing open road density would not change but 1.8 miles of additional restricted road would be built.

Action Alternative: Cumulative Effects

Under the Action Alternative, timber harvesting would alter 237.5 acres of the 875.8 acres (27.1%) of mature forest habitat available in the Small CEAA. Harvest treatments would remove 224.9 acres of mature forest for 80-100 years and reduce habitat quality on another 12.6 acres (TABLE WI-3). Reductions in the availability of suitable mature forested habitat would be additive to past harvest activities, and those that are proposed or ongoing in the Small CEAA (TABLE WI-2). Across the CEAA, 4.9% of mature, forested habitats would remain and landscape connectivity would be altered to a moderate degree given habitat conditions within the surrounding forested landscape. Habitat availability and connectivity would be reduced, as the number of mature forest patches would increase from 30 to 34 and average patch size would decrease from 29.2 acres to 19.0 acres (TABLE WI-3). Old-growth forest would be minimally impacted at the scale of the CEAA because it is largely absent outside of the project area. Two acres of mature forest along a Class 2 stream in Section 4 of the project area would remain connected to a larger 22-acre patch in the CEAA, however the width of this corridor would be less than 300 feet, which could reduce its effectiveness for some species sensitive to forest openings. The largest mature patch (138 acres) within the CEAA would not be altered.

Under the Action Alternative, 1.8 miles of new restricted roads would be built and road use would increase on 8.4 and 5.1 miles of open and restricted road, respectively. During activities, open road density would increase from 1.1 miles/sq. mile to 1.4 miles/sq. miles within the CEAA. Thus, moderate adverse cumulative effects to mature forested habitat abundance, suitability, and connectivity would be anticipated as a result of the Action Alternative since: 1) existing habitat suitability and connectivity of mature and old-growth forest is low; 2) the abundance of mature forested habitat in the CEAA would decrease by 225 acres (27.1% of existing mature forest); 3) average patch size of mature forested habitat would decrease by 10.2 acres; 4) some connectivity with larger patches in the CEAA would be maintained but patch size would remain relatively small; 5) temporary increases in open roads would occur but long-term open road density would not change.

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 WI-4 – Fine Filter provides an analysis of the anticipated effects for each species.

Table WI-4 – Anticipated Effects of the North Meadows/Upper Indian Creek Timber Sale on wildlife species.

Species/Habitat	[Y/N] Potential Impacts and Mitigation Measures N = Not Present or No Impact is Likely to Occur Y = Impacts May Occur (Explain Below)
Threatened and Endangered Species	
Canada lynx <i>(Felix lynx)</i> Habitat: Subalpine fir habitat types, dense sapling, old forest, deep snow zones	[Y] Detailed Analysis Provided Below. The Project Area contains approximately 213 acres of suitable lynx habitat.
Grizzly bear <i>(Ursus arctos)</i> Habitat: Recovery areas, security from human activity	[N] Detailed Analysis Provided Below. The project area is located over 3 miles outside of grizzly bear recovery zone and non-recovery occupied habitat associated with the Cabinet-Yaak Ecosystem (USFWS 1993, Wittinger 2002) and no recent sightings of grizzly bears have occurred in the area (MNHP 2016, Kasworm et al. 2011). Use of the project area by grizzly bears is unlikely due to its location, lack of preferred habitat and surrounding unsuitable habitat. Thus, negligible direct, indirect, or cumulative effects to grizzly bears would be expected to occur as a result of either alternative.
Sensitive Species	
Bald eagle <i>(Haliaeetus leucocephalus)</i> Habitat: Late-successional forest less than 1 mile from open water	[N] No known nest territories are present in the vicinity of the project area and no large water bodies exist within one mile of the project area that might provide suitable locations for nesting. Thus, no direct, indirect, or cumulative effects to bald eagles would be expected to occur as a result of either alternative.
Black-backed woodpecker <i>(Picoides arcticus)</i> Habitat: Recently burned or beetle-infested forest	[N] No recently (<5 years) burned areas occur within 1 mile of the Project Area. Thus, no direct, indirect, or cumulative effects to black-backed woodpeckers would be expected to occur as a result of either alternative.

Species/Habitat	[Y/N] Potential Impacts and Mitigation Measures N = Not Present or No Impact is Likely to Occur Y = Impacts May Occur (Explain Below)
<p>Coeur d'Alene salamander (<i>Plethodon idahoensis</i>) Habitat: Waterfall spray zones, talus near cascading streams</p>	<p>[N] 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.</p>
<p>Columbian sharp-tailed grouse (<i>Tympanuchus Phasianellus columbianus</i>) Habitat: Grassland, shrubland, riparian, agriculture</p>	<p>[N] 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.</p>
<p>Common loon (<i>Gavia immer</i>) Habitat: Cold mountain lakes, nest in emergent vegetation</p>	<p>[N] No suitable lake habitat occurs within 500 feet of the Project Area. Thus, no direct, indirect, or cumulative effects to common loons would be expected to occur as a result of either alternative.</p>
<p>Fisher (<i>Martes pennanti</i>) Habitat: Dense mature to old forest less than 6,000 feet in elevation and riparian</p>	<p>[Y] Detailed Analysis Provided Below – Approximately 141 acres of suitable fisher habitat occur within the Project Area.</p>
<p>Flammulated owl (<i>Otus flammeolus</i>) Habitat: Late-successional ponderosa pine and Douglas-fir forest</p>	<p>[Y] Detailed Analysis Provided Below – Approximately 76 acres of potentially suitable flammulated owl habitat occur in the Project Area.</p>
<p>Gray Wolf (<i>Canis lupus</i>) Habitat: Ample big game populations, security from human activities</p>	<p>[N] Wolves may use habitat in the vicinity of the Project Area. Disturbance associated with timber sales at den and rendezvous locations can adversely affect wolves; however, timing restrictions would apply if den or rendezvous sites are documented (<i>ARM 33.11.430(1)(a)(b)</i>). Thus, negligible adverse direct, indirect, or cumulative effects to wolves would be anticipated as a result of the Action Alternative.</p>
<p>Harlequin duck (<i>Histrionicus histrionicus</i>) Habitat: White-water streams, boulder and cobble substrates</p>	<p>[N] No suitable stream habitat occurs in the vicinity of the Project Area and harlequin ducks have not been observed in the area (<i>MNHP 2016</i>). Thus, no direct, indirect, or cumulative effects to harlequin ducks would be expected to occur as a result of either alternative.</p>
<p>Northern bog lemming (<i>Synaptomys borealis</i>) Habitat: Sphagnum meadows, bogs, fens with thick moss mats</p>	<p>[N] No suitable wetlands occur within 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.</p>
<p>Peregrine falcon (<i>Falco peregrinus</i>) Habitat: Cliff features near open foraging areas and/or wetlands</p>	<p>[N] No known cliffs suitable for peregrine falcon nesting exist within the project area. Recent or historical observations of peregrine falcons within 10 miles of the project area are lacking (<i>MNHP 2016</i>). Thus, no direct, indirect, or cumulative effects to peregrine falcons would be anticipated as a result of either alternative.</p>
<p>Pileated woodpecker (<i>Dryocopus pileatus</i>) Habitat: Late-successional ponderosa pine and larch-fir forest</p>	<p>[Y] Detailed Analysis Provided Below – Approximately 264 acres of suitable pileated woodpecker habitat occur in the Project Area.</p>

Species/Habitat	[Y/N] Potential Impacts and Mitigation Measures N = Not Present or No Impact is Likely to Occur Y = Impacts May Occur (Explain Below)
Townsend's big-eared bat (<i>Plecotus townsendii</i>) Habitat: Caves, caverns, old mines	[N] 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 would be expected to occur as a result of either alternative.
Wolverine (<i>Gulo gulo</i>) Habitat: Alpine tundra and high-elevation boreal forests that maintain deep persistent snow into late spring	[N] 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 (average 150+ sq. miles) wolverines occupy, 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	[Y] Detailed Analysis Provided Below – The Project Area contains potential elk, mule deer, and white-tailed deer winter range habitat.
Whitetail Deer	
Mule Deer	

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 young and mature coniferous stands with high levels of horizontal cover (Squires et al. 2010, Squires et al. 2013). 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 forest stands with abundant horizontal cover and coarse woody debris 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 Area

The analysis area for direct and indirect effects is the Project Area and the analysis area for cumulative effects is the 43,187-acre Large CEAA as described in *TABLE WI-1* and depicted in *FIGURE WI-1*. The Large CEAA approximates the size of a lynx home range, is centered on the project area, and is defined according to geographic features (e.g., ridgelines, high traffic roads), which are likely to influence movements of Canada lynx in the vicinity of the project area; providing a reasonable analysis area for Canada lynx that could be influenced by project-related activities.

Measurement Criteria

Factors considered in the analysis include: 1) the level of harvesting, 2) the availability of suitable lynx habitat, and 3) landscape connectivity. Suitable lynx habitat was subdivided into the following lynx habitat classes: 1) winter foraging, 2) summer foraging, 3) other suitable and 4) temporary non-habitat. Other suitable lynx habitat is defined as habitat that has the potential to provide connectivity and lower quality foraging habitat, but does not contain the necessary attributes to be classified as winter or summer foraging habitat classes. The temporary non-habitat category consists of forested stands that are not expected to be used by lynx until suitable horizontal cover develops. All habitat classes were identified according to DNRC's lynx habitat mapping protocols (*USFWS and DNRC 2010*). On non-DNRC lands, mature stands with $\geq 40\%$ canopy cover provided by trees > 9 inches dbh on average was queried to estimate potential lynx habitat. Using these forest metrics on non-DNRC lands provides a conservative estimate and likely underestimates the total amount of suitable lynx habitat on the landscape because it excludes young, dense stands that can also serve as suitable habitat for lynx and lynx prey.

Affected Environment

The Project Area contains 205 acres of suitable lynx habitat (*TABLE WI-5*). In the project area, winter foraging habitat is the most abundant type of suitable habitat (*TABLE W-5 – LYNX HABITAT*). Suitable lynx habitat is well-connected within each parcel of the project area, however connectivity between project area parcels is low due to recently harvested surrounding private industrial timberland and relative lack of riparian areas as travel corridors. Additionally, dry open south-facing slopes and unsuitable cover types likely limit use of the project area by lynx.

The Large CEAA contains 2,091 acres (4.8%) of suitable lynx habitat on DNRC lands and another 4,987 acres (11.5%) of potentially suitable habitat on other ownerships (*TABLE WI-5*). The remaining portions of the CEAA that do not provide vegetation likely to support lynx consist primarily of scree slopes, dry south-facing slopes, and logged stands with $< 40\%$ canopy cover. DNRC manages 11% of the CEAA, private timber companies own 79%, USDA Forest Service administers 8%, and other private owners account for 2% of the CEAA. Approximately 33,960 (78.6%) of the CEAA has been harvested within the last 30 years and reduced the availability of suitable lynx habitat containing mature trees. In the vicinity of the Project Area and in surrounding private timberlands, abundance and connectivity of suitable lynx habitat is low. The largest potentially suitable block of habitat is situated on higher-elevation USDA Forest Service lands in the far western portion of the CEAA. Observations of lynx within the CEAA are lacking within the last 30 years (*MNHP 2016*). Lower elevations, lower average snow depths, and the interspersed of unsuitable habitat types within the CEAA are factors that likely reduce the overall suitability of the CEAA for appreciable use by lynx.

Table WI-5 – 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^a present on DNRC-managed lands.*

Lynx Habitat Category	Acres of lynx habitat			
	Project Area		Cumulative Effects Analysis Area	
	Existing	Post-Harvest	Existing	Post-Harvest
Other Suitable	0.0 (0%)	14.4 (7%)	116.6 (5.1%)	130.9 (5.8%)
Summer Forage	0.0 (0%)	0.0 (0%)	127.7 (5.6%)	127.7 (5.6%)
Temporary Nonsuitable	0.0 (0%)	190.4 (93%)	181.4 (8%)	371.9 (16.4%)
Winter Forage	204.8 (100%)	0.0 (0%)	1,847.0 (81.3%)	1,642.2 (72.3%)
Grand Total: Suitable Lynx Habitat	204.8 (100%)	14.4 (7%)	2,091.3 (92%)	1,900.9 (83.6%)

^aTotal potential lynx habitat describes all areas that contain appropriate habitat types for lynx (i.e., sum of summer forage, winter forage, other suitable, and temporary non-suitable lynx habitat classes).

^bTotal suitable lynx habitat describes all DNRC lynx habitat categories that contain structural attributes necessary for use by lynx (i.e., sum of summer forage, winter forage, other suitable lynx habitat classes).

Environmental Effects – Canada Lynx

No Action Alternative: Direct and Secondary Effects 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.

No Action Alternative: Cumulative Effects on Canada Lynx

No appreciable change in lynx habitats would occur under this No-Action Alternative, and no further changes in landscape connectivity would be anticipated. Past forest management projects not associated with the proposed North Meadows/Upper Indian Creek Timber Sale(s) have affected lynx habitat in the CEAA, and ongoing and proposed projects could alter lynx habitat in the future (TABLE WI-2). 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.

Action Alternative: Direct and Secondary Effects on Canada Lynx

The proposed activities would alter approximately 205 acres (100%) of the 205 acres of suitable lynx habitat available in the Project Area. After harvest, approximately 14.4 total acres of potential habitat would remain suitable and 190 acres would be converted to temporary nonsuitable habitat (TABLE WI-5). To ensure that forest structural attributes preferred by snowshoe hares remain following harvest, some patches of advanced regeneration and shade-tolerant tree species would be retained where possible within portions of lynx winter forage

habitat. The total area of these patches would not be expected to comprise more than 5% of the acres proposed for harvest. However, steeper slopes on up to 204 acres of the project area could undergo prescribed burning after harvest, which would decrease shade-tolerant understory species in the short-term but likely increase conifer regeneration in the long-term. Additionally, 4 to 24 tons/acre of coarse woody debris would be retained in accordance with DNRC Forest Management Rules (*ARM 36.11.414*) and retention of downed logs ≥ 15 inch diameter would be emphasized. Lynx habitat connectivity would be reduced; however, some connectivity would be maintained through tree retention along a ridgeline and a small riparian area in section 4 of the project area. Habitat connectivity across the project area would continue to be limited by nonsuitable habitat on surrounding private timberlands and unsuitable habitat types on warm dry slopes. If present in the vicinity of the Project Area, lynx could be temporarily displaced by forest management activities for up to 4 years due to disturbance caused by motorized activities. However, appreciable use of the area by lynx would not be expected before or after implementation of the Action Alternative. Thus, moderate adverse direct and indirect effects to Canada lynx associated with landscape connectivity and availability of suitable habitat would be anticipated as a result of the Action Alternative since: 1) suitable habitat for lynx would be altered on 205 acres and reduced by 190 acres (100.0% of existing suitable habitat in the Project Area, *TABLE WI-5*); 2) coarse woody debris and some small shade-tolerant conifers would be retained to promote forest structural complexity in harvest units, expediting their growth back into suitable lynx habitat; and 3) existing suitable lynx habitat within the project area is scattered and habitat connectivity to the project area is poor; and 4) vegetative cover would persist along important travel features despite an overall reduction in landscape connectivity.

Action Alternative: Cumulative Effects on Canada Lynx

The proposed activities would affect 205 acres (2.9%) of the 7,078 acres of potentially suitable lynx habitat available in the Large CEAA. Approximately 190 of these harvested acres would be temporarily unsuitable for use by lynx due to lack of canopy cover in the understory and overstory. Habitat suitability would be reduced on another 14.4 acres, however adequate vegetation would be retained (total crown closure $\geq 40\%$) to remain suitable for use by lynx after harvesting. Some patches of shade tolerant trees and approximately 4 to 24 tons/acre of coarse woody debris would be retained and downed logs ≥ 15 inch diameter would be emphasized. Lynx habitat connectivity would be slightly reduced across the CEAA; however, overall connectivity of lynx habitat is currently poor. Connectivity in riparian areas would remain in parts of the CEAA, but many corridors are less than 300 feet wide. Changes to lynx habitat availability and connectivity would be additive to past and ongoing forest management projects within the CEAA (*TABLE WI-2*). Thus, minor adverse cumulative effects to Canada lynx associated with landscape connectivity and availability of suitable habitat would be anticipated as a result of the Action Alternative since: 1) overall baseline habitat suitability would remain poor with 16.4% of the CEAA in suitable habitat; 2) existing suitable lynx habitat within the CEAA would be reduced by 2.7% and those areas would remain unsuitable for at least 15 years, 3) habitat connectivity within the CEAA would be affected by proposed activities to a minor degree, and 4) lynx could be temporarily displaced by logging activities in the portion of CEAA overlapping the project area.

Sensitive Species

FISHERS

Issue

The proposed activities could decrease habitat suitability for fishers 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.

Introduction

In the Rocky Mountains, fishers prefer mesic late-successional forests with complex vertical and horizontal structure, large-diameter trees, and relatively dense canopies (*Schwartz et al. 2013, Raley et al. 2012*). Fishers generally avoid large openings, clearcuts, and ponderosa pine and lodgepole pine stands (*Schwartz et al. 2013*). Fishers prey upon snowshoe hares, ungulate carrion, porcupines, birds, and small mammals as well as seasonally available fruits and berries. Fisher 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 fishers involve providing upland and riparian resting and denning habitat, retaining adequate snags and downed woody debris, maintaining a network of travel corridors, and reducing trapping risk associated with motorized access.

Analysis Area

The analysis area for direct and indirect effects is the Project Area and the analysis area for cumulative effects is the 43,187-acre Large CEAA as described in *TABLE WI-1* and depicted in *FIGURE WI-1*. The Large CEAA is centered on the Project Area and is defined according to geographic features and could support the home range of at least one male fisher and multiple female fishers, providing a reasonable analysis area for fishers that could be influenced by project-related activities.

Measurement Criteria

Factors considered in the analysis include: 1) the degree of harvesting, 2) availability and structure of preferred fisher habitats (upland, riparian), 3) landscape connectivity, and 4) human access as it relates to risk of trapping mortality. Fisher habitat classifications considered in the analysis include: a) upland fisher habitat, and b) riparian fisher habitat, which are defined according to proximity of the stand to streams. Riparian fisher habitat is located within 100 feet of Class 1 streams or within 50 feet of Class 2 streams (*ARM 36.11.440(b)*). The remaining fisher habitat is considered upland fisher habitat. Habitat structure considered appropriate for fisher use includes stands with 40-100% total stocking density. Potential fisher habitat (riparian, upland) on other ownerships was identified by identifying mature forested habitat ($\geq 40\%$ cover, trees >9 inches dbh average) below 6,000 feet elevation in proximity to perennial and intermittent streams.

Affected Environment

The proposed project area contains 141 acres (50.2% of project area) of suitable fisher habitat (*TABLE W-6*). Riparian fisher habitat within the project area is comprised of approximately 2 acres of preferred fisher cover types, of which 2 acres (100.0% of preferred cover types) of riparian habitat are currently suitable for use by fishers. The only stream within the project area is a short, intermittent Class 2 stream, which limits suitable riparian habitat and likely disrupts connectivity for any fisher traveling in the riparian corridor. Snags and coarse woody debris (CWD) were quantitatively assessed during field visits. Analysis of sampling plots and field observations indicated snags within the project area occurred at a density of 16.5 snags per acre (range 0-66). The average diameter of all snags >8 " dbh was 13.7" dbh (range 8-27"). Coarse woody debris levels were also variable across the project area, averaging 22.2 tons per

acre (range 5.1-69.1 tons per acre). Downed logs were generally small diameter (6.2" at transect line, range 3-18"), although some larger logs were observed. Existing suitable stands are providing the forest conditions ($\geq 40\%$ crown closure) necessary for use as fisher travel habitat in upland areas. Within each project area parcel containing suitable fish cover types, suitable fisher habitat is moderately well-connected. However, these parcels are relatively small (80-120 acres) and scattered among recently logged private industrial timberland. Thus, habitat connectivity across the project area as a whole is poor. The lands surrounding the project area contain few areas of suitable habitat, few riparian areas, and poor connectivity, making it unlikely that fishers would den or breed in the project area. The project area does not contain any open roads that could facilitate access for trappers and firewood gathering. Given existing habitat conditions and the lack of historical observations in the vicinity of the project area (MNHP 2016), appreciable use of the project area by fishers is unlikely.

Historical records of fisher occurring in the CEAA within the last 50 years are lacking, however fishers have been documented in Lincoln and Flathead Counties (MNHP 2016, Foresman 2012) and fishers potentially use the CEAA. Within the CEAA, there are 6,222 acres (14.4% of the CEAA) of potentially suitable fisher habitat (TABLE WI-6). The majority of this potentially suitable habitat (3,165 acres) occurs on USDA Forest Service lands in the far western portion of the CEAA. Approximately 1,235 acres of suitable fisher habitat on DNRC lands occurs in small scattered parcels interspersed among recently logged private industrial timberland. Thus, connectivity of suitable upland habitat is low throughout much of the Large CEAA. Riparian fisher habitat within the CEAA consists of approximately 215 acres of preferred fisher cover types on DNRC lands, of which 58 acres (27.9% of preferred fisher cover types) are currently suitable for use by fishers. Approximately 514 acres adjacent to Class 1 and 2 streams within the CEAA have accompanying riparian vegetation that would facilitate fisher travel, and contribute to habitat suitability and connectivity. This potential riparian habitat primarily consists of narrow stringers of timber surrounded by recently logged lands. Abundance and connectivity of suitable fisher habitat is influenced by wet meadows with low canopy cover, streams that flow intermittently, rock/scree fields, dry south-facing slopes, and past timber harvesting within the CEAA. Within the CEAA, past harvesting has modified mature crown closure, snags and coarse woody debris levels. The CEAA contains a network of existing roads (density = 6.4 mi/sq. mile) that facilitate trapper access and firewood harvesting. Collectively, habitat suitability for fishers within the CEAA is poor and risk factors are moderate.

Table WI-6 – Fisher habitat. *Estimates of existing and post-harvest acreages of suitable fisher habitat within the project area and CEAA for the North Meadows/Upper Indian Creek Timber Sale(s), including potential habitat on non-DNRC ownership. Values in parentheses refer to the percentage that each fisher habitat type represents within the larger analysis area.*

Fisher Habitat Attribute	Project Area (281 acres)		Cumulative Effects Analysis Area (43,187 acres)	
	Existing	Post-Harvest	Existing	Post-Harvest
Upland Fisher Habitat (DNRC)	138.9 (49.4%)	6.3 (2.2%)	1,174.8 (2.7%)	1,042.2 (2.4%)
Upland Fisher Habitat (non-DNRC)	0.0 (0%)	0.0 (0%)	4,533.2 (10.5%)	4,533.2 (10.5%)
Riparian Fisher Habitat (DNRC)	2.0 (0.7%)	2.0 (0.7%)	59.9 (0.1%)	59.9 (0.1%)
Riparian Fisher Habitat (non-DNRC)	0.0	0.0	454.0	454.0

	(0%)	(0%)	(1.1%)	(1.1%)
Total Suitable Fisher Habitat (DNRC)	140.9 (50.1%)	8.3 (3%)	1,234.7 (2.9%)	1,102.1 (2.6%)
Total Suitable Fisher Habitat (DNRC lands & non-DNRC lands)	140.9 (50.1%)	8.3 (3%)	6,221.9 (14.4%)	6,089.3 (14.1%)

Environmental Effects – Fishers

No Action Alternative: Direct and Secondary Effects on Fishers

Under this alternative, no proposed project activities would occur. Thus, no direct or indirect effects associated with fisher habitat suitability or trapping mortality risk would be anticipated as a result of the No-Action Alternative.

No Action Alternative: Cumulative Effects on Fishers

Under this alternative, no proposed project activities would occur. Past forest management projects not associated with the proposed North Meadows/Upper Indian Creek Timber Sale have affected fisher habitat in the CEAA, and ongoing and proposed projects could alter fisher habitat in the future (TABLE WI-2). Activities on non-DNRC lands could continue altering fisher habitat and create increased trapping risk within the CEAA. Thus, since no additional changes in available habitat or level of human access would be anticipated as a result of the No-Action Alternative, no cumulative effects to fisher habitat suitability or trapping mortality risk would be anticipated.

Action Alternative: Direct and Secondary Effects on Fishers

Approximately 141 acres of the 141 acres (100.0%) of suitable fisher habitat in the project area would be harvested under the Action Alternative (TABLE WI-6). Approximately 135 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 6 acres of upland fisher habitat would receive harvest treatments that would reduce tree densities but retain adequate overstory crown closure ($\geq 40\%$) for use by fishers. Up to 2 acres of suitable riparian habitat (100.0% of riparian habitat) within 50 feet of a Class 2 stream could undergo selective harvesting that would leave adequate overstory crown closure ($\geq 40\%$) suitable for use by fishers after treatment, however habitat quality would be lower within these acres. Approximately 100.0% (2 acres) of preferred fisher cover types in riparian areas would remain suitable for use by fishers (*ARM 36.11.440(1)(b)(i)*). In all areas, harvest prescriptions call for retention of at least, 2 snags and 2 snag recruits per acre (≥ 21 in. dbh) where they exist, otherwise the next largest size class. In addition, 4 to 24 tons of coarse woody debris per acre would be planned for retention within harvest units. However, steeper slopes on up to 204 acres of the project area could undergo prescribed burning after harvest, which could further limit snags and down wood in these areas. 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 1.8 miles of newly constructed road would be restricted from public motorized use. Thus, 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 and appreciable use by fishers is unlikely, 2) harvesting would reduce suitable upland fisher habitat

in the project area by 95.5%, 3) reductions in upland habitat connectivity would occur but existing levels of riparian fisher habitat would be minimally affected, 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.

Action Alternative: Cumulative Effects on Fishers

Approximately 141 acres (0.8%) of 10,919 acres of potentially suitable fisher habitat in the CEAA would be harvested. Of these proposed harvest acres, 139 acres would be upland fisher habitat and 2 acres would be riparian habitat (TABLE WI-6). Approximately 2 acres of riparian fisher habitat would receive harvest treatments that would reduce tree densities but retain adequate overstory crown closure ($\geq 40\%$) suitable for use by fishers. Of the approximately 215 acres of preferred fisher cover types associated with Class 1 and 2 streams on DNRC lands, 59.9 acres (27.9% of preferred fisher cover types) would remain suitable for use by fishers. Reductions in upland fisher habitat would be additive to the changes associated with current timber harvesting in the CEAA, including the planned Skookum Point Timber Sale (TABLE WI-2), and past harvesting within the last 40 years. Approximately 6,089 acres of the 43,187-acre cumulative effects analysis area (14.1%) would remain as suitable fisher habitat (TABLE WI-6). Reductions in landscape connectivity of suitable upland fisher habitat within the CEAA would occur; however existing narrow forest stands along riparian areas would persist and appreciable effects 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 open roads would be built and all existing restricted roads would remain restricted. 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) existing baseline suitability and connectivity of fisher habitat within the project area is low and appreciable use by fishers is unlikely, 2) harvesting would alter tree density, snags, and stand structure in 0.3% of suitable fisher habitat within the CEAA, 3) no changes to fisher habitat associated with riparian areas in the CEAA would be anticipated and 27.9% of the total preferred cover type acreage would remain moderately to well-stocked, 4) suitable fisher habitat would remain connected within riparian areas but overall connectivity would remain low, and 5) no change in the risk of snag/coarse woody debris loss and trapping mortality would be expected.

Flammulated Owl

Issue

The proposed activities could alter the structure of flammulated owl (*Otus flammeolus*) preferred habitat types, which could reduce habitat suitability for flammulated owls.

Introduction

The flammulated owl is a small insectivorous species that is migratory and inhabits old, open stands of warm-dry ponderosa pine and cool-dry Douglas-fir forests in the western United States (McCallum 1994). Flammulated owls are secondary cavity nesters, typically nesting in 12 to 25 inch dbh aspen, ponderosa pine, or Douglas-fir cavities excavated by pileated woodpeckers or northern flickers (*Colaptes auratus*). Forest management considerations for flammulated owls include providing open, dry stands of ponderosa pine and Douglas-fir with scattered dense sapling thickets, and retaining snags for nesting.

Analysis Area

The analysis area for direct and indirect effects is the Project Area and the analysis area for cumulative effects is the 13,301-acre Small CEAA as described in *TABLE WI-1* and depicted in *FIGURE WI-1*. The Small CEAA scale includes sufficient area to support multiple pairs of flammulated owls if ample suitable habitat is present (McCallum 1994) and is defined by landscape features (i.e., ridgelines) which are likely to influence movements of a Flammulated owl in the vicinity of the project area; providing a reasonable analysis area for Flammulated owl that could be influenced by project-related activities.

Measurement Criteria

Analysis methods include field evaluations, aerial photograph interpretation, and GIS analysis of available habitats. Stand level data were used to identify preferred flammulated owl habitat types (*ARM 36.11.403(28)*). Snags were assessed during site visits using 10 stratified random plots in the proposed project area and reviewing past DNRC harvesting information. Canopy cover, trees/acre, and cover type were considered in the analysis of flammulated owl habitat availability and structure. Factors considered in the analysis include: 1) the degree of harvesting, and 2) the availability and structure of flammulated owl preferred habitats.

Affected Environment

Forest stands in the project area are largely ponderosa pine, lodgepole pine, and Douglas-fir. Within the project area there are approximately 76 acres (27.1%) of potential flammulated owl habitat. Of these potential acres, over 75% currently contain dense forest conditions likely unsuitable for foraging by flammulated owls, although widespread beetle mortality is likely improving habitat conditions. Much of the project area (73.0%) contains cover types not preferred by flammulated owls. Site-specific growing conditions and past timber harvesting have influenced the abundance and distribution of flammulated owl habitat and large snags within the proposed project area. Analysis of sampling plots and field observations indicated snags within the project area occurred at a density of 16.5 snags per acre (range 0-66). The average diameter of all snags >8" dbh was 13.7" dbh (range 8-27"). Recent tree mortality due to beetles is creating large snags (>21" dbh) that could be suitable nesting sites for flammulated owls. Given the relatively small amount of preferred forest habitat and dense forested conditions in this habitat, habitat suitability for flammulated owls within the project area is currently low to moderate.

The CEAA contains approximately 794 acres (6.0% of the Small CEAA) of potentially suitable flammulated owl habitat. Of these acres, approximately 716 acres (90.2% of potential habitat) consist of preferred flammulated owl cover types on DNRC lands. Similar to the project area, the majority of these acres (>50%) on DNRC lands contain dense stocking and canopy levels not typically used by flammulated owls. Flammulated owls have been recorded within the CEAA in the past as recently as 2014 (MNHP 2016) and presence of flammulated owls within the CEAA is likely. Suitable flammulated owl habitat within the CEAA is primarily limited by the presence of non-preferred cover types, the lack of large snags for nesting, dense forested conditions on DNRC lands, and recent harvesting. Harvesting on 11,484 acres (86.3 of the CEAA) of private timberlands within the CEAA has created more open canopy habitat favored by flammulated owls, however it has also likely reduced the number and quality of snags available for nesting. Additionally, 22.7 miles of open road within the CEAA allow widespread access for firewood gathering, which likely further reduces the amount of available snags. Currently, habitat suitability for flammulated owls within the CEAA is low to moderate.

Environmental Effects – Flammulated owl

No Action Alternative: Direct and Secondary Effects on Flammulated owl

Under this alternative, no proposed project activities would occur. Thus, since there would be no change in availability or structure of preferred flammulated owl habitats, no direct or indirect effects to habitat suitability for flammulated owls would be anticipated as a result of the No-Action Alternative.

No Action Alternative: Cumulative Effects on Flammulated owl

Under this alternative, no proposed project activities would occur. Past forest management projects not associated with the proposed North Meadows/Upper Indian Creek Timber Sale have affected Flammulated owl habitat in the CEAA, and ongoing and proposed projects could alter owl habitat in the future (TABLE WI-2). Activities on non-DNRC lands could continue altering Flammulated owl habitat and create disturbance within the CEAA. Thus, since no additional change in the availability or structure of preferred flammulated owl habitats would occur, no cumulative effects to habitat suitability for flammulated owls would be anticipated as a result of the No-Action Alternative.

Action Alternative: Direct and Secondary Effects on Flammulated owl

Timber harvest would occur on 76 of the 76 acres (100.0%) of suitable flammulated owl cover types available in the project area. The proposed activities would open stands to 5% to 15% canopy cover, improving stand structure suitability for flammulated owls in harvest units. Additionally, the proposed harvest prescription would favor leaving larger-diameter ponderosa pine and Douglas-fir live trees and snags, however the density of these species would decrease. Some snags could be removed by the proposed harvest, but at least 2 snags and 2 snag recruitment tree per acre (>21 inches dbh, or largest available) would be retained (*ARM 36.11.411*). Flammulated owls are tolerant of human disturbance (McCallum 1994), however disturbance associated with harvesting could temporarily displace flammulated owls should they be present in the project area. Flammulated owls would not be displaced by activities occurring in the winter months when the birds have migrated to their winter range. All existing restricted roads and 1.8 miles of newly constructed restricted roads would remain restricted; potential for snag loss due to firewood gathering in the future would not appreciably change. Thus, minor direct and indirect effects to flammulated owl habitat suitability would be anticipated as a result of the Action Alternative since: 1) no change in the availability of preferred flammulated owl habitat would occur, 2) proposed harvesting would alter 100.0% of existing suitable cover types; 3) changes in forest structure and cover type caused by harvesting would generally increase flammulated owl habitat suitability; and 4) the number of large snags available for nesting would decrease but at least 2 large snags/acre would be retained.

Action Alternative: Cumulative Effects on Flammulated owl

Timber harvest would occur on 76 of the 794 acres (9.6%) of potentially suitable flammulated owl habitat available in the project area. On DNRC lands, harvesting would affect 10.6% of the suitable flammulated cover types available. The proposed activities would open stands to 5% to 15% canopy cover, improving the suitability of stand structure for flammulated owls in harvest units. The proposed harvest prescriptions would favor leaving 4-35 trees per acre of larger-diameter ponderosa pine, western larch, and Douglas-fir. Some snags could be removed by the proposed harvest, but at least 2 snag and 2 snag recruitment trees per acre (>21 inches dbh, or largest available) would be retained (*ARM 36.11.411*). Flammulated owls are tolerant of human disturbance (McCallum 1994), however disturbance associated with harvesting could temporarily displace flammulated owls should they be present in the project area. Flammulated owls would not be displaced by activities occurring in the winter months when the birds have migrated to their winter range. Thus, minor direct and indirect effects to flammulated owl habitat suitability would be anticipated as a result of the Action Alternative since: 1) no change in the

availability of preferred flammulated owl habitats would occur, 2) harvesting would alter approximately 9.6% of potentially suitable habitat, and 3) changes in structure and cover type within harvest units would generally increase flammulated owl habitat suitability.

Pileated Woodpeckers

Issue

The proposed activities could reduce tree density and alter the structure of mature forest stands, which could reduce habitat suitability for pileated woodpeckers.

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. 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 Area

The analysis area for direct and indirect effects is the Project Area and the analysis area for cumulative effects is the 13,301-acre Small CEAA as described in *TABLE WI-1* and depicted in *FIGURE WI-1*. The Small CEAA is centered on the Project Area and provides a sufficient area to support multiple pairs of pileated woodpeckers if enough suitable habitat is present (*Bull and Jackson 2011*).

Measurement Criteria

Factors considered in the analysis include: 1) the degree of harvesting and 2) the amount and structure of pileated woodpecker preferred habitat types. On DNRC-managed lands, sawtimber stands ≥ 100 years old within preferred pileated cover types (*ARM 36.11.403(58)*) with $\geq 40\%$ canopy closure were considered potential pileated woodpecker habitat. On non-DNRC lands, the stands considered potential pileated woodpeckers habitat were mature forest stands ($\geq 40\%$ canopy cover, >9 inches dbh average) below 6,000 feet elevation.

Affected Environment

In the project area, there are approximately 263 acres (93.7% of project area) of potential pileated woodpecker habitat. Pileated woodpecker calling was heard and foraging evidence was observed during field visits to the project area. Current potential pileated habitat within the project area consists of mature Douglas-fir, ponderosa pine, that function as a single patch within each parcel; resulting in 3 separate patches. These patches are generally not connected to surrounding patches due to the lack of suitable habitat on adjacent private industrial timberlands. Snags and coarse woody debris within the proposed project area generally abundant for the existing habitat types. Snags and coarse woody debris (CWD) were quantitatively assessed during field visits. Analysis of sampling plots and field observations indicated snags within the project area occurred at a density of 16.5 snags per acre (range 0-

66). The average diameter of all snags >8" dbh was 13.7" dbh (range 8-27"). Coarse woody debris levels were also variable across the project area, averaging 22.2 tons per acre (range 5.1-69.1 tons per acre). Similar to snags, downed logs were generally small diameter (6.2" at transect line, range 3-18"), although some larger logs were observed. Firewood gathering, which can result in a reduction of snags and downed logs valuable as woodpecker nesting and foraging substrates, is unlikely within much of the project area due the lack of roads. Given these observed existing habitat conditions, pileated woodpecker habitat suitability is currently moderate within the project area for 1-3 pairs of birds.

The CEAA contains approximately 896 acres (6.7% of the CEAA) of potential pileated woodpecker habitat. Together, these are distributed among 30 patches and average patch size is 29.2 acres. The largest patches of potential habitat (3 patches >100 acres) occur primarily on DNRC lands and in narrow stringers of unharvested forest along riparian areas. Recent harvesting on 12,289 acres (92.4% of the CEAA) within the last 40 years has altered forest habitat and created forest conditions unsuitable for use by pileated woodpeckers. Firewood gathering is active along 22.6 miles of open road and on private lands within the CEAA. Thus, habitat quality and availability for pileated woodpeckers within the CEAA is currently low.

Environmental Effects – Pileated Woodpeckers

No Action Alternative: Direct and Secondary Effects on Pileated Woodpeckers

Under this alternative, no proposed project activities would occur. Thus, no direct or indirect effects to pileated woodpecker habitat suitability would be anticipated as a result of the No-Action Alternative.

No Action Alternative: Cumulative Effects on Pileated Woodpeckers

Under this alternative, no proposed project activities would occur. Past forest management projects not associated with the proposed North Meadows/Upper Indian Creek Timber Sale have affected pileated woodpecker habitat in the CEAA, and ongoing and proposed projects could affect habitat suitability in the future (TABLE WI-2). Activities on non-DNRC lands could continue altering pileated woodpecker habitat within the CEAA. Thus, since no additional changes in available habitat would be anticipated as a result of the No-Action Alternative, no cumulative effects to pileated woodpecker habitat suitability would be anticipated.

Action Alternative: Direct and Secondary Effects on Pileated Woodpeckers

The proposed activities would occur in 263 acres (100.0%) of the 263 acres of pileated woodpecker habitat available in the Project Area. Proposed harvest prescriptions on 251 acres would open stands to 5-20% canopy cover causing the structure of these stands to become unsuitable for appreciable use by pileated woodpeckers. An additional 13 acres of suitable habitat would undergo harvest treatments that would reduce habitat suitability but would retain sufficient large trees for some use by pileated woodpeckers. Patch size and connectivity of suitable habitat would be reduced, although limited connectivity of remaining habitat with adjacent suitable habitat would be retained in narrower corridors. Snags would likely be removed by the proposed harvest, but at least 2 large snags and 2 large snag recruitment trees per acre (>21 inches dbh, or next largest size class) would be retained (*ARM 36.11.411*) where present. Disturbance associated with harvesting could adversely affect pileated woodpeckers on portions of the Project Area for approximately 4 years, should they be present in the Project Area. Thus, high adverse direct and indirect effects to pileated woodpecker habitat suitability in the Project Area would be anticipated as a result of the Action Alternative since: 1) harvesting would reduce pileated woodpecker suitable habitat availability by 251 acres (95.4%) and alter 12 acres (4.6%) of available suitable habitat; 2) forest structural changes would occur, but

mitigation would include retention of snags and coarse woody debris (*ARM 36.11.411*, *ARM 36.11.414*); 3) patch size of suitable habitat would decrease and connectivity would be converted to patches not large enough to support nesting pileated woodpeckers; and 4) pileated woodpeckers could be temporarily displaced for up to 4 years.

Action Alternative: Cumulative Effects on Pileated Woodpeckers

Under this alternative, pileated woodpecker habitat would be altered on 263 acres (29.3%) of the 896 acres of potentially suitable habitat in the CEAA. Harvesting would remove 251 acres of suitable habitat and reduce habitat suitability on another 13 acres 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 live trees would be reduced from existing levels in all of the proposed harvest units. Disturbance associated with the proposed activities could adversely affect pileated woodpeckers in the vicinity of the Project Area for up to 4 years. Past harvesting 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. Timber harvesting throughout the CEAA and firewood gathering along open roads would continue to limit the abundance of snags and woody debris within areas of the CEAA. Thus, moderate cumulative effects to habitat suitability for pileated woodpeckers would be anticipated since: 1) 29.3% of suitable pileated woodpecker habitat currently present within the CEAA would be altered; 2) patch size of suitable habitat would decrease and connectivity of suitable habitat would remain poor within CEAA; and 3) some snags and snag recruits 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 per acre in harvested areas.

BIG GAME

ELK, WHITE-TAILED DEER, AND MULE DEER WINTER RANGE

Issue

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.

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 cover on winter range 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 male animals and resulting decrease in hunter opportunity.

Analysis Area

The analysis area for direct and indirect effects is the Project Area and the analysis area for cumulative effects is the 43,187-acre Large CEAA as described in TABLE WI-I and depicted in FIGURE WI-1. The Large CEAA is defined according to geographic features (e.g., watershed boundaries), which provide a reasonable biological analysis unit for big game animals that could be influenced by project-related activities.

Measurement Criteria

Factors considered in the analysis include: 1) the degree of timber harvesting, 2) the availability and structure of forest cover on big game winter range, and 3) the level of human access for recreational hunting. Forested habitat ($\geq 40\%$ canopy cover, > 9 inch dbh average) was considered capable of providing minimal conditions capable of providing thermal cover for big game in the Large CEAA.

Affected Environment

The entire proposed project area (281 acres) has been identified by DFWP as white-tailed deer, moose and elk winter range. Evidence of summer/fall deer and elk use was observed during field visits to the project area. The project area contains approximately 237 acres (84.5%) 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 44 acres (15.7%) of the project area have forested stands that contain a more open overstory canopy ($< 40\%$ canopy cover) or small-diameter trees than what would be considered high-quality thermal cover or cover that would provide appreciable snow intercept. Forest stands within the project area are undergoing widespread mortality due to Douglas-fir bark beetles, with the largest trees most susceptible to attack. Thus, the quality and quantity of thermal cover/snow intercept is decreasing as these trees die. Motorized hunter access is not present in the project area due to road restrictions and the lack of roads in two of three parcels. The density of open roads in the project area is 0 miles/sq. mile. Elk security habitat is not present in the project area due to the small size of project area parcels and their proximity to open roads on surrounding lands (Hillis et al. 1991).

White-tailed deer winter range occupies approximately 12,700 acres (90.3%) of the CEAA. Approximately 28,971 (67.1%) and 26,484 acres (61.3%) of the CEAA were identified as moose and elk winter range, respectively. Big game winter ranges within the CEAA are connected to a much larger winter range area ($> 500,000$ acres) extending north along US Highway 2 and south along US Highway 200. Presently, approximately 7,319 acres (17.0%) within the CEAA are providing usable thermal cover and snow intercept for big game. These forest patches are distributed primarily on DNRC and Forest Service lands within the CEAA, as private lands consist of meadows or have undergone harvesting. Due to past harvesting within the CEAA, small dense patches of 10-20 foot-tall trees are interspersed within most of the area and could be providing marginal levels of thermal cover/snow intercept. In the last 40 years, harvesting has reduced thermal cover and snow intercept on winter range within the CEAA. These recent harvests 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. The CEAA also likely receives moderate to high levels of hunter access, especially in areas where roads, both open and restricted, are more numerous. Open road density within the CEAA is 1.3 miles/sq. mile and total road density is 6.4 miles/sq. mile.

Environmental Effects

No Action Alternative: Direct and Secondary Effects on Big Game

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 visual screening 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 big game habitat 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.

No Action Alternative: Cumulative Effects on Big Game

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 North Meadows/Upper Indian Creek Timber Sale 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 (TABLE WI-2). Activities on other ownerships 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.

Action Alternative: Direct and Secondary Effects on Big Game

Under the Action Alternative, approximately 281 acres (100.0% of project area) of big game habitat and winter range would be harvested on the project area. Of these acres, 237 acres (100.0%) of available mature canopy forest currently providing thermal cover would be harvested. Harvest prescriptions in 225 acres of harvest units would result in forest canopy too open to effectively function as thermal cover or snow intercept. Harvesting on another 13 acres would reduce tree densities and winter range habitat quality, however overstory crown closure in these treated stands would remain above 40% postharvest and could provide measurable levels of snow intercept for big game, albeit in small patches. 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.

Proposed tree removal would increase sight distances in harvest units and could increase risk of hunting mortality for 15-20 years. Additionally, 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. Approximately 1.8 miles of new roads would be constructed, these roads would be restricted during harvesting and gated or bermed after activities end. During all phases of the project, any restricted roads 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.

Thus, 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) 100.0% of thermal and hiding cover in the project area would be altered and lesser amounts of suitable thermal/cover (13 acres) would remain; 2) existing winter range habitat quality for big game has been lowered by extensive tree mortality due to beetles; 3) sight distances would increase on 281 acres, which could increase big game vulnerability and associated hunting mortality risk; 4) topography, riparian areas, and retained patches of regenerating conifers would mitigate some of the adverse effects of cover removal; 5) relatively short-term logging activities would create disturbance in this area; and 6) long-term open road density would not change.

Action Alternative: Cumulative Effects on Big Game

Forest stands providing suitable thermal cover and snow intercept would be altered by harvesting on approximately 237 acres (3.2%) of the 7,319 acres containing these habitat qualities. Approximately 225 acres (3.1%) undergoing treatment would be too open to provide adequate hiding or thermal cover after project completion. This reduction in thermal cover and snow intercept would be additive to past reductions and future plans (Table WI-2) within the CEAA due to forest management. Some limited dense patches of regenerating conifers (>6 feet height) would be retained, providing some residual cover in harvest units. Reductions in cover may cause moderate decreases in winter use by deer, moose, and elk in the project area; however, appreciative changes in deer, elk, or moose distribution or abundance would not be expected at the scale of the CEAA. Continued maturation of previously harvested 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 temporarily displace wintering big game for up to 4 years. Under the Action Alternative, use of existing roads for harvesting activities could temporarily increase access and disturbance on 16.9 miles. After harvesting, open road density would not change, however an extensive network of roads would continue to facilitate moderate to high amounts of hunter access.

Thus, minor adverse cumulative effects to big game winter range would be expected since: 1) harvesting would reduce overall levels of cover on 225 acres (3.2% of existing cover) of winter range within the CEAA; 2) existing thermal cover and snow intercept on winter range in the CEAA would be altered, but approximately 7,094 acres (16.4% of the CEAA) of these attributes would remain; 3) some canopy cover and regenerating conifer patches would remain; 4) overall habitat quality within the larger winter range would not be appreciably altered and big game use of the CEAA would not be expected to appreciably change; 5) logging activities would create additional disturbance on a minor portion of the CEAA; and 6) long-term open road densities would not change.

Wildlife Mitigations

- If a threatened or endangered species is encountered, consult a DNRC biologist immediately. Similarly, if undocumented nesting raptors or wolf dens are encountered within ½ mile of the Project Area contact a DNRC biologist.
- 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)*.

- Contractors will adhere to food storage and sanitation requirements as described in the timber sale contract. Ensure that all attractants such as food, garbage, and petroleum products are stored in a bear-resistant manner.
- Restrict public access at all times on restricted roads that are opened for harvesting activities. Effectively close all restricted roads following harvest completion.
- Close roads and trails to the maximum extent possible following the proposed activities to reduce the potential for unauthorized motor vehicle use and/or loss of snags to firewood gathering.
- Retain patches of advanced regeneration of shade-tolerant trees within harvest units as per *LY-HB4 (USFWS and DNRC 2010)*.
- Retain visual screening along roads where possible to increase security for wildlife.
- Retain at least 2 snags and 2 snag recruits per acre, particularly favoring western larch, ponderosa pine and Douglas-fir for retention. Increase snag retention within the old-growth maintenance unit to the extent practicable. If designated snags are cut for safety concerns, leave them in the harvest unit. Retain coarse-woody debris as described in the Forest Management ARMs and *SOILS ANALYSIS* in this document.

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Figure WI-1 –Wildlife analysis areas for the proposed North Meadows/Upper Indian Creek Timber Sale(s).

