Little Rock Sears
Environmental Assessment

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

Little Rock Sears

Environmental Assessment

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MEMORANDUM

To: Tyrell Colombo, Plains Unit Management Forester

From: David Olsen, Plains Unit Resource Program Manager

Date: January 23, 2015

RE: Little Rock Sears Timber Sale Objectives

Primary Objective

The primary objective of the Little Rock Sears Timber Sale is to generate income for the Common Schools (CS) and Public Buildings (PB) trusts. The land parcels involved in this proposed project are located in Section 2, Township 22 North, Range 27 West, Section 36 Township 23 North, Range 27 West and Section 30, Township 23 North, Range 26 West. This project would provide an estimated 6.0 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: Little Rock Sears
Proposed Implementation Date: June 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 the Little Rock Sears Timber Sale for 2016 and Thin Mint Timber Sale for 2019. The projects are located approximately 18 miles north of Plains, MT (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	**S36 T23N R27W**	**640**	**578**
Public Buildings	**S2 T22N R27W** **S30 T23N R26W**	**320** **320**	**276** **294**
MSU 2nd 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 (CS) and Public Building Trusts (PB).
- Harvest approximately 6 MMBF.
- Improve stand health by removing trees infected or susceptible to insect and disease.
- Bring portions of the project area closer to the Desired Future Conditions.

Proposed activities include:

Action	Quantity
Proposed Harvest Activities	
Clearcut	
Seed Tree	
Shelterwood	1148 ac.
Selection	
Commercial Thinning	
Salvage	
Total Treatment Acres	
Proposed Forest Improvement Treatment	
Pre-commercial Thinning	
Planting	
Proposed Road Activities	
New permanent road construction	4.2 mi
New temporary road construction	0.2 mi
Road maintenance	8.3
Road reconstruction	1.0 mi
Road abandoned	2.1 mi
Road reclaimed	
Existing Temp	1.9 mi
Other Activities	

Duration of Activities:	5 Years
Implementation Period:	06/01/2016 to 12/31/2021

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)

Project Development

SCOPING:

- DATE:
  - April 1, 2015 → May 15, 2015
- PUBLIC SCOPED:
  - 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 scoping notice was also published in the *Clark Fork Valley Press*, the *Sanders County Ledger* and the *Missoulian* newspapers.
- AGENCIES SCOPED:
  - Montana Fish Wildlife & Parks, Montana tribal organizations, US Forest Service, US Fish & Wildlife Service, State of Montana
- COMMENTS RECEIVED:
  - How many: One
  - Concerns: Cultural resources.
  - Results: If cultural resources are found operations would stop and the DNRC archeologist would be notified.

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

INTERDISCIPLINARY TEAM (ID):

- Project Leader: Ty Colombo
- Archeologist: Patrick Rennie
- Wildlife Biologist: Leah Breidinger
- Hydrologist: Tony Nelson
- Soil Scientist: Tony Nelson
- Economist: Sarah Lyngholm
- Silviculturist: Ty Colombo

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.

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

- **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.

- **Montana Department of Fish, Wildlife and Parks (DFWP)-** A Stream Protection Act Permit (124 Permit) is required from DFWP for activities that may affect the natural shape and form of a stream's channel, banks, or tributaries. Such activities include:
  - Installation of bridge across Little Thompson River.

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 or Public Buildings Trusts at this time. Natural events, such as plant succession, tree mortality due to insects and diseases, windthrow, down fuel accumulation, and in-growth of ladder fuels, would continue to occur.

Action Alternative : Two commercial timber harvests would take place to remove approximately 6 million board feet of timber. Timber would be harvested using ground-based and skyline methods on 1,148 acres. A temporary bridge would be installed over the Little Thompson River.

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: 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 would decrease the productivity of the trees. The increase in competition would also stress the trees which would increase the trees susceptibility for disease and insect outbreaks.
- Old Growth: The potential old growth is present in the project area.

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

- Wash equipment prior to harvest to limit weed seed dispersal.
- Spray weeds along roadsides to limit spread of existing weeds.
- Plant grass on newly disturbed road surfaces to limit the resources available for weeds to establish.
- Prescribe a selection harvest in order to emulate natural disturbance historically present on the landscape.
- Maintain 89 acres of old growth.

FOR COMPLETE VEGETATION ANALYSIS SEE ATTACHMENT 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 would 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 F.

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.

- Implement Riparian Management Zones on all Class 1 streams based on site-potential tree heights in the project area
- Implement BMPs on all new roads and improve BMPs on existing roads where needed
- On portions of roads where any portion of the road is within the 50-foot SMZ boundary, install a slash filter windrow or wire-backed sediment filter fence to minimize potential for sediment delivery
- 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.

FISHERIES RESOURCES *(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 fisheries resources:

- The proposed actions may adversely affect fisheries habitat features

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

- Applying all applicable Forestry BMPs (including the SMZ Law and Rules) and Forest Management Administrative Rules for fisheries, soils, and wetland riparian management zones (ARMs 36.11.425 and 36.11.426)

FOR COMPLETE FISHERIES RESOURCE ANALYSIS SEE ATTACHMENT E.

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:

- The proposed activities could decrease mature forested cover, which could reduce habitat connectivity and suitability for wildlife species associated with mature forest.
- The proposed activities could affect Canada lynx, fishers, flammulated owls, pileated woodpeckers, and big game winter range.

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

- If threatened or endangered species is encountered contact DNRC biologist.
- Contractors would adhere to food storage requirements and not have firearms while on job site.
- Restrict public access and retain visual screening along open roads.
- Retain at least 2 snags and 2 snag recruits per acre >21 inches dbh or the next available size class, particularly favoring western larch and Douglas-fir for retention. If snags are cut for safety concerns, they must be left in the harvest unit. Retain 5-15 tons/acre of coarse-woody and emphasize retention of 15-inch diameter downed logs where they occur.
- Protect natural regeneration.

FOR COMPLETE WILDLIFE ANALYSIS SEE ATTACHMENT G.

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.

HISTORICAL AND ARCHEOLOGICAL SITES:

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

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

There would 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:

- Mudd Creek Timber Sale EA (2007)
- Cook Mountain Salvage Sales Area EA (2007)
- Little Thompson Thinning Timber Sale EA (2010)

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, Mineral, Lake, and Flathead 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 would be produced during pile burning.
- Dust would 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 would 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		
No-Action														
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	X				X				X					

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		
Revenues														
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					
Action														
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 or goals are associated with this timber sale.

OTHER APPROPRIATE SOCIAL AND ECONOMIC CIRCUMSTANCES:

The proposed action has a projected harvest volume between 5.5 and 6.5 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 $2,100,000. 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 $315,000 and $735,000. 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 Northwest 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 6 MBF of timber towards the sustained yield target thus helping sustain current mill capacity.

Environmental Assessment Checklist Prepared By:

Name: Ty Colombo
Title: Management Forester
Date: April 6, 2016

Finding

Alternative Selected

The Action Alternative meets the project objectives and is selected for implementation. The No Action Alternative fails the 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	X	No Further Analysis

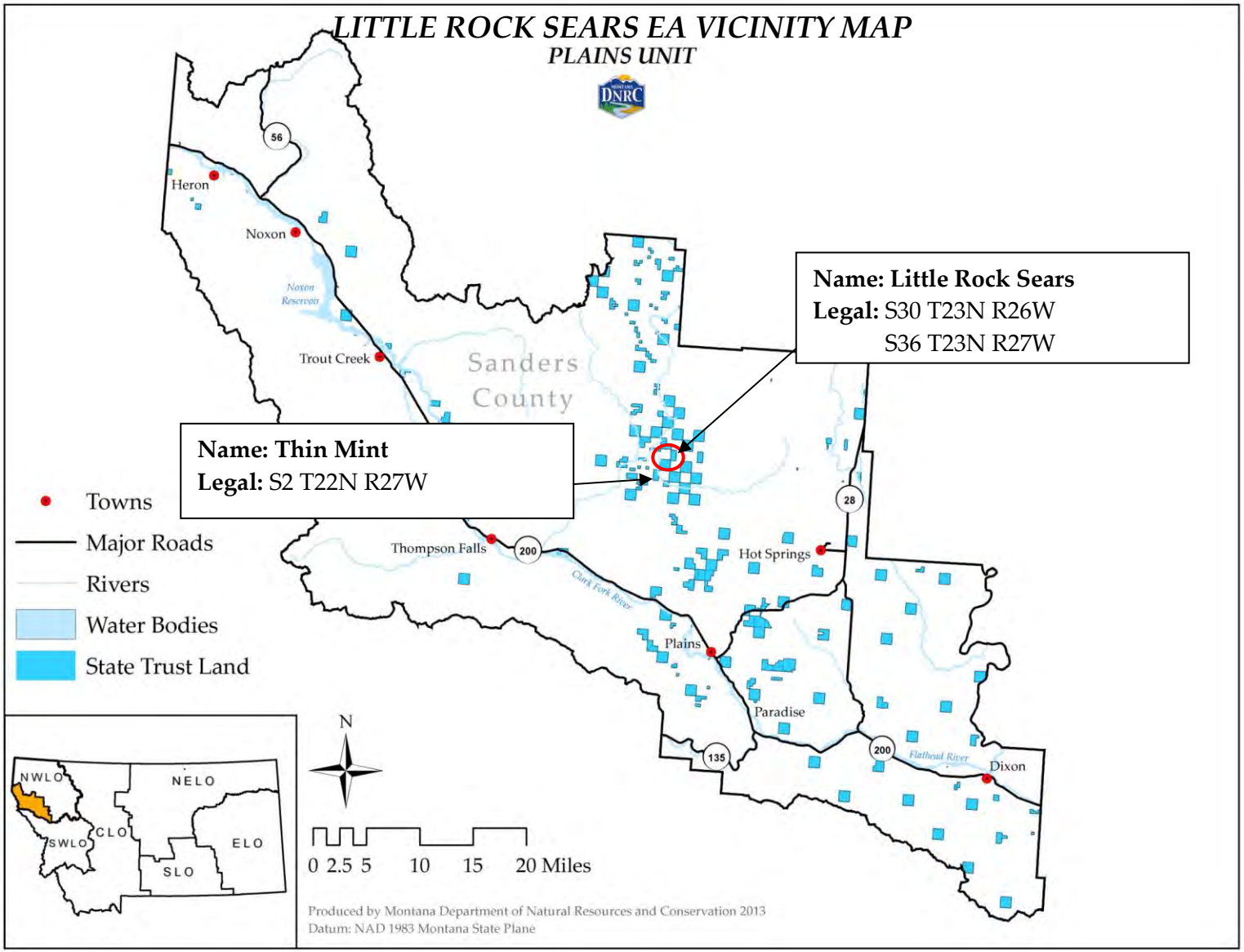
Environmental Assessment Checklist Approved By:

Name: David M. Olsen
Title: Plains Unit Program Manager
Date: April 7, 2016

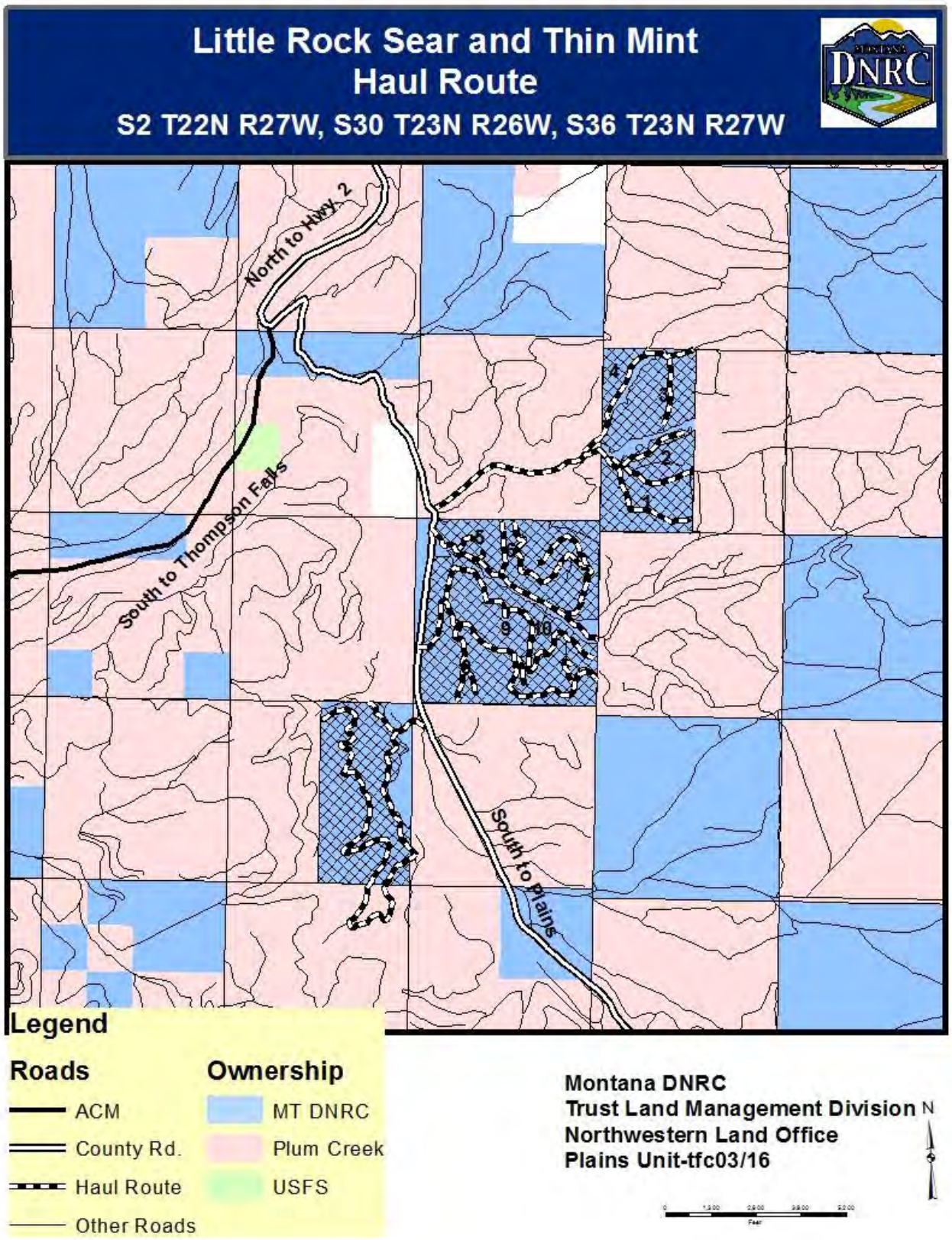
Signature: /s/ *David M. Olsen*

Attachment A - Maps

A-1: Little Rock Sears and Thin Mint Timber Sales Vicinity Map

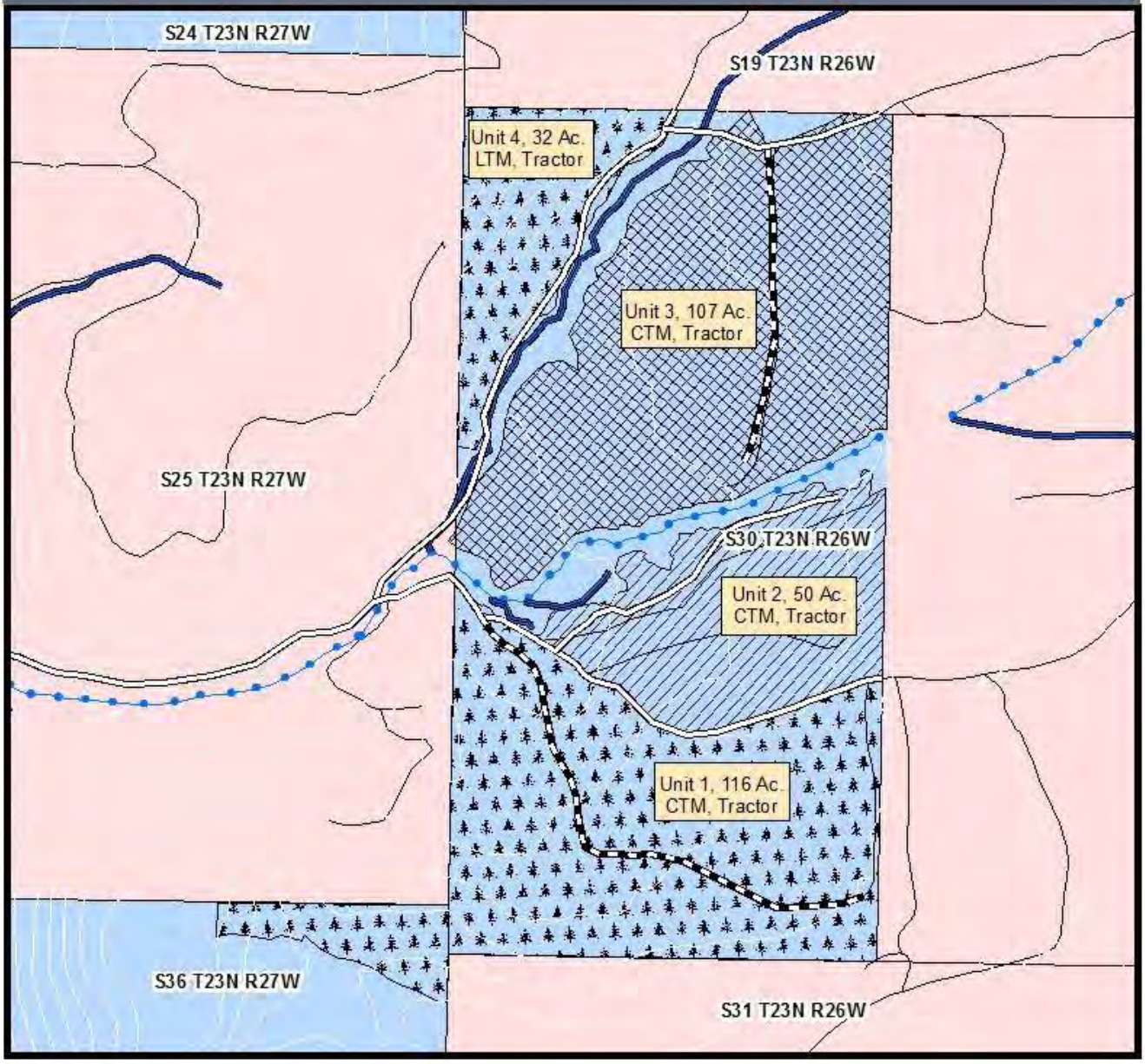


A-2: Little Rock Sears and Thin Mint Timber Sales Transportation Plan



A-3: Little Rock Sears Timber Sale Harvest Units

Little Rock Sears Timber Sale
Harvest Map: A
Sec. 30 T23N R26W



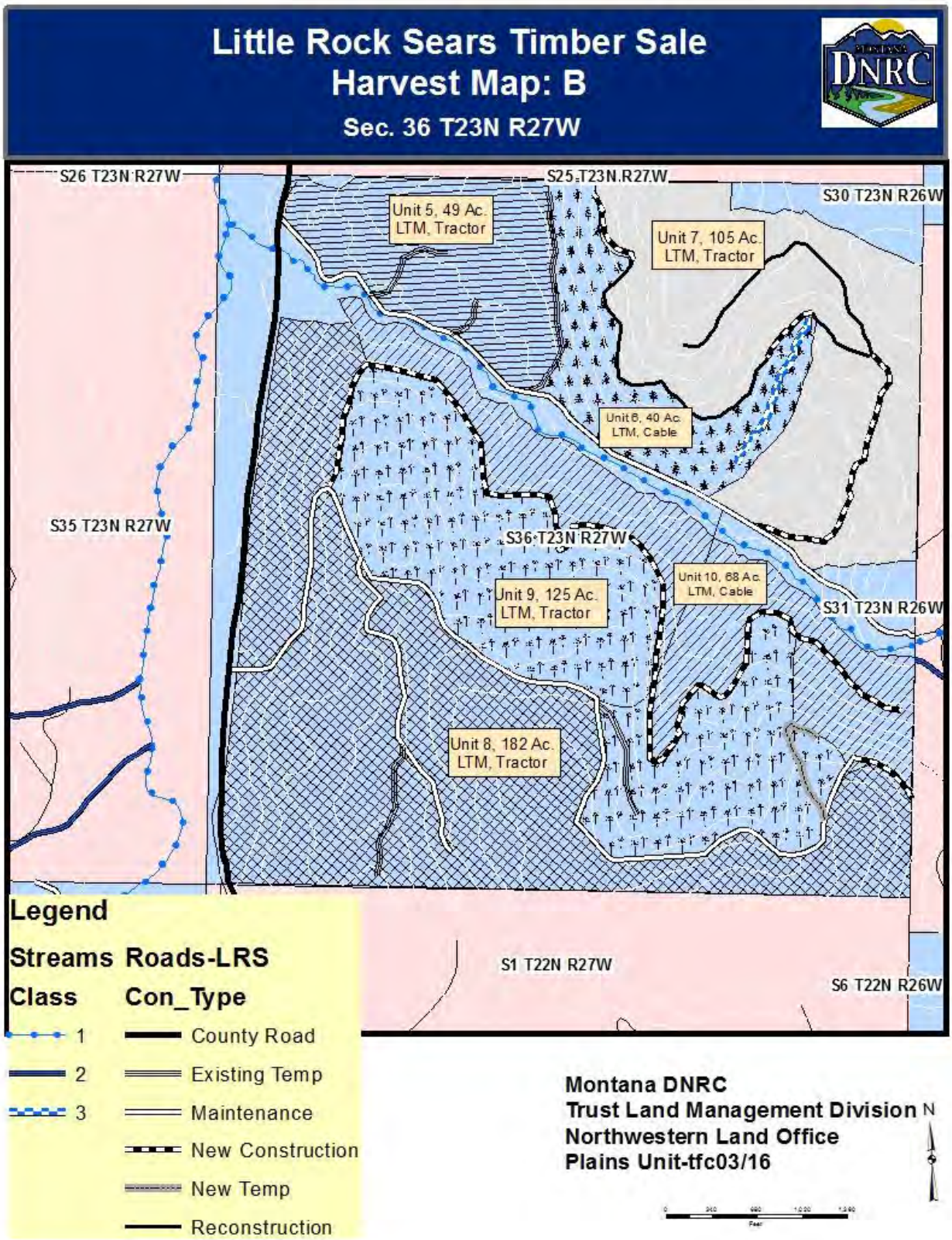
Legend

Streams	Roads-LRS
Class	**Con_Type**
1	Existing Temp
2	Maintenance

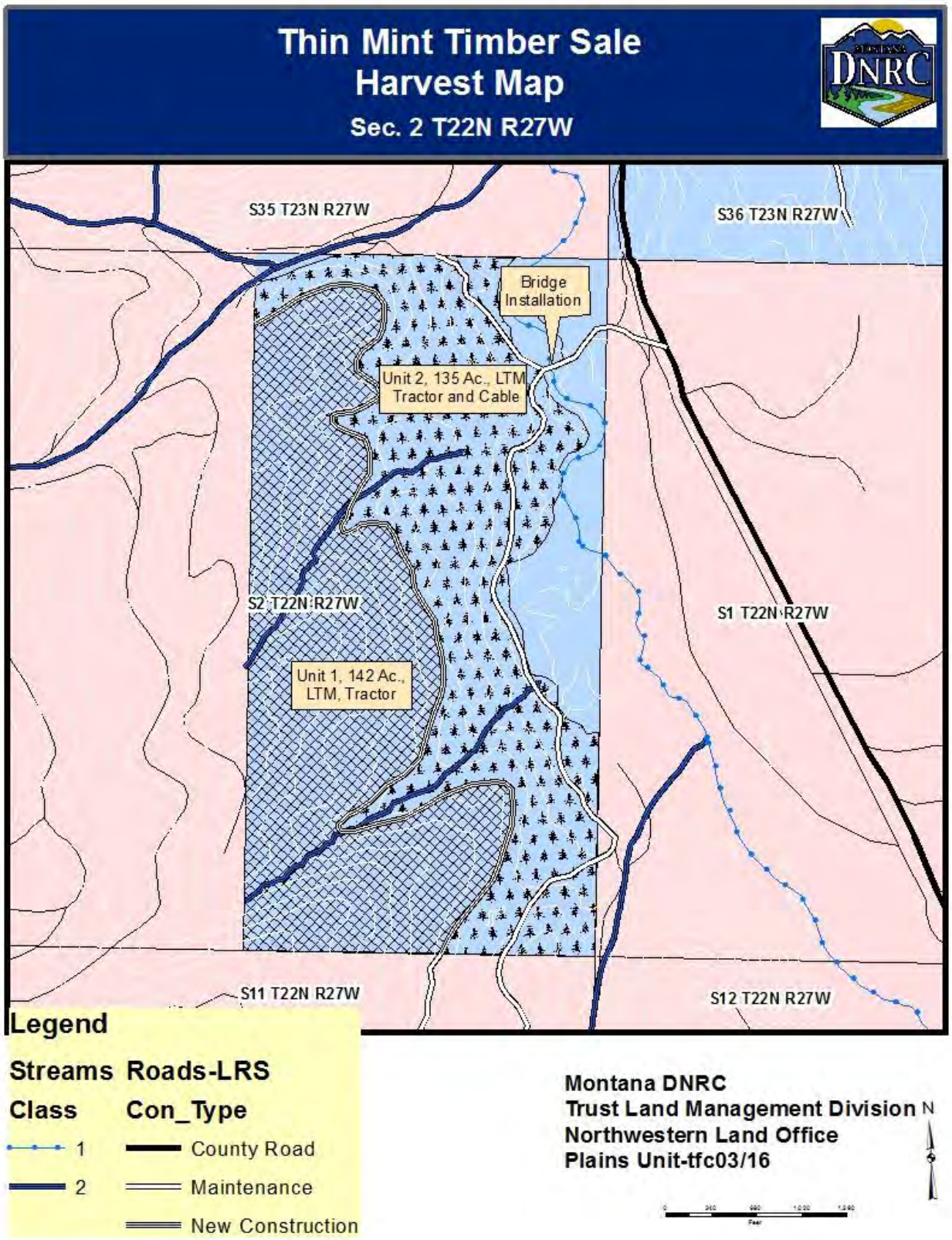
Montana DNRC
Trust Land Management Division
Northwestern Land Office
Plains Unit-tfc03/16

N

A-4: Little Rock Sears Timber Sale Harvest Units



A-5: Thin Mint Timber Sale Harvest Units



Attachment B – Prescriptions

LITTLE ROCK SEARS TIMBER SALE

STAND PRESCRIPTION

Unit Number: 1 **Location:** ¼ SW S30 T23N R27W **Acres:** 116

Elevation: 3,320 Ft. **Slope:** 0%-20% **Aspect(s):** NW

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

Soils: Gravelly Loam

Description of stands:

- The stands have Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*) and western larch (*Larix occidentalis*) evenly distributed in the overstory.
- The stands are multi-storied with Douglas-fir and lodgepole pine (*Pinus contorta*) dominating the mid-level and understory.
- The stands are poorly stocked with 60 ft^2 basal area per acre.
- The stands ages average about 160 years.
- These stands have a high frequency, low severity fire regime of about 10-30 years

Treatment Objectives:

- Move the stands toward the desired future conditions of 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:

- Shelterwood treatment. Trees will be marked to cut.
- Trees would be spaced to about 35-45 ft., leaving approximately 25-35 trees per acre.
- Favor leaving dominant and co-dominant ponderosa pine, western larch and Douglas-fir while protecting understory.
- 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.
- 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 Numbers: 2, 3 **Location:** ¼ NE, ¼ NW S30 T23N R26W **Acres:** 50, 107

Elevation: 3,280 Ft. **Slope:** 0%-15% **Aspect:** W

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

Soils: Gravelly Loam, Cobbly Ashy Silt Loam

Description of stands:

- The stands have mostly Douglas-fir and ponderosa pine in the overstory with a few scattered western larch.
- The stands are multi-storied with lodgepole pine dominating the mid-level and understory.
- The stands are poorly stocked with 50 ft^2 basal area per acre.
- The stands ages average about 185 years.
- These stands have a high frequency, low severity fire regime of about 10-30 years

Treatment Objectives:

- Move the stands toward the desired future conditions of 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 regeneration.
- Retain logging slash for woody debris recruitment and nutrient cycling of foliage and fine fuels to maintain site productivity.

Prescribed Treatment:

- Shelterwood treatment. Trees will be marked to cut.
- Trees would be spaced to about 35-45 ft., leaving approximately 25-35 trees per acre.
- Favor leaving dominant and co-dominant ponderosa pine, western larch and Douglas-fir while protecting understory.
- 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.
- These units 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:** ¼ NE, ¼ NW S30 T23N R26W **Acres:** 32

Elevation: 3,360 Ft. **Slope:** 10%-35% **Aspect:** SE

Habitat type: PSME/CARU-ARUV

Soils: Gravelly Loam

Description of stand:

- The stand has Douglas-fir, ponderosa pine and western larch comprising most of the overstory.
- The stand is multi-storied with Douglas-fir, ponderosa pine and lodgepole pine distributed throughout the mid-level and understory.
- The stand is medium stocked with 70 ft^2 basal area per acre.
- The stand age is 155 years.
- These stands have a high frequency, low severity fire regime of about 10-30 years

Treatment Objectives:

- Move the stands toward the desired future conditions of 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:

- Shelterwood treatment. Trees will be marked to leave.
- Trees would be spaced to about 35-45 ft., leaving approximately 25-35 trees per acre.
- Favor leaving dominant and co-dominant ponderosa pine, western larch and Douglas-fir while protecting understory.
- 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.
- 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: 5, 6, 7 **Location:** ½ N S36 T23N R26W **Acres:** 49, 40, 105

Elevation: 3,320 Ft. **Slope:** 10-55% **Aspects:** W-SW-S

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

Soils: Gravelly Sandy Loam, Gravelly Loam

Description of stand(s):

- The stands have ponderosa pine dominating the overstory with scattered western larch and Douglas-fir.
- The stands are multi-storied with Douglas-fir and lodgepole pine dominating the mid-level and understory.
- The stands are medium stocked with 80 ft^2 basal area per acre.
- The stands age averages about 170 years.
- These stands have a high frequency, low severity fire regime of about 10-30 years

Treatment Objectives:

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

- Shelterwood treatment. Trees will be marked to leave.
- Trees would be spaced to about 35-45 ft., leaving approximately 25-35 trees per acre.
- Favor leaving dominant and co-dominant ponderosa pine, western larch and Douglas-fir while protecting understory.

- 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.
- Units 5 and 7 would be tractor logged. Unit 6 would be line logged.
- Machine scarify if needed after post-harvest evaluation.
- Monitor success of natural regeneration and plant seedlings if necessary.

Unit Number: 8 **Location:** ½ S S36 T23N R26W **Acres:** 182

Elevation: 3,320 Ft. **Slope:** 10%-45% **Aspects:** W-NW-N

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

Soils: Gravelly Loam

Description of stand(s):

- The stands have Douglas-fir, ponderosa pine and western larch comprising most of the overstory.
- The stands are multi-storied with Douglas-fir, ponderosa pine and lodgepole pine comprising most of the mid-level and understory.
- The stands are medium stocked with 100 ft^2 basal area per acre.
- The stands average age is 160 years.
- These stands have a high frequency, low severity fire regime of about 10-30 years

Treatment Objectives:

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

- Shelterwood treatment. Trees will be marked to leave.
- Trees would be spaced to about 35-45 ft., leaving approximately 25-35 trees per acre.
- Favor leaving dominant and co-dominant ponderosa pine, western larch and Douglas-fir while protecting understory.
- 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.
- 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 Numbers: 9, 10 **Location:** ½ S S36 T23N R26W **Acres:** 125, 68

Elevation: 3,320 Ft. **Slope:** 15%-55% **Aspects:** N-NE

Habitat type: PSME/SYAL-CARU, ABGR/CLUN-CLUN, ABGR/LIBO-LIBO

Soils: Gravelly Loam, Gravelly Ashy Silt Loam

Description of stand(s):

- The stands have Douglas-fir, ponderosa pine and western larch comprising most of the overstory.
- The stands are multi-storied with Douglas-fir, grand fir (*Abies grandis*) and lodgepole pine comprising most of the mid-level and understory.
- The stands are medium stocked with 80 ft^2 basal area per acre.
- The stands average age is 170 years.
- These stands have a mixed severity disturbance regime.

Treatment Objectives:

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

- Shelterwood treatment. Trees will be marked to leave.
- Trees would be spaced to about 35-45 ft., leaving approximately 25-35 trees per acre.
- Favor leaving dominant and co-dominant ponderosa pine, western larch and Douglas-fir while protecting understory.
- 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.
- Unit 9 would be tractor logged and unit 10 would be line logged.
- Machine scarify if needed after post-harvest evaluation.
- Monitor success of natural regeneration and plant seedlings if necessary.

THIN MINT TIMBER SALE

STAND PRESCRIPTIONS

Unit Number: 1 **Location:** ½ W, ½ E S2 T22N R27W **Acres:** 142

Elevation: 3,320 Ft. **Slope:** 10%-55% **Aspect(s):** NE-E

Habitat type: PSME/SYAL-CARU, PSME/CAGE, ABGR/CLUN-CLUN, ABGR/LIBO-LIBO

Soils: Gravelly Loam, Gravelly Ashy Silt Loam

Description of stand(s):

- The stands have Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*) and western larch (*Larix occidentalis*) comprising most of the overstory.
- The stands are multi-storied with Douglas-fir comprising most of the mid-level and understory.
- The stands are medium stocked with 110 ft^2 basal area per acre.
- The stands average age is 195 years.
- These stands have a mixed severity disturbance regime.

Treatment Objectives:

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

- Shelterwood and old growth maintenance treatment. Trees will be marked to leave.
- Trees would be spaced to about 35-45 ft., leaving approximately 25-35 trees per acre. In old growth units, leave a minimum of 8 trees/acre >21” dbh and a minimum 60 sq. ft BA/acre.
- Favor leaving dominant and co-dominant ponderosa pine, western larch and Douglas-fir while protecting understory.
- 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.
- 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:** ½ E, ½ E S2 T22N R27W **Acres:** 135

Elevation: 3,200 Ft. **Slope:** 5%-35% **Aspect(s):** NE-E

Habitat type: PSME/SYAL-CARU, PSME/CARU-ARUV, PSME/CAGE, ABGR/CLUN-CLUN, ABGR/LIBO-LIBO

Soils: Gravelly Loam

Description of stand(s):

- The stands have Douglas-fir, ponderosa pine and western larch comprising most of the overstory.
- The stands are multi-storied with Douglas-fir, grand fir (*Abies grandis*) and lodgepole pine (*Pinus contorta*) comprising most of the mid-level and understory.
- The stands are medium stocked with 100 ft^2 basal area per acre.
- The stands average age is 195 years.
- These stands have a mixed severity disturbance regime.

Treatment Objectives:

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

- Shelterwood and old growth maintenance treatment. Trees will be marked to leave.
- Trees would be spaced to about 35-45 ft., leaving approximately 25-35 trees per acre. In old growth units, leave a minimum of 8 trees/acre >21" dbh and a minimum 60 sq. ft BA/acre.
- Favor leaving dominant and co-dominant ponderosa pine, western larch and Douglas-fir while protecting understory.
- 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.
- This unit would be tractor and line logged.
- Machine scarify if needed after post-harvest evaluation.
- Monitor success of natural regeneration and plant seedlings if necessary.

Attachment C – Vegetation Analysis

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 would decrease the productivity of the trees. The increase in competition would also stress the trees which would increase the trees susceptibility for disease and insect outbreaks.
- Old Growth: The potential old growth is present in the project area.

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 1,280 acres located in S2 T22N R27W, S36 T23N R27W, and S30 T23N R26W.

Cumulative Effects Analysis Area
The Little Rock Creek, Sears Creek, Mint Creek and the Plains Unit.

Existing Conditions

Noxious Weeds
Spotted knapweed (*Centautea 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 oficinale*) 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**

Section 2 Township 22N Range 27W

- The only major entry into these stands was in the late 1940s to early 1950s. The sale produced 3.3 MMBF of mostly ponderosa pine and western larch with some Engelmann spruce and Douglas-fir.

Section 30 Township 23N Range 27W

- These stands have been entered twice. The first was in the late 1940s to early 1950s. This sale produced 2.5 MMBF of western larch, Douglas-fir and ponderosa pine. The second entry was in 1981.

This sale produced about 1 MMBF of western larch, Douglas-fir, ponderosa pine, and lodgepole pine. Shelterwood and commercial thin prescriptions were used in the second entry.

Section 36 Township 23N Range 27W

- These stands were entered twice. The first was in the late 1940s to early 1950s. The sale produced about 5.2 MMBF of western larch, Douglas-fir, and ponderosa pine. The second entry was in 1967 and 1968. This sale produced 1.6 MMBF of western larch, Douglas-fir, ponderosa pine, and lodgepole pine.
-
- **Current stand conditions**

The stands within the project area are comprised of a mix of Douglas-fir and ponderosa pine with intermittent western larch on the wetter sites. Douglas-fir is established in the mid-level and understory. The stands average age is about 170 years and average heights range from 60-90 feet. The mountain pine beetle *(Dendroctonus ponderosae)* has been active in the stand. There has been tree mortality in past years as well as some new attacks. There are also patches of western larch that are infected with Pini (*Phellinus pini*).

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.

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 four cover types present within the proposed project area are: Non-forested, Mixed Conifer, Ponderosa pine, and western larch/Douglas-fir. The desired future cover types identified for the project area are: Non-forested, Lodgepole pine, 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 Little Rock Sears Project Area.

Cover Type	Current Acres	Current Percent of Project Area	Desired Future Condition (DFC)	
			Acres	Percent
Subalpine fir				
Douglas-fir				
Lodgepole pine			62	5%
Mixed conifer	8	1%		
Ponderosa pine	911	71%	893	69%
Western larch/Douglas-fir	314	24%	278	22%
Western white pine				
Non-stocked				
Non-forest	47	4%	47	4%
Other (specify)				
Total:	***1280***	***100%***	***1280***	***100%***

Old Growth
There are 89 acres of field verified old growth within the project area (S2, T22N, R27W). 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.

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, trees would become susceptible to insect and disease causing 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 1,148 acres and promote the desired future conditions of ponderosa pine and western larch/Douglas-fir. A shelterwood harvest prescription would be implemented on 1,059 acres and an old growth maintenance treatment on 89 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 occurs to the overall vegetation community of the Plains Unit.

Old Growth
Direct and Secondary

The proposed action alternative would implement a maintenance treatment on the 89 acres of old growth present in the project area. This would maintain a minimum of 8 trees per acre, 21" diameter breast high and greater, with a minimum basal area of 60 sq. ft/acre.

Cumulative

The Plains Unit had 558 forested acres verified as old growth. Through field verification, 89 acres of unidentified old growth was inventoried. This should result in an increase of forested acres classified as old growth on the Plains Unit.

Vegetation Mitigations

- Wash equipment prior to harvest to limit weed seed dispersal.
- Spray weeds along roadsides to limit spread of existing weeds.
- Plant grass on newly disturbed road surfaces to limit the resources available for weeds to establish.
- Prescribe a selection harvest in order to emulate natural disturbance historically present on the landscape.
- Maintain acres of old growth.

Recommended Mitigations and Adjustments of Treatments for the Benefit of Other Resources

- Snags, snag recruits, and coarse woody debris would be managed according to *ARM 36.11.411* through *36.11.414*, particularly favoring western larch. Clumps of existing snags would be maintained where they exist to offset areas without sufficient snags. Coarse woody debris retention would emphasize retention of downed logs of 15-inch diameter or larger.
- No timber harvest within 50 feet of Class 1 SMZs. Retain 50% of the sawtimber within the SMZs, RMZs and designated fisher habitat.

VEGETATION REFERENCES

Green, P., J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann. 1992. Old-growth forest types of the Northern Region. R-1 SES. Unpublished report on file at US Forest Service, Northern Region, Missoula, MT.

Montana Natural Heritage Program (MTNHP). 2014. Plant species of concern report. Available online at: http://mtnhp.org/SpeciesOfConcern/?AorP=p Last accessed January, 22, 2015.

Attachment D – Water Shed Analysis

Little Rock Sears – 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 Little Rock Sears project area. Direct, secondary, and cumulative effects to water resources of both the No-Action and Action alternatives will be analyzed.

Issues and Measurement Criteria

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 Little Rock Sears project area were used to assess the impacts of past management to water yield. Aerial photo interpretation was used to determine the extent of past management in these watersheds.

Regulatory Framework

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

Montana Surface Water Quality Standards

According to the Montana Surface Water Quality Standards found in *ARM 17.30.607* (*1*)(*a*), this portion of the Clark Fork River drainage, including the Little Thompson River, Mint Creek, Little Rock Creek and Sears Gulch, is classified as B-1. Among other criteria for B-1 waters, no increases are allowed above naturally occurring levels of sediment, and minimal increases over natural turbidity. "Naturally occurring," as defined by *ARM 17.30.602* (*19*), includes conditions or materials present during runoff from developed land where all reasonable land, soil, and water conservation practices (commonly called Best Management Practices or BMPs) have been applied. Reasonable practices include methods, measures, or practices that protect present and reasonably anticipated beneficial uses. These practices include, but are not limited to, structural and nonstructural controls and operation and maintenance procedures. Appropriate practices may be applied before, during, or after completion of activities that could create impacts.

Designated beneficial water uses within the project area include cold-water fisheries and recreational use in the streams in the surrounding area. Surface water rights in the proposed project area include irrigation and domestic use.

Water-Quality-Limited Waterbodies

The Little Thompson River is listed in the *2014* *List of Waterbodies in Need of Total Maximum Daily Load (TMDL) Development* publication produced by the Montana Department of Environmental Quality (DEQ, 2014). This list is compiled by the Montana Department of Environmental Quality (DEQ) as required by Section 303(d) of the Federal Clean Water Act and the Environmental Protection Agency (EPA) Water Quality Planning and Management Regulations (40 CFR, Part 130). Under these laws, DEQ is required to identify water bodies that do not fully meet water quality standards, or where beneficial uses are threatened or impaired. These water bodies are then characterized as “water quality limited” and thus targeted for Total Maximum Daily Load (TMDL) development. The TMDL process is used to determine the total allowable amount of pollutants in a water body of watershed. Each contributing source is allocated a portion of the allowable limit. These allocations are designed to achieve water quality standards.

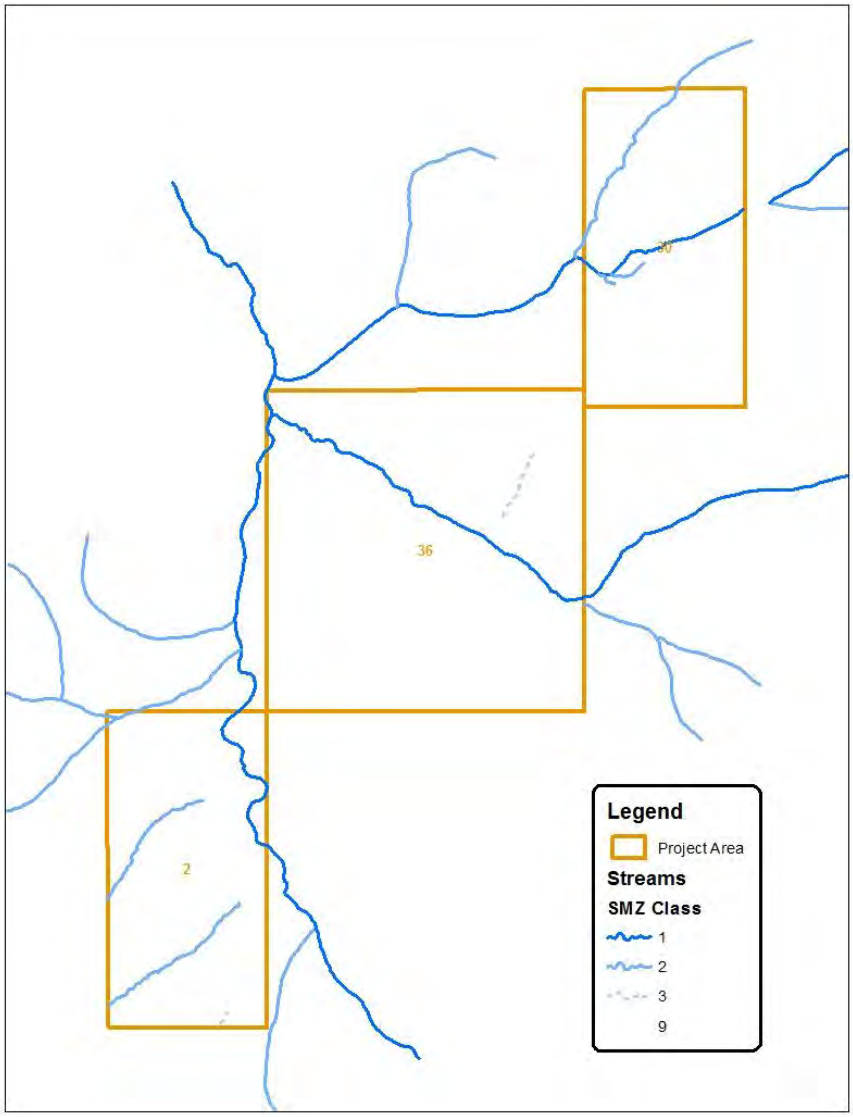
The Montana Water Quality Act (MCA 75-5-701-705) also directs the DEQ to assess the quality of state waters, insure that sufficient and credible data exists to support a 303(d) listing and to develop TMDL for those waters identified as threatened or impaired. Under the Montana TMDL Law, new or expanded nonpoint source activities affecting a listed water body may commence and continue provided they are conducted in accordance with all reasonable land, soil and water conservation practices. Total Maximum Daily Loads have not been completed for the Little Thompson River drainage. DNRC will comply with the Law and interim guidance developed by DEQ through implementation of all reasonable soil and water conservation practices, including Best Management Practices, commitments in the State Forest Land Management Plan, and the Forest Management Rules.

Reaches of the Little Thompson River listed in need of TMDL development are located above, below and within the proposed project area. Aquatic life and primary contact recreation are listed as not supported in the 2014 list. Listed causes of impairment in the Little Thompson River are sedimentation/siltation, nitrogen (total), phosphorus (total) and alteration in stream-side or littoral vegetative covers. Probable sources are listed as silviculture harvesting, forest roads (road construction and use) and grazing in riparian or shoreline zones.

Montana SMZ Law

By the definition in *ARM 36.11.312* (*3*), the majority of the stream reaches in the proposed project area are Class 1 and Class 2 streams. The Little Thompson River, Sears Gulch and Little Rock Creek are perennial fish-bearing streams. Several other stream segments identified in ***Figure H-1*** are class 2 (each either flows more than 6 months per year and does not contribute surface flow to another body of water or flows less than 6 months per year but contributes surface flow to another body of water when it flows). According to ARM 36.11.312 (4), a Class 2 stream is a portion of a stream that is not a Class 1 or Class 3 stream segment.

Figure H-1 *– Stream Class Map for Little Rock Sears Timber Sale*



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 area and the streams found within the project area is found in ***Figure H-1***. All existing activities on all ownership and proposed activities related to the Little Rock Sears project 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 Little Rock Sears project area were used to assess the impacts of past management to water yield. All existing activities on all ownership within project area watersheds and proposed activities related to the Little Rock Sears project will be analyzed using methods described above.

Existing Conditions

General Description

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

Sediment Delivery

Sediment delivery on these parcels was reviewed by a DNRC hydrologist in 2015. Numerous stream channels were identified in the project area. Little Rock Creek flows through the northeast parcel in the project area and is a perennial Class 1 stream with an approximately 10-foot bankfull width. The stream was classified as a B3/4 channel using a classification system developed by Rosgen (1996). Channel types rated as “B” are typically in the 2- to 4-percent gradient range, and have a moderate degree of meander (sinuosity). Channel-bed materials in B3/4 types are mainly cobble and gravel. Little Rock Creek has one tributary stream with a 3 foot bankfull width. This tributary flows less than 6 months and contributes to Little Rock Creek 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 this parcel 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 Little Rock Creek or its tributaries.

Sediment delivery from in-channel sources in the middle portion of the project area was reviewed by a DNRC hydrologist in 2015. The primary stream in this area is Sears Gulch, a perennial Class 1 tributary to the Little Thompson River with a 10-12 foot bankfull width that flows through section 36 of the proposed project area. Sears Gulch was classified as a B3/4 channel using a classification system developed by Rosgen (1996). Channel types rated as “B” are typically in the 2- to 4-percent gradient range, and have a moderate degree of meander (sinuosity). Channel-bed materials in B3/4 types are mainly cobble and gravel. To the north of the main stem of Sears Gulch in the northeast ¼ of section 36 there is a class 3 stream that flows less than 6 months and does not contribute surface flow to Sears Gulch. This channel has definable banks and approximately a 1-2 foot bankfull width, but does not have a scoured bed. No areas of unstable or actively down-cut channels were identified during field reconnaissance. Large woody debris was found in adequate supply to support channel form and function. Woody material in a stream provides traps for sediment storage and gradient breaks to reduce erosive energy and work as flow deflectors to reduce bank erosion. No recent evidence of past SMZ harvesting was found. Based on these findings, no in-channel sources of erosion or deposition were identified in Sears Gulch or its tributaries.

Sediment delivery from in-channel sources in the southwestern parcel of the project area was reviewed by a DNRC hydrologist in 2015. The Little Thompson River flows through the eastern portion of this parcel. The reach of the river flowing through this parcel is stable and healthy with well-vegetated banks and no active down-cutting identified. There are several unnamed class 2 and class 3 streams identified in this parcel. These streams do not contribute surface water to any downstream waters. These streams have 1 to 3 foot bankfull widths and are found in section 2 of the proposed project area. These streams are classified as B4/5 channels using a classification system developed by Rosgen (1996). Channel types rated as "B" are typically in the 2- to 4-percent gradient range, and have a moderate degree of meander (sinuosity). Channel-bed materials in B4/5 types are mainly gravel and coarse sand. No areas of unstable or actively down-cut channels were identified during field reconnaissance. Large woody debris was found in adequate supply to support channel form and function. Woody material in a stream provides traps for sediment storage and gradient breaks to reduce erosive energy and work as flow deflectors to reduce bank erosion. No evidence of past SMZ harvesting was found. Based on these findings, no in-channel sources of erosion or deposition were identified in this unnamed stream or its tributaries.

No sediment delivery from the existing road system was identified on any of the proposed haul routes within or leading to the project area. The existing road system in the proposed project area is low to moderate standard native-surfaced road. 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. In addition, there are reaches of the main haul route along Sears Gulch and Little Rock Creek that were constructed within the 50-foot SMZ. Where these roads are within the SMZ boundary, there is not an adequate buffer to properly filter sediment from surface runoff prior to reaching the stream. 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. In 2007, a stand replacing fire burned a portion of the Lower Little Thompson River watershed, which includes Sears Gulch and Little Rock Creek. 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 the 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 watershed 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 Little Rock Sears project area, by ARM 36.11.423, a detailed quantitative watershed analysis is not needed in this parcel.

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 70 acres of harvesting in the SMZ and or Riparian Management Zone (RMZ). 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. Primary risks to sediment delivery in the project area include portions of the existing road systems adjacent to Sears Gulch and Little Rock Creek. Portions of these roads are located less than 50 feet from these class 1 streams. All surface drainage outlets would be routed through a slash filter or similar structure to ensure proper filtration of road runoff. Also, the fill slope portion of the road would have a sediment fence or similar structure installed in all areas where there is less than a 50-foot natural buffer to minimize risk of sediment delivery from unfiltered road surface runoff. In addition, the action alternative proposes to construct approximately 4.2 miles of new road. Proposed new road construction would involve 2 new stream crossings in the southwest parcel of the proposed project area. These crossings are on perennial discontinuous class 2 streams. All applicable BMPs as well as recommendations and requirements from Stream Protection Act permits from Montana Department of Fish, Wildlife and Parks would be followed in order to minimize potential impacts to these streams. Short-term risk of low levels of erosion and deposition would be increased for approximately 2 to 3 years after completion 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. Overall, there is a low risk of short-term low-level increase in erosion and sediment delivery for about 2-3 years at the new and existing stream crossings. However, water quality standards are expected to be met and there is a low risk of impacts to downstream beneficial uses.

There is a high risk of low impacts to sediment delivery from construction of approximately 4.2 miles of new road. This risk would be elevated due to construction of 2 new stream crossings on one of the proposed new roads. This activity would likely release a short-term pulse of fine sediment into the stream during construction. The project proposal would also install a 60-foot bridge over the Little Thompson River. Construction of bridge approaches would present a high risk of sediment delivery during the course of operation. The risk of sediment delivery from all of these sites would remain elevated for 2 to 3 years after project completion while bare soils are revegetated.

Cumulative

Risk of sediment delivery and sediment loading to Little Rock Creek, Sears Gulch 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. Overall, there is a high risk of short-term low-level increases in sediment loading for about 2 to 3 years. However, water quality standards are expected to be met and there is a low risk of impacts to beneficial uses.

Water Yield

Direct and Secondary

There is a low risk of very low direct or secondary effects to water yield from harvesting of approximately 1,151 acres of timber under this alternative within the proposed project area. It is a low risk that this level of harvesting would be sufficient to generate measurable increases in water yield in any streams located within or near the project area or cause channel instability. The stability of channels would be sufficient to handle any anticipated increases without measurable change. 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 area with a shelterwood 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 Riparian Management Zones on all Class 1 streams based on site-potential tree heights in the project area

- implement BMPs on all new roads and improve BMPs on existing roads where needed
- on portions of roads where any portion of the road is within the 50-foot SMZ boundary, install a slash filter windrow or wire-backed sediment filter fence to minimize potential for sediment delivery
- 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 – Fisheries Analysis

Fisheries Resources Assessment

Assessment Prepared By:

Name: Tony Nelson
Title: Hydrologist, Montana DNRC

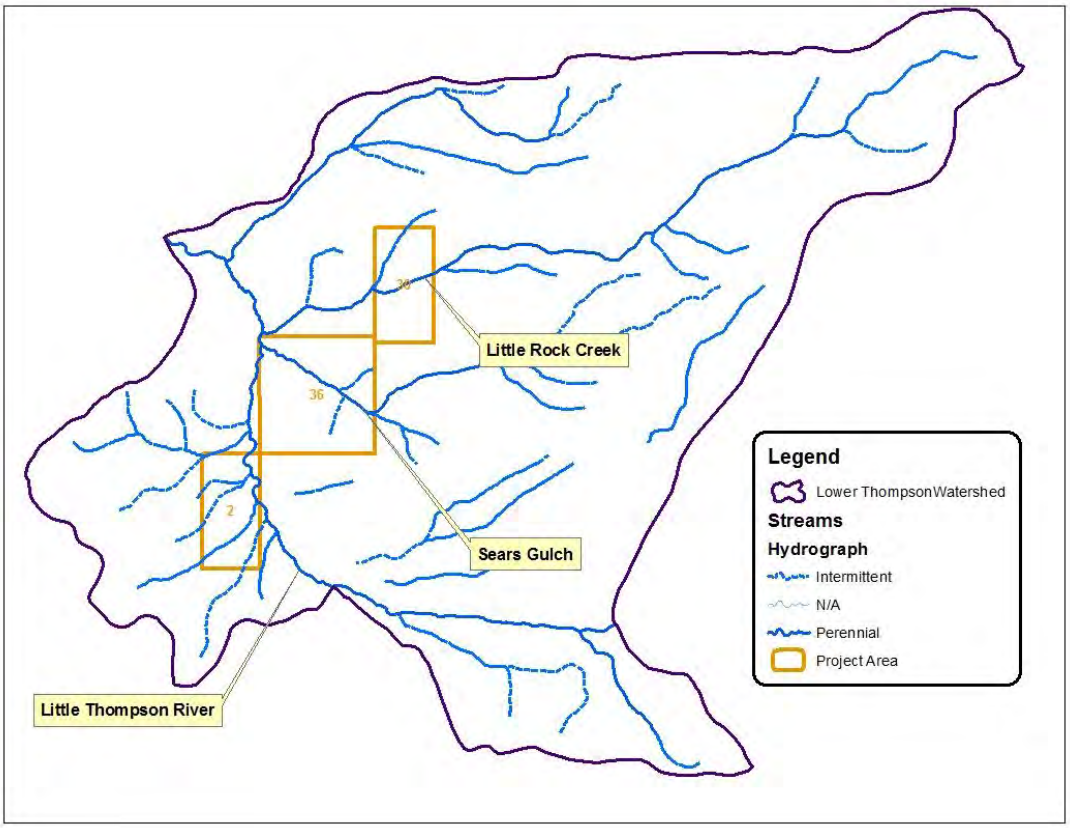
Introduction

The following assessment will disclose anticipated effects to fisheries resources within the Little Rock Sears project area.

Assessment Areas

The assessment area for direct, indirect and cumulative effects will be used to evaluate the existing and potential impacts to fisheries resources associated with the proposed project. The assessment area was chosen because it includes (1) the watershed of known or potential fish-bearing streams and (2) the proposed harvest units and haul routes that could have foreseeable, measurable, or detectable impacts to those fisheries resources. The assessment area is shown in Figure F1 below.

Figure F1 – Fisheries Assessment Area



Assessment Methods

Methodology to assess the status and potential impacts of the proposal to fish populations will include presence/absence determinations in project area parcels and evaluating risk factors to habitat degradation. The risk factors to habitat degradation were evaluated with a sediment source inventory during preparation of the Little Rock Sears Timber Sale. The inventory included cataloging channel stability, in-channel and out-of-channel sediment sources.

The descriptions of foreseeable adverse impacts to fisheries resources are described in Table F1 – Descriptions of foreseeable adverse impacts. Positive impacts to fisheries resources will also be described, if applicable, using information on impact extent and duration.

Table F1 – Descriptions of foreseeable adverse impacts.

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

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

Issues

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

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

Regulatory Framework

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

DNRC is a cooperator and signatory to the following relevant agreements: Restoration Plan for Bull Trout in the Clark Fork River Basin and the Kootenai River Basin, Montana (2000), Memorandum of Understanding (2005) for the Swan Valley Bull Trout Work Group, and Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout and Yellowstone Cutthroat Trout in Montana (2007). All 3 agreements contain land management conservation strategies or action items utilized by DNRC as decision-making tools.

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

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

Existing Conditions

Lower Little Thompson River Assessment Area

The entire Lower Little Thompson River watershed defines the boundary of this assessment area. The proposed activities that may affect fisheries resources in the Lower Little Thompson River assessment area are: upland and RMZ timber harvest; forest road construction, reclamation and maintenance; road-stream crossing structure removal and associated stream restoration; and forest road utilization for timber hauling and equipment transportation. The fisheries resource variables potentially affected by the proposed actions are channel forms, sediment, flow regime, stream shading, stream temperature, and connectivity.

Bull trout are known to occur throughout at least 12.6 miles of stream reaches in the Lower Little Thompson River watershed. Westslope cutthroat trout are known to occur throughout at least 20.3 miles of the Little Thompson River, at least 6.7 miles of Little Rock Creek and at least 4.1 miles of Sears Gulch.

Channel forms comprise the primary spatial component of fisheries habitat and include the frequency and volume of different slow and fast water features. Stream temperature is the primary thermal component of fisheries habitat and typically includes watershed-specific seasonal and daily fluctuations. Although channel forms and stream temperature are a function of numerous environmental processes, the variables of sediment,

flow regime, woody debris and stream shading are major contributors that are also potentially affected by the proposed actions. Furthermore, the ranges of conditions of all of these variables throughout a watershed are highly varied, and the mechanisms by which they are naturally affected are also numerous and complex. For the purposes of this environmental assessment, potentially measureable or detectable effect mechanisms to these variables will be used to evaluate existing conditions and the foreseeable effects of the proposed actions. Site-specific surveys within project area lands serve as a resource subsample to extrapolate foreseeable effects across the assessment area.

Road-stream crossings and roads adjacent to stream channels (both perennial and intermittent stream channels) may be major sources of existing direct and indirect effects to the sediment component of fisheries habitats. Three road-stream crossings occur in the assessment area on DNRC-managed land. Road-stream crossing density per square mile is 1.5 in the assessment area on DNRC-managed land. The length of all roads within 300 feet of all streams is 3.6 miles. The density of adjacent roads is 1.8 miles per square mile in the assessment area. No direct sediment delivery was observed during field reconnaissance from roads located adjacent to streams. Sediment delivery is analyzed in the watershed and hydrology portion of the analysis. While the precise level and extent of impact from each individual road-stream crossing or adjacent road is unknown, the expected existing direct and indirect impact to sediment from road sources is moderate in the assessment area due to proximity of roads to fish-bearing streams.

Flow regime components include total annual water yield and peak seasonal flow timing, duration and magnitude. In addition to the physical geography of a watershed, this variable is also greatly affected by both nature disturbances and land management activities. The Water Resources analysis indicates that the existing condition in the assessment area is expected to be within the historic range of variability.

Riparian zone vegetation heavily influences the delivery and in-channel frequency of woody debris, a major component of channel forms. The riparian zone is also a major regulator (shading) of stream temperature, since direct solar radiation is an important driver of stream thermal regimes, especially during peak seasonal periods. Riparian vegetation in Sears Gulch is mainly a thick cover of hawthorn with an overstory of mature trees. Riparian vegetation along the Little Thompson River is mainly shrubs and some overstory trees. Riparian vegetation in Little Rock Creek is mainly mature timber with some shrub cover. The expected direct and indirect impact to stream shading is low in the assessment area.

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

No existing impacts to fisheries connectivity were found in the proposed project area. None of the existing road stream crossings exist on fish-bearing reaches of streams.

Other existing impacts to fisheries resources in all of the analysis areas include: high impacts to native fish species through displacement, disease, and hybridization by nonnative species; road-stream crossings that likely affect habitat connectivity; grazing impacts that may exacerbate in-stream sedimentation, adverse effects to riparian vegetation, and nutrient inputs; recreational fishing pressures; stream dewatering for agricultural or other purposes; and off-road vehicle impacts. (Past potential effects from forest management activities performed on all land ownerships are included in the assessment of existing direct and indirect effects.) The combination of direct and indirect effects and other existing impacts are expected to have an existing moderate cumulative impact to fisheries resources in the assessment area.

Fisheries Mitigations

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

- Applying all applicable Forestry BMPs (including the SMZ Law and Rules) and Forest Management Administrative Rules for fisheries, soils, and wetland riparian management zones (ARMs 36.11.425 and 36.11.426)

Environmental Effects

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

Lower Little Thompson River Assessment Area

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

Future-related actions considered part of cumulative impacts include other forest management practices; continued high impacts to native fish species by nonnative species; a stable to declining number of road-stream crossings that affect habitat connectivity; continued grazing impacts; stable to increasing recreational fishing pressures; ongoing stream dewatering for agricultural or other purposes; and ongoing off-road vehicle impacts. Open, public roads that intersect the analysis areas will continue to be utilized year-round for forest management, recreation and other purposes. Consequently, foreseeable cumulative impacts to fisheries resources are expected to be similar to those described in Existing Conditions.

Action Alternative: Direct, Indirect, and Cumulative Effects
The proposed actions and affected fisheries resources in all analysis areas are broadly described in Chapter 2 of this analysis. Project-specific BMPs and road maintenance would be applied to all segments of the haul routes through the assessment area (see Water Resources analysis). All impact descriptions are short-term unless otherwise noted.

Increased truck traffic can accelerate the mobilization and erosion of roadbed material at road-stream crossings and roads located adjacent to streams. However, through the implementation of project-specific BMPs and road maintenance, the associated road sites would be expected to deliver most mobilized sediment away from the stream and road prism and filter eroded material through roadside vegetation. The number of road-stream crossings intersecting the haul route in the assessment area is four. The assessment area has an existing road-stream crossing density of 1.5 sites per square mile, and the Action Alternative would utilize one additional road-stream crossing by installing a bridge across the Little Thompson River, and construct 2 additional stream crossings on discontinuous class 2 streams in the assessment area. The length of roads that would be used within 300 feet of all streams is 4.4 miles. Although project-specific BMPs and road maintenance would be expected to substantially offset the risk of increased sediment delivery due to project-specific vehicle traffic, moderate impacts to sediment are expected in the assessment area.

Additionally, a moderate impact to fisheries resources would occur from 1.1 miles of road construction within 300 feet of a perennial channel.

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

As described in the Water Resources analysis, the levels of proposed timber harvest is not expected to lead to measureable increases in water yield or consequent changes in flow regime.

Riparian harvest of 50 percent of merchantable trees between 50 and 100 feet away from fish-bearing and non-fish-bearing perennial streams would occur in the assessment area. [No riparian harvest would occur within 0 to 50 feet of any fish-bearing and non-fish-bearing perennial streams.] An analysis of this same riparian harvest prescription in the Environmental Impact Statement for the Forested State Trust Lands Habitat Conservation Plan indicates a low risk of impacts to woody debris and stream shading (and stream temperatures affected by direct solar radiation). Due to the very limited magnitude and extent of this management action, low impact to woody debris and stream shading is expected in the assessment area.

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

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

Fisheries References

Attachment F – Soils Analysis

Little Rock Sears – 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 Little Rock Sears project area. 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).

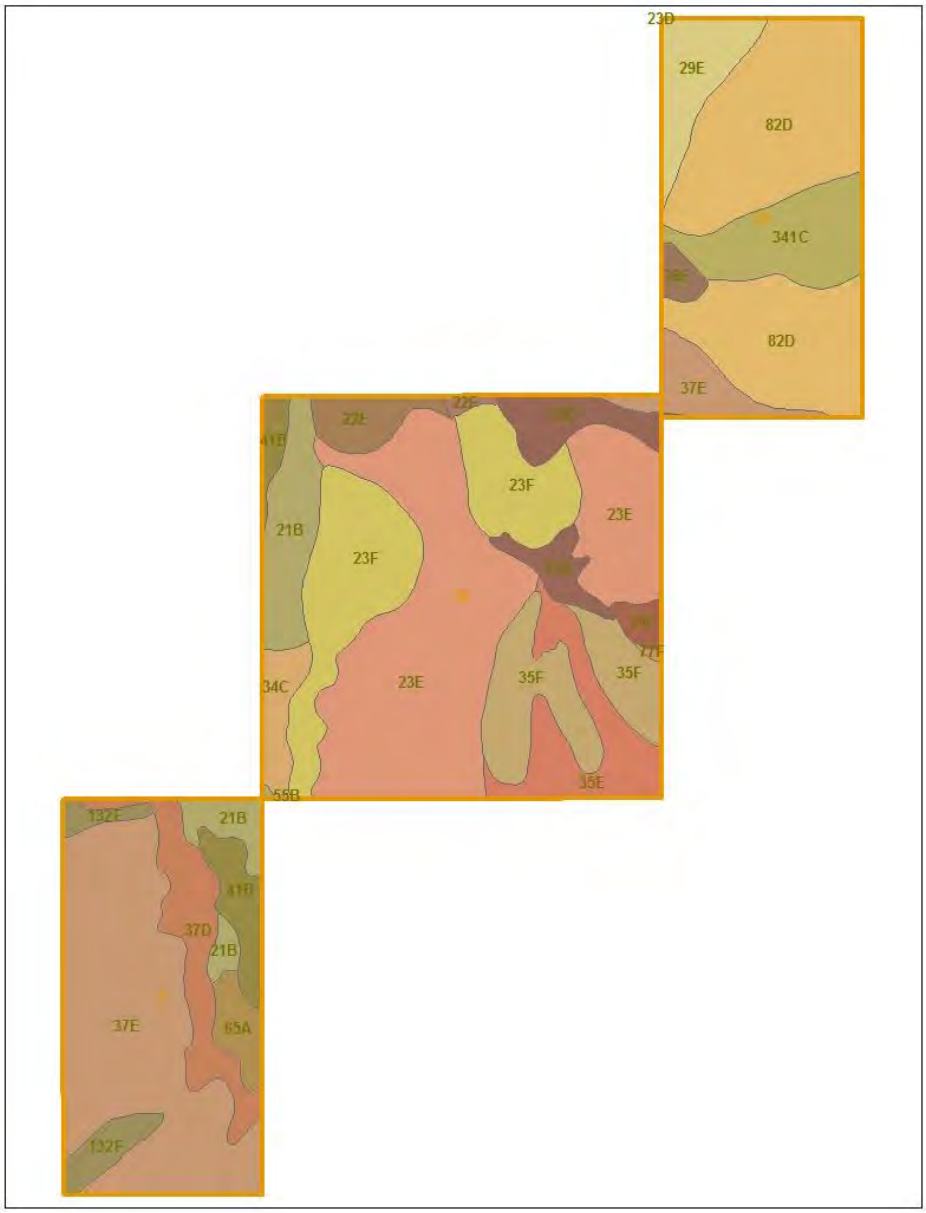
Measurement Criteria: Slope stability risk will be measured based on percentage of slopes steeper than 60% with high risk landtypes.

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 Little Rock Sears project area. A map of the Landtypes in the Little Rock Sears project area is found below in ***Figure S-1***.

Figure S-1 *– Little Rock Sears 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 – Soil Map Unit Description

Map Unit	Description	Acres	Analysis Area	Landtype Description	Compaction hazard	Erosion Hazard	Displacement Hazard

21B	Totelake gravelly loam, 2-8%	64	5.1%	Stream terraces, alluvial fans	M	L	L
22E	Winkler gravelly sandy loam, cool, 15-35%	20	1.6%	Mountain slopes, colluvium derived from quartzite and/or argillite	M	L	M
22F	Winkler gravelly sandy loam, cool, 35-60%	3	0.2%	Mountain slopes, colluvium derived from quartzite and/or argillite	M	L	M
23D	Yourame gravelly loam, 4-15%	42	3.3%	Moraines, Alpine till or drift derived from argillite and quartzite	M	L	L
23E	Yourame gravelly loam, 15-30%	251	19.8%	Moraines, Alpine till or drift derived from argillite and quartzite	M	L	L
23F	Yourame gravelly loam, 30-50%	125	9.9%	Mountains, Alpine till or drift derived from argillite and quartzite	M	L	L
24F	Repp gravelly loam, 35-60%	7	0.6%	Mountains, Colluvium derived from calcareous argillite or quartzite	M	L	H
29E	Yourame gravelly loam, dry, 15-30%	36	2.8%	Moraines, Alpine till or drift derived from argillite and quartzite	H	L	L
34C	Krause gravelly ashy silt loam, 2-8%	19	1.5%	Stream terraces, Volcanic ash over alluvium or outwash	M	L/M	H
35E	Courville gravelly ashy silt loam, 8-30%	54	4.3%	Moraines, Volcanic ash over till or drift	M	L	L
35F	Courville gravelly ashy silt loam, 30-50%	47	3.7%	Moraines, Volcanic ash over till or drift	M	L	L
36E	Rumblecreek gravelly loam, 15-30%	8	0.6%	Moraines, Alpine till or drift derived from argillite and quartzite	M	L	H
37D	Rumblecreek gravelly loam, dry, 4-15%	51	4.0%	Moraines, Alpine till or drift derived from argillite and quartzite	M	L	H
37E	Rumblecreek gravelly loam, dry, 15-30%	213	16.8%	Moraines, Alpine till or drift derived from argillite and quartzite	M	L	H
41B	Oldtrail-Glaciercreek-Larchpoint complex, 0-8%	31	2.4%	Flood plains, Alluvium	M	L/M	M
65A	Larchpoint silt loam, 0-2%	16	1.3%	Flood plains, Alluvium	M	M	H
82D	Bignell gravelly loam, 4-15%	201	15.9%	Mountains	M	L	L
132F	Mitten-Tevis complex, 35-60%	22	1.7%	Mountains, Volcanic ash over colluvium	M	L	L

341C	Krause very cobbly ashy silt loam, 2-8%	56	4.4%	Stream terraces, Volcanic ash over alluvium or outwash	M	L/M	H

Erosion
No areas of soil erosion were identified during field reconnaissance in 2015 by a DNRC hydrologist. Upland areas harvested during previous entries were found to be stable, well-vegetated and not actively eroding. 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 14 transects to estimate the current levels of coarse woody debris. These transects were focused on proposed harvest units. The average coarse woody debris is 3.1 tons/acre, with a range of 0 to 10.5 tons/acre and a median of 2.3 tons/acre. These results are well below the recommended range discussed in *Managing Coarse Woody Debris in Forests of the Rocky Mountains* (Graham et. al., 1994) on similar habitat types. Grand fir and Douglas-fir habitat types in Montana 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 and glacially derived soils 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 Little Rock Sears project area and their associated management implications is found in **Table S-3**.

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 on up to 152 of the total 1151 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 6 to 21 percent of the acres treated, with an average disturbance rate of 14% (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 6 to 21 percent of ground-based harvested acres, and approximately 3 to 8.3 percent of cable harvest acres. The proposal includes 1043 acres of ground-based mechanical harvesting and 108 acres of cable yarding.

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 13.2 percent of the proposed harvest units in an impacted condition. This level is below the range analyzed for in the *EXPECTED FUTURE CONDITIONS* section of the *SFLMP*, and well within the 20-percent impacted area established as a level of concern in the *SFLMP (DNRC 1996)*. This level translates to a low risk of low direct and indirect impacts to soil physical 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, nearly all of the 1151 acres proposed for harvesting have had previous ground-based timber sale operations. Existing skid trails where compaction has begun to ameliorate through freeze-thaw cycles and revegetation would return to a higher level of impact due to this alternative. Additional trails may also be required if existing trails are in undesirable locations. 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 13.2% of the proposed harvest units 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 S4 – Detrimental Soil Disturbance for the Action Alternative

Area of Analysis	Total Area (Acres)	Disturbance Rate (%)	Affected Area (Acres)
Harvest Units (including	1151	13.2	152

landings)			
Roads *	12.7	100	12.7

Nutrient Cycling

Direct and Secondary

Direct and indirect effects to nutrient cycling would include an increase in coarse woody debris 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 8 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 G – Wildlife Analysis

Little Rock Sears – Wildlife Analysis

Analysis Prepared By:
Name: Leah Breidinger
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 and connectivity. The proposed activities could decrease mature forested cover, which could reduce habitat connectivity and suitability for wildlife species associated with mature forest.
- Canada lynx. The proposed activities could reduce landscape connectivity and the availability of suitable Canada lynx habitat, reducing the capacity of the area to support Canada lynx.
- Fishers. The proposed activities could reduce the availability and connectivity of suitable fisher habitat and increase human access, which could reduce fisher habitat suitability and increase trapping mortality.
- Flammulated owls. The proposed activities could alter the structure of flammulated owl preferred habitat, 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.
- Big game winter range. The proposed activities could reduce cover, which could reduce the quality of big game winter range habitat.

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 and TABLE WI-1*).

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 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. The Medium and Large CEAAs are managed primarily by DNRC and Plum Creek Timber Company with 30% and 31% of the Medium and Large CEAAs managed by DNRC, and 69% and 51% of the Medium and Large CEAAs managed by Plum Creek Timber Company, respectively. Mature forested habitat is concentrated primarily on state and USFS lands located in the western half of the Medium and Large CEAAs. The majority of the CEAAs are located at a low elevation and major creeks in the area include Little Rock Creek, the Little Thompson River, and Mud Creek. The northeast portion of the Large CEAA burned in the Chippy Creek Fire of 2007 and the area does not provide mature connected forest for wildlife species. Open road density is high and the area receives a substantial amount of use by the public. Detailed descriptions of each analysis area are located in the affected environment section for each issue or species evaluated (e.g., pileated woodpecker etc.).

***Table WI-1*– Descriptions of the Project Area and cumulative effects analysis areas**.

Analysis Area Name	Description	Total Acres	Issues/Species Analyzed
Project Area	DNRC managed lands in Section 30 T23N R26W, Section 36 T23N R27W, and Section 2 T22N R27W	1,291	Direct & indirect effects for all issues/species
Medium CEAA	Portions of the Little Thompson River Subwatershed in the vicinity of the Project Area	8,322	mature forest cover & connectivity, big game, fishers, flammulated owls, pileated woodpeckers
Large CEAA	The Little Thompson River Subwatershed and portions of the Mudd Creek Subwatershed	20,839	Canada lynx

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, 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, connectivity of mature forest habitats, and snags and coarse woody debris.

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 (≤10 years) that could contribute to cumulative effects are summarized in the following table. DNRC is not aware of any proposed projects on other ownerships (*USFS 2015*)

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	Medium CEAA	Large CEAA
Little Thompson Thinning	DNRC	2010	0	132	883
Mudd Creek Timber Sale	DNRC	2007	0	0	441
Seared Gulch Timber Sale	DNRC	2007	0	0	258
Cooked Mountain Timber Sale	DNRC	2007	0	0	276

Coarse Filter Wildlife Analysis

MATURE FOREST COVER AND CONNECTIVITY

Issue

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

Introduction

Mature forests characterized by large-diameter trees and dense canopy cover provide many wildlife species with food, shelter, breeding sites, and travel corridors. Historically, the spatial configuration of mature forested habitat in the western United States was shaped by natural disturbance events, primarily wildfire, blowdown, and pest outbreaks. These events resulted in a mosaic-like spatial configuration of forest patches varying in age, species composition, and development. Spatial configuration, including patch size and connectivity of forested habitat, is important for many wildlife species. Patch size may affect the distribution of wildlife species that are attracted to, or avoid forest edges. Additionally, connectivity of mature forested habitat may facilitate movements of wildlife species that avoid openings in canopy cover. For example, discontinuous mature forested habitat would negatively affect movements of fisher, which avoid large openings in canopy cover. Timber harvest, like wildfire and blowdown, is a disturbance event that often creates open patches of young, early-successional habitats. Forest management considerations for wildlife species dependent on mature forested habitat include providing well-connected patches of habitat with ≥40% canopy cover.

Analysis Area

The analysis area for direct and indirect effects is the Project Area and the analysis area for cumulative effects is the 8,322-acre Medium CEAA as described in *TABLE W-1* and depicted in

FIGURE W-1. The Medium CEAA is defined by geographic features and provides a reasonable analysis area to assess the impact of the proposed activities on wildlife species in the vicinity of the Project Area.

Measurement Criteria
Factors considered in the analysis include: 1) the degree of timber harvesting, 2) availability and patch size of mature forested habitat (≥40% canopy cover, trees >9 inches dbh average), 3) open and restricted road density, and 4) the availability of potential travel corridors. Mature forested habitat is defined here and in the remainder of the document as forest stands with ≥40% canopy cover comprised primarily of trees that are on average >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 wildlife species that benefit from well-connected mature forest conditions.

Affected Environment
The Project Area currently contains mature stands composed primarily of ponderosa pine stands with Douglas-fir in the understory, Douglas-fir-larch stands, and lodgepole stands (*TABLE WI-3*). Some Engelmann spruce and a small aspen stand are located in Section 2. Mature forested habitat is continuous in Sections 2 and 36, but little mature forested habitat is available in Section 30. Mint Creek, Little Rock Creek, and Sears Creek all provide potential corridors for wildlife travel. Open road density is high at 3.8 miles/square mile, which may influence connectivity for wildlife species that avoid roads.

The Medium CEAA contains a low amount of mature forested habitat, which is patchy on the landscape and found primarily on USFS and DNRC lands in the Medium CEAA (*TABLE WI-3*). Overall, connectivity of mature forested habitat is low (*FIGURE WI-1*). Open road density is high in the Medium CEAA at 4.4 miles/square mile.

***Table WI-3*– Average patch size and acreage of mature forested habitat (≥40% canopy cover, >9 inches dbh) pre- and post-harvest in the Project Area and Medium CEAA for the Little Rock Sears and Thin Mint Timber Sales. Percent of the total corresponding analysis area is in parentheses.**

Mature Forest Attribute	Project Area		Medium CEAA	
	Existing	Post-Harvest	Existing	Post-Harvest
Acres of mature forest	888 (68.8%)	41 (3.1%)	2,356 (28.3%)	1,483 (17.8%)
Average patch size (acres)	111	5	87	51
Number of patches	8	8	27	29

<u>Environmental Effects – Mature Forest Cover and Connectivity</u>
No Action Alternative: Direct and Secondary Effects
None of the proposed forest management activities would occur. In the short-term, no changes to the amount, quality, or spatial arrangement of mature forested habitat would occur. In the long-term and in the absence of natural disturbance, the availability and connectivity of mature forested wildlife habitat may increase as stands age.

No Action Alternative: Cumulative Effects

None of the proposed forest management activities would occur. Mature forested habitat availability and stand characteristics would not be affected by the DNRC Little Rock Sears and Thin Mint Timber Sales; however, mature forest stands may be affected by other projects on other ownerships in the Medium CEAA. In the short-term, no changes to the amounts, quality, or spatial arrangement of mature forested habitat would occur. In the long-term and in the absence of natural disturbance and forest management activities, the availability and connectivity of mature forested wildlife habitat would increase as stands age.

Action Alternative: Direct and Secondary Effects

The proposed activities would occur in a high proportion of the mature forested habitat available in the Project Area (*TABLE WI-3*). Post-harvest, all of the 888 acres of mature forested habitat proposed for harvest would retain approximately 15-25% mature canopy cover, reducing habitat availability and patch size for species that prefer dense mature stands (*TABLE WI-3*). Approximately 70 acres of riparian habitat associated with stream SMZs and RMZs in the Project Area would be harvested, but vegetation retention measures would apply (See WATER RESOURCES for additional information). Harvest would be light with retention of 40% mature canopy cover in many of these acres. Road density would increase post-harvest following the construction of 0.1 miles of new open road and 4.1 miles of roads that would be closed behind gates and kelly humps. An additional 0.4 miles of currently closed roads would be temporarily open post-harvest following installation of a temporary bridge over the Little Thompson River. This bridge would remain in place until it is needed at a different site. Connectivity of upland mature canopy forest within the proposed Project Area would be reduced, but a corridor would remain along Sears Creek in Section 36 and a travel corridor would be present along Mint Creek in Section 2. Little Rock Creek in Section 30 would also retain some mature canopy cover; however, the stand structure in the vicinity of the creek is more open with a greater shrub component and less likely to be used by animals that prefer mature forest conditions. Thus, since: 1) the abundance of mature forested habitat would decrease by 855 (95.1% of existing mature forest) and average patch size would decrease, 2) open and restricted road density would increase post-harvest; high adverse direct or indirect effects to mature forested habitat abundance, suitability, or connectivity would be anticipated as a result of the Action Alternative.

Action Alternative: Cumulative Effects

The proposed activities would affect 855 acres of the 2,356 acres (36.2%) of mature forested habitat available in the Medium CEAA. Post-harvest, these acres would retain 15-25% mature canopy cover and would not provide mature forested habitat for wildlife, causing average patch size to decrease and reducing connectivity (*TABLE WI-3*). Reductions in the availability of suitable mature forested habitat would be additive to harvest activities that are proposed or ongoing in the Medium CEAA (*TABLE WI-2*). Approximately 70 acres of riparian habitat associated with stream SMZs and RMZs in the Project Area would be harvested, but retention measures would apply (see WATER RESOURCES section in this document for additional information). Road density would increase post-harvest following the construction of 0.1 miles of new open road and 4.1 miles of roads that would be closed behind gates and kelly humps. Additionally 0.5 miles of currently closed roads would be temporarily open post-harvest following installation of a temporary bridge over the Little Thompson River. Connectivity across the Medium CEAA would be reduced, especially in the vicinity of Mint Creek; which connects habitat along the Little Thompson River with habitat patches located higher in the Mint Creek drainage that connect to the Thompson River. Thus, since: 1) the abundance of mature forested habitat in the Medium CEAA would decrease by 855 acres (36.2% of existing mature forest); 2) average patch size of mature forested habitat would decrease by 36 acres; and 3) road density would increase post-harvest; moderate adverse cumulative effects to mature

forested habitat abundance, suitability, or connectivity would be anticipated as a result of the Action Alternative.

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 Little Rock Sears 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	
Grizzly bear *(Ursus arctos)* Habitat: Recovery areas, security from human activity	[**N**] The Project Area is located outside of grizzly bear recovery zone and non-recovery occupied habitat (*USFWS 1993, Wittinger 2002)*. However, a grizzly bear was killed in the vicinity of the Project Area in the fall of 2014 (*DFWP 2014*). Grizzly bears are rarely observed in the area (*Kasworm et. al 2014*; *MNHP data, October 30, 2015*), but any bears in the vicinity could be displaced by the proposed activities if present in the vicinity. Thus, negligible adverse direct, indirect, or cumulative effects to grizzly bears would be anticipated.
Canada lynx (*Felix lynx)* Habitat: Subalpine fir habitat types, dense sapling, old forest, deep snow zone	**[Y]** ***Detailed Analysis Provided Below*.** The Project Area contains approximately 227 acres of suitable lynx habitat.
Sensitive Species	
Bald eagle *(Haliaeetus leucocephalus)* Habitat: Late-successional forest within 1 mile of open water	[**N**] No bald eagle nests have been documented in the vicinity of the Project Area and no lake habitats are located within 1 mile of the Project Area. Thus, no direct, indirect, or cumulative effects to bald eagles would be anticipated.
Black-backed woodpecker *(Picoides arcticus)* Habitat: Mature to old burned or beetle-infested forest	**[N]** No recently burned forest habitat occurs in the vicinity 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.
Coeur d'Alene salamander *(Plethodon idahoensis)* Habitat: Waterfall spray zones, talus near cascading streams	[**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.
Columbian sharp-tailed grouse *(Tympanuchus Phasianellus columbianus)* Habitat: Grassland, shrubland, riparian, agriculture	[**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.
Common loon *(Gavia immer)* Habitat: Cold mountain lakes, nest in emergent vegetation	[**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 anticipated.
Fisher	[**Y**] **Detailed Analysis Provided Below** – Approximately 526 acres

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)
(Martes pennanti) Habitat: Dense mature to old forest less than 6,000 feet in elevation and riparian	of suitable fisher habitat occur within the Project Area.
Flammulated owl *(Otus flammeolus)* Habitat: Late-successional ponderosa pine and Douglas-fir forest	[**Y**] **Detailed Analysis Provided Below** – Approximately 664 acres of cover types preferred by flammulated owls occur within the Project Area.
Gray Wolf *(Canis lupus)* Habitat: Ample big game populations, security from human activities	[**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 (*ARM 33.11.430(1)(a)(b)*). Thus, negligible adverse direct, indirect, or cumulative effects to wolves would be anticipated as a result of the Action Alternative. No direct, indirect, or cumulative effects would be anticipated as a result of the No Action Alternative.
Harlequin duck *(Histrionicus histrionicus)* Habitat: White-water streams, boulder and cobble substrates	[**N**] No suitable stream habitat occurs in the vicinity of the Project Area. Thus, no direct, indirect, or cumulative effects to harlequin ducks would be expected to occur as a result of either alternative.
Northern bog lemming *(Synaptomys borealis)* Habitat: Sphagnum meadows, bogs, fens with thick moss mats	[**N**] Wetlands occur in the Project Area; however, thick sphagnum mats were not observed. No harvest would be allowed within 50 feet of wetlands larger than 0.25 acres and no equipment would be allowed to enter wetlands of any size. Thus, no direct, indirect, or cumulative effects to northern bog lemmings would be expected to occur as a result of either alternative.
Peregrine falcon *(Falco peregrinus)* Habitat: Cliff features near open foraging areas and/or wetlands	[**N**] Although present in the landscape, large cliffs and rock outcrops were not observed in the Project Area or within 0.5 miles of the Project Area. Additionally, peregrine eyries have not been documented in the vicinity of the Project Area (*MNHP data, October 30, 2015*). Thus, no direct, indirect, or cumulative effects to peregrine falcons would be anticipated as a result of either alternative.
Pileated woodpecker *(Dryocopus pileatus)* Habitat: Late-successional ponderosa pine and larch-fir forest	[**Y**] **Detailed Analysis Provided Below –** Approximately 935 acres of pileated woodpecker habitat occur in the Project Area.
Townsend's big-eared bat *(Plecotus townsendii)* 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 *(Gulo gulo)* Habitat: Alpine tundra and high-elevation boreal forests that maintain deep persistent snow into late spring	[**N**] No high-elevation habitat with persistent spring snowpack occurs in the Project Area and wolverine observations have not been reported in the vicinity (*MNHP data, October 30, 2015*) although they may travel through the area at any time. Thus, negligible adverse direct, indirect or cumulative adverse effects to wolverines would be expected to occur under the proposed action. No direct, indirect, or cumulative effects would be anticipated as a result of the No Action 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)
Big Game Species	
Elk	[Y] **Detailed Analysis Provided Below –** The Project Area contains potential white-tailed deer and elk winter range as identified by DFWP (*2008*).
Whitetail	
Mule Deer	

CANADA LYNX

Issue

The proposed activities could reduce landscape connectivity and the availability of suitable Canada lynx habitat, reducing the capacity of the area to support Canada lynx.

Introduction

Canada lynx are medium-size felines that prey primarily on snowshoe hares and they are federally listed as a threatened species *(Ruediger et al. 2000)*. Lynx foraging habitat in western Montana consists of a mosaic of young coniferous stands and mature forested stands with high levels of canopy cover, which provide snowshoe hare habitat (*Squires et al. 2010, Squires et al. 2013)*. Retaining habitat connectivity of both summer and winter lynx foraging habitat is important since winter corridors may provide local connectivity while summer corridors are more likely to facilitate long-distance dispersal (*Squires et al. 2013*). Forest management considerations for lynx include providing a mosaic of well-connected young and mature lynx habitat patches containing high horizontal cover.

Analysis Area

The analysis area for direct and indirect effects is the Project Area and the analysis area for cumulative effects is the 20,839-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 (i.e., ridgelines), 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 classes, 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 stands with ≥40% canopy cover provided by trees >9 inches dbh on average was queried to estimate potential lynx habitat, although availability of habitat is likely higher considering that stands providing 40% of total conifer cover of any size class may provide lynx habitat.

Existing Environment

The Project Area contains suitable lynx habitat (*TABLE WI-5*) in Section 2, but no potential lynx habitat is located in the remaining parcels due to the prevalence of dry ponderosa pine and Douglas-fir stands. Suitable lynx habitat is continuous across Section 2; however, dry stands that are not likely to provide lynx habitat are located on south-facing slopes. Mint Creek contains suitable lynx habitat and could provide a potential corridor for lynx travel.

The Large CEAA contains suitable lynx habitat (*TABLE WI-5*). The remaining portions of the CEAA consist primarily of logged stands that may not contain >40% mature canopy cover and thus were not included in estimates of potentially suitable lynx habitat. However, summer foraging habitat composed of small saplings and pole timber stands are available in a portion of these logged stands. In the vicinity of the Project Area and in surrounding lands, connectivity of lynx habitats is low due to the prevalence of dry forest types in the Large CEAA and lack of mature stands with high canopy cover.

Table WI-5– Estimated acreage of lynx habitat that would remain in the Project Area and Large CEAA post-harvest. Values in parentheses refer to the percentage of the total potential lynx habitat[a] that each lynx habitat class represents.

Lynx Habitat Category	Project Area		Large CEAA	
	Existing	Post-Harvest	Existing	Post-Harvest
Summer Forage	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Winter Forage	227 (100.0%)	13 (5.8%)	607 (17.6%)	393 (11.4%)
Other Suitable	0 (0.0%)	0 (0.0%)	245 (7.1%)	245 (7.1%)
Temporary non-habitat	0 (0.0%)	214 (94.1%)	326 (9.5%)	540 (15.7%)
Additional Habitat - non-DNRC Ownership	0 0.0%	0 0.0%	2,264 (65.8%)	2,264 (65.8%)
Grand Total - Suitable Lynx Habitat (All Ownerships)	227 (100.0%)	13 (5.7%)	3,116 (90.5%)	2,902 (84.3%)

[a]Total 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).
[b]Total suitable lynx habitat describes all lynx habitat categories that contain structural attributes necessary for lynx use (i.e., sum of summer forage, winter forage, other suitable lynx habitat classes).

Environmental Effects

No Action Alternative: Direct and Secondary Effects on Canada Lynx

None of the proposed forest management activities would occur. In the short-term, lynx habitat availability and connectivity would not change. In the long-term and in the absence of natural disturbance, winter foraging habitat availability would increase due to natural forest succession while summer foraging habitat availability would decrease due to the lack of new regenerating stands. Connectivity may also increase in the long-term due to increasing canopy cover over time.

No Action Alternative: Cumulative Effects on Canada Lynx
None of the proposed forest management activities would occur. The availability of suitable lynx habitat and landscape connectivity in the Large CEAA would not be affected by the proposed DNRC Little Rock Sears and Thin Mint Timber Sales. In the short-term, no changes to lynx habitat would be anticipated. In the long-term and in the absence of natural disturbance, winter foraging habitat would become more prevalent over time due to natural forest succession while summer foraging habitat would become less prevalent due to the absence of regenerating stands. Connectivity may also increase due to increasing canopy cover in the understory and overstory.

Action Alternative: Direct and Secondary Effects on Canada Lynx
The proposed activities would affect 214 acres (94.3%) of the 227 acres of suitable lynx habitat available in the Project Area. After harvest, these acres would be temporarily unsuitable for lynx use due to lack of canopy cover in the understory and overstory (*TABLE WI-5*). Post-harvest these acres would retain 15-25% canopy cover in the overstory and variable amounts of canopy cover in the understory. To ensure that forest structural attributes preferred by snowshoe hares remain following harvest, dense patches of advanced regeneration would be retained within portions of lynx winter forage habitat. Additionally, 5 to 15 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. Due to the high level of habitat removal, connectivity would be limited post-harvest; however, a 300-foot wide travel corridor would be retained along Mint Creek, providing connectivity from the Little Thompson River to higher portions of the drainage. If present in the vicinity of the Project Area, lynx could be temporarily displaced by forest management activities for up to 3 years due to disturbance caused by motorized activities. Thus, since: 1) lynx suitable habitat availability would be reduced by 214 acres (94.3% of existing habitat in the Project Area); 2) patches of shade-tolerant trees advanced regeneration would be retained where feasible; 3) landscape connectivity would be maintained via a corridor along Mint Creek; and 4) the Project Area has a limited capacity to support lynx due to the prevalence of dry habitat types in the Project Area and surrounding landscape; 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.

Action Alternative: Cumulative Effects on Canada Lynx
The proposed activities would affect 214 acres (6.7%) of the 3,116 acres of suitable lynx habitat available in the Large CEAA. All of the affected stands would be temporarily unsuitable for lynx due to lack of canopy cover in the understory and overstory until young trees grow in the harvest units, which may take 10-15 years. Shade-tolerant trees would be retained in all lynx winter foraging habitat and as a component of all pre-commercial thinning units. Approximately 5 to 15 tons/acre of coarse woody debris would be retained and downed logs ≥15 inch diameter would be emphasized. Lynx habitat connectivity would be reduced in the vicinity of the harvest units in Section 22; however, a travel corridor along Mint Creek would connect potential habitat along the Little Thompson to potential habitat in the Thompson River drainage. Changes to lynx habitat availability and connectivity would be additive to past, proposed, and ongoing project (see TABLE WI-2). Lynx could be temporarily displaced by forest management activities associated with the Little Rock Sears and Thin Mint Timber Sales and other ongoing activities for approximately 3 years. Thus, since: 1) lynx suitable habitat availability would be reduced by up to 214 acres (6.7 % of potentially suitable lynx habitat in the Large CEAA); 2) patches of advanced regeneration and shade-tolerant understory trees would be retained where feasible;

3) landscape connectivity would be reduced, but connectivity would be retained between the Little Thompson River and habitat in the Thompson River Drainage; and 4) the Large CEAA has a limited capacity to support lynx due to the prevalence of dry ponderosa pine habitat types; minor adverse cumulative effects to Canada lynx associated with landscape connectivity and suitable habitat type availability would be anticipated as a result of the Action Alternative.

Sensitive Species

FISHERS

Issue

The proposed activities could reduce the availability and connectivity of suitable fisher habitat and increase human access, which could reduce fisher habitat suitability and increase trapping mortality

Introduction

In the Rocky Mountains, fishers home ranges typically consist of mesic late-successional forests with complex vertical and horizontal structure, large-diameter trees, and >50% canopy cover of mature forested stands (*Raley et al. 2012, Schwartz et al. 2013, Sauder and Rachlow 2014*). Fishers typically avoid ponderosa pine and lodgepole pine stands, and large openings such as clearcuts; however, high use areas within home ranges contain high habitat heterogeneity (*Schwartz et al. 2013, Sauder and Rachlow 2015*). 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, 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 8,322-acre Medium CEAA as described in *TABLE WI-I* and depicted in *FIGURE WI-1*. The Medium CEAA is centered on the Project Area and is defined according to geographic features and could support the home range of a male fisher, female fisher, and several juveniles (*Olson et al. 2014*), 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. Fisher habitat classifications considered in the analysis include: 1) upland fisher habitat, and 2) 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 (≥40% cover, trees >9 inches dbh average) below 6,000 feet elevation in proximity to perennial and intermittent streams.

Existing Environment

Fisher habitat is present in the Project Area and Medium CEAA (*TABLE WI-6*). In the Project Area, suitable mixed conifer stands are scattered across the Project Area in isolated patches separated by xeric dry ponderosa pine, lodgepole, and Douglas-fir stands. In the Medium CEAA, the availability of potential fisher habitat is limited due to the lack of large-diameter stands with high canopy closure for resting and denning and consequently the landscape is not likely to support fisher use considering the low availability of mature stands and the high proportion of xeric forest types in the landscape. Potential habitat exists as fragmented patches isolated by young recently harvested stands. Overall, open road density and trapping risk are high in both the Project Area and Medium CEAA.

Table WI-6 –Fisher Habitat and Road Density in the Project Area and Medium CEAA and anticipated effects of the Little Rock Sears and Thin Mint Timber Sales, 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 harvest refers to the total amount of habitat that would be harvested.

Fisher Habitat Attribute	Project Area		Medium CEAA	
	Existing	Post-Harvest	Existing	Post-Harvest
Fisher Habitat	536 (40.7%)	45 (3.5%)	1,403 (16.9%)	912 (11.0%)
Fisher Riparian Habitat	25 (1.9%)	21 (1.6%)	101 (1.2%)	97 (1.2%)
Open Road Density (miles/square mile)	3.8	4.0	4.4	4.5
Fisher Habitat Harvest (% of available habitat)	491 (93.3%)		491 (35.0%)	

<u>Environmental Effects</u>

No Action Alternative: Direct and Secondary Effects on Fishers

None of the proposed forest management activities would occur. The level of motorized access would not change and no additional risk associated with trapping would be expected. In the short term, no changes to fisher habitat availability or connectivity would occur in the Project Area. In the long term and in the absence of natural disturbance, fisher habitat suitability and connectivity may increase as stands age, the availability of large-dbh trees increases, and mature canopy cover increases.

No Action Alternative: Cumulative Effects on Fishers

None of the proposed forest management activities would occur. Ongoing and proposed forest management projects within the Medium CEAA may influence fisher habitat availability, habitat structure, and landscape connectivity. The level of motorized access would not change and no additional risk associated with trapping would be expected; thus, no cumulative effects would be anticipated. In the short term, no changes to fisher habitat availability or connectivity associated with the Little Rock Sears and Thin Mint Timber Sales would occur. In the long term and in the absence of natural disturbance, fisher habitat suitability and connectivity may increase as stands age, the availability of large-dbh trees increases, and mature canopy cover increases.

Action Alternative: Direct and Secondary Effects on Fishers

The proposed activities would affect fisher habitat and these harvested acres would not be suitable for fisher use post-harvest (see TABLE WI-6). The availability of some important habitat characteristics (i.e., snags, coarse woody debris) could be reduced by harvest activities; although retention of dead material and live snag recruitment trees would meet DNRC Forest Management Rules (*ARM 36.11.411, ARM 26.11.414*). Post-harvest, trapping risk would increase following the construction 0.1 miles of open road and 4.1 miles of restricted roads. An additional 0.4 miles of existing gated road would temporarily be open while a temporary bridge is in place on the Little Thompson River. Connectivity of mature forested habitats suitable for fisher use would decrease under the Action Alternative; however, existing potential travel corridors along Sears Gulch and Mint Creek would remain. If present in the vicinity of the Project Area, fishers could be temporarily displaced by forest management activities approximately 3 years. Thus, since: 1) habitat availability would be reduced by 491 acres (93.3%), but some snags and coarse woody debris would be retained; 2) 4 acres of riparian fisher habitat would be removed; 3) landscape connectivity would be reduced but travel corridors would remain; 4) trapping risk would increase following road construction; and 5) the area is unlikely to support fishers due to the prevalence of dry forest types; moderate adverse direct and indirect effects to fisher associated with habitat suitability and trapping risk would be anticipated as a result of the Action Alternative.

Action Alternative: Cumulative Effects on Fishers

Fisher habitat affected by the proposed activities would become unsuitable for fishers post-harvest (TABLE WI-7). The availability of some important habitat characteristics (i.e., snags, coarse woody debris) could be reduced by harvest activities; although retention of some dead material and live snag recruitment trees would be required to meet DNRC Forest Management Rules (*ARM 36.11.411, ARM 26.11.414*). Connectivity of fisher habitats would be reduced, but travel corridors associated with riparian habitat would be maintained. Adverse effects to fisher would be additive to any proposed or ongoing sales in the Medium CEAA (*TABLE WI-2*). Displacement associated with the proposed Little Rock Sears and Thin Mint Timber Sales and any other activities in the CEAA could occur for up to 3 years. Thus, since: 1) habitat availability would decrease by 491 acres (35.0% of available habitat), but snags and coarse woody debris would be retained (*ARM 36.11.411, ARM 26.11.414*); 2) 4 acres if fisher riparian habitat would be removed; 3) landscape connectivity would be reduced but travel corridors would remain; and 4) open road density would increase post-harvest; and 5) the area is unlikely to support fishers considering the prevalence of dry forest types and low proportion of large-diameter mature forest stands; moderate adverse cumulative effects to fisher associated with habitat suitability and trapping risk would be anticipated as a result of the Action Alternative.

Flammulated Owl

Issue

The proposed activities could alter the structure of flammulated owl preferred habitat, which could reduce habitat suitability for flammulated owls.

Introduction

Flammulated owls are small, migratory, insectivorous forest owls that inhabit mature, dry stands of ponderosa pine and Douglas-fir forests with an open physiognomy *(Linkhart and McCallum 2013)*. Flammulated owls are secondary cavity nesters, and in Montana, typically nest in large-diameter ponderosa pine or Douglas-fir cavities excavated by pileated woodpeckers or northern flickers (*Seidensticker et al. 2013*). Forest management considerations for flammulated owls include providing open stands of ponderosa pine and Douglas-fir and retaining large snags for

nesting. Timber harvest may affect the structure of timber stands and reduce the availability of snags, potentially reducing habitat suitability for flammulated owls.

Analysis Area
The analysis area for direct and indirect effects is the Project Area and the analysis area for cumulative effects is the 8,322-acre Medium CEAA as described in *TABLE WI-I* and depicted in *FIGURE WI-1*. The Medium CEAA is defined according to ridgelines and creeks, which provides a reasonable analysis area for local flammulated owls that could be affected by project-related activities.

Measurement Criteria
Factors considered in the analysis include: 1) the degree of harvesting, and 2) the structure of flammulated owl preferred habitat. In the Project Area, SLI data were used to identify preferred flammulated owl habitat types (*ARM 36.11.403(28)*). Stands were considered suitable for flammulated owl use if the stocking density of trees >9 inches dbh was in the poorly-stocked class (10-39% canopy cover). On non-DNRC lands, stands containing 10-39% canopy cover that were composed primarily of trees >9 inches dbh below 6,000 feet were considered likely to contain habitat types preferred by flammulated owls as well as matrix habitat.

Existing Environment
The Project Area contains 664 acres (51.4% of Project Area) of cover types preferred by flammulated owls. This habitat is composed primarily of ponderosa pine stands that contain Douglas-fir in the understory. All of these stands are mature (>9 inches dbh), but the stocking density is high in all but 226 acres of these stands, thus the majority of potential habitat is not likely to be used by flammulated owls.

The Medium CEAA contains approximately 3,337 acres (40.1% of Medium CEAA) of potential flammulated owl habitat including 734 acres on of stands with suitable tree densities (10-39% canopy cover) on DNRC lands, 1,688 acres of stands with suitable tree densities on other ownerships, and 935 acres on DNRC lands with appropriate cover types for flammulated owl use, but high stocking densities of trees. These stands are scattered throughout the Medium CEAA, but are more common in the northern portion of the CEAA. Considering that road density is high, suitable snags may be limited for nesting habitat.

<u>Environmental Effects</u>
No Action Alternative: Direct and Secondary Effects on Flammulated Owls
None of the proposed forest management activities would occur. In the short-term, no change in the availability of flammulated owl habitat would occur. In the long-term and in the absence of natural disturbance, the suitability of flammulated owl habitat may decrease as stand density increases and Douglas-fir continues to grow in the understory.

No Action Alternative: Cumulative Effects on Flammulated Owls
None of the proposed forest management activities would occur. Ongoing and proposed forest management projects within the Medium CEAA may affect the suitability of flammulated owl habitat; however, no adverse effects associated with the Little Rock Sears and Thin Mint Timber Sales would occur. In the short-term, no change in the availability of flammulated owl habitat would occur. In the long-term and in the absence of natural disturbance, the availability of flammulated owl habitat may decrease as stand density increases and Douglas-fir continue to grow in the understory of many stands.

Action Alternative: Direct and Secondary Effects on Flammulated Owls
Timber harvest would occur in 606 of the 663 acres (91.4%) of preferred flammulated owl cover types available in the Project Area. The proposed activities would open stands to 15-25% canopy cover in these acres, improving stand structure suitability for flammulated owls. Additionally, the proposed harvest would favor leaving ponderosa pine and Douglas-fir, which is preferable for flammulated owl habitat (*ARM 36.11.437(b)*). Some snags could be removed by the proposed harvest, but at least 2 large snag and 2 large snag recruitment tree per acre (>21 inches dbh) would be retained (*ARM 36.11.411*). Disturbance associated with harvesting could adversely affect flammulated owls for approximately 3 years, should they be present in the Project Area. Thus, since: 1) changes in stand structure and cover type would generally increase flammulated owl habitat suitability, and 2) snags would be retained to meet DNRC administrative rules (*ARM 36.11.411*), minor beneficial direct and indirect effects to flammulated owl habitat suitability would be anticipated as a result of the Action Alternative.

Action Alternative: Cumulative Effects on Flammulated Owls
The proposed activities would occur in 606 acres of the 3,337 (18.2%) of potential flammulated owl habitat in the Medium CEAA. The proposed activities would open stands to 15-25% canopy cover, favor retention of ponderosa pine and Douglas-fir, and retain patches of regenerating conifers, improving stand structure suitability for flammulated owls (*ARM 36.11.437(b)*). The availability of suitable flammulated owl habitat in the Medium CEAA is expected to increase by 606 acres, from 2,422 acres to 3,048 total acres (36.6% of Medium CEAA). Changes in flammulated owl habitat suitability would be additive to proposed and ongoing activities occurring in the Medium CEAA, although DNRC is currently unaware of such projects. The proposed activities could disturb flammulated owls for up to 3 years should they be present in the vicinity of the Project Area. Thus, since 1) changes in structure and cover type would generally increase flammulated owl habitat suitability, and 2) snags would be retained to meet DNRC administrative rules (*ARM 36.11.411*), minor beneficial cumulative effects to flammulated owl habitat suitability would be anticipated as a result of the No-Action Alternative.

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 role in mature forests because they excavate large cavities that are often used in subsequent years by a variety of wildlife species for nesting and roosting. Pileated woodpeckers require mature forest stands with large-diameter (≥20 inch dbh) dead or defective trees for nesting and foraging and the density of pileated woodpeckers is positively correlated with the amount of dead and dying wood in a stand (*McClelland 1979*). Timber harvest may remove large-diameter trees necessary for nesting and fragmentation can make birds more vulnerable to predation as they travel between habitat patches (*Bull and Jackson 2011)*. Forest management considerations for pileated woodpeckers include retaining dense patches of old and mature coniferous forest with abundant large snags and coarse-woody debris for foraging, roosting, and nesting.

Analysis Area
The analysis area for direct and indirect effects is the Project Area and the analysis area for cumulative effects is the 8,322-acre Medium CEAA as described in *TABLE WI-I* and depicted in

FIGURE WI-1. The Medium CEAA is defined according to geographic features. This scale provides a sufficient area to support multiple pairs of pileated woodpeckers (*Bull and Jackson 2011)*.

Measurement Criteria
Factors considered in the analysis include: 1) the degree of harvesting and 2) the 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 ≥40% canopy closure were considered potential pileated woodpecker habitat. On non-DNRC lands, the stands considered potential pileated woodpeckers habitat were mature forest stands (≥40% canopy cover, >9 inches dbh average) below 6,000 feet elevation.

Existing Environment
The Project Area contains 935 acres (72.4% of Project Area) of suitable pileated woodpecker habitat. This habitat is composed of ponderosa pine and Douglas-fir-larch stands. Pileated woodpeckers were not observed during field visits, but limited foraging on snags was observed.

The Medium CEAA contains approximately 1,631 acres (20.1% of Medium CEAA) of potential pileated woodpecker habitat scattered across the Medium CEAA. Habitat availability is low due to the young average age of stands in the Medium CEAA Open road density in the Medium CEAA is high and snags are more likely to be available in areas without open roads.

Environmental Effects
No Action Alternative: Direct and Secondary Effects on Pileated Woodpeckers
None of the proposed forest management activities would occur. In the short-term, no changes to pileated woodpecker habitat would be anticipated. However, in the long-term, and in the absence of natural disturbance, pileated woodpecker habitat availability and connectivity may increase due to natural succession and aging of timber stands.

No Action Alternative: Cumulative Effects on Pileated Woodpeckers
None of the proposed forest management activities would occur. Ongoing and proposed forest management projects within the Medium CEAA could change pileated woodpecker habitat availability. In the long-term, and in the absence of natural disturbance, pileated woodpecker habitat availability and connectivity may increase due to natural succession and aging of timber stands.

Action Alternative: Direct and Secondary Effects on Pileated Woodpeckers
The proposed activities would occur in 880 acres (94.1%) of the 935 acres of pileated woodpecker habitat available in the Project Area. These stands would be treated with a shelterwood cut leaving approximately 15-25% mature canopy cover post-harvest and would not be considered suitable for pileated woodpeckers post-harvest. Snags would be removed by the proposed harvest, but at least 2 large snags and 2 large snag recruitment trees per acre (>21 inches dbh) would be retained and all snags cut for safety reasons would be left in the harvest unit (*ARM 36.11.411*). Disturbance associated with harvesting could adversely affect pileated woodpeckers on portions of the Project Area for approximately 3 years, should they be present in the Project Area. Thus, since: 1) forest structural changes would occur, but mitigation would include retention of snags and coarse woody debris (*ARM 36.11.411, ARM 36.11.414*); 2) harvesting would reduce pileated woodpecker suitable habitat availability by 880 acres (94.1%); 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.

Action Alternative: Cumulative Effects on Pileated Woodpeckers
The proposed activities would occur in 880 acres (38.9%) of the 2,261 acres of potential pileated woodpecker habitat in the Medium CEAA, reducing habitat availability. These stands would retain 15-25% mature canopy cover post-harvest and would not be considered suitable pileated woodpecker habitat. Snags would be removed by the proposed harvest, but at least 2 large snags and 2 large snag recruitment trees per acre (>21 inches dbh) would be retained (*ARM 36.11.411*). Changes in pileated woodpecker habitat suitability would be additive to past, proposed, and ongoing activities occurring in the Medium CEAA (*TABLE WI-2*). Disturbance associated with the proposed activities could adversely affect pileated woodpeckers in the vicinity of the Project Area for up to 3 years. Thus, since: 1) structural changes would occur, but mitigations would include retention of snags and coarse woody debris; and 2) harvesting would reduce pileated woodpecker suitable habitat availability by 880 acres (38.9%) within the Medium CEAA; moderate adverse cumulative effects to pileated woodpecker habitat suitability would be anticipated as a result of the Action Alternative.

BIG GAME

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

Issue
The proposed activities could reduce cover, which could reduce the quality of big game winter range habitat.

Introduction
Elk, mule deer, and white-tailed deer require areas with adequate amounts of cover and forage at lower elevations during winter. Effective big game winter range contains ample mid-story and overstory, which can ameliorate severe winter conditions by reducing wind velocity and providing snow intercept, enabling big game to move across the landscape, and by improving access to forage with less energy expenditure. Forest management considerations for big game include providing adequate hiding cover and ample overstory, which lessen the effects of harsh winter weather conditions.

Analysis Area
The analysis area for direct and indirect effects is the Project Area and the analysis area for cumulative effects is the 8,322-acre Medium CEAA as described in *TABLE WI-I* and depicted in *FIGURE WI-1*. The Medium CEAA is defined according to geographic features including watershed boundaries, which, provides a reasonable analysis area for local animals that could be influenced by project-related activities.

Measurement Criteria
Factors considered in the analysis include: 1) the degree of timber harvesting and 2) the availability and structure of big game winter range. Forested habitat (≥40% canopy cover, >9 inch dbh average) was considered capable of providing minimal conditions capable of providing thermal cover for big game in the Medium CEAA.

Existing Environment
The Project Area provides winter range for wintering white-tailed deer and elk (*DFWP 2008*) and the area contains favorable characteristics for winter range including low elevations (below

3,500 feet), south facing slopes in Sections 30 and 36, and high canopy cover in Sections 2 and 36. The Project Area is connected to low elevation winter range habitat along the Thompson River and Clark Fork River. Approximately 888 acres (70.3% of Project Area) contain mature canopy cover composed primarily of Douglas-fir, ponderosa pine, and some western larch. Grasses, kinnikinnick, snowberry, serviceberry, and hawthorn are common in the understory of these stands. Extensive winter browsing of conifers was not observed in the Project Area.

The Medium CEAA also contains elk and white-tailed deer winter range (*DFWP 2008*). Frequently used portions of the winter range are likely on south facing slopes of Little Rock Creek and Sears Gulch in the eastern portion of the CEAA. These south facing slopes typically contain more xeric cover types and lower amounts of canopy cover, but are also warmer and provide more access to grasses when snowpack is low. Approximately 2,358 acres (28.3% analysis area) of mature forested habitat (≥40% canopy cover, >9 inch dbh average) occur in the Medium CEAA and provides thermal protection for big game. Residential development is mostly absent from the Medium CEAA, which reduces the likelihood of big game displacement due to human activity (*Vore 2012*). Extensive winter browsing of conifers was not observed in the Medium CEAA.

Environmental Effects

No Action Alternative: Direct and Secondary Effects on Big Game

None of the proposed forest management activities would occur. No changes in disturbance levels would occur. In the short term, no change in the availability of thermal cover would occur. In the long term and in the absence of natural disturbance, thermal cover may increase as stands age and canopy cover increases.

No Action Alternative: Cumulative Effects on Big Game

None of the proposed forest management activities would occur. Ongoing and proposed forest management projects within the Medium CEAA may disturb wintering big game or reduce thermal cover availability; however, no adverse effects associated with the Little Rock and Thin Mint timber sales would occur. In the short term, no change in the availability of thermal cover would occur. In the long term and in the absence of natural disturbance, thermal cover may increase as stands age and canopy cover increases.

Action Alternative: Direct and Secondary Effects on Big Game

Canopy cover would be reduced in mature forested habitat from 40 to 75% to approximately 15-25% in 845 acres (95.1%) of mature forested habitat, reducing the capacity of these acres to provide snow intercept and reduce wind velocity. Considering that canopy cover would be reduced below 70% in these harvest units, white-tailed deer would likely not use the harvest units post-harvest when snow accumulation is high. However, elk may continue using these areas, if snow conditions and temperatures are favorable. Additionally, a 300 foot wide corridor along Mint Creek would facilitate the movement of animals between the Little Thompson and Thompson rivers. Young, conifers would be also retained throughout Section 2, providing some residual cover and needle-foraging opportunities. Winter logging may occur, but would not be required and wintering animals could be displaced for up to 3 winters by the proposed activities. Thus, since: 1) canopy cover would be reduced on 845 acres, (95.1% of existing mature forested habitat); 2) the harvest prescriptions would create stand physiognomy more consistent with xeric ponderosa pine and Douglas-fir forest types, 3) displacement of big game would be temporary (up to 3 years), 4) connectivity would be retained at a reduced level along riparian areas, and 5) visual screening will be maintained along open roads to the extent possible;

moderate adverse direct and indirect effects to big game winter range quality and wintering animals would be anticipated as a result of the Action Alternative.

Action Alternative: Cumulative Effects on Big Game
The proposed harvest would reduce canopy cover to 15-25% within 845 (35.8%) of the 2,358 acres of mature habitat available in the Medium CEAA. Canopy cover retention is suitable for ponderosa pine and dry Douglas-fir forest types found throughout the CEAA, although big game use of these stands would likely be reduced when snowpack is high. Reductions in thermal cover would be additive to any proposed and ongoing activities in the Medium CEAA, although DNRC is currently unaware of such projects. Winter logging may occur, but would not be required and wintering animals could be displaced for up to 3 winters by the proposed activities. Displacement would be additive to any displacement associated with other activity in the Medium CEAA. Connectivity would be reduced within the Project Area, but connectivity of mature canopy cover would be retained along riparian corridors. Thus, since: 1) 845 acres of mature forested habitat would be removed (35.8% of mature forested habitat); 2) the harvest prescriptions would create stand physiognomy more consistent with xeric ponderosa pine and Douglas-fir forest types; 3) displacement of big game would additive to other sources of disturbance, but would occur for a short period of time (3 years); 4) connectivity would be retained at a reduced level along riparian areas; and 5) visual screening will be maintained along open roads; moderate adverse cumulative effects to big game winter range quality and wintering animals would be anticipated as a result of the Action Alternative.

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.
- 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.
- 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)*.
- Restrict public access at all times on restricted roads that are opened for harvesting activities. Effectively close temporary and illegal roads in the project area via a combination of kelly humps, rocks, and road obliteration.
- Retain visual screening along open roads where possible to increase security for wildlife, especially adjacent to regeneration treatments.
- Retain at least 2 snags and 2 snag recruits per acre >21 inches dbh or the next available size class, particularly favoring western larch and Douglas-fir for retention. If snags are cut for safety concerns, they must be left in the harvest unit. Retain 5-15 tons/acre of coarse-woody and emphasize retention of 15-inch diameter downed logs where they occur.
- In commercial harvest units currently providing lynx winter foraging habitat (applies to all units in the Thin Mint Timber Sale) retain patches of advanced regeneration of shade-tolerant trees as per *LY-HB4* (*USFWS and DNRC 2010*).

- Retain a 300-foot wide travel corridor along Mint Creek with ≥40% total canopy cover of conifers to facilitate travel of lynx and other wildlife species as per *LY-HB5* (*USFWS and DNRC 2010*).

Wildlife References

Bull, E. L. and J. A. Jackson. 2011. Pileated woodpecker (*Dryocopus pileatus*).*in* A. Poole, editor. The birds of North America online. Cornell Lab of Ornithology, Ithaca.

DFWP. 2008. Maps of moose, elk, mule deer, and white-tailed deer distribution in Montana. Individual GIS data layers. Available online at: http://fwp.mt.gov/gisData/imageFiles/distributionElk.jpg http://fwp.mt.gov/gisData/imageFiles/distributionMoose.jpg http://fwp.mt.gov/gisData/imageFiles/distributionMuleDeer.jpg http://fwp.mt.gov/gisData/imageFiles/distributionWhiteTailedDeer.jpg.

DFWP. 2014. Investigation into dead grizzly bear in Little Thompson River Area completed. Available online at: http://fwp.mt.gov/news/newsReleases/enforcement/nr_0211.html

Kasworm, W. F., T. G. Radandt, J. E. Teisberg, M. Proctor, and C. Servheen. 2014. Cabinet-yaak grizzly bear recovery area 2013 reasearch and monitoring progress report. UFWS grizzly bear recovery coordinator's office. Missoula, MT.

Linkhart, B. D. and D. A. McCallum. 2013. Flammulated Owl (*Psiloscops flammeolus*).*in* A. Poole, editor. The birds of North America online, Cornell Lab of Ornithology, Ithica.

McClelland, B. R. 1979. The Pileated Woodpecker in forests of the northern Rocky Mountains. Pages 283-299 *in* J. G. Dickson, R. N. Conner, R. R. Fleet, J. C. Kroll, and J. A. Jackson, editors. The role of insectivorous birds in forest ecosystems. Academic Press, New York.

Olson, L. E., J. D. Sauder, N. M. Albrecht, R. S. Vinkey, S. A. Cushman, and M. K. Schwartz. 2014. Modeling the effects of dispersal and patch size on predicted fisher (*Pekania [Martes] pennanti*) distribution in the U.S. Rocky Mountains. Biological Conservation **169**:89-98.

Raley, C. M., E. C. Lofroth, R. L. Truex, J. S. Yaeger, and J. M. Higley. 2012. Habitat ecology of fishers in western North America: a new synthesis.*in* K. B. Aubry, W. J. Zielinski, M. G. Raphael, G. Proulx, and S. W. Buskirk, editors. Biology and Conservation of Martens, Sables, and Fishers: a New Synthesis. Cornell University Press, Ithaca, New York.

Ruediger, B., J. Claar, S. Gniadek, L. Lewis, B. Holt, S. Mighton, B. Naney, G. Patton, T. Rinaldi, and J. Trick. 2000. Canada Lynx Conservation Assessment and Strategy (Second Edition). USDA Forest Service, USDI Fish and Wildlife Service, Bureau Land Management, and National Park Service., Missoula, MT.

Sauder, J. D. and J. L. Rachlow. 2014. Both forest composition and configuration influence landscape-scale habitat selection by fishers (*Pekania pennanti*) in mixed coniferous forests of the Northern Rocky Mountains. Forest Ecology and Management **314**:75-84.

Sauder, J. D. and J. L. Rachlow. 2015. Forest heterogeneity influences habitat selection by fishers (*Pekania pennanti*) within home ranges. Forest Ecology and Management **347**:49-56.

Schwartz, M. K., N. J. DeCesare, B. S. Jimenez, J. P. Copeland, and W. E. Melquist. 2013. Stand- and landscape-scale selection of large trees by fishers in the Rocky Mountains of Montana and Idaho. Forest Ecology and Management **305**:103-111.

Seidensticker, M. T., D. W. Holt, and M. D. Larson. 2013. Breeding Status of Flammulated Owls in Montana. Northwestern Naturalist **94**:171-179.

Squires, J. R., N. J. Decesare, J. A. Kolbe, and L. F. Ruggiero. 2010. Seasonal Resource Selection of Canada Lynx in Managed Forests of the Northern Rocky Mountains. Journal of Wildlife Management **74**:1648-1660.

Squires, J. R., N. J. DeCesare, L. E. Olson, J. A. Kolbe, M. Hebblewhite, and S. A. Parks. 2013. Combining resource selection and movement behavior to predict corridors for Canada lynx at their southern range periphery. Biological Conservation **157**:187-195.

USFWS. 1993. Grizzly bear recovery plan. Missoula, MT.

Vore, J. 2012. Big game winter range recommendations for subdivision development in Montana: justification and rationale. Montana Fish, Wildlife & Parks Professional Paper.

Wittinger, W. 2002. Grizzly bear distribution outside of recovery zones. Unpublished memorandum on file at USDA Forest Service, Region 1, Missoula, MT.

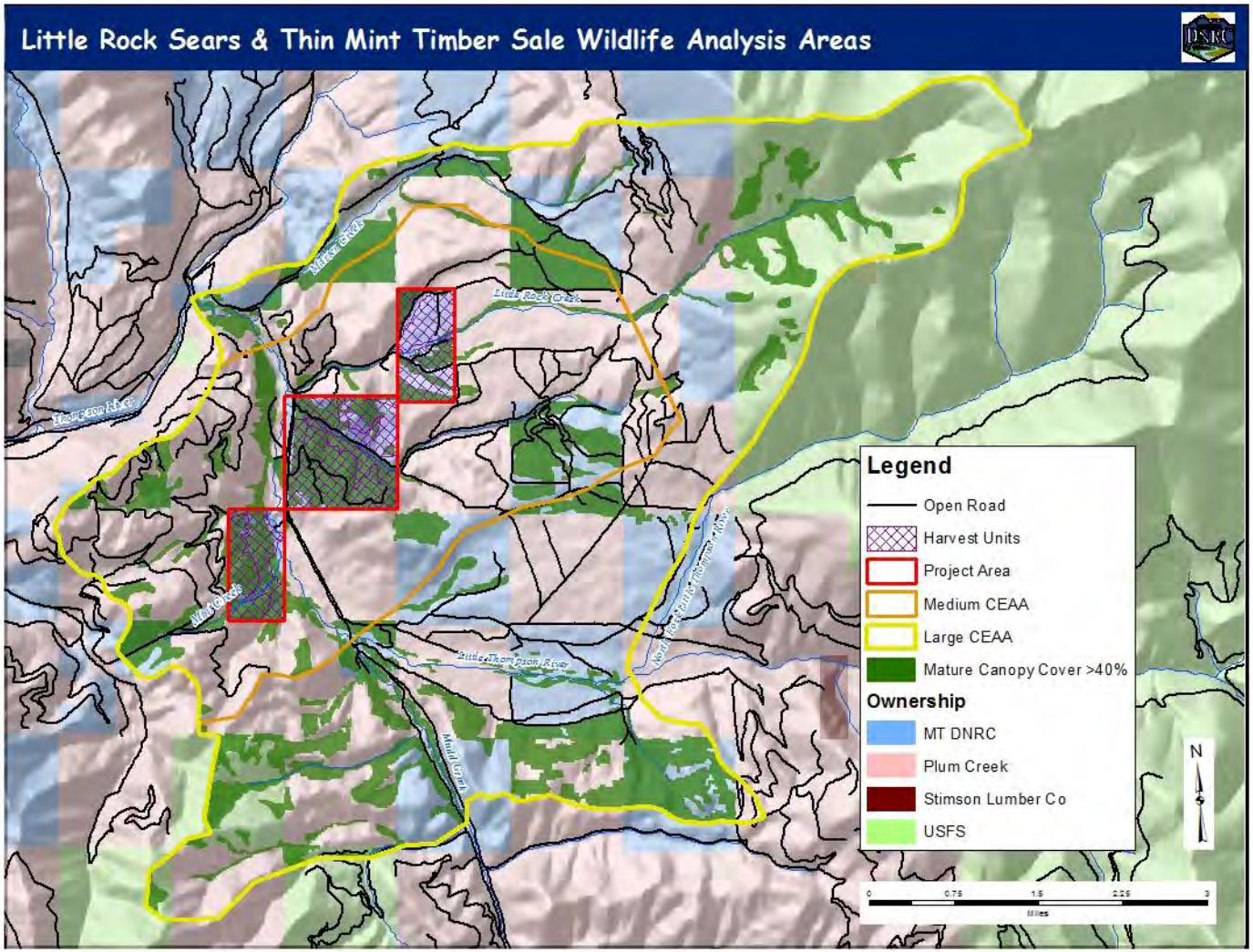



Figure WI-1. Wildlife analysis areas for the DNRC Little Rock Sears and Thin Mint Timber Sales.