Dirty Donovan Project
Environmental Assessment

Missoula Unit
Southwest Land Office
Montana Department of Natural Resources and Conservation
February 2016

Dirty Donovan Project

Environmental Assessment

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Project Name: Dirty Donovan Project
Proposed Implementation Date: Fall, 2016
Proponent: Missoula Unit, Southwest Land Office, Montana DNRC
County: Missoula
Duration: 2016-2023

Type and Purpose of Action

Description of Proposed Action:

The Missoula Unit of the Montana Department of Natural Resources and Conservation (DNRC) is proposing to conduct management activities on 4,523 acres known as the Dirty Donovan project area. The project area is located southeast of Missoula, near Clinton, MT (refer to Attachments A-1 and A-2) and includes the following sections:

Beneficiary	Legal Description	Total Acres	Treated Acres
Common Schools	**Sections 2,4,10,12,13,24 T12N R17W; Section 36 T13N R17W Section 6 T12N R 16W**	**3,590**	**2,217**
Public Buildings			
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	**Section 31 T13N R16W Section 6 T12N R 16W**	**933**	**152**

The proposal includes timber harvest on approximately 1,989 acres and the removal of an estimated 8.5 million board feet (MMBF). In addition to timber harvest, the following table outlines all proposed activities under this EA:

Action	Quantity
Proposed Harvest Activities	
Clearcut	37.6
Seed Tree	103.6
Selection	1,653.7
Commercial Thinning	55.6
Old Growth Maintenance	139
Total Treatment Acres	**1, 989**
Proposed Forest Improvement Treatment	
Pre-commercial Thinning	**380**
Planting	**343**
Proposed Road Activities	# Miles
New permanent construction	7
Road maintenance	55
Road abandoned	8.1
Road reclaimed	1.7
Road temporary	0.5
*some PCT (pre-commercial thinning) units and planting units overlap harvest unit acres	

Objectives of the project include:

- Generate revenue for the Common Schools Trust.
- Improve access and Best Management Practices(BMP) compliance with the new construction and road maintenance activities.
- Bring stands closer to historic conditions and/or the DNRC's identified Desired Future Conditions(DFC).
- Reduce stand densities and fuel loads, in turn decreasing the potential of stand replacing wildfires.
- Pre-commercially thin stands to reduce competition and improve tree vigor.
- Remove phenotypically inferior leave trees from past harvests to promote better stand genetics.
- Perform Old Growth maintenance treatments to reduce shade tolerant species, while maintaining Old Growth characteristics within treated stands.
- Harvest stands infected with dwarf mistletoe, root rot, spruce budworm, or other insects/disease in an attempt to control loss of productivity.
- Plant seral species (PP, WL) in harvested DF stands with high amounts of dwarf mistletoe, root rot, and spruce budworm infestations.
- Reduce the risks of insect and disease infestation by promoting tree health and vigor with multiple age classes and mixed-species stands.

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)
- All other applicable state and federal laws.

Project Development

SCOPING:

- DATE:
  - Dirty Donovan TS (Sections 2,4,10,12,13,24 T12N R17W): December 2014.
  - Game Changer TS (Section 6 T12N R16W, Section 36 T13N R17W): May 2015.
    ***The areas scoped under the timber sales named; "Dirty Donovan TS" and "Game Changer TS" comprise the project area now named "Dirty Donovan Project".*
- PUBLIC SCOPED:
  - The Scoping Notice was posted on the DNRC Website: http://dnrc.mt.gov/PublicInterest/Notices/Default.asp
  - 53 individuals, organizations and agencies including, 7 adjacent landowners, near section 24 T12N R17W were scoped.
  - A notice was placed in the Missoulian newspaper for the following Initial Proposals: Dirty Donovan: December 2014, Game Changer TS: May of 2015.

- AGENCIES SCOPED:
  - Agencies scoped included: THPO Blackfeet Tribe, CSKT Tribal Preservation Department, THPO Fort Belknap Tribe, THPO Fort Peck Assiniboine and Sioux Tribes, THPO Crow Tribe, THPO Confederated Salish and Kootenai Tribes, THPO Chippewa Cree Tribe, THPO Northern Cheyenne Tribe, and Montana FWP.

- COMMENTS RECEIVED:
  - (1) A letter from the **Confederated Salish and Kootenai** Tribes (for both initial proposals) stating: *"At this time we do not know of any cultural sites that will be impacted by the undertaking. In the event that cultural materials or cultural modified tees (CMT) are inadvertently encountered during the implementation of this project, we would appreciate being notified".*

  - (2) **Laurence Bonham**, an adjacent landowner, sent a letter with the following concerns:
    (a) The type and extent of road construction of the road entering the DNRC section from his property;
    (b) Safety concerns for operations that occur within 500 yards of his property;
    (c) A request for notice of a week in advance whenever logging or construction occurs within a 500 yard radius from Mr. Bonham's home.

(d) Concern that over thinning of property boundary trees would lead to loss of privacy and soil destabilization;

(e) A request for a noise and dust mitigation plan;

(f) Impacts on resident elk and Grizzly Bear populations and effects on local hunting opportunities;

(g) The proposed activity may damage any ground water that flows off the state land across his property.

- (3) **Guy Bodfish**, an adjacent landowner called with the following concerns:

  (a) The road needed to access the DNRC ownership is right next to Mr. Bodfish's house and needs to be improved.

  (b) Mr. Bodfish is ok with logging traffic, but does not want additional public use to result from proposed project.

  (c) According to Mr. Bodfish, when the east side of Wallace Creek was harvested, some of the wells in the bottom went dry.

  (d) Mr. Bodfish is concerned with post-harvest aesthetics.

- (4) **Jim Bower**, DNRC Fisheries Program Specialist, emailed the following concern regarding the Game Changer Initial Proposal: Existing fish passage impairment sites occur at road-stream crossing sites downstream of the project area on both Game (1 site) and Arkansas (3 sites) Creeks on State Trust Lands. The primary means that DNRC utilizes to mitigate fish passage impairments and bring road-stream crossing sites up to BMPs is through timber sales.

- (5) **Sharon Rose** of the Montana Department of Fish Wildlife and Parks (DFWP) emailed/forwarded the following concern regarding the Game Changer Initial Proposal: On the Clark Fork side of the divide, upper portions of both Donovan and Dirty-Ike Creeks support genetically pure westslope cutthroat trout populations. It is important that HCP standards and other watershed protection measures are implemented on all surface waters as part of the sale.

- (6) **Kelsey Noack Myers of the Chippewa Cree Cultural Resource and Preservation Department** sent a letter requesting to visually survey the project area.

- RESPONSE
  - (1) In the event that cultural materials or cultural modified trees (CMT) are encountered during the implementation of this project, the DNRC would notify the Confederated Salish and Kootenai Tribes. Any contract awarded within the Project Area would include the stipulation: If a cultural resource is discovered, the Purchaser shall immediately suspend all operations in the vicinity of the cultural resource and notify the Forest Officer. Operations may only resume if authorized by the Forest Officer. Cultural resources identified and protected elsewhere in this contract are exempted from this clause. Cultural resources, once discovered or identified, are not to be disturbed by the Purchaser, or his, her or its employees and/or sub-contractors.

  - (2a) The DNRC does not plan any construction/improvements on the road entering DNRC property from Mr. Bonham's property. The DNRC does not possess any access rights at this time and is not currently pursuing them. ***See recreation section for additional information***

(2b) The DNRC is planning to develop an appropriate plan to cover harvest related activities that take place within 500 yards of Mr. Bonham's property.
(2c) The DNRC would inform Mr. Bonham a week prior to commencement when logging activity is going to occur within a 500 yard radius of his home.
(2d) Unit prescriptions that border Mr. Bonham's property line would take into account privacy concerns; leaving as much visual cover as possible for 100-200 feet interior without compromising DNRC's DFC (Desired Future Condition) goals. Soil destabilization issues were considered in the *Soils Analysis, Attachment D*
(2e) Contract clauses would provide for the use of dust abatement (if deemed necessary by the Forest Officer) or require trucks to reduce speed if necessary to reduce dust near any affected residences. Noise impacts associated with the project were analyzed in the *Impacts on the Physical Environment* Section, under *Noise (see mitigations).*
(2f) Impacts on wildlife were analyzed in the *Wildlife Analysis, Attachment E.* Effects on local hunting opportunities were considered in the *Impacts on the Human Population*, under *Recreation*.
(2g) Effects to ground water were considered in the *Water and Fisheries Analysis, Attachment C.*

- (3a) The DNRC does not possess any access rights to the road adjacent to Mr. Bodfish's property at this time and is not currently pursuing them.
  (3b)The road in question is not open to motorized use and the DNRC is planning to abandon portions of the road.
  (3c) Surface water recharge to domestic wells was considered in the *Water and Fisheries Analysis,* under *Environmental Effects, Attachment C.*
  (3d) Post-Harvest Aesthetics were considered in the *Aesthetics Section.*

- (4) Water & Fisheries impacts were analyzed in the *Water and Fisheries Analysis, Attachment C.*

- (5) Water & Fisheries impacts were analyzed in the *Water and Fisheries Analysis, Attachment C.*

- (6) Scott Allen of the Missoula Unit DNRC responded with an invitation to meet and give a tour; however Mr. Myers declined due to travel funding constraints.

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: Scott Allen
- Archeologist: Patrick Rennie
- Wildlife Biologist: Garrett Schairer
- Hydrologist and Soil Scientist: Jeff Collins
- Decision Maker: Amy Helena

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

- **Missoula Public Health, City-County Health Department** - DNRC is classified as a "Major Outdoor Burning Source" by the Missoula City-County Air Pollution Control Program and is issued a permit from Missoula City-County Air Pollution Control Program to conduct burning activities on state lands managed by DNRC. As a permit holder, DNRC agrees to comply with the limitations and conditions of the permit. The Air Quality Division at the Missoula City-County Health Department (MCCHD) monitors air quality and regulates outdoor air pollution sources such as: industry, wood stoves, fireplaces, outdoor burning and dusty roads.

- **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.

ALTERNATIVES CONSIDERED:

No-Action:
Under the No-Action Alternative, the following stand conditions would persist:

- Increased fuel loading/ladder fuels (due to encroachment from shade tolerant species) would increase the severity of a wildfire; resulting in a stand replacing fire where

historically, low intensity fires took place. This mortality could occur across all age classes, including Old Growth stands within the project area.

- No pre-commercial thinning would occur at this time and all areas burned in the 2003 Dirty-Ike fire would remain LPP (lodgepole pine) and not be converted to future desired conditions such as DF (Douglas-fir) and PP (Ponderosa pine) stands.

- No revenue would be generated for the Common Schools Trust from the project area.

- Douglas-fir and other shade tolerant species would continue to out-compete seral species causing an overall reduction in species that were historically present in the area.

Action Alternative:

- DNRC would harvest approximately 8.5 MMBF from approximately 1,989 acres. Implementation of this alternative would consist of multiple entries in the form of both timber sales and timber permits depending on market conditions and the viability of timber sale size and timing. The first being Dirty Donovan timber sale (2.46MMBF), followed by the Dirty Wallace timber sale (1.58MMBF), and then subsequent timber sales such as the Game Changer timber sale and timber permits to follow. Slash would be piled and burned post-harvest.

- Planting and pre-commercial thinning activities would also take place to improve growth and vigor in treated stands.

- New road construction, road maintenance, and road abandonment activities would also take place to improve access and bring existing roads up to BMP standards.

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:

No-Action Alternative:

- Dwarf mistletoe, root rot, mountain pine beetle, and western spruce budworm may continue to suppress productivity/growth or cause mortality in the project area.

- Young stands are currently overstocked.

- Shade tolerant species would continue to out-compete seral species, removing stands from their historic cover type and species distribution.

- Fuel loads/stand conditions are above historic levels; which may lead to high intensity stand replacing fires.

Action Alternative:

- Timber harvesting and road building may introduce or spread noxious weeds in the project area.

- Phenotypically inferior leave trees from past harvests would be removed to promote better stand genetics.

- Forest management activities may adversely affect Old Growth.

- Stand productivity and tree health/vigor would be increased, insuring long term sustainability of product yield.

Issues dismissed from further review

- *There is concern the proposed project could negatively impact populations of threatened, endangered, or sensitive plant species.*

This issue has been dismissed from further study because no rare plants have been identified within the project area through field surveys and a search of the Montana Natural Heritage Program. Therefore, no direct, indirect, or cumulative impacts to rare plants would be expected under either alternative.

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

- All road construction, maintenance, and harvest equipment would be washed prior to entering the project area to prevent the introduction/spread of noxious weeds.

- Implementation of Old Growth maintenance treatments would maintain Old Growth on the landscape.

- Plant western larch or ponderosa pine in dwarf mistletoe, root rot, and spruce budworm infected areas to convert stands to a more resistant species.

- Favor seral trees such as ponderosa pine and western larch for leave tree selection in silvicultural prescriptions to move stands toward a more historic species composition and the DNRC's Desired Future Condition.

- Develop and implement a silvicultural prescription that emulates natural disturbance historically present on the landscape where possible. Implement individual tree selection prescriptions in historically low intensity fire regimes and clearcut/seed prescriptions in historically high intensity fire regimes such as lodgepole pine.

- Pre-commercially thin (PCT) overstocked stands to reduce competition and improve vigor; favoring seral species helping to return stands to natural, historic conditions.

FOR COMPLETE VEGETATION ANALYSIS SEE ATTACHMENT B.

SOILS:

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

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

- Slope Stability/landslides- A public concern was expressed that tree over thinning or logging operations could destabilize soils and create a hazard of rock or landslides/mudslides to adjacent private lands that are downslope of state operations.

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

- DNRC would implement all applicable BMP's, Montana Administrative Rules for Forest Management, and reasonable mitigation and erosion control practices during timber harvest, road maintenance, and road construction and road use activities. The commitments of the DNRC Habitat Conservation Plan (HCP) would be implemented across the area.

- Limit harvest equipment and hauling operations to periods when soils are relatively dry, (less than 20%), frozen or snow covered to minimize soil compaction and rutting, and maintain drainage features. Check soil moisture conditions prior to equipment start-up.

- On ground based harvest units the logger and sale administrator would agree to a general skidding plan prior to equipment operations to limit trails to 15% or less of the harvest unit. Feller-bunchers may work on slopes up to 45% as long as displacement and turning is minimized to prevent excessive disturbance. Slopes over 45% would be cable harvested to reduce soil impacts and improve harvest efficiency.

- Whole tree skidding can reduce slash hazard, but also remove a portion of nutrients from growing sites. Target fine slash and woody debris levels are to retain 5-15 tons/acre well distributed on site while meeting the requirements of the slash law. On sites with lower basal area, retain large woody debris as feasible since it may not be possible to retain 5 tons/acre and the emphasis will be on providing additional coarse woody debris CWD in the future. Slash may be placed on main skid trails to protect soils and reduce erosion potential.

- Existing road segments would be improved and maintained in association with the harvest activities. Road improvements would include surface blading and installation of drainage features to control surface erosion and prevent sediment delivery to streams as needed to comply with BMP'S, and to protect water quality.

- If a road slough occurs on the haul routes, it would be repaired concurrent with operations.

- Harvest operations and road conditions would be monitored as part of the on-going project operations and repairs including erosion control, culvert cleaning and re-vegetation would be made as needed. If cut-slope or fill-slope slumps occurred on new roads they would be stabilized to control erosion as part of the harvest project.

- New road construction, including drainage features should be completed prior to freezing conditions. Road cutslopes are to be constructed at relatively stable angles as noted in contract.

FOR COMPLETE SOILS ANALYSIS SEE ATTACHMENT C.

WATER AND FISHERIES RESOURCES ANALYSIS:

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

- Cold Water Fisheries- There is a concern that the proposed forest management actions may have effects to fisheries due to sediment delivery to streams.

- Fisheries Connectivity- There is a concern that several stream crossings on existing access roads across State and The Nature Conservancy lands have restricted fish passage.

- Water Quality - There is a concern that the proposed action may cause impacts to water quality and quantity from timber management, road construction, and road use. Timber harvest may affect downslope groundwater to adjacent private ownerships.

- There is a concern that over-thinning could increase the winter avalanche hazard during heavy snowfall years.

- There is a concern that the timber management project may reduce water yield to ground water downslope to homeowner's wells in the Wallace Creek drainage.

- Cumulative Watershed Effects- There is a concern that the proposed timber harvest may cause or contribute to cumulative watershed impacts as a result of potential increased runoff and sedimentation.

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

- DNRC would implement all applicable Best Management Practices (BMP's), Montana Administrative Rules for Forest Management, and reasonable mitigation and erosion control practices during timber harvest, road maintenance, and road construction and

road use activities. The commitments of the DNRC Habitat Conservation Plan (HCP) would be implemented on the applicable parcels.

- DNRC would locate, clearly mark and maintain suitable water resource protection boundaries including Streamside Management Zones (SMZ's), Riparian Management Zones (RMZ's) and Wetland Management Zones (WMZ's) adjacent to streams and wetlands consistent with State Forest Land Management Rules. DNRC has determined a 105 ft. RMZ width for harvest units adjacent to Class 1 stream segments on Donovan Creek and Arkansas Creek. DNRC would maintain a 50ft. no-harvest buffer within the Class 1 RMZ's.

- DNRC would retain trees in the RMZ'S and SMZ's that meet the minimum tree retention requirements of the SMZ Law.

- Mitigations to reduce soil impacts and control erosion on skid trails and cable corridors would be implemented to protect water quality including limiting harvest and hauling operations to periods when soils are relatively dry, (less than 20%), frozen or snow covered to minimize soil compaction and rutting, and maintain drainage features.

- Existing and new roads would be maintained concurrently in association with the harvest and road use activities. Road improvements would include surface blading, rock armor culvert inlets, and installation of road drainage features where needed to prevent surface erosion and sediment delivery to streams as needed to comply with BMP'S, and to protect water quality.

- All culvert replacements would be completed in accordance with all BMP's and FWP 124 stream permit requirements. Replacement stream crossings on fish bearing streams would be constructed to provide adequate passage of fish with minimum impact to water quality. Site specific erosion control measures including slash filters, and grass seeding will be implemented during culvert replacements and perennial flows would be diverted from the culvert during construction.

- New road construction, including drainage features should be completed in the summer or fall prior to freeze-up or periods of expected high rainfall.

- All newly disturbed soils on road cuts and fills would be promptly reseeded to site adapted grasses to reduce erosion/sediment from roads.

FOR COMPLETE WATER AND FISHERIES ANALYSIS SEE ATTACHMENT D.

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

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

- Proposed activities could alter mature forested habitats and/or landscape connectivity, which could affect species that rely on these mature forested habitats, and/or alter connectivity and the ability of wildlife requiring corridors to move through the landscape.

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

- Proposed activities could negatively affect Canada lynx by altering lynx winter foraging habitat, summer foraging habitat, and other suitable habitat, rendering these habitats unsuitable for supporting lynx.

- Proposed activities could negatively affect bald eagles by reducing nesting and perching structures and/or disturbing nesting bald eagles.

- Proposed activities could reduce the amount and/or quality of fisher habitats, which could alter fisher use of the area.

- Proposed activities may alter flammulated owl habitat by reducing canopy closure and increasing tree spacing, and could remove snags needed by flammulated owls for nesting.

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

- Proposed activities could reduce suitable nesting and foraging habitat for pileated woodpeckers, which could alter pileated woodpecker use of the area.

- Proposed activities could remove forest cover on big game winter range, which could reduce the carrying capacity of the winter range.

- Proposed activities could remove big game security cover, which could affect hunter opportunity and local quality of recreational hunting.

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

- A DNRC biologist would be consulted if a threatened or endangered species is encountered to determine if additional mitigations that are consistent with the administrative rules for managing threatened and endangered species (ARM 36.11.428 through 36.11.435) are needed.

- Motorized public access would be restricted at all times on restricted roads that are opened for harvesting activities; signs would be used during active periods and a physical closure (gate, barriers, equipment, etc.) would be used during inactive periods (nights, weekends, etc.). These roads and skid trails would remain closed following harvest to reduce the potential for unauthorized motor vehicle use.

- Snags, snag recruits, and coarse woody debris would be managed according to *ARM 36.11.411* through *36.11.414*, particularly favoring western larch and ponderosa pine. Clumps of existing snags could be maintained where they exist to offset areas without

sufficient snags. Coarse woody debris retention would emphasize retention of downed logs of 15-inch diameter or larger.

- Contractors and purchasers conducting contract operations would be prohibited from carrying firearms while on duty.

- Food, garbage, and other attractants would be stored in a bear-resistant manner.

- Retention of patches of advanced regeneration of shade-tolerant trees, such as sub-alpine-fir and spruce, in units in lynx habitats would break-up sight distances, provide horizontal cover, and provide forest structural attributes preferred by snowshoe hares and lynx.

- In pre-commercial thinning units, retain small shade tolerant trees (such as sub-alpine fir and spruce to provide potential habitat structure for snowshoe hares by increasing the levels of horizontal cover and accelerating the development of multi-storied stands.

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

FOR COMPLETE WILDLIFE ANALYSIS SEE ATTACHMENT E.

AESTHETICS:

Changes to the scenery in the project area would be visible from:

- Clinton, MT and the I-90 corridor (the project area in the Donovan Creek, Dirty-Ike Creek, and Wallace Creek watersheds).

- Potomac, MT and the Hwy 200 corridor (the project area in the Game Creek and Arkansas Creek head waters).

Existing Conditions

The Dirty Donovan Project area is surrounded by former large industrial private ownership. Past forest management has produced large areas of young single aged stands. This stand appearance is in contrast to the current project area stand size and composition and has produced “hard edges”, or straight unnatural breaks between the young/short moderately stocked forests and the older/taller overstocked stands on portions of the Project Area. In addition to past management, the stand-replacing Dirty-Ike fire, and subsequent Dirty Ike

Salvage Timber Sale also produced "hard edges" that are visible within the Project Area.

Example of "hard edges" observed from Hwy 200

No-Action Alternative:

Direct, Secondary, and Cumulative Effects

"Hard edges" would persist until the trees adjacent to the project area grew large enough to blend or until a naturally occurring event, such as wildfire or wind throw shaped the landscape. The risk of direct effects would be expected to be low. Over time, tree growth would be expected to fill in current, naturally occurring openings. Due to the amount of time needed to allow revegetation to occur, the No-Action Alternative cumulative effects on athletics would be low.

Past forest management activity on surrounding lands, would continue to contribute to the cumulative visual effects within the project area landscape. The risk of cumulative effects would be expected to be reduced as disturbances from past forest management activities revegetate.

Action Alternative:

Direct, Secondary, and Cumulative Effects

The proposed timber harvest would be visible from stretches of Highway 200 within the Potomac Valley and portions of I-90 in the Clinton area, but would appear to be "an extension" of other cutting units from the past. Some of the areas of harvest would be blocked from long distance viewing due to topographic changes. An experienced observer or someone who resides in the area would notice the changes to the other stands, due to the decrease in stand density and "softer edges" along previous ownership boundaries and past stand replacing fire disturbance.

Much of the proposed cutting would be moderate in intensity. Silvicultural treatments would emulate natural disturbances, many of the largest trees would be left, and a random, natural spacing would be used, which would decrease contrast in form, line, color, and texture between past management activities as well as areas where stand replacing wildfire occurred.

Any change to the scenery in the area due to the implementation of the Action Alternative would be in addition to past timber harvests, road building, vegetation management (grazing, pre-commercial thinning, etc.) and fire activity within the project area. Post-harvest vegetation transitions in the project area would be less abrupt to the general observer. As young stands continue to grow and revegetate, edges would blend and become less noticeable than those in the existing conditions as well as in the No-Action Alternative. Thus direct, secondary and cumulative effects to aesthetics would be low.

NOISE:

Existing Conditions
The southern half of the project area lies along the I-90 corridor and is adjacent to rural subdivisions. From the project area the following activities can be heard regularly:

- Trains
- Interstate traffic
- Traffic from the Wallace Creek road and/or residents in the adjacent area

- Various noise associated with building and development

No-Action Alternative:
No harvest activities would occur in the project area. There would be no additional noise beyond what currently occurs in the area.

Action Alternative:

Direct, Secondary, and Cumulative Effects
Harvest activities would be audible, and, depending upon air conditions, equipment could be heard miles away from their location. Noise would be generated by harvest operations, harvest related traffic, road construction, and administrative oversight. This could be expected to be present for the entire season of harvest, typically from mid-June through mid-March of the following year, for the duration of the harvest (two to three years during the general "work week").

Portions of the proposed project (Section 24 T12N R17W) are located adjacent to landowners' residences within the urban interface. Approximately 2,000 linear feet of the Dirty Donovan Project Area within this section borders 5 privately owned parcels (other than The Nature Conservancy ownership); 3 of which are occupied by residents.

Recommended Mitigation Measures for Noise- The analysis and levels of effects of noise in Section 24 T12N R17W is based on implementation of the following mitigation measures:

- Log hauling would typically take place during the general "work week".
- New road construction and log hauling routes within Section 24 T12N R17W would be located a distance of more than 1,500 feet from the private boundary.
- Hand felling and skidding/yarding operations would be limited to daylight hours of the general "work week".

Increases in noise levels would exceed those currently found within the surrounding residential areas. However, logging has taken place adjacent to these areas for decades and the noise created through implementation of the Action Alternative is not expected to exceed those levels which were common historically.

Based on the anticipated operating periods, short duration of the timber sale, and minimal acreage directly adjacent to private property; direct, secondary, and cumulative effects of noise would be low.

HISTORICAL AND ARCHEOLOGICAL SITES:
A Class I (literature review) level review was conducted by the DNRC staff archaeologist for the area of potential effect (APE). This entailed inspection of project maps, DNRC's sites/site leads database, land use records, General Land Office Survey Plats, and control cards. The Class I search results revealed that while historic mining related properties are in the general project area, they have been documented and would be avoided with ground disturbing activities. No additional archaeological investigative work would be conducted in response to this proposed development. However, if previously unknown cultural or paleontological materials are identified during project related activities, all work would cease until a professional assessment of such resources can be made.

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:

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

- USFWS and DNRC. 2010. Montana Department of Natural Resources and Conservation Forested Trust Lands Habitat Conservation Plan, Final Environmental Impact Statement, Volumes I and II. U.S. Department of Interior, Fish and Wildlife Service, Region 6, Denver, Colorado, and Montana Department of Natural Resources and Conservation, Missoula, MT. September 2010.

- Dirty Ike Salvage Environmental Assessment (EA), DNRC October 2003

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).

Missoula City-County Air Pollution Control of the Missoula Public Health, City-County Health Department classifies the DNRC as a “Major Outdoor Burning Source” by and is issued permits from Missoula City-County Air Pollution Control Program to conduct burning activities on the state lands managed by DNRC located within Missoula County. As a permit holder, DNRC agrees to comply with the limitations and conditions of the permit. The Air Quality Division at the Missoula City-County Health Department (MCCHD) monitors air quality and regulates outdoor air pollution sources such as: industry, wood stoves, fireplaces, outdoor burning and dusty roads.

The project area is located within Montana Airshed 3A, which encompasses Missoula County. Portions of the Project Area are located within Impact Zone M. Within Impact Zone M, the DNRC may not conduct prescribed wildland burning except when good or excellent dispersion is forecast for the entire period of expected smoke generation. Prescribed wildland burning is not allowed in “Impact Zone M” (Sections 2, 4, 10, 13, and 24 T12N R17W) December 1 through the end of February, except as allowed under Rule 7.106(2).

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 both the Missoula City-County Air Pollution Control Program and the Montana/Idaho Airshed group and DEQ.
- Follow all guidelines and requirements of the burn permits issued by the Missoula City-County Air Pollution Control Program within Impact Zone M of the Project area (Sections 2, 4, 10, 13, and 24 T12N R17W).
- 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 3A.

Action Alternative:

Direct and Secondary Effects
Slash consisting of tree limbs, 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. Burning within the project area would be short in duration and would be conducted when conditions favor good to excellent ventilation and smoke dispersion as determined by the Montana Department of Environmental Quality, Missoula County, and the Montana/Idaho Airshed Group. 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 the 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 the 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.

LOG HAULING TRAFFIC:

Historically, log hauling traffic was common in the project area.

Recommended Mitigation Measures for Log Hauling Traffic- The analysis and levels of effects of log hauling traffic is based on implementation of the following mitigation measures:

- Log hauling would typically take place during the general "work week".
- Signs would be posted making the public aware of log hauling traffic in the area.
- If necessary, a slower speed limit may be imposed in the timber harvest contract.

No-Action Alternative:
No increase in log truck traffic would occur.

Action Alternative:

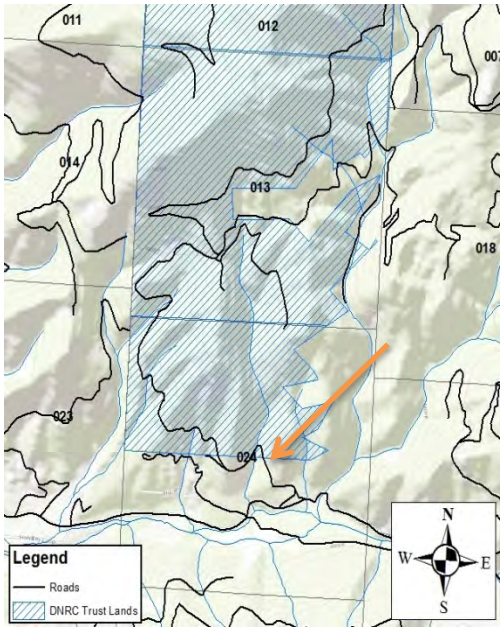
Direct, Secondary, and Cumulative Effects
Log truck traffic in the area would increase for the duration of the timber sale. However, signs would be posted indicating that log truck traffic is present in the area. If necessary, a slower speed limit may be imposed in the timber harvest contract.

Based on the mitigation measures direct, secondary, and cumulative effects of log hauling on human health and safety would be minimal.

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

The project area is used for hiking, hunting, cross-country skiing, snowmobiling and general recreating.

In development stages of the Dirty Donovan project, it was discovered that a road entering Section 24 T12N R17W was being used illegally for both recreating and access to private property.



The road is designated "closed" to all motorized travel as it enters the DNRC property boundary. The DNRC does not possess any access rights to the road adjacent to DNRC property at this time and is not currently pursuing them.

Currently, roads through the project 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.

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

- Adjacent landowners are concerned with additional public access through privately owned property in Section 24 T12N R17W.

- Project would limit the public's and adjacent landowners' access to vehicular recreation and hunting opportunities by limiting access through a privately owned road in Section 24 T12N R17W.

Recommended Mitigation Measures for Recreation- The analysis and levels of effects of recreation is based on implementation of the following mitigation measures:

- Timber harvest operations in Sections 13 and 24 T12N R17W would not occur during the Montana general big game hunting season (October 15 – December 1).

No-Action Alternative:
There would be no change from existing road closures.

Action Alternative:
Under the proposed Action Alternative there would be no change from existing road closures. Therefore, it would be expected to have no measurable direct, secondary, or cumulative impacts on recreation from this proposed action.

Will Alternative 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 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**					
Action														
Health and Human Safety		**X**				**X**				**X**			**YES**	**1**
Industrial, Commercial, and Agricultural Activities and Production	**X**				**X**				**X**					
Quantity and Distribution of Employment		**X**				**X**				**X**			**YES**	**2**
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: Health and Human Safety

Impacts -

Log truck traffic in the area would increase for the duration of the timber sale. This could cause a low impact to human safety.

Mitigations -
Signs would be posted indicating that log truck traffic is present in the area.
If necessary, a slower speed limit may be imposed in the timber harvest contract.
Log hauling would typically take place during the general "work week".

Based on the mitigation measures direct, secondary, and cumulative effects of log hauling on human health and safety would be minimal.

Comment Number 2: Quantity and Distribution of Employment

Impacts –
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 45 person years of employment in the forest products industry. A few short-term jobs would also be created/sustained by issuing pre-commercial thinning and planting 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.):*

None

OTHER APPROPRIATE SOCIAL AND ECONOMIC CIRCUMSTANCES:

The proposed action has a projected harvest volume between 7 and 10 MMBF. This volume is worth approximately $380/MBF delivered to a forest products manufacture site at current market prices. Delivered to market, the proposed action has a total estimated revenue value of $3,230,000. 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 $484,500 and $1,130,500. 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 Southwestern Land Office was 1:1.82. This means that, on average, for every $1.00 spent in costs, $1.82 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 56.9 MMBF, which represents approximately 16.4% of timber harvested in the state of Montana. This project would provide approximately 8.5 MBF of timber towards the Sustained Yield target thus helping sustain current mill capacity.

Environmental Assessment Checklist Prepared By:

Name: Scott Allen
Title: Missoula Unit Management Forester
Date: February 19, 2016

Finding

Alternative Selected

An interdisciplinary team (ID Team) has completed the Environmental Assessment (EA) for the proposed Dirty Donovan Projects EA prepared by the Montana Department of Natural Resources and Conservation (DNRC). After a review of the EA, project file, public correspondence, Department Administrative Rules, policies, and the State Forest Land Management Plan (SFLMP), I have made the following decisions:

The No Action Alternative does not include the harvest of any timber. The Action Alternative proposes to harvest approximately 8,500,000 board feet of timber on 1,989 acres. Subsequent review determined that the alternatives, as presented, constituted a reasonable range of potential activities.

For the following reasons, I have selected the Action Alternative without additional modifications:

The Action Alternative meets the Project Need and the specific project objectives as described on page 2 of the EA. The Action Alternative would produce an estimated **net** return of $484,500 - $1,130,500 to the Common School (CS) Trust (with a portion of that being Acquired Land), while providing a mechanism whereby the existing timber stands would be moved towards conditions more like those, which existed historically.

The analysis of identified issues did not disclose any reason compelling the DNRC to not implement the timber sale.

The Action Alternative includes mitigation activities to address environmental concerns identified during both the Public Scoping phase and the project analysis.

SIGNIFICANCE OF IMPACTS
For the following reasons, I find that the implementation of the Action Alternative will not have significant impacts on the human environment:

Soils-Leaving 5-15 tons of large, woody debris on site will provide for long-term soil productivity. Harvest mitigation measures such as skid trail planning and season of use limitations will limit the potential for severe soil impacts.

Water Quality-The Action Alternative would improve the surface drainage on approximately 55 miles of existing roads, install culverts, clean ditches and culverts thereby reducing the amount of current sedimentation within the project area. Water Quality Best Management Practices for Montana Forests (BMPs) and the Streamside Management Zone (SMZ) law will be strictly adhered to during all operations involved with the implementation of the Action Alternative.

Cumulative Watershed Effects-Estimated increases in annual water yield for the proposed action have been determined to be negligible by the DNRC Hydrologist. Increases in sediment yield are expected to be negligible due to the amount of area treated, location along the landscape, replacement and/or improvement of existing culverts and mitigations designed to minimize erosion.

Cold Water Fisheries- Due to planning and associated mitigation, it is unlikely that the proposed timber sale will affect large woody debris recruitment, shade or in-stream temperature in any fish-bearing streams within the project area.

Air Quality-Any slash burning conducted as part of the Dirty Donovan Projects will be conducted in coordination with the Montana/Idaho Airshed group and Missoula County in order to ensure that ideal smoke dispersion conditions exist prior to ignition and throughout the duration of any burning operations. As a result, impacts to air quality should be minor and short in duration.

Noxious Weeds-Equipment will be cleaned prior to entering the project area, which will reduce the likelihood of weed seeds being introduced onto treated areas. The DNRC will monitor the project area for two years after harvest and will use an Integrated Weed Management strategy to control weed infestations should they occur.

Forest Conditions and Forest Health-The proposed harvest will begin the process of returning the timber stands within the project area to those conditions that most likely existed on the site(s) prior to organized fire suppression.

Log Truck Use of Public Roads-Implementation of the recommended mitigations-i.e. strict adherence to posted speed limits, dust control if necessary and restrictions on the use of compression brakes should minimize the opportunity for conflicts between log trucks, other traffic and/or residences within the project area.

Visual Quality- Silvicultural treatments would emulate natural disturbances, many of the largest trees would be left, and a random, natural spacing would be used, which would decrease contrast in form, line, color, and texture between past management activities as well as areas

where stand replacing wildfire occurred. Post-harvest vegetation transitions in the project area would be less abrupt to the general observer.

Wildlife-The proposed harvest operations present a minimal likelihood of negative impacts to Threatened and Endangered Species. Those potential impacts that do exist have been mitigated to levels within acceptable thresholds. The same is true for those species that have been identified as "sensitive" by the DNRC. The effects of the proposed action on Big Game species would be moderate.

Recreation- There would be no changes to existing road status. Current motorized trespass would be mitigated through more effective closures on roads currently classified as closed to motorized use. Damage caused by illegal motorized use would be repaired during the Dirty Wallace timber sale.

Economics-The Action Alternative would provide approximately $484,500-$1,130,500 in net revenue to the Common School Trust (with a portion of that being Acquired Land) and does not limit the DNRC's options for generating revenue from these sites in the future.

Noise-Log hauling would take place during the general work week. Hand felling and skidding/yarding operations would be limited to daylight hours of the general work week.

3. PRECEDENT SETTING AND CUMULATIVE IMPACTS-

The project area is located on State-owned lands, which are "principally valuable for the timber that is on them or for growing timber or for watershed" (**MCA 77-1-402**). The proposed action is similar to past projects that have occurred in the area. Since the EA does not identify future actions that are new or unusual, the proposed timber harvest is not setting precedence for a future action with significant impacts.

Taken individually and cumulatively, the identified impacts of the proposed timber sale are within established threshold limits. Proposed timber sale activities are common practices and none of the project activities are being conducted on fragile or unique sites.

The proposed timber sale conforms to the management philosophy adopted by DNRC in the SFLMP and is in compliance with existing laws, Administrative Rules, the HCP and standards applicable to this type of action.

4. SHOULD DNRC PREPARE AN ENVIRONMENTAL IMPACT STATEMENT (EIS)?

Based on the following, I find that an EIS does not need to be prepared:

- The EA adequately addressed the issues identified during project development, and displayed the information needed to make the pertinent decisions.
- Evaluation of the potential impacts of the proposed timber sale indicates that significant impacts to the human environment will not occur as a result of the implementation of the Action Alternative.
- The ID Team provided sufficient opportunities for public review and comment during project development and analysis.

Need for Further Environmental Analysis

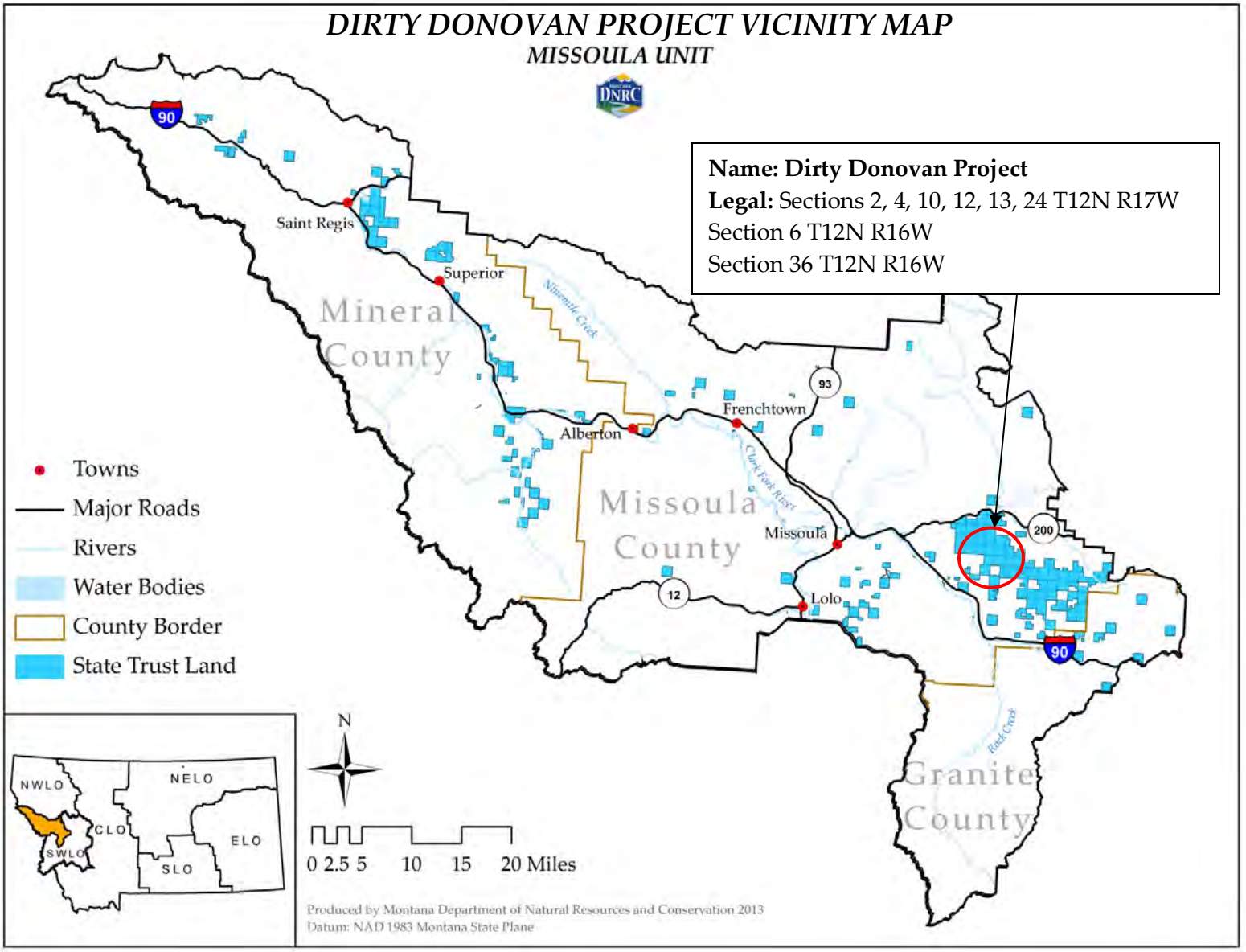
☐	EIS	☐	More Detailed EA	X	No Further Analysis

Environmental Assessment Checklist Approved By:

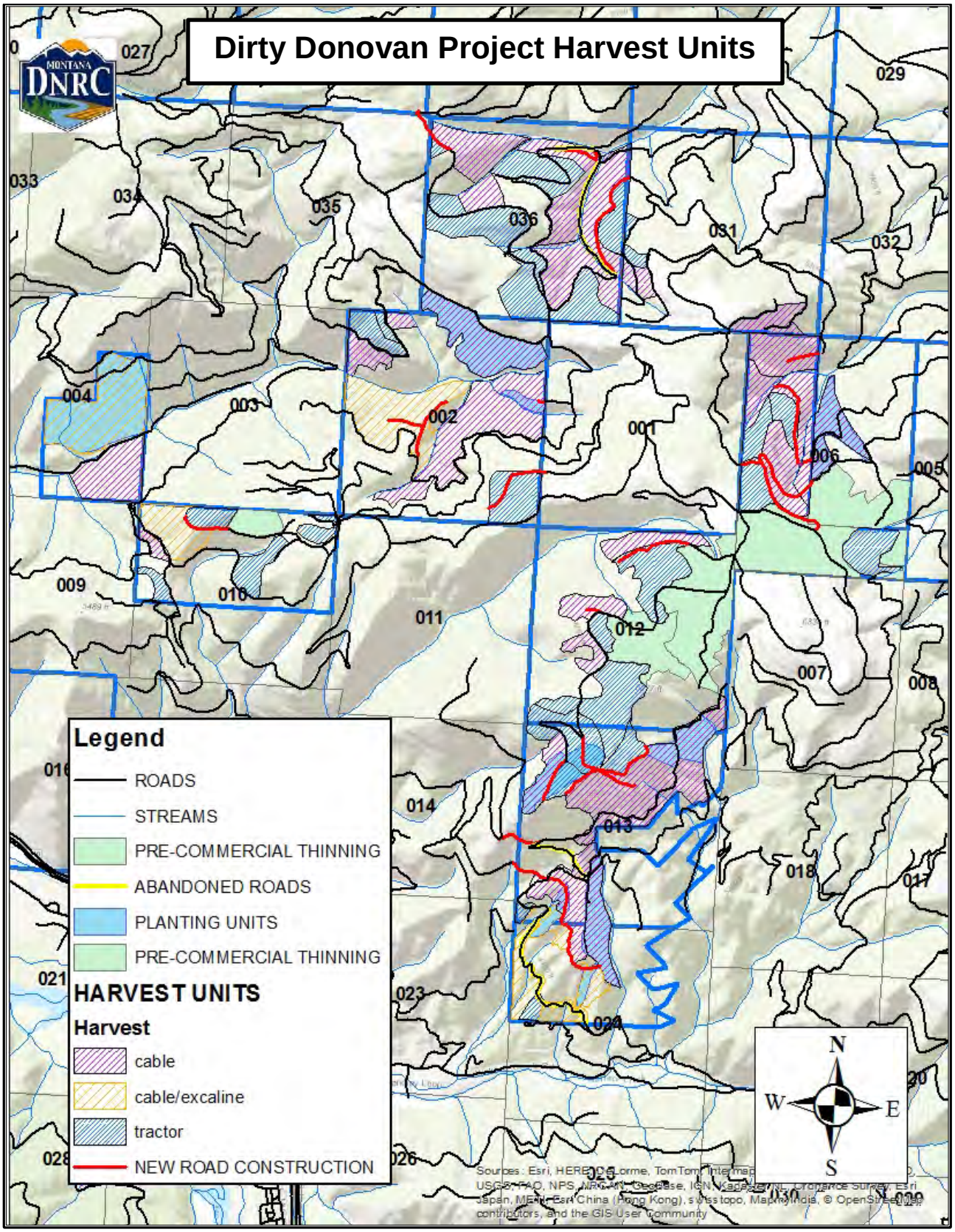
Name: Amy Helena
Title: Missoula Forest Management Supervisor
Date: February 19, 2016
Signature: /s/ Amy Helena

Attachment A - Maps

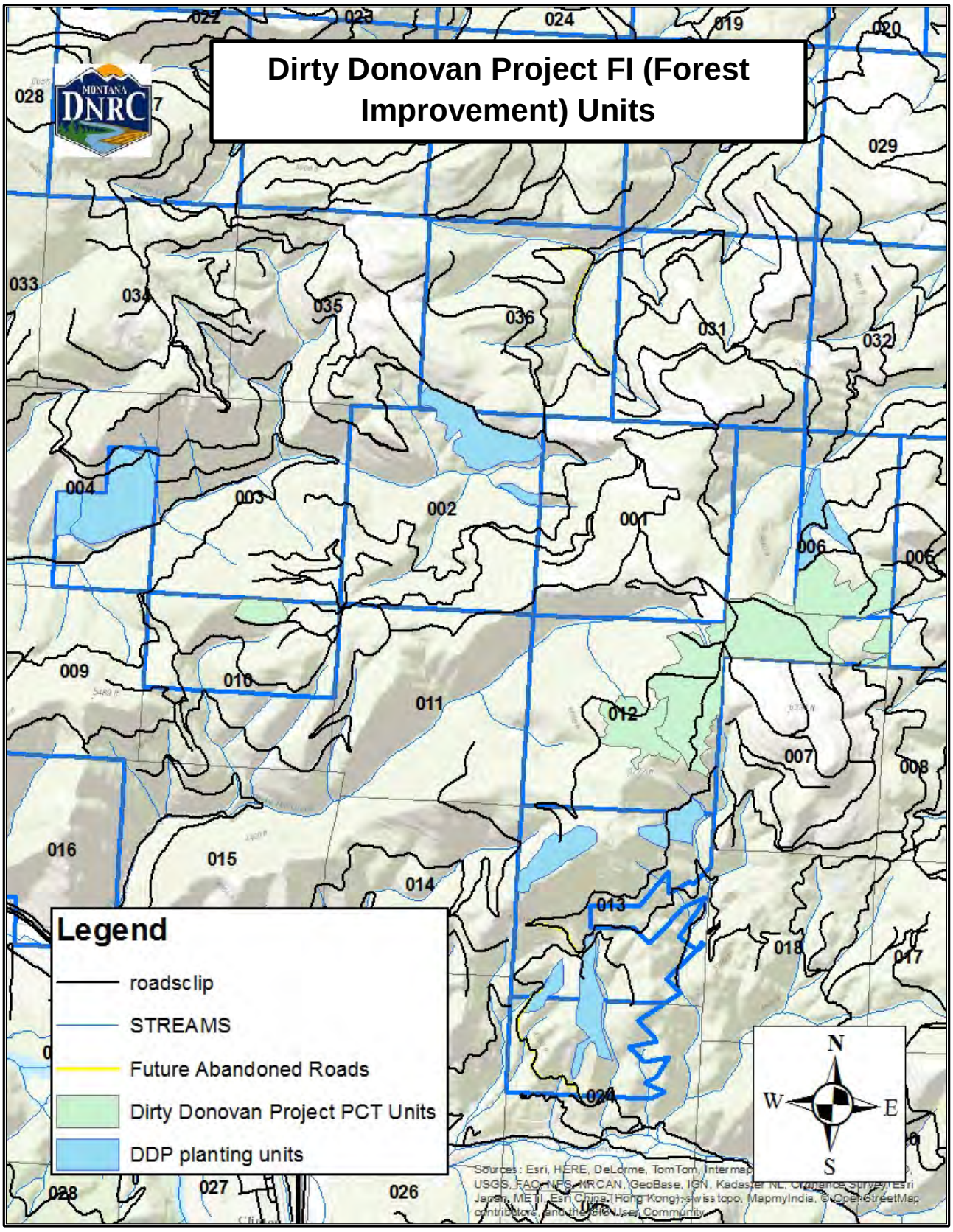
A-1: Dirty Donovan Project Vicinity Map



A-2: Dirty Donovan Project Harvest Units



A-3: Dirty Donovan Project FI (Forest Improvement) Units



Attachment B – Vegetation Analysis

Dirty Donovan Project – Vegetation Analysis

Analysis Prepared By:
Name: Scott Allen-Forest Vegetation & Jeff Collins-Noxious Weeds
Title: Management Forester, Missoula Unit & Hydrologist/Soil Scientist, SWLO DNRC

Introduction

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

Issues

No-Action Alternative:

- Dwarf mistletoe, root rot, mountain pine beetle, and western spruce budworm may continue to suppress productivity/growth or cause mortality in the project area.
- Young stands are currently overstocked.
- Shade tolerant species would continue to out-compete seral species, removing stands from their historic cover type and species distribution.
- Fuel loads/stand conditions are above historic levels; which may lead to high intensity stand replacing fires.

Action Alternative:

- Timber harvesting and road building may introduce or spread noxious weeds in the project area.
- Phenotypically inferior leave trees from past harvests would be removed to promote better stand genetics.
- Forest management activities may adversely affect Old Growth.
- Stand productivity and tree health/vigor would be increased, insuring long term sustainability of product yield.
- Shade tolerant species would be preferred for removal and no longer continue to out-compete seral species; helping to return stands to their historic covertype, DFC (desired future condition), and species distribution.

Issues dismissed from further review

- *There is concern the proposed project could negatively impact populations of threatened, endangered, or sensitive plant species.*

This issue has been dismissed from further study because no rare plants have been identified within the project area through field surveys or a search of the Montana Natural Heritage Program database. Therefore, no direct, indirect, or cumulative impacts to rare plants would be expected under either alternative.

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
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 will 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.

Noxious Weed Applicable Weed Management Requirements The following plans, rules, and practices have guided this projects planning and/or would be implemented during project activities: All applicable weed management requirements of the County Weed Control Act 7-22-2101 to 7-22-2153, Best Management Practices, State Forest Land Management rules and regulations, and measures outlined in the DNRC Habitat Conservation Plan would be implemented. This includes, but is not limited to management rules for classified forest lands ARM 36.11.445 where the department shall use an integrated pest management approach for noxious weed management that includes prevention, education, cultural, biological, and chemical methods as appropriate.

Analysis Areas

Direct and Secondary Effects Analysis Area
The proposed treatment areas- approximately 2,369 acres

Cumulative Effects Analysis Area
The proposed project area- Sections 2,4,10,12,13,24 T12N R17W; Section 36 T13N R17W; Section 6 T12N R 16W , Section 31 T13N R16W– totaling approximately 4,523 acres

Noxious Weeds
The methods for disclosing impacts for this analysis include using descriptions of weeds occurring in the area, weed management efforts that have been completed and then qualitatively assess the risk of weed spread based on the proposed actions and mitigations.

Existing Conditions

Noxious Weeds
Noxious weeds occurring in the project parcels are mainly a combination of knapweed (Centaurea maculosa), houndstongue (Cynoglossum officinale L) and spot infestations of toadflax. Knapweed was found along all roadsides as well as on more open and drier southerly slopes of forested portions of the project area. Houndstongue was found mostly along roadsides along the access haul routes within project sections and on adjacent lands. Spot infestations of Toadflax occur in the area and more extensively near Clinton and highway I-90. Road use, timber harvest activities, grazing, and soil disturbance from fire are most likely the reasons for the existing rate of spread of noxious weeds and the potential future spread and introduction of noxious weeds.

The prevailing winds from the Clark Fork valley and lower Blackfoot also carry windblown weed seed throughout this area. Approximately 6 miles of roadside weeds were treated in 2013 and 2015 along the Arkansas Creek access route along roads in the Potomac valley side, yet weeds continue to spread by wind, animals and vehicles. No recent weed treatments have been completed on the Clark Fork side including Donovan, Dirty-Ike Creek or Wallace Creek areas. Weed management treatments on adjacent ownerships in the area varies from no-action to combinations of revegetation, herbicide treatments and bio-control measures.

Standard Vegetative Community

- **Stand History/Past Management-**

This area falls within climatic section 332B, which was historically 79% forested. (Losensky, 1997). Climatic Section 332B includes valley bottoms as well as high elevations in the Bitterroot and Blackfoot region. The project area ranges in elevation from 3,800'-6,300'. Stands throughout the project area were variable based primarily on aspect in relation to elevation. Lower elevation south facing aspects were historically dominated by uneven aged ponderosa pine stands. Low severity, high frequency fires played a large role in shaping these stands. As elevation increases and aspect changes toward a north facing aspect within the project area; sites become moister. Within these moister stands, fire frequency decreases as severity increases, trending toward historically stand replacing fires. Both fire and past management have shaped the characteristics of the project area. An overview of known past history follows:

1977 –Approximately 95 MBF was harvested from section 2 T12N R17W; 60% WL (western larch), 30% DF (Douglas-fir), and 10% PP (ponderosa pine)/other. Harvest methods and prescriptions were not available, but evidence suggests overstory removal or seed tree harvests were implemented using ground-based equipment

1978 – Approximately 50MBF of PP was harvested from section 2 T12N R17W.
1980 – 100 rails were harvested from section 2 T12N R17W.
1983 – 400 posts were harvested from section 2 T12N R17W.
1984 – 600 posts were harvested from section 2 T12N R17W.
1985 – Approximately 38MBF of WL was harvested from section 2 T12N R17W.
1988 – Approximately 80 MBF (90% WL and 10% DF) and 850 stakes were harvested from section 2 T12N R17W.
2003 - Approximately 202 acres of the project area (NW portion of Section 12 T12N R17 and NW portion of Section 6 T12 R16W) were burned during the Dirty-Ike fire of 2003.
2004 - Approximately 202 acres of the project area (NW portion of Section 12 T12N R17 and NW portion of Section 6 T12 R16W) were salvage harvested in 2004 after a high intensity fire (Dirty Ike Salvage SO1473); the harvest prescription was to remove all dead/dying merchantable timber from within the fire perimeter. Approximately 191acres were harvested using ground based harvest methods and 13 acres using skyline harvest methods.

- **Current stand conditions**

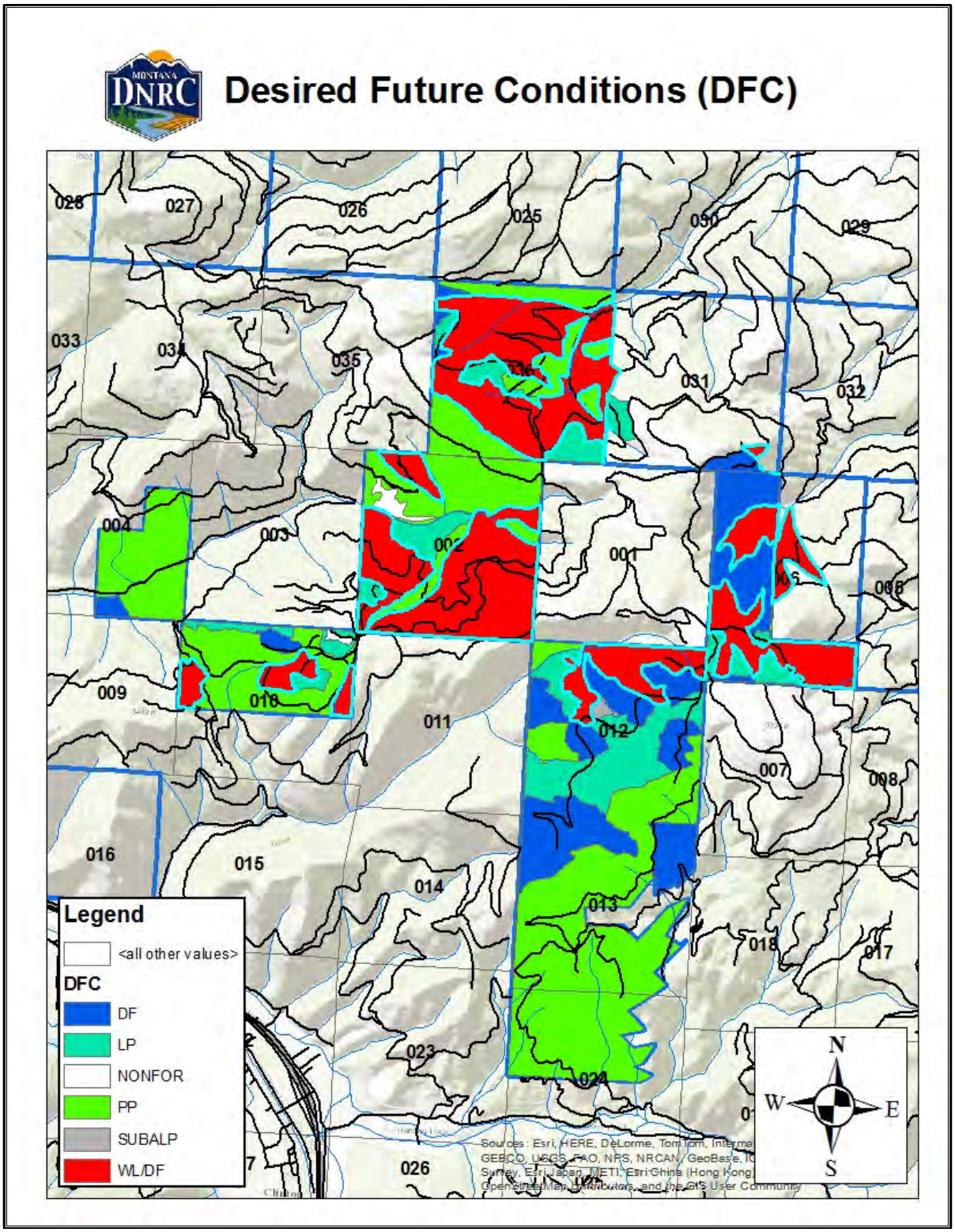
The current stand conditions in the project area are a result of past timber management and wildfire activity and/or suppression. Many of the current cover types differ from the Desired Future Condition (DFC). See table V-1 for current project area cover types as well as the DFC for the project area.

Table V-1 – Current and appropriate cover types for the Dirty Donovan Project Area.

Cover Type	Current Acres	Current Percent of Project Area	Desired Future Condition (DFC)	
			Acres	Percent
PP (Ponderosa pine)	986	22%	1,650	36%
DF (Douglas-fir)	1,253	27%	451	10%
WL/DF (Western larch/Douglas-fir)	810	18%	1,845	41%
LP (Lodgepole pine)	509	11%	560	12%
SUBALP (Sub-alpine fir)	734	16%	-	-
NONFOR (Non-forested)	16	1%	17	1%
Mixed Conifer	152	3%	-	-
Non Stocked	63	2%	-	-
Total:	***4,523***	***100***	***4,523***	***100***

Species composition, size, density and age class in the project area vary based on aspect, elevation, and past disturbance.

For descriptive purposes, the project area vegetation will be described using the DFC (Desired Future Condition) as identified by the DNRC. Although there are discrepancies due to variability, these areas share many attributes due to similar habitat type, aspect, and elevation. ***See map on following page***



WL/DF (western larch/Douglas-fir) DFC-
1,845 acres of the Dirty Donovan project fall within the western larch/ Douglas-fir Desired Future Condition. These multistoried stands are located in cool and moist to cool and moderately dry habitat groups. Current upper and mid-level canopy covertypes consist of 16-26 inch DBH Douglas-fir, subalpine fir (SAF), lodgepole pine, and western larch. Intermediate and suppressed trees within the older cohort (upper to

mid-level canopy) are overstocked and suppressed, exhibiting poor form, with a few exceptions, in natural openings. The mid-level canopy of a younger cohort or age class exhibits better form and vigor. Regeneration within the lower canopy is dominated by shade tolerant species such as subalpine fir and Douglas-fir. High stocking levels and overcrowding of the mid and lower canopy levels has led to an increase in insect and disease infestations primarily defoliators (spruce budworm) and root rot.

PP (ponderosa pine) DFC-
1,650 acres of the Dirty Donovan project fall within the ponderosa pine Desired Future Condition. Stands within the ponderosa pine DFC are generally located on low to mid elevation, south facing aspects within the project area. These forested areas were historically dominated by a "park-like", uneven-aged Ponderosa pine overstory. Lack of active management or fire suppression has led to encroachment by shade tolerant species such as Douglas-fir. The canopy structure is multistoried consisting of approximately 70% ponderosa pine, 30% Douglas-fir, with small amounts of western larch and lodgepole pine. In most areas of the project, trees within the second tier canopy of a different cohort (age class) are overstocked and suppressed due to competition for limited resources. Regeneration is also dominated by shade tolerant species (primarily Douglas-fir) due to limited canopy openings. Overstocking or overcrowding has led to an increase in insect and disease infestations primarily dwarf mistletoe and small patches of pine beetles. Without wildfire or active forest management, PP stands within the project area would convert to more shade tolerant species.

DF (Douglas-fir) DFC-
451 acres of the Dirty Donovan Project fall within the Douglas-fir Desired Future Condition. Site conditions range from cool and moderately dry to warm and dry. The canopy structure is multistoried consisting of Doulas-fir (70%-90% stocking levels) and ponderosa pine (10%-30% stocking levels). Stands are generally uneven-aged and clumpy. Clumps within the stands consist of many different cohorts or age classes with non-uniform stocking levels ranging from small un-stocked openings in the canopy to overstocked "dog-hair" clumps (very dense and suppressed tree spacing). Dwarf mistletoe and spruce budworm are prevalent throughout the Douglas-fir DFC.

LP (lodgepole pine) DFC-
560 acres of the Dirty Donovan Project fall within the lodgepole pine DFC. Within the lodgepole pine DFC approximately 150-200 acres within section 12 T12N R17W was harvested using a seed tree prescription (40-50 ft. average spacing). Site conditions are cool and moderately dry. Stands within the previously harvested area have a canopy cover of Douglas fir (90%) and LP (10%). Leave trees (trees selected to be left unharvested) were suppressed at the time of harvest. The upper canopy possesses less than 30% crown ratio and exhibit poor form/vigor. The mid and lower level canopy consist of Doulas-fir (70%), lodgepole pine (20%), and subalpine fir (10%).

SAF (subalpine fir) DFC-
A very small portion (less than half a percent) of the Dirty Donovan Project area is within the subalpine fir Desired Future Condition. Site conditions are cool and moist. The upper level canopy consists of poorly stocked 14-15 inch DBH Douglas fir and western larch. The lower level canopy is dominated by subalpine fir and spruce regeneration. Spruce budworm is prevalent within the SAF Desired Future Condition.

Non-Forested DFC-
17 acres of the Dirty Donovan Project area consist of non-forested terrain; rock scree or water features prohibit forest vegetation from establishing.

Old Growth
Old Growth was identified and analyzed using criteria outlined in Green et al. (1992). Stand Level Inventories of the project area were queried to identify potential Old Growth and Old Growth stands. Once identified through the query as potential Old Growth, a standardized sample was cruised. Plots within the cruise

sampled attributes such as age, BA (basal area), and TPA (trees per acre) of 17 inch or greater DBH (diameter at breast height); these results were used to verify classification. See table V-2 for current verified Old Growth within the Dirty Donovan Project area.

Table V-2 – Old Growth in the Project Area.

Stand ID (as classified by DNRC Stand Level Inventory)	SLI Old Growth Status	Acres	*Field Verified Old Growth Status	Old Growth Type	Acres of verified Old Growth
12_N16_W0600001	Possible	47.1	No	N/A	0
12_N16_W0600004	Possible	26.6	No	N/A	0
12_N16_W0600005	Possible	25.8	Yes	4	25.8
12_N16_W0600007	Possible	60.1	Yes	4	60.1
12_N16_W0600008	Possible	42.7	Yes	1	42.7
12_N17_W0200003	Possible	12.7	Yes	4	12.7
12_N17_W0200016	Possible	41.1	No	N/A	0
12_N17_W0200025	Possible	54.4	No	N/A	0
13_N17_W3600002	Possible	7.4	No	3	0
13_N16_W3100020	Possible	8.6	Yes	2	8.6
TOTAL		**326.5**			**149.9**

The "field verified Old Growth status" column indicates Old Growth Status following field verification in which all the stands listed in the table were sampled.

Environmental Effects

No Action Alternative: Direct, Secondary and Cumulative Effects

Standard Vegetative Community

Under the No Action Alternative, natural processes would continue to have a direct influence on forest conditions within the Dirty Donovan Project Area. Dwarf mistletoe, root rot, mountain pine beetle, and western spruce budworm would continue to suppress productivity/growth or cause mortality. Some stands classified as Old Growth could potentially become non-Old Growth as mortality increases in the older age class. Young stands that are currently overstocked would remain suppressed. Fuels would continue to build in stands increasing the potential for a stand replacing wildfire. In areas affected by insects and disease; shade tolerant species would continue to out-compete seral species, removing stands from their historic cover type and species distribution or DFC. Weed spraying and pre-commercial thinning activities would be conducted on priorities set by the Missoula Unit as funding allows.

Noxious Weeds

With no action, noxious weeds will continue to spread along roads and may increase on the drier site habitats. Hawkweed is a shade tolerant plant and the windblown seed is expected to increase across the landscape as

it has in Idaho and northwest Montana. Limited weed control efforts on access roads across multiple ownerships in the area, increases the potential for windblown seed. Following disturbance events such as fires, road construction and timber harvest, the establishment and spread of noxious weeds can be more prevalent than in undisturbed areas. DNRC would continue to treat selected sites on DNRC roads based on priorities and funding availability, but the levels of weed control treatments would be lower than with the action alternative. If new weed invader species are found they would have highest priority for management.

Cumulative effects of noxious weeds within the project areas are moderate. Weeds are established along most roads in the Dirty Donovan drainage and have spread across ownerships over time by multiple uses from wind, fire, traffic, forest management, wildlife and grazing animals. As tree density and ground cover vegetation increase over time, weeds are reduced through vegetative competition.

Table WS-2 Summary Effects of the Alternatives on Noxious Weeds

Water Quality & Quantity	Impact								Can Impact Be Mitigated ?
	Direct & Secondary				Cumulative				
	No	Low	Mod	High	No	Low	Mod	High	
No-Action									
Weed Occurrence and spread			**X**				**X**		**NA**
Action									
Weed Occurrence and spread			**X**				**X**		**Y**

Action Alternative: Direct, Secondary, and Cumulative Effects

Noxious Weeds

Implementation of the action alternative would involve ground-disturbing activities that have the potential to introduce or spread noxious weeds in susceptible habitat types, principally on drier vegetation types. For the action alternative, an Integrated Weed Management (IWM) approach was considered for treatment of existing and prevention of potential noxious weeds. For this project: prevention, revegetation of new roads and weed control measures on existing roads are considered the most effective weed management treatments. Prevention measures would require cleaning of off-road equipment. Roadsides would be sprayed prior to operations. Noxious weeds control efforts would promote rapid revegetation and emphasize treatment of any new noxious weeds found. Newly disturbed roadsides would be reseeded to promote revegetation that would slow noxious weed spread and reduce weed density and occurrence compared to no-action, yet noxious weeds are expected to spread along roadways. There would be a similar increase in weed infestation within portions of harvest units due to soil disturbance and reduction of tree canopy, especially with hawkweed which can be slowed but will expand in area unavoidably. The silvicultural prescriptions are designed to control disturbance and scarification to goals need for sustained forest growth.

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

Overall, cumulative effects of increased noxious weeds within the project area are expected to be moderate, based on herbicide treatments of existing weeds along roads and implementing prevention measures to reduce new weeds, by cleaning equipment and planting grass on roads to compete against weeds. The combined efforts of weed control across ownerships continues to improve through cooperative efforts with the Missoula County Weed District and local weed control interest groups including the Blackfoot Challenge.

Standard Vegetative Community

Direct, Secondary & Cumulative Effects

The proposed Action Alternative would treat approximately 2,369 acres out of the 4,523 acre project area. In addition, 723 acres of Forest Improvement treatments would take place. Treatment type and size would vary based on stand conditions. The proposed treatment types would include:

- Tree planting would occur on approximately 343 acres. Areas to be planted include; areas currently experiencing high amounts of mortality and defect due to root-rot and dwarf mistletoe in the DF (Douglas-fir) would be planted with WL (western larch) or PP (ponderosa pine); areas that exhibit poor phenotypical attributes in advanced natural regeneration following harvest would be planted with WL or PP.

- Pre-commercial thinning would occur on approximately 380 acres of overstocked sub-merchantable stands to promote primarily WL and PP. Shade tolerant species such as Douglas-fir would be targeted for removal as well as any trees displaying signs of insects, disease and defect, such as forked tops. Pre-commercial thinning projects would reduce the stand density to 200-300 trees/acre or an average spacing of 14'.

- The timber sales conducted in the Dirty Donovan Project Area would be designed to promote future desired conditions and emulate natural disturbances based on fire regimes historically present in the project area. The timber sales would also be used to promote favorable phenotypical form and tree health/vigor. This harvest would occur across 1,989 acres in the 4,523 acre project area, removing approximately 70% of the overstory. The prescriptions implemented would vary depending on site/stand conditions;
    - ITS (Individual Tree Section) would retain heathy seral species (PP or WL) exhibiting desirable phenotypical attributes (good form, no forked tops, no crook, sweep, etc.). Residual overstory spacing (averaging 30-50 feet) would be variable or clumpy depending on stand health; an average basal area of 15-25 square feet per acre would remain. Basal area is defined as the total cross-sectional area of all stems in a stand measured at breast height, and expressed as per unit of land area (square feet per acre). Post-harvest, stand appearance would resemble a natural disturbance with scattered clumps remaining as well as unevenly spaced overstory trees.
    - Old Growth maintenance and/or restoration harvest(s) would be designed to retain Old Growth attributes, including large live trees and snags. Shade tolerant species would be targeted for removal. This prescription is a variation of the ITS harvest described earlier, however size, age class per acre, and basal area minimums, dependent on Old Growth type, would be retained to maintain the Old Growth criteria outlined in Green et al.
    - Seed Tree harvest spacing of an average 60-70 feet between leave trees would be used to remove unhealthy trees or trees left from prior harvests which are exhibiting bad form. These harvest units would help improve stand health.
    - Clear Cut harvest techniques would be implemented in even aged lodgepole pine stands to mimic a stand replacing fire.
    - Commercial thinning would take place in younger, even aged Douglas-fir and western larch stands to reduce competition and improve growth and vigor.

- At least two snags and two snag recruits per acre (where available) would exist scattered among the overstory component of all harvest units. If snags were not available, 4 snag recruits would be left.

- Healthy, vigorous advanced regeneration exhibiting good form would be protected during harvest activities.

- Harvest would not occur within the first 50 feet of Class One Streamside Management Zones (SMZ). Depending on slope, these areas vary from 50 feet -100 feet from the stream. Harvest would take place within Class 3 Streamside Management Zones. Trees marked to cut would be concentrated along the outer edge of the SMZ to ensure protection along stream banks.

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

Given the following factors:

- Douglas-fir across all size classes are currently succumbing to root-rot, spruce budworm, and dwarf mistletoe due in part to overstocking.
- Post-harvest, the overall stand health and vigor would be improved in the residual overstory.
- More shade tolerant species would be removed, favoring seral species.
- Areas would be pre-commercially thinned increasing growth and vigor in young age classes.
- Seral tree species would be planted.
- Post-harvest conditions would represent a more diverse age and species class within the project area; promoting resiliency to insect and disease damage.

The proposed action would be expected to result in low to moderate direct, indirect, and cumulative impacts on forest vegetation beyond those projected for the No Action Alternative.

Old Growth

Direct, Secondary & Cumulative Effects

149.9 acres of Old Growth (as defined by Green et. al.) exist within the project area, of that, 141.3 acres of Old Growth currently exists within the treatment area. The following table illustrates Old Growth acres pre and post-harvest for the treatment area (direct and secondary effects analysis area) and the project area (cumulative effects analysis area).

Table V-3 –Old Growth acres pre-harvest vs. post-harvest for the Dirty Donovan Project Area

Stand ID	Project area current Old Growth acres	Post-harvest project area Old Growth acres
12_N16_W0600005	25.8	25.8
12_N16_W0600007	60.1	60.1
12_N16_W0600008	42.7	42.7
12_N17_W0200003	12.7	12.7
13_N16_W3100020	8.6	8.6
TOTAL	**149.9**	**149.9**

Stands containing Old Growth are intermixed with non-Old Growth stands throughout the project area. Old Growth stands within the treatment area would receive an Old Growth Maintenance treatment. This treatment would be designed to retain Old Growth attributes (as defined by Green et. al.); including the number of large live trees and snags per acre. This prescription would insure that stands identified as Old Growth would retain Old Growth classification.

Given the following factors:

- If left untreated, insect and disease infested stands that currently are classified as Old Growth may no longer meet Old Growth classification because of ongoing mortality.
- Post treatment all stands would retain their Old Growth classification.
- Shade tolerant species would be removed, favoring seral species historically present on the site.

The proposed action would be expected to result in low to moderate direct, indirect, and cumulative impacts on Old Growth beyond those projected for the No Action Alternative.

Vegetation Mitigations

- Plant western larch and ponderosa pine in treatment areas affected by insects and disease (primarily dwarf mistletoe, spruce budworm, and root rot) to convert to a more resistant covertype. Planting seral species (WL, PP) in treatment areas would also retain more fire tolerant species in historically low severity fire regimes.
- Favor seral species (WL, PP) in treatment areas to retain more fire tolerant species in historically low severity fire regimes.
- Implement harvest prescriptions that would emulate natural disturbances historically present on the landscape.
- Conduct Old Growth maintenance treatments to maintain Old Growth on the landscape.
- 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 become established.

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 harvest within the first 50 feet of Class One SMZs (streamside management zones)

VEGETATION REFERENCES

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Attachment C – Soils Analysis

Dirty-Donovan Timber Sale – Soils Analysis

Analysis Prepared By: Jeff Collins, Hydrologist/Soil Scientist DNRC 2/16/2016

Introduction

The following analysis will describe the existing soil conditions and the anticipated effects to soil resources within the Dirty Donovan project area. Direct, indirect, and cumulative effects to soil resources of both the No-Action and Action alternatives will be analyzed.

Issues

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

Slope Stability/landslides- A public concern was expressed that tree over thinning or logging operations could destabilize soils and create a hazard of rock or landslides/mudslides to adjacent private lands that are downslope of state operations.

Regulatory Framework

The following plans, rules, and practices have guided this projects planning and/or will be implemented during project activities:
All applicable Best Management Practices, State Forest Land Management rules and regulations, and measures outlined in the DNRC Habitat Conservation Plan would be implemented. This includes, but is not limited to silviculture considerations for sustained forest growth (ARM 36.11.420) and biodiversity. As required by ARM 36.11.410 and 36.11.414, adequate vegetative debris shall be left on site to support nutrient conservation whole tree skidding shall be discouraged unless mitigation measures are taken to retain a portion of (fine litter) nutrients on site. The proportions of vegetative materials retained are based on the range of comparable levels determined by Graham et al (1994).

Analysis Methods & Analysis Areas

The methods for disclosing impacts for this analysis include using general soil descriptions and management limitations and then qualitatively assessing the risk of adverse effects to soil productivity from compaction, displacement and erosion from each alternative.

The soils analysis included an evaluation of Missoula County Soil Survey data, air photos, past harvest designs and on-site field reviews by DNRC hydrologist/soil scientist. Within the project area, map unit boundaries were verified and revised based on field observations.

For the purposes of this analysis, minor soils of 5% or less of the area were grouped based on slope, soil properties and interpretations. Field reviews were conducted to verify the soil properties and current conditions to assess past and predicted effects based on DNRC soil monitoring results from over 80 DNRC postharvest monitoring projects (DNRC, 2006, 2011). The soil analysis considered soil management interpretations and the physical effects to soils from the area and degree of harvest disturbance associated with skidding and roads. The analysis for soil nutrients considers the area of disturbed surface and the fine litter and coarse woody

debris available to supply organic materials to the soil. While the anticipated impacts from each alternative will disclose the direct/indirect effects, the cumulative impacts would be the result of previous and proposed activities.

Slope stability will be assessed qualitatively considering geology/soil limitations, slope steepness and past indicators of instability or severe channel scour. The area of slope stability analysis will consider proposed harvest areas, roads, and potential for downslope impacts to homes adjacent to the project.

Direct, Indirect and Cumulative Effects Analysis Areas: The analysis area for geology and soil resources includes the proposed harvest units and locations of existing roads and the new and temporary roads proposed for construction on the road R/W across ownerships and within state parcels of Sections 6, T12N, R16W, Sections 2, 4, 10, 12, 13 & 24T12N, R17W, Section 31, T13N, R16W and Section 36, T13N, R17W, that are on mountain slopes north of Clinton, Montana.

Existing Conditions

Geology The proposed harvest areas are located on the mountain sideslopes and ridges of the Garnet Range North and east of Clinton. The bedrock geology in the project area includes Pre-Cambrian age meta-sedimentary quartzite's, argillites and limestone, that are mainly well fractured and soils on mountain sideslopes have high rock contents that makes the materials stable, resistant to erosion and high water infiltration properties that exceed precipitation rates. An igneous formation (the Clinton Stock) with numerous boulders projects from Wallace Creek over the divide to Ashby Creek and was an area of historic mining. Numerous old explorations and mines are located along the eastern state property boundary in sections 13 and 24 T12N, R17W. The footslopes of Game Creek and Arkansas Creek have deep tertiary valley fill deposits that have high clay contents along portions of the access roads.

Donovan Creek and Dirty-Ike Creek are abrupt deep V shaped canyon formed by underling faults. Bedrock outcrops occur on steeper side-slopes and ridges throughout the area especially on the Bonner quartzite's common in the Donovan Creek, Dirty-Ike Creek and Game Creek drainages. Talus slopes composed of boulders and fractured rock are mapped as rock complexes and generally have few trees. Rock spalling is common on steeper slopes and roadcuts. Steep side-slopes with shallow depth to fractured rock are generally rippable, yet steep road cut-banks are subject to rock ravel and can be slow to revegetate, especially on southerly aspects. Balanced road cut/fills are practical up to 55% where slope steepness increases the quantity of material excavated. Road fill-slope sloughing was identified on a segment of the Dirty-Ike Creek road

Slope Stability-Debris flows The area of primary concern is Section 24, T12N, R17W where the homeowners downslope of state lands expressed a concern for risk of slope instability/debris flows. Debris/mudflows in western Montana are more associated with wildfires and deep fine textured deposits where there are steep draws or features that concentrate high amounts of runoff onto unstable geologic materials (such as fine textured materials or clay shales) and high soil moisture conditions. Areas recognized as being at risk of dangerous debris flows include combinations of the following:

- Steep slopes with marginal stability fine textured soil materials or geology or where landslides have occurred before and surface runoff is concentrated.
- Areas where severe wildfires remove vegetation or extensive man caused disturbance of the land that has removed surface vegetation and exposed extensive bare land.
- Steep slopes and areas at the bottom of slopes or canyons with no anchoring vegetation.

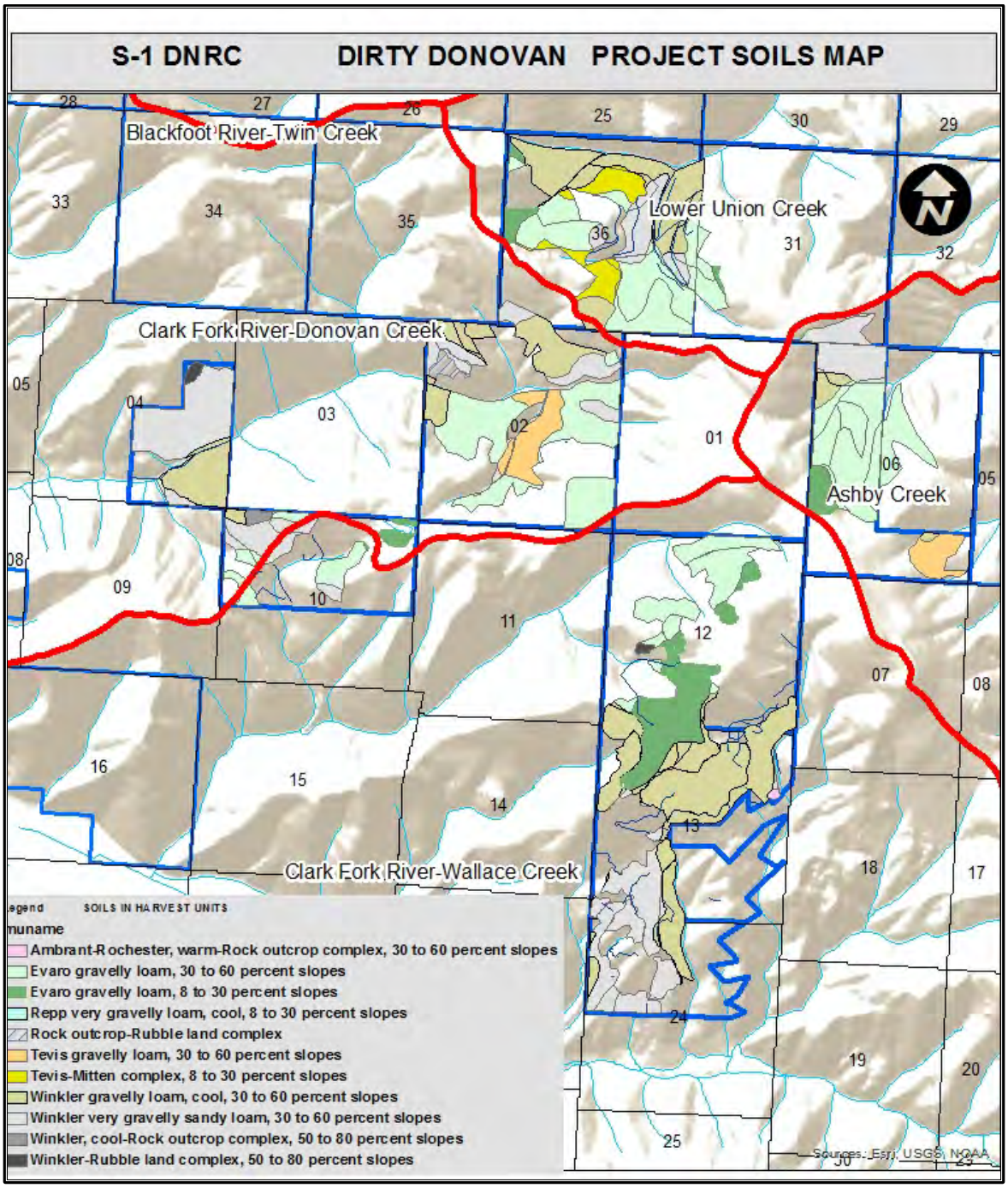
Short steep draws above the homesites were field reviewed by a soil scientist with experience in evaluating slope stability and has observed debris/mudflows principally following severe fires. There is a small area of slopes >60%. The extensive nature of rocky soils derived from quartzite and argillite parent materials in this area are stable and resistant to overland flows and do not have the >50% fines that are common on mudflows.

No field indicators of previous debris flow/mudflow scour or damage to trees were found in the draws, no tension cracks in the ground, and no rotational slump or scarp features that indicate instability, were observed during field reviews in the area of concern above the homesites. A road-cut that crosses the slope appears stable, but there were some rocks on the road that have rolled downslope likely from freeze/thaw conditions and gravity. Both of the draws are relatively small for runoff accumulation and the draw bottoms have high levels of rock. Anchoring trees occur in both draws that would help intercept mudflows or debris flows and rock and there is no scarring or draw scour that indicates previous avalanches or snow movement that carried far enough to cause scouring in the draw.

Soils- Soil map units are displayed on Soil Maps S-1 and summary properties and management interpretations are described in attached Table S1 addendum. Slope ranges from 5 to 80% and over 90% of slopes in harvest areas are over 30%. Slopes of 10-45% are well suited to ground based skidding operations and have a long operational season of use, once soils dry out in the spring. Slope steepness over 45% limits tractor operations due to potential for excessive displacement and erosion, which can be mitigated by using cable harvest practices. The southerly aspects in the Donovan Creek, Dirty-Ike Creek, and Wallace Creek drainages are shallow to moderately deep Winkler very gravelly loams on 30-60% slopes and Winkler rock outcrop complex covers 23% of harvest acres. Surface soils are shallow and low to moderate productivity sites supporting ponderosa pine and Douglas-fir and lodgepole pine. Soils in the proposed harvest units have high gravel contents that make the materials very stable and resistant to erosion.

The Winkler soils have shallow surface soils and are somewhat excessively drained with high water infiltration properties the exceed precipitation rates. Winkler soils have lower fine contents in subsoils and lower soil moisture retention. Competition for moisture from understory vegetation and high solar insolation can constrain conifer growth and regeneration. Conifers are subject to drought stress on these very well drained rocky soils and may have more common root rot incidence (Filip 1989).

Primary soils on the northerly aspects included; Winkler very gravelly loams cool phase, Evaro gravelly loams, Tevis gravelly and Mitten gravelly loams. Evaro and Mitten soils have a volcanic ash influenced surface and improved fertility and moisture compared to Winkler soils and Tevis soils. Evaro and Mitten soils have a moderate to high risk of displacement and compaction. Evaro and Mitten soils which support western larch, ponderosa pine, Douglas-fir and lodgepole pine are more productive growing sites than Winkler soils.



Tevis very gravelly loams occur on 30 to 60 percent slopes and do not have a volcanic ash surface and slightly lower productivity than Evaro and Mitten soils. Tevis soils have slightly greater soil fines, moisture retention and productivity than the Winkler soils and support western larch, ponderosa pine, Douglas-fir and lodgepole pine.

Minor soils in the proposed harvest areas are Ambrant–Rochester warm rock outcrop complex that are derived from igneous rock in the eastern boundary of 13, T12N, R17W. Boulders limit road construction and slopes require cable harvest. Narrow bands of stream bed alluvium form gravelly deposits adjacent to intermittent tributary streams within the project parcels.

Primary soil management concerns are avoiding excessive disturbance during harvest that may displace shallow surface soils and expose gravel subsoils or lead to erosion. Erosion risk can be effectively controlled with standard drainage practices and implementation of BMP's. Sediment delivery is a concern on the finer textured soils within and adjacent to riparian areas yet can be mitigated by implementation of buffer areas and implementation of Best Management Practices (BMP's).

Effects of Past Management Previous harvest is extensive in the area, but more moderate on the state lands proposed for harvest. Several of the parcels were recently acquired from The Nature Conservancy in 2008 that were previously Plum Creek forest lands and extensively managed. The most recent harvest was completed on 204 acres of fire salvage that occurred along the ridgeline divide between the Dirty-Ike watershed and Ashby Watershed.

Best Management Practices (BMP's) were implemented during harvest operations and ground impacts are estimated at less than 10 % of the salvage harvest area based on field reviews. Older harvests > 30years ago have low to moderate effects from ground based skidding and ground impacts have largely ameliorated and skid trails have revegetated. A few major skid trails and landing sites are still apparent and harvest effects are estimated to be less than 5% of the previous harvest units, based on field reviews. Road drainage was recently improved along the Arkansas access road to meet BMP's.

Nutrient Cycling & Soil Productivity There are moderate to high levels of existing downed coarse woody debris across the proposed harvest areas due to minor previous harvest, and existing conditions are representative of woody debris levels on similar vegetation types measured by Graham et al. (1994). The tree mortality from insects and disease has resulted in downed lodgepole logs and many trees shedding their needles, which helps return organic matter and nutrients to the soil. Root rot pockets may be a partial result of increased vegetative stress on droughty sites and shallow soils (Filip 1989), or on areas of partial thinning where high stocking levels of Douglas-fir are retained. Infection is more frequent on poor sites with low moisture, and poor fertility such as on quartzites, than on soils with higher fine contents or volcanic ash influenced surfaces.

Retaining vegetative litter and woody debris helps to control erosion on disturbed sites, provides media for healthy soil fungi, acts as mulch for water retention and conservation of soil nutrients important to tree growth. It is desirable to maintain moderate levels of litter and old and new coarse woody debris (>3" dia.) at approximately5-15 tons/acre on the harvest units. Retention of well distributed forest cover provides protection from high solar insolation and can help reduce drought stress to improve conifer regeneration.

Environmental Effects on Soils

No Action Alternative: Direct, Indirect, and Cumulative Effects
The No-Action Alternative is expected to result in similar direct or indirect effects to soils as described under existing conditions. Erosion would continue on roads that do not have adequate drainage. The steep draws are very rocky and stable and there are no field indicators of past slope instability or channel scour. In the unlikely event of a severe fire followed by intense rainfall, there is a low to moderate risk of debris flows to one home below the state project area in section 24, T 12N, R17W. If a debris flow occurred, it is not likely to be large or carry past anchor trees to the home-site that is located in the bottom of a draw downslope of state lands. The existing cross-slope road above the homes acts as a catch point for gravity rolling rocks. A summary of both Alternative effects is shown in table S-2.

Table S-2 Summary Effects of the Alternatives on Soil Resources

Soil Disturbance and Productivity	Impact								Can Impact Be Mitigated?
	Direct & In Direct				Cumulative				
	No	Low	Mod	High	No	Low	Mod	High	
No-Action									
Physical Disturbance (Compaction and Displacement)		X				X			NA
Erosion			X				X		NA
Nutrient Cycling		X				X			NA
Slope Stability			X			X			NA
Soil Productivity		X				X			NA
Action									
Physical Disturbance (Compaction and Displacement)			X				X		Y
Erosion			X				X		Y
Nutrient Cycling			X				X		Y
Slope Stability		X	X			X			Y
Soil Productivity			X				X		Y

Action Alternative: Direct and Indirect Effects on Soils- Implementation of the Action Alternative is a combination of salvage harvest of dead, dying and high-risk trees and regeneration harvest to reduce competition and improve growth of diverse tree species that are more resistant to root rot. Approximately 1,989 acres of timber harvest and 380 of precommercial thinning is proposed which would be completed over several years. Tree planting, grass seeding roads and noxious weed management would also occur. The proposed project could construct 7 miles of new road and complete repairs and maintenance on up to 55 miles of existing road to meet BMP's.

Harvest effects Slope Stability-Debris flow- Under the Action Alternative, there is 100- 200 ft. of vegetated area between the proposed harvest and downslope homes. Harvest further upslope in the draws is moderate removal of dead, dying and overstocked trees that would retain 35 to 60% of existing forest crown cover and promote healthy forest stands. Operations are planned to minimize soil impacts to less than 15%. The 100-200 ft. harvest buffer area below the project would retain anchor trees in draws that reduce any potential downslope soil and rock movement. No new roads are proposed in the area of concern that would affect slope stability and a current road acts as a bench to catch occasional naturally spalling rocks that may roll downslope. There is low potential for increased direct, indirect or cumulative slope instability impacts based on the following; proposed moderate harvest and thinning would be expected to reduce the risk of severe intensity wildfire, ground disturbance would be minimized, vegetated buffer maintained upslope of homes and no previous indicators of slope instability or channel scour.

All new roads would be located on stable terrain and constructed to meet Best Management Practices. One site of road fill failure on the Dirty Ike Creek road would be repaired. There is a low to moderate risk of small road sloughs during the operations, and any road sloughs that occur on the haul routes would be repaired concurrent with operations.

The 7 miles of new road construction would change the land use of the added roads to transportation and disturb up to 28 acres of land. On existing roads, road maintenance and site specific road reconstruction requirements would be implemented on 55 miles of road to improve road drainage and control erosion. Road improvements include gravel surfacing select segments of roads that cross high clay content soils along the Arkansas-Game Creek footslope roads. Road reclamation would occur on 1.7 miles of old poorly located existing roads, and 8.1 miles of old road that is no longer needed would be abandoned and stabilized as needed to reduce miles of road maintenance. The actual area disturbed varies with road width, slope steepness and extent of temporary roads that would be reclaimed.

On upper slopes, the proposed roads cross segments of shallow soils and fractured bedrock, and rock raveling is expected that would require periodic maintenance. The high rock/coarse fragment soils are excessively well drained and durable to road traffic with implementation of standard road drainage features. All new roads would be grass seeded with site adapted grass to speed revegetation and control erosion and weeds.

Soils- Primary soil concerns with harvest operations are the potential for excessive surface disturbance that could remove the shallow volcanic ash surface soils and expose the less productive subsoils, and an increased risk of erosion.

To maintain soil productivity, and promote conifer regeneration, BMP's and the listed mitigation measures would be implemented to minimize the area and degree of soil effects associated with harvest operations. Ground based harvest with tractors would be limited to slopes less than 45% and steeper slopes would be cable logged for less disturbance. Implementation of BMP's and the recommended mitigation measures, has been shown to effectively limit detrimental soil impacts to less than 15% of the harvest units based on DNRC soil monitoring on comparable sites (DNRC 2006, 2011) and recent harvest on nearby sites. The estimated area that may be detrimentally impacted is displayed in table ST-2.

Table ST-2 Estimated Detrimental Soil Disturbance for the Action Alternative

Area of Analysis	Total Area (Acres)	Disturbance Rate (%)	Estimated Impacted Area (Acres)
Harvest Units (including landings)	1046 acres Cable 315 ac. Cable/Excaliner 628 acres Tractor	Cable up to 8% Tractor up to15%	Cable 109 Tractor 94.5 *
Roads 7 miles	28	< 1% of project parcels	28
Estimated Total Impacted Acres from harvest is up to 203.5 acres=10.2 % of 1989 harvest acres Combined harvest and road impacts of up to 231.5 acres = 5 % of the 4523 acres in the State Lands Project Parcels.			
* Actual area impacted is expected to be less with use of planned skid trails to optimize timber skidding and avoid excessive disturbance.			

We expect that by implementing BMP's and protecting at least ~80% of a harvest area in non-detrimental soil impacts, soil properties important to soil productivity would be maintained (DNRC 2006), and the projected impacts are below that range. Cable operations on steeper slopes reduce ground disturbance and impacts.

Nutrient Cycling & Soil Productivity Considering nutrient cycling, the level of tree mortality has already caused many needles and fine litter to fall to the forest floor. A substantial proportion of plant available nutrients are retained in the forest floor duff and surface mineral soils. Forest duff and litter provide a mulching cover that retains surface moisture. A substantial portion of fine foliage that has not already fallen would be expected to break off during logging operations. The proposed harvest and slash treatments is expected to retain a proportion of the existing coarse and fine woody debris, based on the planned harvest and retaining a proportion of fine materials. On all proposed harvest areas a portion of old and new course woody debris (CWD >3" dia.) at ~5-10 tons/acre and fine litter (similar to historic ranges) would be retained as noted in attached mitigations. There would be no effects of the proposed thinning that would lop and scatter stems and needles.

Contract administration would monitor on-going operations to control soil disturbance to avoid excessive impacts and meet silvicultural goals to reduce competition. The improved tree spacing would improve growth of retained trees, due to reduced competition for soil moisture and nutrients, and promote diverse species more tolerant of root rot, as discussed in the vegetation section. For all these reasons, there would be moderate risk of direct and indirect effects to geology or soil resources as a result of the proposed action.

Cumulative Effects of the Action Alternative on Soil productivity

Cumulative effects to soils can occur from repeated ground skidding entries into the harvest area and additional road construction, depending on the area included. The total of area in new roads and harvest effects would be up to 10% of the 1,989 project acres. Past harvest over 30 years ago in the project area resulted in soils impacts of less than 5% of the harvest acres which have largely ameliorated, thus there would be a moderate potential for additive cumulative effects to soils with the proposed actions.

There would be short to mid-term reductions in fine litter on high priority fuels reduction treatment zones along open roads and near residences. Cumulatively over the rotation of the forest stands, the combination of fine litter and coarse woody debris would be expected to maintain surface organic matter that provides media for healthy soil fungi and conserves soil nutrients and moisture important to tree growth and supports long term productivity. Improved tree spacing will reduce competition for nutrients and soil moisture, enhance growth of retained trees, and promote regeneration of conifers as noted in the vegetation section.

Soils Mitigations

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

- DNRC would implement all applicable BMP's, Montana Administrative Rules for Forest Management, and reasonable mitigation and erosion control practices during timber harvest, road maintenance, and road construction and road use activities. The commitments of the DNRC Habitat Conservation Plan (HCP) would be implemented across the area.

- Limit harvest equipment and hauling operations to periods when soils are relatively dry, (less than 20%), frozen or snow covered to minimize soil compaction and rutting, and maintain drainage features. Check soil moisture conditions prior to equipment start-up.

- On tractor harvest units the logger and sale administrator would agree to a general skidding plan prior to equipment operations to limit trails to 15% or less of the harvest unit. Feller-bunchers may work on

slopes up to 45% as long as displacement and turning is minimized to prevent excessive disturbance. Slopes over 45% would be cable harvested to reduce soil impacts and improve harvest efficiency.

- Whole tree skidding can reduce slash hazard, but also remove a portion of nutrients from growing sites. Target fine slash and woody debris levels are to retain 5-15 tons/acre well distributed on site while meeting the requirements of the slash law. On sites with lower basal area, retain large woody debris as feasible since it may not be possible to retain 5 tons/acre and the emphasis will be on providing additional coarse woody debris CWD in the future. Slash may be placed on main skid trails to protect soils and reduce erosion potential.

- Existing road segments would be improved and maintained in association with the harvest activities. Road improvements would include surface blading and installation of drainage features to control surface erosion and prevent sediment delivery to streams as needed to comply with BMP'S, and to protect water quality.

- If a road slough occurs on the haul routes, it would be repaired concurrent with operations.

- Harvest operations and road conditions would be monitored as part of the on-going project operations and repairs would be made as needed, including erosion control, culvert cleaning and re-vegetation. If cut-slope or fill-slope slumps occurred on new roads they would be stabilized to control erosion as part of the harvest project.

- New road construction, including drainage features should be completed prior to freezing conditions. Road cutslopes are to be constructed at relatively stable angles as noted in contract.

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Soil Interpretations Table S1 Dirty Donovan Timber Sale Project Area

Map #	Mapping Unit Name	Soil Description	Erosion Potential	Displacement Hazard	Compaction Hazard	Notes
3	Ambrant-Rochester Rock outcrop 30-60%	Igneous Bedrock Shallow with deep gravelly sandy loams where rock fractured	High Kf .2 K.15	Mod to high on slopes >45%	Low	Boulders common, roads require rip or blast
36	Evaro gravelly loam, on 8 to 30 percent slopes	Deep Gr Silt Loam colluvium from argillites/qtz Volcanic ash Surface AWC 3.7"	Mod Kf .37 K .17	Mod	Mod	Productive soils suited to larch and Douglas-fir. Avoid excessive disturbance of ash surface
37	Evaro gravelly loam, on 30 to 60 percent slopes	Mod. Deep Gr Silt Loam Colluvium from argillites / quartzite Volcanic ash Surface AWC 3.7".	Mod Kf .37 K .17	Mod to high on slopes >45%	Mod	Limit ground skid to slopes less than 45% Avoid excessive disturbance of ash surface
90	Repp very gravelly loam Cool phase 8-30% slope	Deep very gravelly loams from rocky limestone colluvium, low clay content, #AWC 3.9"	Low, coarse Kf .37 /K. 15	Mod Carbonates @ 12"	Low	Minor soil Well suited to tractor
102	Tevis gravelly sandy loam 30-60% slope	Deep very gravelly loams from rocky quartzite & argillite colluvium, low clay content AWC 2.8"	Mod to high on slopes >45%, coarse Kf .37 /K .2	Mod to high on slopes >45%	Mod	Well suited to ground based operations, More productive than 131.
103	Tevis-Mitten 8-30% slope	Tevis Vr. Gr. Loams Mitten Gr. Silt loam Deep very gravelly loam subsoil s from rocky quartzite & argillite colluvium, low clay content Mitten AWC 3.3"	Mod to high on slopes >45%, coarse Kf .37 /K 15	Mod	Mod	Well suited to ground based operations, More productive than 102, 131.
131	Winkler, very gravelly loams, 30 to 60 % slopes	Shallow-mod deep very gravelly loams residuum & colluvium low clay content Droughty AWC 2.8"	Low, coarse Kf .2 /K .05	Mod to high on slopes >45%	Mod Remains wet late in spring	Shallow-Mod depth soils with fractured rock at shallow depth, Limit ground skid to slopes less than 45%

Map #	Mapping Unit Name	Soil Description	Erosion Potential	Displacement Hazard	Compaction Hazard	Notes
132	Winkler gravelly loam, cool, 8 to 30 percent slopes	Mod deep very gravelly loams from rocky residuum & colluvium, low clay content AWC 2.8"	Mod. coarse Kf .2 /K .05	Mod	Low	Well suited to ground based operations, More productive than 131.
133	Winkler gravelly loam, cool, 30 to 60 percent slopes	Shallow-mod deep very gravelly loams from rocky residuum & colluvium, low clay content AWC 2.8"	Mod. coarse Kf .37 /K .15	Mod to high on slopes >45%	Low	Shallow-Mod depth soils with fractured rock at shallow depth, northerly aspect cool and more productive than 131 .Limit ground skid to slopes less than 45%
134	Winkler Rubble Complex, 50 to 90 % slopes	Shallow-mod deep very gravelly loams from rocky residuum & colluvium, low clay content AWC 2.8"	Mod. coarse Kf .2 /K .05	Mod to high on slopes >45%	Low	Shallow-Mod depth soils with fractured rock at shallow depth, northerly aspect cool and more productive than 131 .Limit ground skid to slopes less than 45%
135	Winkler, Cool, Rock Complex 50 to 80 %t slopes	Shallow-mod deep very gravelly loams from rocky residuum & colluvium, low clay content AWC 2.8"	Mod. coarse Kf .2 /K .05	Mod to high on slopes >45%	Low	Shallow-Mod depth soils with fractured rock at shallow depth, northerly aspect cool and more productive than 131 .Limit ground skid to slopes less than 45%

Attachment D – Water and Fisheries Analysis

Dirty Donovan Timber Sale – Water & Fisheries Resources Analysis

Analysis Prepared By: Jeff Collins, Hydrologist/Soil Scientist, DNRC 2/9/2016

Introduction

The following analysis will disclose anticipated effects to water and fishery resources within the Dirty Donovan project area. The sections on issues & concerns, regulations and mitigations have been combined for water and fishery resources. Direct, indirect, and cumulative effects to water and fisheries resources of both the No-Action and Action alternatives will be analyzed.

Water & Fisheries Resources Issues

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

- Water Quality - There is a concern that the proposed action may cause impacts to water quality and quantity from timber management, road construction, and road use. Timber harvest may affect downslope groundwater to adjacent private ownerships.

- There is a concern that over-thinning could increase the winter avalanche hazard during heavy snowfall years.

- There is a concern that the timber management project may reduce water yield to ground water downslope to homeowner's wells in the Wallace Creek drainage.

- Cumulative Watershed Effects- There is a concern that the proposed timber harvest may cause or contribute to cumulative watershed impacts as a result of potential increased runoff and sedimentation.

- Cold Water Fisheries- There is a concern the proposed forest management actions may have effects to fisheries due to sediment delivery to streams.

- Fisheries Connectivity- There is a concern that several stream crossings on existing access roads across State and The Nature Conservancy lands have restricted fish passage.

Regulations, Laws, Rules & Agreements that Apply to Water & Fisheries Resources

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

Montana Surface Water Quality Regulations
The Blackfoot River and its tributary streams in the project analysis areas are classified as B-1 in the Montana Surface Water Quality Standards (ARM 17.30.623). The water quality standards for protecting beneficial uses in B-1 classified watersheds are described in ARM 17.30.623. The B-1 classification is for multiple use waters suitable for; domestic use after conventional treatment, growth and propagation of cold-water fisheries, associated aquatic life and wildlife, agricultural, and industrial uses. Other criteria for B-1 waters include; no increases are allowed above naturally occurring concentrations of sediment, which will prove detrimental to fish

or wildlife and a maximum 1 degree Fahrenheit increase above naturally occurring water temperature is allowed within the range of 32 to 66 degrees Fahrenheit.

Naturally occurring includes conditions or materials present from runoff or percolation on developed land, where all reasonable land, soil, and water conservation practices have been applied. Reasonable conservation practices include methods, measures, or practices that protect present and reasonably anticipated beneficial uses. The State has adopted Forestry Best Management Practices BMP's through its Non-point Source Management Plan as the principle means of controlling non-point source pollution from silvicultural activities. Stream temperatures are discussed in the fisheries section. DNRC provides further protection of water quality and sensitive fish through implementation of the Streamside Management Zone (SMZ) Laws and Forest Management Rules.

Water Quality Limited Waterbodies and Beneficial Uses
The Clean Water Act requires development of Total Maximum Daily Loads (TMDL's) that will provide conditions that can support all beneficial uses. A TMDL is a pollutant budget to identify the maximum allowable amounts of specific pollutants (i.e. sediment, nutrients, metals, temperature) that a water body can assimilate without causing water quality standards to be exceeded. DNRC is committed to implementing TMDL mitigations that ensures compliance with water quality standards and protection of beneficial water uses.

Wallace Creek (MT 76E004_010) is 4.3 miles long to the mouth @ the Clark Fork River, and is on the State's 303(d) list of impaired waterbodies (DEQ 2014) for not supporting aquatic life, yet supports drinking water and agricultural beneficial uses. Probable cause is excessive copper in Wallace Creek and the source is abandoned mine lands that are located in the drainage above the timber management project area. Montana Department of Environmental Quality MTDEQ completed a TMDL for copper for Wallace Creek (Bonita-Superior Metals TMDL, DEQ 2103), and the Wallace Mill site and pond are listed as a priority sites for abandoned mine clean up. The proposed harvest is located in an unnamed tributary to Wallace Creek.

West Fork Ashby Creek (MT76F006_020) is 3.1 miles long to the confluence with Ashby Creek, and is on the State's 303(d) list of impaired waterbodies (DEQ 2014) for not supporting aquatic life and recreation contact. Probable causes are alteration of stream-side covers, sedimentation and total phosphorus. Probable sources are livestock grazing, forest roads (siltation) and silvicultural activities. TMDL's needed to rectify sedimentation and phosphorus impairments were included in the approved Lower Blackfoot TMDL (DEQ 2009).The proposed harvest is located in the headwaters of West Ashby Creek above the impaired stream reach.

Union Creek (MT76F006_010) is 19 miles long to the confluence with the Blackfoot River. The project area is located in the headwaters of the southwest portion of Lower Union Creek watershed that is drained by Game Creek, Blixit and Norman Creek, that are tributary to Union Creek, and the tributaries are not listed as impaired. Union Creek is on the State's 303(d) list of impaired waterbodies (DEQ 2014) for not supporting aquatic life and recreation contact, yet supports drinking water beneficial uses. Probable causes are alteration of stream-side covers, sedimentation, total nitrogen, total phosphorus and stream temperatures. Probable sources are livestock grazing/feeding, septic systems and irrigation diversions impact on stream temperatures. All TMDL's needed to rectify impairments were included in the Lower Blackfoot TMDL (DEQ 2009, 2013).

Beneficial Uses- Downstream beneficial uses include aquatic life, drinking water, recreation, agriculture and industry. There are no water rights on the state lands parcels proposed for harvest, but there are direct uses of water for livestock grazing. The project sections are not located within designated in municipal watersheds.

Montana Streamside Management Zone (SMZ) Law
All rules and regulations pertaining to the SMZ Law will be followed. An SMZ width of 100 feet is required on Class I and II streams when the slope is greater than 35%. As stated in SMZ ARM 36.11.302(ii), where the slope of the SMZ decreases to 15% or less to form a bench that is 50 to100 ft. from the ordinary high water

mark and at least 30 ft. wide, the SMZ boundary is located at the edge of the bench nearest the stream. An SMZ width of 50 feet is required when the slope is less than 35%.

DNRC Forest Management Rules and Habitat Conservation Plan (HCP)
All applicable State Forest Land Management rules and regulations regarding watershed and fisheries management will be followed. This includes, but is not limited to rules listed for water quality (ARM 36.11.422), cumulative effects (36.11.423) Riparian Management Zones (RMZ) (ARM 36.11.425), Fisheries (ARM 36.11.427) and Conservation Strategies outlined in the DNRC Habitat Conservation Plan (HCP 2011) where applicable. As part of ARM 36.11.427(3)(a)(i) and (iv) and ARM 36.11.436, DNRC is committed to designing forest management activities to protect and maintain bull trout, westslope cutthroat trout and all other sensitive fish and aquatic species as noted in the fisheries assessment. Donovan Creek, Dirty-Ike Creek and Arkansas Creek are Class 1 fish bearing streams within the project watersheds. No Bull trout habitat is identified on streams (MFISH 2015) in the project sections or along the access roads.

The HCP requires designation of a Riparian Management Zone along Class 1 fisheries streams based on stand potential tree height and no-harvest within 50 feet of a Class 1 fisheries stream. Donovan Creek, Game Creek and Arkansas Creek are Class 1 fisheries streams and are adjacent to proposed harvest units.

Water Resources Analysis Methods and Areas

Initially 4 separate watershed analysis areas were designated to evaluate the existing and proposed impacts to water resources associated with the proposed actions. The analysis areas are watershed boundaries (6th order HUC's) that include: Wallace Creek, Donovan Creek, Ashby Creek and the southwest portion of Union Creek watersheds. Refer to the hydrology map WS-1 for analysis areas that include the proposed harvest units and road haul routes.

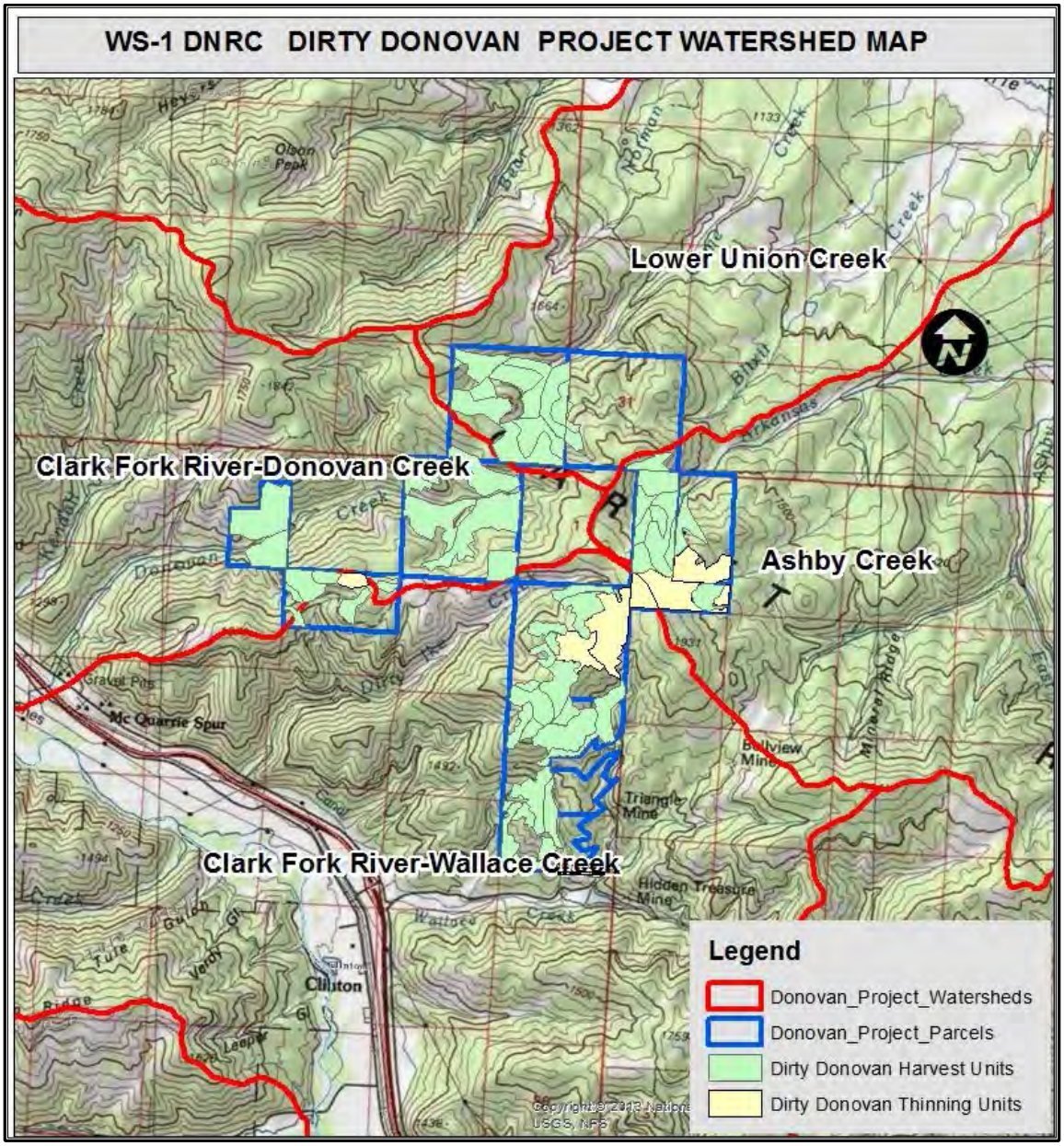
A watershed analysis and field survey was completed by a DNRC hydrologist for the proposed project to determine direct, indirect and cumulative effects to water quality. The water quality evaluation included a review of existing inventories for water resources (NRIS 2015, Lower Blackfoot TMDL (DEQ 2009), Bonita-Superior Metals TMDL (Wallace Creek, DEQ 2103), road inventories, reference to previous DNRC projects, and comparisons of aerial photos combined with GIS analysis to estimate the area of past timber harvest and vegetative recovery. Field reviews were completed for the proposed harvest units, condition of access roads and associated streams and the observations, information and data were integrated into the watershed analysis and design of project mitigations.

Sediment delivery- The analysis areas for sediment delivery are limited to the harvest units and roads used for hauling and will focus on the streams described as affected watersheds. The analysis areas for sediments encompass the proposed harvest units and road haul routes (refer to the hydrology map WS-1). A road inventory was completed to identify sediment sources and to design mitigation measures. The analysis includes in-channel and upland sources of sediment that could result from this project. In-channel areas include the stream channels adjacent to and directly downstream of harvest areas. Upland sources include harvest units and roads that may contribute sediment delivery as a result of this project. The measurement criteria for this sediment analysis are 1) miles of new road construction and road improvements and 2) potential for sediment delivery to streams.

Water Yield - Cumulative watershed effects can be characterized as impacts on water quality and quantity that result from the interaction of past, current or foreseeable future disturbances, both natural (fire) and human-caused. Past, current, and known future planned activities have been taken into account for the cumulative effects analysis. There is a concern that the timber management project may damage the ground water that

flows downslope to homeowners in the Wallace Creek drainage and will be addressed within cumulative effects.
The analysis for cumulative effects to water yield considers the area of harvest units and access roads within the project drainages described as the affected watersheds. A DNRC hydrologist completed a coarse filter qualitative assessment of watershed conditions and cumulative effects as outlined in the Forest Management Rules (ARM 36.11.423) and the commitments described in the HCP concerning watershed management. Based on extensive past logging in the area, a more detailed assessment of sediment sources and stream channel conditions was also completed. The measurement criteria for the water yield analysis are the potential for increases to surface runoff water yield and affects to stream flow will be described qualitatively considering the distribution and timing of peak flows.

The analysis areas for watershed cumulative effects include the watersheds that wholly surround the DNRC project sections and the access roads to those sections. Past, current, and future planned activities within each analysis area have been taken into account for the cumulative effects analysis.



Affected Watersheds

The proposed harvest areas are located within Montana state trust lands parcels in Sections 6, T12N R16W, Sections 2, 4, 10,12,13,24, T12N R17W, Section 31, T13N R16W and Section 36, T13N R17W, that are on mountain slopes north of Clinton, Montana. The proposed harvest and thinning units are located within 4 watersheds (listed in table WS-1) that drain into the Clark Fork River basin and the Blackfoot River Basin.

The Donovan Creek drainage (HUC 170102021405) spans both sides of the Clark Fork River and is 29,627 acres (46.2 sq. mi.) in size. Precipitation occurs mainly as snow, and spring runoff is flashy due in part to considerable shallow rocky soils and steep slopes. The average precipitation for the Donovan Creek drainage ranges from 17”/year at the mouth of Donovan Creek up to 25”/year on the Garnet divide. The drainage average annual precipitation is 21”/year. The analysis area supports a mixed forest of mainly Douglas-fir, ponderosa pine, lodgepole pine and western larch. The proposed harvest areas are located in the eastern upper ½ of the drainage.

The Clark Fork River – Wallace Creek drainage (HUC 170102021404) spans both sides of the Clark Fork River and is 31,408 acres (49 sq. mi.) in size. Precipitation occurs mainly as snow, and spring runoff is flashy due in part to considerable shallow rocky soils and steep gradients. The average precipitation for the Wallace Creek drainage is from 17”/year at the mouth of Wallace Creek up to 23”/year in the headwaters at 6,300ft. elevation, and the drainage average is a moderate 21”/year, which is mainly snowfall. The analysis area supports a mixed forest of mainly Douglas-fir, ponderosa pine, lodgepole pine and western larch. The proposed harvest areas are located northeast of Clinton.

The Ashby Creek drainage (HUC 170102031305) is 15,871 acres (24.8 sq. mi.) in size and 3.1 miles in length, flowing north from its headwaters at 6,200 ft. elevation to the confluence with Lower Union Creek near Potomac (elev. 3,020 ft.). Ashby Creek’s named tributaries include Arkansas Creek, East Ashby Creek and West Ashby Creek. The project area is in the headwaters of Arkansas Creek. The average annual precipitation for the Ashby Creek drainage is from 15”/year near Potomac up to 23”/year in the headwaters at 6,300ft. elevation, and the drainage average is a moderate 20”/year which is mainly snowfall. The analysis area supports a mixed forest of mainly, Douglas-fir, ponderosa pine, western larch, lodgepole pine and spruce.

The Lower Union Creek drainage (HUC 170102031306) is 33,603 acres (21.5 sq. mi) in size and the proposed harvest area is located in the southwest portion of the drainage in the headwaters of Game Creek. The average precipitation for Lower Union Creek is from 15”/year near Potomac to 25”/year in the headwaters. The state project parcels are located in the headwaters of Game Creek where the average precipitation is moderate at 20”/year and elevation range is 3,220ft. to 3,600ft. Precipitation occurs mainly as snow, and spring runoff is moderate on the principally north aspects of the project area The analysis area supports a mixed forest of mainly, Douglas-fir, ponderosa pine, western larch, lodgepole pine and spruce.

Existing Conditions- Water Resources

Existing Conditions- Water Quality and Sediment Delivery

Past management activities in the project area include timber harvest, road construction, fire suppression, mining, rural homes and subdivisions, grazing, and recreation. Streams in the project area were reviewed for channel stability and sediment sources. Donovan Creek, Dirty-Ike Creek, Arkansas Creek and Game Creek are not 303d listed impaired streams and all beneficial uses are currently supported, including fish and aquatic life. Yet there are cumulative effects to water quality within the project drainages that include, past timber harvest, old mining exploration, water diversions, grazing, housing developments, highways, forest roads, segments of poor road locations and substandard crossing sites.

The timber stands are dominated by mixed conifer forests that were largely initiated by fires. Timber harvests started in the late 1800's with mine exploration with some poor road locations and timber harvest practices. Mechanized operations occurred mainly from 1930-2010 and older operations had greater impacts prior to BMP adoption in 1988. There has been extensive past timber harvest on private, BLM, and State lands that has largely regenerated to young and intermediate conifer forests.

Sediments

Sediment surveys found a moderate direct and indirect impact of sediment sources from forest and mining roads in the analysis areas. Material quality is fair to good throughout the project areas as noted in the soil analysis. Portions of the lower Ashby and Arkansas existing haul roads cross fine textured soils on footslopes in the Potomac valley. Forest roads include segments that are steep and do not meet BMP's for adequate road surface drainage, principally at stream crossing locations noted in the following drainage descriptions. In a general framework, the potential for sediment risk increases with area in roads. Table WS-1 is a comparison of existing road densities throughout the analysis areas and displays a lower road density of roads /square mile on state trust land parcels within the project area than on adjacent lands, except for the Wallace Creek drainage.

Table WS-1 Comparison of Existing Road density within Analysis Areas

Analysis Area Drainages	Clark Fork River Donovan Creek	Clark Fork River Wallace Creek	Ashby Creek-Arkansas Creek	Lower Union Creek- Game Creek
Drainage Areas in Square Miles	46.2	49	24.8	21.5
Existing Road Miles/Sq. Miles on All Ownerships	5	4.3	6	10.8
Existing Road Miles/Sq. Miles on State Project Parcels	4.7	5.9	4.2	4.1
Estimates of road miles were based field reviews and ARC database files				

Donovan Creek- Donovan Creek is a narrow V shaped drainage with steep sideslopes and shallow soils with common rock outcrops. The valley bottom is narrow in the upper half on state trust land parcels within the project area and Donovan Creek opens into a wider alluvial valley in the lower half where home sites are located. Current dispersed sediment sources within the drainage are associated with forest roads, grazing and rural homes in the lower drainage. There are 3 state trust land parcels in the drainage (sections 2, 4 and 10, T12N, R17W) that are accessed from the Dirty-Ike road. Road density is moderate in these three parcels considering the slope steepness. Existing roads in section 2 mainly comply with BMP's, yet require road maintenance, and no direct sediment sources were found. Stream channel stability is excellent within the section. Within section 2 the main stream channel has Class 2 perennial flow that goes subsurface in a large talus/boulder field near the western section boundary and there is no sediment delivery to lower Donovan Creek.

Donovan Creek flows through the center of section 4 and the 200 acre state lads parcel. There is some minor grazing disturbance that appeared to be wildlife related. There is an old abandoned road that parallels the stream that is well vegetated and not a sediment source. Water quality within the section 4 project area adjacent to Donovan Creek is good and stream channel stability is excellent based on stream channel stability assessments. Lower Donovan Creek downstream of the project site has sediment impacts from grazing disturbance, home sites, road crossings and past historic timber management. Donovan Creek supports westslope cutthroat trout through the state trust lands in section 4 up to Section 3, T12N, R17W.The existing access road planned for hauling across adjacent Nature Conservancy lands in section 3, has several stream

crossings that have minor sediments that require some additional road surface drainage and maintenance grading. The section 10 parcel is located on a ridgeline that divides Donovan Creek and Dirty-Ike Creek. Roads are on steep grades and require surface drainage repairs to meet BMP's.

Wallace Creek -The project area within the Wallace Creek drainage includes Dirty-Ike Creek and the haul route to state trust land parcels in sections 12, 13, and 24, T12N, R17W. Current sediment sources within the drainage are associated with roads, abandoned mines, grazing, irrigation diversion of flow, and rural homes in the lower drainage. Abandoned mines and prospects are sources of heavy metals that have impacted stream water chemistry. The existing Dirty-Ike road parallels the stream that has several sediment sources from poor road surface drainage and 3 crossing sites on TNC land in section 15 that are sediment sources. Section 12 is accessed by a haul route to the north and down the Game Creek drainage to the Potomac valley. Section 12 existing roads meet BMP's and there are no stream crossings or sediment sources and road density is low. Sections 13 and 24 will be accessed from the Dirty-Ike road that crosses several intermittent streams on TNC lands. The road crossings meet BMP's, yet the roads require grading and maintenance.

Existing roads within sections 13 and 24 are steep, narrow and on a relatively high density from past mine exploration and logging within these parcels. Steep road grades up to 22% and unauthorized ATV trails have inadequate road surface drainage, are eroded and not safe for current logging practices. Two intermittent culvert sites are at risk of washout on the steepest road grade. The parcel is drained by an unnamed perennial stream that flows south to Wallace Creek and several intermittent draws. Small areas were disturbed along this stream by historic mine exploration from the 1900's and have since revegetated. The tributary stream is a B2 Rosgen Classification Stream channel stability for this tributary has returned to a good rating based on assessments, but there is still minor sediment runoff. This intermittent stream does not support fish.

Ashby Creek/Arkansas Creek-The Ashby Creek drainage includes the tributary Arkansas Creek where the proposed harvest units and existing haul roads are located. The state project parcels in sections W ½ 6 T12N, R16W and SE corner section 31, T13N R16W are located in the headwaters of Arkansas Creek that is tributary to Ashby Creek. The Arkansas haul route begins in lower Arkansas Creek and will also provide access over the Garnet Range divide to Wallace Creek section 12, T12N R17W. Road density is moderate within section 6, T12N R16W. No direct sediment sources were identified on the haul route, yet roads require maintenance repairs for road surface drainage to meet BMP's. Two miles of the lower Arkansas haul road were recently improved to meet BMP's.

Water quality within the section 6 project area adjacent to Arkansas Creek is good and stream channel stability is excellent based on sediment surveys and recent stream channel stability assessments. Downstream of the project site in section 6 there are moderate impacts to sediment from grazing disturbance, past historic timber management, mine exploration along Arkansas Creek , and irrigation diversions. The headwaters intermittent and perennial stream reaches adjacent to the proposed harvest areas within section 6 do not support fish based on DNRC shocking surveys. Westslope cutthroat trout do occur in the lower reaches of Arkansas Creek.

Lower Union Creek/Game Creek The state project section 36, T13N, R17W is located in the southwestern corner of the Lower Union Creek drainage that includes the tributary Game Creek, Blixit Creek and Norman Creek. The harvest units are located in Game Creek and existing haul roads pass through Game Creek, Blixit Creek and Arkansas Creek drainages to junction with the Arkansas haul road. Road density is moderate/high within section 36. Segments of the Game Creek access road require maintenance repairs for road surface drainage to meet BMP's. An abandoned road used for historic harvest and mine exploration parallels the stream and two crossing sites are minor chronic sources of sediment. Game Creek has perennial flow through the Section 36 parcel and water quality and stream channel stability is rated as good within the section 36 project area adjacent to Game Creek. Downstream of the project site in section 6 there are moderate impacts to sediment from grazing disturbance, past historic timber management, and mine exploration along Game Creek. The headwaters intermittent and perennial stream reaches adjacent to the proposed harvest areas

within section 36 do not support fish. Westslope cutthroat trout do occur in the lower reaches of Game Creek. There is partial diversion of flows for irrigation.

Additional sites were identified that that have dispersed road sediments from road surface drainage which is inadequate to meet BMP's. Maintenance needed includes cleaning of ditch relief culvert inlets and repairs or maintenance grading of road surface drainage features.

Avalanche hazard- Avalanches may occur where there are high snow concentrations in steep draws and conducive weather conditions. The area of primary concern for this project is Section 24, T12N R17W where a homeowner downslope of state lands expressed a concern for risk of avalanche damage. Avalanche risk increases with slope steepness and generally occurs on slopes > 35 degrees (70%) where there are deep snow accumulation, conducive weather conditions and a triggering disturbance (http://www.fsavalanche.org/). But just because a slope is steep enough, does not mean a snow pack will avalanche. This assessment will consider the two short steep draws that are upslope of the concerned homeowner. One draw is about 510 meters long of which less than 200 meters has slopes of 50 to 65% and no slope over 70%. The shorter draw has about 95 meters length of which about 30 meters is 40-60% slopes. Both of the draws are relatively small for snow accumulation and average snow depths are less than 2ft. depth based on weather records (NOAA 2015). Anchoring trees occur in both draws that would help intercept snow movement and there is no scarring or draw scour that indicates previous avalanches or snow movement that carried far enough to cause scouring in the draw.

Water Yield

Tree canopy reduction by timber harvest activities, tree mortality or wildfire can affect the timing of runoff, increase peak flows and increase the total annual water yield of a particular drainage, principally in areas with an average of 30 inches or more of annual precipitation. Moderate to high increases in water yield can increase stream channel scour and in-stream sediments that impact water quality and fish habitat, so we assessed stream channel conditions as part of the project analysis. Water yield can also decline based on forest canopy regrowth that increases precipitation interception and transpiration, which reduces runoff. Snowmelt in the project areas typically occurs early in April and prior to peak runoff in May from snowmelt in the basins. Snowmelt occurs first and is flashy on the more southerly aspects of Donovan, Dirty-Ike and Wallace Creeks. The more northerly forested aspects of Game Creek/Lower Union and Arkansas/Ashby Creek have considerably slower runoff. As noted in the soil analysis, soil infiltration rates generally exceed 6 inches/ hour and even in rapid snowmelt, surface runoff carries only a short distance before infiltrating into the soil. This low to moderate potential for runoff is reinforced by moderate precipitation in the area and estimates of Relative Effective Annual Precipitation (REAP) developed by the Montana Natural Resources Conservation Service (NRCS web reference 2015). REAP is an indicator of the amount of moisture available at a location taking into account precipitation, slope, aspect and soil properties and is displayed as a map layer (in project file). The REAP data and climate summary for the project area indicates that effective precipitation is at a deficit in the summer when transpiration exceeds precipitation. Areas of overstocked trees increase competition for limited soil moisture.

Historically, tree cover comprised about 65-80% of forest stands in combination with natural openings, talus area and areas in various successional stages after fires, as noted in the vegetation section description. Currently, older lodgepole pine and a portion of ponderosa pine that are dead, dying and at risk of mountain pine beetle mortality comprise 20-30% of the overall stand volume in proposed state lands harvest areas. Insect mortality may have resulted in a minor increase in water yield, but is unlikely to be measurable and would be within the range of natural conditions expected.

Stream channel conditions were reviewed near and below the proposed harvest areas using the USFS Stream Reach Inventory and Channel Stability Evaluation Procedure (Pfankuch, 1978) and the evaluation rated as good on all streams sites adjacent proposed harvest areas in 2015. Past riparian harvest has occurred in the area across ownerships and along all of the drainages, yet channel morphology is rated as fair to good with

extensive vegetation growth along the channels. Primary impacts to stream channel stability in the drainages are grazing and historic/legacy logging and mining disturbances from the 1900's. Past timber harvest was extensive, but has regenerated to sapling, pole and intermediate conifer stands that are largely overstocked. Channel stability is good through the state parcels in part due to the bedrock control of headwaters streams segments, the high amounts of vegetative recovery on channel banks. A comparison of past harvest areas on water yield effects and stream assessments reveals that water yield has had low to moderate impact on channel stability on the project section reaches.

Water yield is not considered constrained in the Wallace Creek and Dirty-Ike Creek drainages based on, field reviews, review of aerial photos, and stream channel stability ratings near the project sites. Wallace Creek has a mill pond up stream of the State project lands. Flow from the mill pond and the unnamed tributary that drains the state sections 13 and 24 are diverted for irrigation. Dirty-Ike Creek and part of Donovan Creek flows are also largely diverted for agricultural irrigation. Dirty-Ike Creek has Rosgen A and B channel types that are very rocky, stable and resilient to increased flows near the project sites and do not reflect channel effects from increased water yields. The project sites located in the headwaters of Game Creek and Arkansas Creek also have Rosgen A and B channel types that are rocky, stable and resilient to increased flows. Segments of Game Creek have been down cut by old mining explorations that has revegetated and largely stabilized. Areas of talus rock slides carry to the stream banks in parts of all analysis drainages near the project areas.

Groundwater Wells in Wallace Creek

There is a concern by adjacent landowner in section 24, T12N, R17W that their groundwater wells may have reduced flow from timber harvest or over-thinning of state lands that are up gradient of their wells. This analysis will qualitatively estimate surface water yield from the proposed harvest area to private lands downslope of the project that are north of Wallace Creek, and compare the properties of existing well depth, static water levels and well yields to determine potential effects to groundwater.

Rocky draws, short intermittent streams and one perennial unnamed tributary drain small, southerly aspect face drainage in sections 13 and 24, T12N, R17W that is considered the surface runoff delivery area to the homesites downslope. The average annual precipitation is 19 inches/year for this area based on weather records. The face drainage area is approximately 180 acres and the baseline water yield for this area is estimated as 58 acre feet from the area.

Well reports for 26 wells were reviewed (Ground Water Information Center- GWIC 2016) that are directly down gradient of the proposed timber harvest and thinning sites to compare well depth, static water levels and well yield. Bedrock geology in the area is complex and the direct sources of groundwater are unknown. Static water levels for seven wells from driller's logs had static water depths of 37 feet or less indicating the wells are possibly hydraulically connected to Wallace Creek flows. Static water levels of greater than 40 feet occurred with 18 wells located on footslope terrain above Wallace Creek, indicating that groundwater is not likely hydraulically connected to Wallace Creek.

One well was reported as dry and not developed. Total well depths varied from 60 feet near Wallace Creek to 244 feet depth. Low well yields of 1 to 5 gallons per minute (GPM), occurred in 8 wells. Static water levels ranged from 10 to 112 foot depth below surface elevations. The 8 wells had 66 to 200 feet of water depth above the bottom of the wells and were located on foot-slope terrain above Wallace Creek.

Moderate water production of 6 to 12 GPM well yield occurred in 4 wells that had 20 to 100 feet of static water depth above the bottom of the wells. The 8 wells had 66 to 200 feet of water depth above the bottom of the wells and were located on foot-slope terrain above Wallace Creek. Good water production of 15 to 40 GPM well yield occurred in 10 wells that had 15 to 230 feet of static water depth above the bottom of the wells. The number of homes and associated wells has increased substantially in the last 20 years within the Wallace Creek drainage and has increased demand on groundwater.

Environmental Effects

No Action Alternative: Direct, Indirect, and Cumulative Effects on Water Quality and Quantity

The No-Action Alternative is expected to result in similar moderate direct or indirect and cumulative effects to water quality or quantity as described under the existing conditions and is summarized in table WS-2. Segments of the existing haul roads do not meet BMP's for drainage, and there are moderate cumulative effects of sediment from roads, historic mining and grazing. Historic mining effects on sedimentation are a long term trending improvement as plants continue to revegetate past disturbances. Grazing effects would be expected to remain the same or slightly decline as grazing management improvements are made consistent with periodic grazing inspections. Sedimentation on segments of existing roads with inadequate surface drainage would continue to impact water quality unless remedial actions are taken, and any repairs would be completed over time based on priorities and limited funds.

The combination of overstocking, root diseases and insect mortality are leading to declining forest cover and vigor as noted in the vegetation analysis, and the reduced canopy would be expected to have a minor increase in runoff. There is a concern that without better tree spacing by harvest and thinning for fire protection, more extreme wildfire may occur in the Clinton area. Continued insect mortality or extreme wildfire may increase runoff and water yield relative to increasing canopy loss. There are low to moderate cumulative effects to water yield and sediments due to past harvest and fire.

Avalanche hazard- Under No-Action Alternative, steep draws have potential to concentrate snow and there is a low existing risk that in a high snowfall year, with rapid snowmelt and a triggering disturbance, a snow avalanche may occur in the headland of these short draws. If an avalanche occurred, it is not likely to be large or carry past anchor trees to the home-site that is located in the bottom of a draw downslope of state lands.

Surface water recharge to domestic wells- There would be no change from existing conditions where low water production wells of 1 to 5 gallons per minute may have gains or loss tied to groundwater flows or additional well drilling. Surface water recharge will vary with levels of precipitation, weather conditions and evapotranspiration. Low to moderate levels of insect mortality would have minor reductions in foliage cover and snow interception and negligible effects to water infiltration and runoff. Fire effects would depend on the area and severity of burn that would reduce canopy cover. A study by Stednik (1996) found that 15% or more of a watershed must burn to generate a hydrologic response. Low to moderate levels of fire severity would have moderate reductions in foliage cover and snow interception that may result in a 10 to 30% increase in water yield and moderate effects to water infiltration and runoff that would be considered within the range of natural occurrences. A reduction of conifer tree cover on a low precipitation Ponderosa Pine area using prescribed fire watershed scale near Whitehall (Tucker 2007) has shown to slight increase and elevated riparian groundwater levels. In the low probability of a high severity fire there would be high reductions in foliage cover and snow interception that may result in a 50 to 75% increase in water yield with above average effects to runoff that would be considered on the extreme range of natural occurrences.

Table WS-2 Summary Effects of the No- Action Alternative on Water Quality and Quantity

Water Quality & Quantity	Impact								Can Impact Be Mitigated ?
	Direct & Secondary				Cumulative				
	No	Low	Mod	High	No	Low	Mod	High	
No-Action									
Water Quality-Quantity Sediments			**X**				**X**		**NA**
Water Quantity			**X**				**X**		**NA**
Action									
Water Quality- Quantity Sediment Delivery			**X**				**X**		**Y**
Water Quantity			**X**				**X**		**Y**

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

Land management activities such as timber harvest and road construction could impact water quality primarily by accelerating sediment delivery to local stream channels. The primary risk to water quality from this project is sediment delivery at haul road stream crossings and a lesser risk from harvest units. Potential change in water yield is addressed under cumulative effects. Grazing effects would be expected to remain the same or slightly decline as grazing management improvements are made consistent with periodic grazing inspections.

Implementation of the Action Alternative is a combination of salvage harvest of dead, dying and high-risk trees to reduce competition, and group selection to promote regeneration of diverse conifer species for improved tree growth and more resistance to root rot. Approximately 1,989 acres would be harvested using a combination of cable logging and ground based skidding. In addition, 380 acres of overstocked young conifers would be pre-commercially thinned by hand crews or equipment in combination with harvest activities and would retain well stocked forest sites. The proposed thinning is expected to have negligible and likely no measurable impacts to water resources and water quality. The summary effects of the action alternative on water quality and quantity are noted in Table WS-2.

Sediments There is low potential for off-site erosion from the harvest areas based on the buffer distances to streams, high rock content soils and rapid water infiltration rates that exceed most runoff events. All harvest operations are designed to minimize surface disturbance and potential for erosion and sediment delivery by implementing adequate stream and wetland buffers and would provide adequate protection of water quality. SMZ's vary from 50 feet -100 feet from a stream.

Riparian Management Zones (RMZ) would be designated for stream protection where harvest units are adjacent to the class 1 streams Game Creek, Donovan Creek and Arkansas Creek (see table WS-4). Within section 2, T12N, R17W Upper Donovan Creek has Class 2 perennial flow that sinks subsurface in a large talus slide, thus would not affect water quality lower in the Donovan Creek watershed. The RMZ distance is based on stand potential tree height that varies from 90 to 105 feet adjacent to Class 1 streams. As a conservative approach, and for ease of layout, all RMZ protective widths were set at 105 feet where proposed harvest units would be adjacent to Class 1 streams. No harvest would occur within 50 feet of a Class 1 fishery stream and all RMZ harvest is planned for low disturbance cable harvest.

Selection harvest would occur within the 50-105 foot RMZ of Donovan Creek, Game Creek and Arkansas Creek. Selection harvest would retain 50% or more representative trees greater than or equal to 8"dbh and retain submerchantable trees to the fullest extent possible in the RMZ.

Table WS-4 Proposed Riparian Management Zone Harvest				
Legal	**Stream Name**	**Fish Presence**	**Lineal feet RMZ Harvest**	**Acres RMZ Harvest**
Section 6 T12N,R16W	Donovan Creek	Fish Bearing Stream Segment	Up to 3,500 ft. in the strip 50-105' from stream banks	4.4 acres
E ½ Section 4 T12N,R17W	Unnamed trib to Arkansas Creek	Non-fish Bearing Stream Segment	Up to 2,000 ft strip 50-105' from both stream banks	5 acres
Section 36 T13N, R17W	Game Creek	Non-fish Bearing Stream Segment	Up to 3,000 ft. in the strip 50-105' from both stream banks	7.6 acres

The Riparian Management Zones proposed for harvest have well established vegetative buffers, and there is low risk of sedimentation to surface waters from the proposed harvest operations, based on implementation of BMP's and RMZ's to protect water quality (DNRC 2012). Sediment trapping research (Lakel et. al. 2010) on the effectiveness of stream buffers, found that > 97% of erosion was trapped by vegetation prior to entering streams for SMZ's of 25ft or more.

Roads- Implementation of the Action Alternative would use 55 miles of existing haul roads across multiple ownerships, and road drainage would be improved or maintained to comply with BMP's and improve water quality. Extensive planning was completed to optimize use of existing roads and minimize the extent of new roads. The proposed project (which includes multiple timber sales) could construct about 7 miles of new road, including relocations and connecting roads to improve the transportation routes. All new roads would be located on mid to upper side-slopes that are stable and away from surface waters and planned to minimize stream crossings.

Up to one half mile of short temporary spur roads may be used and would be stabilized after use. Stabilization and reclamation would occur on about 1.7 miles of road adjacent to Game Creek and a steep road in the Wallace Creek drainage. Approximately 8.1 miles of old roads would be abandoned with drainage installed where needed and the roads removed from the transportation system to reduce haul road density and maintenance.

One stream crossing would be removed in Game Creek and a ford site would be improved with a culvert crossing to meet BMP's. Undersized culvert crossings on Game Creek in Section 30 T13N R16W and Arkansas Creek Section 33, T13N, R16W would be replaced in combination with the timber project and road infrastructure improvements. All requirements of 124 stream permits, BMP's and erosion control measures would be implemented at the proposed culvert sites to minimize erosion and sediments. There would be short term sediment increases during stream crossing replacements that would result in long term sediment reductions. DNRC turbidity sampling on streams below construction sites, found short duration sediment spikes occurred and quickly declined the same day as operations. All new access routes on state lands would be gated or closed to year round use, which would reduce road damages and sedimentation and there would be no change in open road access. A complete list of mitigations is attached.

Refer to Table WS-5 for a comparison of changes in road density associated with this project. In the Donovan Creek drainage 1.2 miles would be added to connect the main haul roads to the Ashby/Potomac road system for improved haul routes. New roads and abandonment would result in a 0.3/sq. mi. increase in roads.
In the Wallace Creek/Dirty-Ike Creek drainage 2.7 miles would be added to connect the main haul roads to the Ashby/Potomac road system for improved haul routes. New roads and abandonment would result in a 1.2 mile decrease in roads.

The Ashby Creek/Arkansas Creek drainage has 6 mi. /sq. mi. across ownerships compared to 4.2 mi. /sq. mi. on the state project parcels. 1.9 miles of new road would be added to this road system to connect the main haul roads between Donovan Creek and Ashby/Potomac road system for improved haul routes.

The Lower Union Creek/Game Creek drainage had the highest road density across ownerships @ 10.8 mi. /sq. mi compared to 4.1 mi. /sq. mi. on the state project parcels. New roads and abandonment would result in a 1.2 mile decrease in roads that includes reclamation of .9 miles of road adjacent to Game Creek that will be a net improvement to water quality.

Table WS-5 Comparison of Changes in Road density with Action Alternative

Analysis Area Drainages	Clark Fork River Donovan Creek	Clark Fork River Wallace Creek	Ashby Creek-Arkansas Creek	Lower Union Creek- Game Creek
Existing Road Miles/Sq. Miles on All Ownerships	5	4.3	6	10.8
Existing Road Miles/Sq. Miles on State Project Parcels	4.7	5.9	4.2	4.1
Project New Roads Miles & Relocations	1.2	2.7	2.0	1.1
Project Road Miles Abandon and Reclaim	0.7	5.9	0	3.3
Net Road Density Miles/Sq. Mi. on State Project Parcels	5.0	4.7	6.1	2.9
Net Change in road miles on project sections	+ 0.3	- 1.2	+ 1.9	-1.2
Estimates of road miles were based field reviews and ARC database files				

All new roads would be grass seeded with site adapted grass to speed revegetation and control erosion and weeds. On the existing haul roads, road maintenance and site specific road reconstruction requirements including culvert cleaning, additional rock armor and sediment control at crossings would be implemented to improve road drainage and reduce potential sediments on existing stream crossing sites.

In summary, there would be reductions in sediments for road repairs and maintenance that would result in long term reductions in sedimentation and overall low to moderate direct and in-direct downstream effects on water quality in these resilient streams.

Harvest Effects to Avalanche hazard- Under the Action Alternative, there is no harvest proposed directly above the homes for 100- 200 ft. and harvest further upslope in the draws would be moderate removal of dead, dying and overstocked trees that would retain 35 to 60% of existing forest crown cover and promote healthy tree stands. There is low potential for increased direct, indirect or cumulative avalanche risk with the proposed harvest based on moderate slopes, anchor trees in draws, moderate harvest, no over thinning and no previous indications of avalanche damage.

Harvest effects to Surface water recharge to domestic wells- The risk of harvest effects changes to water yield that may affect well water production focuses on the face drainage in sections 13, 24 T12N R17W that is upslope of concerned homeowners. Soils are shallow to deep, extremely gravelly loams with high rock contents and rapid surface infiltration rates that exceed precipitation rates and surface runoff is uncommon except on roads and bare areas. Several rocky draws exhibit no sign of surface water flow. The face drainage area is approximately 180 acres and the estimated water yield for this area is estimated as 58 acre feet from the area. The proposed harvest is about 34 acres of moderate intensity harvest and thinning that may make a

minor increase of up to 4 acre feet (a 7% increase) in water yield that is to be within the range of natural conditions such as moderate fire. This slight increase in downslope water yield from the proposed harvest area may slightly increase recharge, but is unlikely to be measurable or have adverse direct, indirect or cumulative effects to groundwater recharge to the wells on downslope adjacent properties.

Cumulative Effects & Water Yield

For this project DNRC determined (per ARM 36.11.423) there was a moderate allowable threshold for increased water yield in the project watersheds to ensure compliance with water quality standards. There is moderate risk of low additive cumulative effect to water quality or water yield for the proposed alternative based on mainly moderate harvest intensity and thinning coupled with new road construction, road abandonment and repairs to improve water quality. The proposed harvest is estimated to produce low levels of water yield increases (less than 5%) and is unlikely to have an adverse effect on stream channel stability or water quality based on the following reasons;

1) The proposed harvest and thinning is well distributed across watersheds as less than 2% of the Donovan Creek drainage, 1.4% of the Wallace Creek drainage, 1.3% of the Lower Union Creek/Game Creek drainage and less than 1.8% of the Ashby Creek/Arkansas Creek drainage. Operations would occur over the duration of the proposed project (2016-2023) based on the roads needed for each proposed timber sale.

2) Removal of dead and dying trees would not measurably contribute to interception or transpiration that is proposed on approximately 20% of the harvest area.

3) The project areas include multi-story forest stands that are generally well regenerated and overstocked with young trees.

4) The proposed moderate intensity, mainly selective and shelterwood harvests would remove stagnant trees and promote codominant and understory trees that use water more efficiently.

5) The harvest units are on moderate precipitation sites of 18” to 25” annual precipitation, where evapotranspiration and soil infiltration rates exceed precipitation levels and surface runoff would be low, except on bare soils or roads. The REAP data and climate summary for the project area indicates that effective precipitation is at a deficit in the summer when transpiration exceeds precipitation.

6) The proposed precommercial thinning would thin overstocked trees of up to 1,000 stems/acre to a spacing of 200-300 stems/acre. Thinning would also reduce competition and promote faster growth and improved water efficiency in the retained trees with no measurable change in water yield.

7) Parent materials in streams adjacent to harvest areas are stable with high rock contents, and reflect resilient stream channel morphology. The minor change in water yields is unlikely to cause a perceptible change to the stream channel stability or cause adverse impacts to channel forms in or directly below the project sections. Over time, the expected improved growth of retained trees and regeneration of more disease tolerant trees should improve stand cover and vigor and further reduce any water yield effects.

Research has shown that water yield is not likely detectable for low precipitation levels of less than 20 inches annually, even with aggressive harvests and extensive canopy removal (MacDonald & Stednick. 2003, Romme et.al.2006).This proposal would involve moderate intensity harvesting and thinning mainly in the 18 to 25 inch precipitation zones well distributed over four watersheds.

The proposed actions would implement BMP’s, rules and permit requirements including listed mitigation measures, repair and stabilization of sediment sources, and reduce total roads. Transportation planning would minimize roads and locate new roads well away from water. There would be a minor net reduction in roads with the abandonment of legacy roads and reclamation of high sediment risk roads adjacent to Arkansas

Creek. For all these reasons, there would be low adverse cumulative effects to water quality or increased water yield that may cause a potential change in stream channel forms or flow regimes.

Fisheries Analysis Methods and Areas

This analysis will consider the presence of fish and potential effects of the proposed harvest and use of roads on fisheries resources. Fish presence or absence will be based on MTFWP MFISH data as of 2015, and field reviews of the potentially affected streams and access road stream crossing sites on the proposed haul routes. Four analysis areas that contain distinct fisheries distributions were initially identified in order to evaluate the existing and potential impacts to fisheries related to the project area. The analysis areas include the 6th code HUC scale or smaller watershed boundaries of Donovan Creek, Dirty-Ike Creek, Arkansas Creek and Game Creek which are Class 1 fish bearing streams that may be affected by the proposed actions (refer to Water Resources map WS-1). Wallace Creek flow is diverted for irrigation and does not support fish in the state project parcel due to historic mine contaminants of copper and heavy metals and will be dismissed from further fishery analysis.

Sediment delivery effects to streams and water quality will follow the same analysis as in the water resources report. Sediment will be qualitatively assessed as the potential sediment delivery to fish bearings streams at stream crossings, access roads within the riparian area and on locations that are downslope of harvest areas or areas of soil disturbance.

Riparian Large Woody Debris and Stream Shading- Riparian large woody debris and stream shading concerns and analysis will be limited to the perennial fish bearing stream segment of Donovan Creek in section 4, T12N, R17W where selective riparian management harvest is proposed. These issues will be qualitatively addressed with the measurement criteria of extent of stream shading and retention of snags that may fall and be recruitable to stream channels where the large woody debris may support fish habitat diversity.

Fish Habitat Connectivity- The connectivity of stream habitat for fish through stream crossing structures can be restricted by flows or crossing design. This issue will be qualitatively addressed based on fish passage surveys.

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 analysis areas are determined by assessing the collective anticipated direct and indirect impacts, other related existing actions, and future actions affecting the fisheries resources.

Regulatory Framework

The following plans, rules, and practices have guided this projects planning and/or will be implemented during project activities. Additional details on these regulations, water quality standards, and beneficial uses please refer to the Water Resources analysis for this project.

All applicable Best Management Practices, State Forest Land Management rules and regulations, and measures outlined in the DNRC Habitat Conservation Plan (HCP) would be implemented. This includes, but is not limited to Fisheries considerations (ARM 36.11.427, 36.11.404-and 36.11.428) for endangered and sensitive species to minimize impacts to fish populations and habitat. DNRC is a cooperator and signator to the Conservation Strategies and Restoration Plans for Bull Trout and Westslope cutthroat trout. The surface waters in the analysis areas are classified as B-1 in the Montana Surface Water Quality Standards (ARM 17.30.610).

DNRC Forest Management Rules and Habitat Conservation Plan
All applicable State Forest Land Management rules and regulations regarding watershed and fisheries management would be followed. This includes, but is not limited to rules listed for water quality (ARM 36.11.422), cumulative effects (36.11.423) Riparian Management Zones (RMZ) (ARM 36.11.425), Fisheries (ARM 36.11.427) and Conservation Strategies outlined in the DNRC Habitat Conservation Plan (HCP 2011) where applicable. As part of ARM 36.11.427(3)(a)(i) and (iv) and ARM 36.11.436, DNRC is committed to designing forest management activities to protect and maintain bull trout, westslope cutthroat trout and all other sensitive fish and aquatic species as noted in the fisheries assessment. Donovan Creek, Dirty Ike Creek and Arkansas Creek are Class 1 fish bearing streams within the project watersheds.

The HCP requires designation of a Riparian Management Zone along Class 1 fisheries streams based on stand potential tree height and no-harvest within 50 feet of a class 1 fisheries streams.

Existing Conditions- Fisheries

Fish Presence/Absence
Fish presence or absence within the analysis areas are presented in Table FS-1 and based on MTFWP MFISH data and field reviews of the potentially affected streams and access road stream crossing sites on the proposed haul routes. No Bull trout habitat is identified on streams (MFISH 2015) in the project sections or along the proposed access roads or crossing sites.

Donovan Creek, Dirty-Ike Creek Game Creek and Arkansas Creek are Class 1 fisheries streams that may be affected by the proposed actions (refer to Fish Presence table FS-1). Donovan Creek supports fish from the mouth at the Clark Fork River up through the state parcel in section 4 and Section 3 T12N, R17W. Class 2 streams in the headwaters of upper Donovan Creek drainage Section 2, T12N, R17W do not support fish because upper Donovan Creek streamflow sinks subsurface into a 1/3 mile long talus slope and resurfaces downslope in section 3. Therefore all fisheries analysis for Donovan Creek will be limited to the stream segment flowing through Section 4 and the planned access roads that connect to the proposed harvest areas. The segments of Arkansas Creek and Game Creek where RMZ harvest is proposed are not fish bearing based on stream shocking surveys (DNRC 2012).

Table Fish-1 Current & Historic Fish Species Distribution within the Watershed Analysis Areas

	Donovan Creek 0-3.9 miles	**Dirty Ike Creek 0-3.0 miles.**	**Game Creek 0-3.6 miles**	**Arkansas Creek 0-5.4 miles**
Species Name	**Abundance**	**Abundance**	**Abundance**	**Abundance**
Westslope Cutthroat Trout- Native	Found- No estimates	Abundant	Abundant	Rare
Brook Trout Non Native	Found- No estimates	None	None	Rare
Rainbow Trout Non Native	Found- No estimates	None	None	None
	Reduced flows from irrigation in lower 2 miles	Reduced flows from irrigation in 1st mile	Irrigation Periodic Dewatering in lower 2 miles	Irrigation Periodic Dewatering in lower 2 miles

Sediment There are moderate direct and indirect impacts of sediments to water quality in the project area. Donovan Creek and Dirty-Ike Creek are not listed as impaired streams and beneficial uses are currently supported, including fish and aquatic life. The lower 4 miles of Donovan Creek have well sustained flow and support westslope cutthroat trout, brook trout and rainbow trout. Donovan Creek flows through state land at about 3-3.5 mile length. There is an existing abandoned road in the state parcel that is stable and not a sediment source. Channel banks are stable and well vegetated. There is minor grazing disturbance. Donovan section 4 T12N, R17W is accessed by the Dirty-Ike Road that parallels Dirty-Ike Creek in the lower 2 miles of the stream. Dirty- Ike Creek is 6 miles in length, but has sustained connected flow principally in the first 3 miles to the mouth. The lower Dirty-Ike Road is a steep road in a narrow canyon that has inadequate road surface drainage and direct delivery of sediment at 3 crossing sites. The road is always open to traffic and rarely maintained. The Dirty-Ike Road climbs over the divide to Donovan Creek Section 4 and 3. There are two existing stream crossings in the headwaters of Section 3 on The Nature Conservancy Lands that are not fish bearing crossings. This upper road system has dispersed sediment but only minor points of sediment delivery and requires maintenance grading to meet BMP's.

The proposed harvest units in the headwaters of Dirty-Ike Creek section 12, T12N, R17W and Arkansas Creek section 6, T12N, R16W are accessed over the Garnet Range divide from the Arkansas Creek Road. There are no perennial fish bearing stream crossings or direct sediment sources to streams on this haul road. Roads require maintenance grading and additional drain-dips to meet BMP's. Within section 6, T12N, R16W, Arkansas Creek channel banks are stable and well vegetated. There is moderate grazing disturbance below the project area.

The proposed harvest units in the headwaters of Game Creek section 36 T13N, R17W are accessed from the lower foothills road that crosses Arkansas Creek in section 33 T13N, R16W. The Arkansas Creek crossing (fish bearing site) is undersized and is a minor source of sediment from road drainage and cattle use. From the Arkansas crossing the access route crosses Blixit Creek (not fish bearing) then across Game Creek (fish bearing site) in section 30, T13N, R16W to climb southwest to the Game Creek harvest areas in section 36, T13N, R17W. The streams within Game Creek section 36 are not fish bearing based on DNRC fish shocking survey and crossing site evaluations, but several roads are poorly located and sources of direct sediment delivery to upper Game Creek. Within section 36, there is a draw bottom road adjacent to Game Creek and two relic crossing sites that are sediment sources. Within the project area, Game Creek channel banks are stable and well vegetated, except at the two relic crossing sites.

Riparian Large Woody Debris and Stream Shading- Large woody debris and snags within Streamside Management Zones (SMZs) and RMZ's provide stream stability and habitat diversity for fish and aquatic life. The stream banks and RMZ of Donovan Creek is well vegetated with riparian shrubs and well distributed mature overstory conifers. An RMZ buffer distance of 105 feet was determined for this site. There was previous selective harvest of riparian trees over 40 years ago maintaining adequate vegetative shading near streams helps to moderate stream temperatures. There are low impacts to riparian large woody debris and stream shading in the Donovan Creek project parcel.

Fish Habitat Connectivity- Donovan Creek, Dirty-Ike Creek, Game Creek and Arkansas Creek all have reduced flows due to irrigation diversions in the lower stream reaches that limits habitat connectivity during summer months on low precipitation years. DNRC fish passage surveys were completed for all fish bearing stream crossings along the proposed haul routes. The surveys identified crossings that may limit fish passage of all fish life stages and the limiting sites are listed in table FS-2. On the proposed haul routes, there are five culvert crossings that are partially limiting connectivity for westslope cutthroat trout.

Table FS-2 Road Crossings of Fisheries Streams that restrict habitat connectivity			
Stream Name	**Number of Haul Road Crossings**	**Fish Connectivity Restriction**	**Sediment Source**
Arkansas Creek	1 on State Land	Restricts juvenile trout	Road Surface does not meet BMP's and maintenance repairs planned in 2016.
Game Creek	1 on State Land	Restricts juvenile trout	Road Surface meets BMP's
Dirty Ike Creek	3 on TNC Lands	Restricts juvenile trout	Road surface does not meet BMP's Partial Plug

Riparian Large Woody Debris and Stream Shading- Large woody debris and snags within Streamside Management Zones (SMZs) and RMZ's provide stream stability and habitat diversity for fish and aquatic life. Maintaining adequate vegetative shading near streams helps to moderate stream temperatures. There was previous selective harvest of riparian trees over 40 years ago along segments of Donovan Creek that flow through section 4, T12N, R17W. The stream banks and RMZ of Donovan Creek are well vegetated with riparian shrubs and well distributed mature overstory conifers. An RMZ duffer distance of 105 feet was determined for this site.

Fishery Resources - Environmental Effects

No Action Alternative: Direct, Indirect, and Cumulative Effects

Implementation of the No-Action Alternative would result in no additive fisheries resource impacts in the project area and effects would remain similar to those described in the existing conditions and displayed in table FS-3. There are moderate cumulative effects to fisheries from road sediments, reduced flows from irrigation and drought periods and crossing limitations to fish passage would.

Water Quality & Quantity	**Impact**								**Can Impact Be Mitigated ?**
	Direct & Secondary				**Cumulative**				
	No	Low	Mod	High	No	Low	Mod	High	
No-Action									
Water Quality-Quantity Sediments			**X**				**X**		
Large Woody debris & Stream Shading		**X**				**X**			
Fish Habitat Connectivity			**X**				**X**		
Action									
Water Quality- Quantity Sediment Delivery			**X**				**X**		**Y**
Large Woody debris & Stream Shading		**X**				**X**			**Y**
Fish Habitat Connectivity		**X**				**X**			**Y**

Action Alternative: Direct, Indirect, and Cumulative Effects

Implementation of the Action Alternative would be a combination of improvement and salvage harvest of dead, dying and high-risk trees and thinning to reduce competition and improve growth of diverse tree species. The proposed harvest is moderate intensity harvest on 1,989 acres and thinning of 380 acres and maintains all riparian buffers on the project parcels outlined on Watershed Map WS-1.

Selection harvest would occur within the 50-105 foot RMZ of Donovan Creek, Game Creek and Arkansas Creek. The segment of Arkansas Creek and Game Creek where RMZ harvest is proposed is not fish bearing based on stream shocking surveys (DNRC 2012). Selection harvest would retain 50% or more of representative trees in the RMZ. All harvest operations are designed to minimize surface disturbance and potential for erosion and sediment delivery by implementing adequate stream and wetland buffers.

Sediment Delivery The primary risk to water quality is expected to be sediment delivery at crossings, since plans are to maintain adequate stream buffers from harvest units. Implementation of the Action Alternative would utilize 55 miles of existing haul roads across multiple ownerships. On existing roads, road maintenance, site specific road reconstruction requirements and all BMP's would be implemented to improve road drainage and control erosion. Site specific road reconstruction requirements include culvert cleaning, additional rock armor and sediment control at crossings to reduce potential sediments and improve water quality.

Approximately 7 miles of new road would be constructed away from streams with 2 new crossings on intermittent, non-fish bearing streams. No new road crossings would be constructed on Class 1 fish bearing streams. Undersized culvert crossings would be planned for replacement on Game Creek, Arkansas Creek, and Dirty-Ike Creek as described in the habitat connectivity section below. One stream crossing would be removed in Game Creek and a ford site would be improved with a culvert crossing to meet BMP's. During stream crossing replacements there would be short term spikes in sediments with moderate direct and in-direct downstream effects on water quality that would quickly subside the same day as operations, based on DNRC monitoring of turbidity during crossing constructions. All requirements of the 124 stream permits, BMP's and erosion control measures would be implemented, at the proposed culvert sites to minimize erosion and sediments.

All new roads would be grass seeded with site adapted grass to speed revegetation to control erosion and sedimentation. Road maintenance and repairs would likely result in short duration, low levels of sedimentation that would quickly subside and result in a long term reduction in existing sediments compared to no-action. There is low potential for off-site sediment delivery to fish bearing streams from proposed new road construction and harvest. There would be reductions in sediments for site specific road repairs and maintenance that would result in long term reductions in sedimentation and overall water quality improvements to streams.

In summary, for all the reasons described, the proposed project has overall low additive direct or indirect impacts to fisheries based on the following: no harvest within 50 feet of Class 1 fishery streams, moderate harvest with cable harvest away from streams, stream channel conditions are stable and resilient, road construction on dry sites with no new stream crossings of fish bearing streams, sediments from road repair would be short duration and quickly subside to lower levels than no-action, implementation of BMP's applicable rules and attached mitigations on roads would reduce sediments.

Riparian Large Woody Debris and Stream Shading- DNRC would designate a Riparian Management Zone (RMZ) width of 105 feet buffer along a fish bearing reach of the Class 1 stream segments of Donovan Creek in the state parcel Section 4, T12N, R17W. No harvest would occur within 50 feet of the Class 1 fisheries streams to limit sediments. The combination of no harvest in the first 50 feet adjacent to Donovan Creek and retention of 50% or more of representative trees in the outside 50 to 105 foot RMZ would maintain adequate stream shading and recruitable large woody debris to support channel forms and habitat. There would be low potential for changes in stream temperature with the limited change in tree canopy and stream shading. All RMZ harvest is planned for low disturbance cable harvest.

Fish Habitat Connectivity- Effects No new stream crossings are proposed on Class 1 fish- bearing streams. Undersized culvert crossings on Game Creek in Section 30 T13N, R16W and Arkansas Creek Section 33, T13N, R16W would be replaced in combination the with timber sale, or as road infrastructure funding becomes available. DNRC would cooperate with The Nature Conservancy to assist in the planned replacement of two

crossings that partially limit fish passage and are undersized on the Dirty-Ike Road access route that are within Section 15 T12N, R17W. One crossing on Dirty-Ike Creek would not be replaced. The proposed crossing replacements on fish bearing streams would improve fish habitat connectivity.

Action Alternative: Cumulative Effects

There would be an overall low risk of additional cumulative impacts to fisheries with the proposed timber harvest and road construction due to the following reasons;
Combined mitigation measures for moderate levels of selection harvest and thinning as well as harvest planning and location of units would be directed at minimizing soil disturbance to prevent erosion and potential sedimentation to streams.

The moderate levels of selection harvest and thinning that would maintain well forested stands and well distributed harvest locations on well drained sites with moderate precipitation, present low risk of cumulative watershed effects from increased surface runoff or water yields that may affect flow regimes or channel conditions as a result of this project.

As detailed in the water resources section, existing road drainage within the project parcels and haul routes would be improved to comply with BMP's, with an emphasis on sediment control at existing stream crossings. Extensive roads that are not needed would be abandoned and identified roads that are sediment sources would be stabilized to improve water quality. The proposed new roads are located well away from streams. No new stream crossings are proposed on fish bearing streams. Replacement of fish passage limiting culverts would improve fish habitat connectivity.

Additional road closures would be installed where needed so there would be no net increase in open roads or travel that may affect sedimentation. Road drainage would be improved by maintenance and repairs on 55 miles of roads. For all these reasons there is low risk of cumulative effect to fisheries from the proposed actions.

Water Quality & Fishery Resource Mitigations

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

- DNRC would implement all applicable Best Management Practices (BMP's), Montana Administrative Rules for Forest Management, and reasonable mitigation and erosion control practices during timber harvest, road maintenance, and road construction and road use activities. The commitments of the DNRC Habitat Conservation Plan (HCP) would be implemented on the applicable parcels.

- DNRC would locate, clearly mark and maintain suitable water resource protection boundaries including Streamside Management Zones (SMZ's), Riparian Management Zones (RMZ's) and Wetland Management Zones (WMZ's) adjacent to streams and wetlands consistent with State Forest Land Management Rules. DNRC has determined a 105 ft. RMZ width for harvest units adjacent to Class 1 stream segments on Donovan Creek and Arkansas Creek. DNRC would maintain a 50ft. no-harvest buffer within the Class 1 RMZ's.

- DNRC would retain trees in the RMZ'S and SMZ's that meet the minimum tree retention requirements of the SMZ Law.

- Mitigations to reduce soil impacts and control erosion on skid trails and cable corridors would be implemented to protect water quality including limiting harvest and hauling operations to periods when

soils are relatively dry, (less than 20%), frozen or snow covered to minimize soil compaction and rutting, and maintain drainage features.

- Existing and new roads would be maintained concurrently in association with the harvest and road use activities. Road improvements would include surface blading, rock armor culvert inlets, and installation of road drainage features where needed to prevent surface erosion and sediment delivery to streams as needed to comply with BMP'S, and to protect water quality.

- All culvert replacements would be completed in accordance with all BMP's and FWP 124 stream permit requirements. Replacement stream crossings on fish bearing streams would be constructed to provide adequate passage of fish with minimum impact to water quality. Site specific erosion control measures including slash filters, and grass seeding would be implemented during culvert replacements and perennial flows would be diverted from the culvert during construction.

- New road construction, including drainage features should be completed in the summer or fall prior to freeze-up or periods of expected high rainfall.

- All newly disturbed soils on road cuts and fills would be promptly reseeded to site adapted grasses to reduce erosion/sediment from roads.

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Attachment E – Wildlife Analysis

Dirty Donovan – Wildlife Analysis

Analysis Prepared By:

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Introduction

The following sections disclose the anticipated direct, indirect, and cumulative effects to wildlife resources from the proposed action in the project area and cumulative-effects analysis areas described for each resource category. Past and ongoing activities on all ownerships, as well as planned future agency actions, have been taken into account in each cumulative-effects analysis for each resource topic.

Issues

- Proposed activities could alter mature forested habitats and/or landscape connectivity, which could affect species that rely on these mature forested habitats, and/or alter connectivity and the ability of wildlife requiring corridors to move through the landscape.
- Proposed activities could alter cover, reduce secure areas, and increase access, which could affect grizzly bears by displacing them from important habitats and/or increasing risk to bears of human-caused mortality.
- Proposed activities could negatively affect Canada lynx by altering lynx winter foraging habitat, summer foraging habitat, and other suitable habitat, rendering these habitats unsuitable for supporting lynx.
- Proposed activities could negatively affect bald eagles by reducing nesting and perching structures and/or disturbing nesting bald eagles.
- Proposed activities could reduce the amount and/or quality of fisher habitats, which could alter fisher use of the area.
- Proposed activities may alter flammulated owl habitat by reducing canopy closure and increasing tree spacing, and could remove snags needed by flammulated owls for nesting.
- Proposed activities could displace gray wolves from important habitats, particularly denning and rendezvous sites, and/or alter prey availability.
- Proposed activities could reduce suitable nesting and foraging habitat for pileated woodpeckers, which could alter pileated woodpecker use of the area.
- Proposed activities could remove forest cover on big game winter range, which could reduce the carrying capacity of the winter range.
- Proposed activities could remove big game security cover, which could affect hunter opportunity and local quality of recreational hunting.

Regulatory Framework

Various legal documents dictate or recommend management direction for terrestrial wildlife species and their habitats on state trust lands. The documents most pertinent to this project include DNRC Forest Management Rules, the Endangered Species Act, the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act.

Analysis Areas

The discussions of existing conditions and environmental effects within each subsection pertain to land areas of 2 different scales. The first scale of analysis is the Project Area (4,523 acres), which includes DNRC-managed lands in sections 2, 4, 10, 12, 13, and 24 in T12N, R17W; section 6 in T12N R16W, section 36 in T13N R17W, and section 31 in T13N, R16W where activities are being proposed. The second scale is the cumulative-effects analysis area, which refers to a broader surrounding landscape useful for assessing cumulative effects to wildlife and habitat. For this proposed project, two distinct cumulative-effects analysis areas were identified. The first cumulative effects analysis area includes the project area and those lands within 1 mile of the project area (18,555 acres). This area includes 8,505 acres (46%) that are managed by DNRC, 6,264 acres (34%) managed by The Nature Conservancy (TNC), 218 acres (1%) managed by the Bureau of Land Management (BLM), and 3,568 acres (19%) that are privately owned. The second cumulative effects analysis area is approximately 44,589 acres and includes the portion of the Garnet mountain range north of the Clark Fork River between Kendall Creek on the west and Ryan Creek on the east. This cumulative effects analysis area contains sizeable areas managed by the DNRC (14,408 acres, 32%) and TNC (16,314 acres, 37%) as well as a large component of privately-owned (13,074 acres, 29%) lands, with smaller amounts managed by the BLM, USFS, and MT Fish, Wildlife, and Parks.

Analysis Methods

Analysis methods are based on DNRC State Forest Land Management Rules, which are 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 other professionals.

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 Dept. of Fish Wildlife and Parks (DFWP).

Coarse Filter Wildlife Analysis

Issue

Proposed activities could alter mature forested habitats and/or landscape connectivity, which could affect species that rely on these mature forested habitats, and/or alter connectivity and the ability of wildlife requiring corridors to move through the landscape.

Introduction

A variety of wildlife species rely on mature to old stands for some or all life requirements. Mature forests, generally characterized by abundant large diameter trees and dense canopy cover, play an important role in providing food, shelter, breeding sites, resting areas, and/or travel corridors for certain animals. Wildlife use of older, mature forests is species-specific; some species use this habitat exclusively, other species only

temporarily or seasonally, and some species avoid mature forests altogether. Several species known to be strongly associated with mature and old forests include American marten (*Martes americana*), northern goshawk (*Accipter gentilis*), and winter wrens (*Troglodytes troglodytes*).

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

Analysis Area
Direct and indirect effects were analyzed for activities conducted in the 4,523-acre project area. Cumulative effects were analyzed on a 44,589-acre area described above in the Analysis Areas portion of this analysis. This scale of analysis would be large enough to support a diversity of species that use mature forested habitats and/or require connected forested habitats.

Affected Environment
The project area currently contains approximately 2,512 acres (56% of project area) of mature stands (100-plus years in age) of Douglas-fir, western larch, ponderosa pine, and lodgepole pine stands that have a reasonably closed canopy. Up to 5 stands in the project area meet the definition of Old Growth as defined by Green et al. (1992) and cover an area of 150 acres (see Vegetation section for additional details). Currently, forested areas cover most of the project area, facilitating some use by those species requiring connected-forested conditions and/or forested-interior habitats.

Roughly 7,886 acres of mature stands of Douglas-fir, western larch, ponderosa pine, and lodgepole pine exist on DNRC-managed lands within the cumulative effects analysis area. A portion of the 7,026 acres (23% non-DNRC lands) of forested habitats and some of the 6,588 acres of moderately stocked forested stands (22% non-DNRC lands) on other ownerships in the cumulative effects analysis area are likely also providing habitat for those species requiring mature, forested habitats and/or forested connectivity. Conversely, much of the 16,351 acres (54% of non-DNRC lands) of shrubs, herbaceous areas, poorly stocked forested stands, and recently harvested stands on other ownerships in the cumulative effects analysis area is likely to open to be useful for these species requiring forested habitats. Past timber management, human developments, roads, and the natural openness of certain habitats in the cumulative effects analysis area has influenced landscape-level connectivity in the cumulative effects analysis area. Ongoing timber management associated with Beavertail Beetles project on DNRC-managed lands in the cumulative effects analysis area would continue altering mature forested stands and overall landscape connectivity.

Environmental Effects- Mature Forested Habitats and Landscape Connectivity

No Action Alternative: Direct and Indirect Effects
No appreciable changes to existing stands would be anticipated. Stands providing forested cover that may be functioning as corridors, including riparian areas, saddles, and ridgelines, would not be altered. No changes to those stands meeting the old stand definition would occur. No changes in human developments, motorized access, or visual screening would occur. No changes in wildlife use would be expected. Thus, no direct or indirect effects to mature forested habitats and landscape connectivity would be expected since: 1) no changes

to existing stands would occur; 2) no changes to human developments, motorized access, or visual screening would occur, and 3) no alterations to existing corridors would be anticipated.

No Action Alternative: Cumulative Effects
No appreciable changes to existing stands would be anticipated. Stands providing forested cover that may be functioning as corridors, including riparian areas, saddles, and ridgelines, would not be altered. No changes to those stands meeting the old stand definition would occur, thus no changes to the amount of old stands in the cumulative effects analysis area. Past harvesting has reduced the amount of mature, forested habitats in a sizeable portion of the cumulative effects analysis area; however, continued successional advances across the cumulative effects analysis area are moving stands toward mature forests. This alternative would continue to contribute to the amount of mature forested stands in the cumulative-effects analysis area. No changes in human developments, motorized access, or visual screening would occur. No changes in wildlife use would be expected. Thus, no cumulative effects to mature forested habitats and landscape connectivity would be expected since: 1) no changes to existing stands would occur; 2) no changes to human developments, motorized access, or visual screening would occur; and 3) no alterations to existing corridors would be anticipated.

Action Alternative: Direct and Indirect Effects
Approximately 1,483 acres (59%) of existing mature Douglas-fir, western larch, and ponderosa pine stands with a closed canopy would be harvested. The majority of these stands would receive a treatment that would reduce habitat for those species relying on mature, closed-canopied forested habitats. In general, habitats for those species adapted to more-open forest conditions would increase in the project area, meanwhile habitats for wildlife species that prefer dense, mature forest conditions would be reduced in the project area. Although proposed treatments on 1,989 acres (44% of the project area) would create more open stands that may not be used by wildlife species that use mature stands to move through the landscape, corridors, particularly along ridges, draws, and other topographic features, would be retained. Proposed pre-commercial thinning and planting would improve the development of future mature forested stands in those areas treated. No changes in legal motorized public access would occur in the project area; proposed improvements to an existing, ineffective closure could slightly decrease overall motorized access in the project area. Additionally, the only permanent human development constructed would be roughly 7 miles of new restricted roads; however, this could increase non-motorized human activity in the project area beyond the proposed timber management activities. The proposed increases in restricted roads would be at least partially offset by the abandonment of 8.1 miles of old road. Contract stipulations would minimize the presence of human-related attractants for the duration of the proposed activities. Some changes in visual screening would occur within individual units, but the combination of irregular-shaped units, topography, un-harvested patches throughout the project area, and distance from open roads would minimize the effects of the reductions in visual screening. Thus, a moderate risk of adverse direct and indirect effects to mature forested habitats and landscape connectivity would be expected since: 1) proposed activities could reduce forested cover in a sizeable portion of the project area (59%), but corridors would be retained; 2) increased human developments in the form of restricted roads, could concentrate human activity, but no changes in human-related attractants would occur; 3) no changes to legal motorized public access would occur, but increases in non-motorized access could facilitate increased human use of the project area; and 4) visual screening in portions of the project area would be reduced, but some visual screening would be retained across the project area.

Action Alternative: Cumulative Effects
Modifications to mature, forested habitats associated with this alternative would be additive to losses associated with past harvesting activities in the cumulative effects analysis area. Across the cumulative effects analysis area a variety of stands are providing for wildlife movements. Minor increases in human developments would occur with the proposed construction of roughly 7 miles of restricted roads. No changes in the presence of human-related attractants would occur. No changes to legal motorized public access to the cumulative effects analysis area would occur. Minor reductions in visual screening in a small portion of the cumulative effects analysis area would be anticipated. Thus, a minor risk of adverse cumulative effects to mature forested

habitats and landscape connectivity would be expected since: 1) proposed activities could reduce forested cover in a small portion of the cumulative effects analysis area, but corridors would exist; 2) minor increases in human developments that could concentrate human activities would occur, but no changes in human-related attractants would occur; 3) no changes to motorized public access would occur; and 4) visual screening in a small portion of the cumulative effects analysis area would be reduced, but considerable visual screening would persist across the cumulative effects analysis area.

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-1 – Fine Filter provides an analysis of the anticipated effects for each species.

Table WI-1 –Anticipated Effects of the Dirty Donovan Project on wildlife species

Species/Habitat	Potential for Impacts and Rationale [Y/N] Potential Impacts and Mitigation Measures N = Not Present or No Impact is Likely to Occur Y = Impacts May Occur (Explain Below) L = Low Potential for Effects
Threatened and Endangered Species	
Grizzly bear *(Ursus arctos)* Habitat: Recovery areas, security from human activity	[Y] Detailed analysis provided below.
Canada lynx (*Felix lynx)* Habitat: Subalpine fir habitat types, dense sapling, old forest, deep snow zone	[Y] Detailed analysis provided below.
Yellow-Billed Cuckoo (*Coccyzus americanus)* Habitat: Deciduous forest stands of 25 acres or more with dense understories and in Montana these areas are generally found in large river bottoms	[N] No suitable deciduous riparian habitats are in the project area. Thus, no direct, indirect, or cumulative effects to yellow-billed cuckoos would be expected to occur as a result of either alternative.
Sensitive Species	
Bald eagle *(Haliaeetus leucocephalus)* Habitat: Late-successional forest more than 1 mile from open water	[Y] Detailed analysis provided below.

Species/Habitat	Potential for Impacts and Rationale [Y/N] Potential Impacts and Mitigation Measures N = Not Present or No Impact is Likely to Occur Y = Impacts May Occur (Explain Below) L = Low Potential for Effects
Black-backed woodpecker *(Picoides arcticus)* Habitat: Mature to old burned or beetle-infested forest	[N] No preferred, recently (less than 5 years) burned areas are in 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 lakes occur in the project area. Thus no direct, indirect, or cumulative effects to common loons would be expected under either alternative.
Fisher *(Pekania pennanti)* Habitat: Dense mature to old forest less than 6,000 feet in elevation and riparian	[Y] Detailed analysis provided below.
Flammulated owl *(Otus flammeolus)* Habitat: Late-successional ponderosa pine and Douglas-fir forest	[Y] Detailed analysis provided below.
Gray Wolf *(Canis lupus)* Habitat: Ample big game populations, security from human activities	[Y] Detailed analysis provided below.
Harlequin duck *(Histrionicus histrionicus)* Habitat: White-water streams,	[N] No suitable high-gradient stream or river habitats occur in the project area. No direct, indirect or cumulative effects to harlequin ducks would be expected to occur as a result of either alternative.

Species/Habitat	Potential for Impacts and Rationale [Y/N] Potential Impacts and Mitigation Measures N = Not Present or No Impact is Likely to Occur Y = Impacts May Occur (Explain Below) L = Low Potential for Effects
boulder and cobble substrates	
Mountain plover (*Charadrius montanus*) Habitat: short-grass prairie, alkaline flats, prairie dog towns	[N] No prairie dog colonies or other shortgrass prairie habitats occur in the project area. Thus, no direct, indirect, or cumulative effects to mountain plovers would be anticipated to occur as a result of either alternative.
Northern bog lemming *(Synaptomys borealis)* Habitat: Sphagnum meadows, bogs, fens with thick moss mats	[N] No suitable sphagnum bogs or fens occur in the project area. Thus, no direct, indirect, or cumulative effects to northern bog lemmings would be expected to occur as a result of either alternative.
Peregrine falcon *(Falco peregrinus)* Habitat: Cliff features near open foraging areas and/or wetlands	[N] No preferred cliffs or suitable rock outcrops suitable for use by peregrine falcons occur on, or within 1 mile of the proposed project area. 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.
Townsend's big-eared bat *(Plecotus townsendii)* Habitat: Caves, caverns, old mines	[N] Numerous historic mining sites are in the vicinity, but no suitable caves or mine tunnels are known to occur in the project area or vicinity. Should DNRC become aware of any potentially suitable caves or mine tunnels before or during proposed activities, a DNRC biologist would be consulted to determine if any additional mitigations would be necessary. No direct, indirect or cumulative effects to Townsend's big-eared bats would be anticipated as a result of either alternative.
Wolverine *(Gulo gulo)* Habitat: Alpine tundra and high-elevation boreal and coniferous forests that maintain deep persistent snow into late spring	[N] Generally wolverines are found in sparsely inhabited remote areas near treeline characterized by cool to cold temperatures year round and rather deep and persistent snow well into the spring (Copeland et al. 2010). The availability and distribution of food is likely the primary factor in the large home range sizes of wolverines (Banci 1994). The project area is generally below the elevations where wolverines tend to be located. No areas of deep persistent spring snow occur in the project area. Individual animals could occasionally use lands in the project area while dispersing or possibly foraging, and they could be displaced by project-related disturbance if they are in the area during proposed activities. However, given their large home range sizes (~150 sq. mi. -- Hornocker and Hash 1981), and manner in which they use a broad range of forested and non-forested habitats, the proposed activities and alterations of forest vegetation on the project area would have

Species/Habitat	Potential for Impacts and Rationale [Y/N] Potential Impacts and Mitigation Measures N = Not Present or No Impact is Likely to Occur Y = Impacts May Occur (Explain Below) L = Low Potential for Effects
	negligible influence on wolverines. Thus, minimal direct, indirect or cumulative effects to wolverines would be anticipated.
Big Game Species	
Elk	[Y] Big game winter range exists in the project area. Potential big game security habitat exists in the project area - Detailed analysis provided below.
Moose	
Mule Deer	
White-tailed Deer	

Threatened and Endangered Species

GRIZZLY BEAR

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

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

Analysis Area
Direct and indirect effects were analyzed for activities conducted in the 4,523-acre project area. Cumulative effects were analyzed on a 44,589-acre area described above in the Analysis Areas portion of this analysis. This area approximates the home range size of a female grizzly bear.

Existing Environment
The project area is approximately 27 miles south of the Northern Continental Divide Ecosystem grizzly bear recovery area, and approximately 13 miles southwest of `occupied' grizzly bear habitat (Wittinger et al. 2002). However, grizzly bears are increasingly being documented south of the recovery zone (J. Jonkel, MT FWP, personal communication, 2011) and recently grizzly bears have been documented roughly 6 miles east of the project area in the Cramer Creek area (DNRC 2011). Although grizzly bears have not been documented in the project area, use of the project area is possible. Grizzly bears generally use different habitats relative to

season. The project area primarily provides mid-elevation forested areas used during the summer along with some riparian habitats and big game winter range.

Managing human access is a major factor in management for grizzly bear habitat. There are roughly 1.3 miles of open roads per square mile in the project area, which is fairly high, and is largely caused by historic roads that lead into the project area from private property which DNRC does not control access. Non-motorized access to the project area is also fairly high given this level of motorized access and numerous other restricted roads in the project area. Open road densities are fairly high in the cumulative effects analysis area (3.1 mi./sq. mi., simple linear calculation); the potential for disturbance to grizzly bears in the cumulative effects analysis area is also fairly high given this level of access. Hiding cover exists on roughly 3,316 acres (85%) in the project area. Within the cumulative effects analysis area, roughly 8,939 acres of grizzly bear hiding cover exists on DNRC-managed lands. Grizzly bear hiding cover is likely present on some of the 7,026 acres (23% of non-DNRC lands) of forested stands with a reasonably closed canopy across the cumulative effects analysis area on other ownerships. Within the cumulative effects analysis area, hiding cover is largely absent from the 16,351 acres (54% of non-DNRC lands) of shrubs, herbaceous, and non-forested habitats and is likely somewhat limited on the other 6,588 acres (22% of non-DNRC lands) of sparsely stocked and young forest habitats in the cumulative effects analysis area. No grizzly bear security habitats (≥ 0.3 miles from roads receiving motorized use and ≥2,500 acres in size) exist slowly within the project area. Portions of the project area contribute to 2 larger blocks of potential grizzly bear security habitat that total 15,776 acres within the cumulative effects analysis area. Timber harvesting and human development that is occurring or has occurred in the cumulative effects analysis area likely altered grizzly bear habitats and/or human disturbance levels. Ongoing timber management with the Beavertail Beetles project on DNRC-managed lands in the cumulative effects analysis area would continue altering potential grizzly bear habitats while introducing potential disturbance to grizzly bears. Across the cumulative effects analysis area, the reductions in hiding cover, the levels of human disturbance, and the mosaic of available habitats likely reduced the overall quality of the cumulative effects analysis area for grizzly bears.

Environmental Effects- Grizzly Bears

No Action Alternative: Direct and Indirect Effects
No direct or indirect effects to grizzly bears would be anticipated since: 1) no disturbance or displacement would be expected, 2) no changes in hiding cover would occur, 3) security habitat would not be altered, 4) no changes in long-term open-road density would be anticipated, and 5) no changes in availability of unnatural bear foods or attractants would occur.

No Action Alternative: Cumulative Effects
No appreciable changes to existing habitats would be anticipated; advances in succession within those recently harvested stands could improve hiding cover and potentially foraging habitats for grizzly bears. Thus, no further adverse cumulative effects to grizzly bears would be anticipated since: 1) no changes in human disturbance levels would be expected; 2) no changes to open road density would occur; 3) no further modifications to hiding cover would occur; 4) no changes to security habitat would be expected; and 5) no changes in availability of unnatural bear foods or attractants would occur.

Action Alternative: Direct and Indirect Effects
This alternative might affect grizzly bears directly through increased road traffic, noise, and human activity, and indirectly by altering the amount of hiding cover and forage resources in the project area. Activities in grizzly bear habitats reduce grizzly bear security, possibly resulting in increased stress and/or energy expenditure to endure the disturbance or to move from the area. These potential disturbances would only be present during harvesting, thinning, and planting operations; therefore, the season of disturbance is important in addressing effects to grizzly bears. Proposed harvesting would likely occur during the non-denning period; some disturbance of grizzly bears would be possible with activities that may occur during the non-denning period, but timing of proposed activities would likely occur when grizzly bears in the area would be able to access

considerable other habitats in the vicinity. Overall, the proposed activities would occur in areas where low- to moderate-levels of grizzly bear use would be anticipated and during a time period when habitat availability would not be limited, leading to minor potential for disturbance and displacement of grizzly bears.

About 7.0 miles of new, restricted roads would be constructed with the proposed activities. These new roads would be partially offset by the abandonment of roughly 8.1 miles of old road. No changes in open road density or motorized public access would be anticipated. An improvement in an existing closure would reduce potential for illegal motorized access to a portion of the project area. Some increases in non-motorized public access could occur on the newly constructed roads, which could facilitate increased contact between humans and grizzly bears. Hiding cover, defined as vegetation that will hide 90 percent of a grizzly bear at a distance of 200 feet, would be reduced on most of the 1,622 acres (49%) of hiding cover proposed to receive treatments. Some hiding cover in the form of brush, shrubs, and sub-merchantable trees would persist in several of the units, albeit at a reduced level from the existing condition; hiding cover would increase through time as young trees and shrub regeneration proceeds over the next 5 to 10 years. Although hiding cover would be reduced, no appreciable changes to security habitat would occur given no changes in open roads would occur in the project area.

Any unnatural bear foods or attractants (such as garbage) would be kept in a bear resistant manner. Any added risk to grizzly bears associated with unnatural bear foods or attractants would be minimal. Thus, a minor risk of adverse direct or indirect effects to grizzly bears would be anticipated since: 1) minor disturbance and displacement would be possible; 2) hiding cover would be reduced in a portion of the project area, but would remain in portions of the project area, and would be expected to recover in the short-term; 3) habitats in potential security habitat would be modified, but no changes in the availability of security habitats would occur; 4) no changes to long-term open road density would be anticipated; and 5) negligible increases in the availability of unnatural bear foods or attractants would be anticipated.

Action Alternative: Cumulative Effects

The increased use of road systems during the proposed project could temporarily increase human disturbance to grizzly bears within a portion of the cumulative effects analysis area. Collectively, short-term (2-4 years) increases in human disturbance would be anticipated in the cumulative effects analysis area. Continued use of the cumulative effects analysis area by grizzly bears would be anticipated at levels similar to present. On DNRC-managed lands in the cumulative effects analysis area, hiding cover would be reduced on most of the 1,622 acres of hiding cover proposed for treatments; no changes to the hiding cover on other ownerships would be anticipated. Reductions in hiding cover would be additive to the reductions from past timber harvesting, ongoing harvesting, as well as more permanent land-cover changes in the cumulative effects analysis area. Early successional stages of vegetation occurring in harvest units could provide additional foraging opportunities for grizzly bears. Quality of grizzly bear security habitat would be reduced in short-term, but would persist through time. No changes in long-term open-road density would be anticipated; a slight increase in non-motorized access to a small portion of the cumulative effects analysis area could occur with the proposed construction of roughly 7 miles of new, restricted roads. Thus, a minor risk of adverse cumulative effects to grizzly bears would be anticipated since: 1) increases in human disturbance levels in the short-term could occur in a small portion of the cumulative effects analysis area; 2) hiding cover would be removed in the short-term on 1,622 acres in the cumulative effects analysis area; 3) no changes in long-term open road density would occur, 4) quality of security habitats would be reduced, but would persist into the future; and 5) negligible increases in the availability of unnatural bear foods or attractants would be anticipated.

CANADA LYNX

Issue

Proposed activities could negatively affect Canada lynx by altering lynx winter foraging habitat, summer foraging habitat, and other suitable habitat, rendering these habitats unsuitable for supporting lynx.

Introduction
Canada lynx are associated with subalpine fir forests, generally between 4,000 to 7,000 feet in elevation in western Montana (Ruediger et al. 2000). Lynx in western Montana preferred mature, multi-storied stands with dense horizontal cover year-round; during the summer lynx also selected earlier successional stands with a high horizontal cover (Squires et al. 2010). For denning sites, the primary component appears to be abundant large woody debris, particularly in the form of downed logs, root wads, slash piles, and live trees (Squires et al. 2008). These conditions are found in a variety of climax vegetation habitat types, particularly within the subalpine fir series (Pfister et al. 1977). Historically, high intensity, stand-replacing fires of long fire intervals (150 to 300 years) occurred in continuous dense forests of lodgepole pine, subalpine fir, and Engelmann spruce. These fires created extensive even-aged patches of regenerating forest intermixed with old stands that maintained a mosaic of snowshoe hare and lynx habitat.

Analysis Area
Direct and indirect effects were analyzed for activities conducted in the 4,523-acre project area. Cumulative effects were analyzed on a 44,589-acre area described above in the Analysis Areas portion of this analysis. The scale of this analysis area approximates the home range size of an individual lynx (Ruediger et al. 2000).

Existing Environment
The proposed project area ranges from approximately 3,920 to 6,200 feet in elevation and is dominated by Douglas-fir and ponderosa pine in the lower elevations to Douglas-fir/western larch, subalpine fire, and lodgepole pine in the upper elevations. Approximately 2,258 acres of lynx habitat occur in the project area (Table WI-2 – Canada lynx habitats and anticipated changes to existing lynx habitats under both alternatives of the Dirty Donovan Project). Much of this habitat was identified as winter/mature foraging habitat, with lesser amounts of other suitable habitats (largely forested lands that provide cover to facilitate movement) and temporary non-suitable habitat. Connectivity of forested habitats in the project area is relatively good, but has been altered by past timber management and wildfires.

On DNRC-managed lands within the cumulative effects analysis area, roughly 1,974 acres of winter/mature lynx foraging habitats exist, along with roughly 180 acres of summer/young foraging habitats, 1,801 acres of other suitable habitats, and 380 acres of temporary non-suitable habitats. On other ownerships, there are roughly 7,026 acres (23% of non-DNRC lands) of forested stands with a reasonably closed canopy across the cumulative effects analysis area; a portion of those stands would likely be suitable lynx habitats and probably include some winter/mature foraging habitats. Additionally, summer/young foraging habitats likely exists on a portion of the 6,588 acres (22% of non-DNRC lands) of sparsely stocked and young forest on other ownerships; no lynx habitats likely exist on the 16,351 acres (54% of non-DNRC lands) of shrubs, herbaceous, and non-forested types on other ownerships in the cumulative effects analysis area. Connectivity of lynx habitats within the cumulative effects analysis area is rather limited due to ownership, past timber management, and wildfires. Ongoing timber management with the Beavertail Beetles project on DNRC-managed lands in the cumulative effects analysis area is not affecting Canada lynx habitats. Roughly 79.8% of habitats on DNRC-managed lands administered by the Southwestern Land Office under the HCP and outside of the Lynx Management Areas, which includes the project area, are in suitable lynx habitat categories.

Environmental Effects- Canada Lynx
No Action Alternative: Direct and Indirect Effects
In the short-term, no changes in lynx habitat elements would be expected in the project area. Landscape connectivity would not be altered. Thus, a negligible risk of adverse direct and indirect effects to Canada lynx would be expected since: 1) existing winter/mature foraging habitats would persist; 2) summer/young foraging habitats would continue to be a relatively minor component in the project area; 3) the amount of temporary non-suitable habitats would not change; and 4) landscape connectivity would not be altered.

No Action Alternative: Cumulative Effects

No appreciable change in lynx habitats in the cumulative effects analysis area would occur. No appreciable changes to landscape connectivity would be anticipated. Roughly 79.8% of habitats on DNRC-managed lands administered by the Southwestern Land Office under the HCP and outside of the Lynx Management Areas would be in suitable lynx habitat categories with this alternative. Thus, a negligible risk of adverse cumulative effects to lynx would be expected since: 1) some winter/mature foraging habitats would persist in the cumulative effects analysis area; 2) summer/young foraging habitats would persist in the near-term across the cumulative-effects analysis area, but longer-term availability of summer foraging habitats would likely decline without disturbance; 3) no changes in the amount of the cumulative-effects analysis area that is in the temporary non-suitable habitat class would occur; and 4) landscape connectivity would not be altered.

Action Alternative: Direct and Indirect Effects

Approximately 1,364 acres of lynx habitats (60% of lynx habitats in the project area) would be altered with this alternative (Table WI-2 – Canada lynx habitats and anticipated changes to existing lynx habitats under both alternatives of the Dirty Donovan Project). The proposed treatments in lynx habitats would be a combination of individual tree selection, old-growth maintenance, seed tree, and pre-commercial thinning. Habitats proposed to receive seed tree treatments would transition to temporary non-suitable habitats. The majority of the stands proposed for pre-commercial thinning would occur in areas already classified as temporary non-suitable habitats and only small amounts of other habitats would be altered with the proposed pre-commercial thinning. A portion of the habitats proposed for individual tree selection and old growth maintenance systems could maintain sufficient cover to continue functioning as other suitable lynx habitats following proposed activities, but the majority would likely drop below the 40% canopy closure threshold that differentiates between suitable and temporary non-suitable habitats due to anticipated retention levels, harvesting corridors, skid trails, damage to sub-merchantable trees, landings, and low original stand density. Thus roughly 52% of the lynx habitats in the project area would be temporarily unsuitable for lynx following proposed treatments. Roughly 19% of the project area would be in foraging habitats and 29% would be in Other Suitable habitats. Following proposed treatments, sufficient habitats would be retained on DNRC-managed lands to satisfy DNRC's commitment for these habitat attributes as required in ARM 36.11.435. The retention of patches of advanced regeneration of shade-tolerant trees, such as sub-alpine fir and Engelmann spruce in foraging habitats, would break-up sight distances, provide horizontal cover, and provide forest structural attributes preferred by snowshoe hares and lynx. Coarse woody debris would be retained (emphasizing retention of some logs 15 inches dbh and larger) to provide some horizontal cover and security structure for lynx. In the short-term, lynx use of the project area could decline due to the resulting openness in the project area. Proposed activities would further reduce forested connectivity in an area where connectivity has previously been compromised; some connectivity would be retained along riparian areas and through unharvested patches between harvested units. Collectively, a moderate to high risk of adverse direct and indirect effects to Canada lynx would be expected since: 1) the majority of winter/mature foraging habitats (72%) would be removed with the largest amount moving into the temporary non-lynx habitat category; 2) a sizable portion of the limited summer/young foraging habitats would be altered (33%) with most of those habitats moving into the temporary non-lynx habitat category; 3) the amount of the project area in the temporary non-suitable lynx habitat category would increase to 52%; and 4) connectivity could be altered, but some connectivity would be maintained along riparian areas and through unharvested patches between units.

Table WI-2 –Acres of Canada lynx habitats and anticipated changes to existing lynx habitats under both alternatives of the Dirty Donovan Project

Lynx Habitat Element	Exiting Condition and No-Action Alternative	Proposed Changes Under Action Alternative				Action Alternative
		Individual Tree Selection (ITS)*	Old Growth Maintenance*	Seed Tree*	Pre-Commercial Thinning**	
Winter/Mature Foraging	1,243 (55%)	-734	-92	-53	-22	342 (15%)
Summer/Young Foraging	135 (6%)	-40	0	-1	-4	90 (4%)
Other Suitable	547 (24%)	139 modified,	1 modified, +92	-8	+27	658 (29%)
Temporary Non-Suitable	333 (15%)	14 modified, +774	0	+62	257 modified, 0	1,169 (55%)
Total	2,258					2,258

*Portions of these units would also receive a pre-commercial thinning treatment
** These areas would only receive pre-commercial thinning treatments

Action Alternative: Cumulative Effects

Within the cumulative-effects analysis area, a sizable portion of the existing lynx habitats on DNRC-managed lands would be modified, and at least 1,216 acres (28%) would be in the temporary non-suitable habitat category following proposed treatments. The reductions in winter/mature foraging (901 acres) and summer/young foraging (45 acres) coupled with increases in temporary non-suitable habitats (836 acres) and other suitable lynx habitats (111 acres) on a small portion of the cumulative effects analysis area could slightly decrease the quality of the lynx habitats in the larger cumulative effects analysis area. Near-term increases in summer/young foraging habitats could occur with the proposed harvesting within a portion of the cumulative effects analysis area. Anticipated reductions in lynx habitats would be additive to past losses from timber harvesting and any ongoing modifications in the cumulative-effects analysis area; likewise, increases in temporary non-suitable lynx habitats would be additive to habitats that have been recently converted due to timber harvesting. No appreciable changes to the suitable lynx habitats on other ownerships would be anticipated. Forest connectivity would be further altered in the project area, which would further isolate some of the patches of lynx habitats in the cumulative effects analysis area. Connectivity of suitable lynx habitats along RMZs and associated riparian habitats would be maintained. The existing mixture of suitable and unsuitable habitats in the vicinity of the project area caused by varying ownerships, past timber management, and wildfires has limited connectivity of upland forested habitats in the vicinity; proposed harvesting activities, would further affect connectivity away from riparian areas, but overall negligible changes to connectivity across the cumulative effects analysis area would be anticipated. Roughly 76.4% of habitats on DNRC-managed lands administered by the Southwestern Land Office under the HCP and outside of the Lynx Management Areas would be in suitable lynx habitat categories following proposed treatments. Thus, a minor to moderate risk of adverse cumulative effects to Canada lynx would be expected since: 1) some winter/mature foraging habitats would persist; 2) summer/young foraging habitats would continue developing for the next 10 to 30 years across the cumulative effects analysis area; 3) a moderate amount of lynx habitats would be in the temporary non-suitable habitat category; and 4) negligible alterations in landscape connectivity would not prevent lynx movements.

Sensitive Species

BALD EAGLE

Issue
Proposed activities could negatively affect bald eagles by reducing nesting and perching structures and/or disturbing nesting bald eagles

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

Analysis Area
Direct and indirect effects were analyzed for activities conducted in the 4,523-acre project area. Cumulative effects were analyzed on home range associated with the Allen Creek bald eagle territory. This scale includes enough area for a nesting pair of bald eagles.

Existing Environment
A small portion of the project area (188 acres) is within the home range associated with the Allen Creek bald eagle territory. The Allen Creek territory has been fairly productive for the last 6-8 years. The aquatic habitats associated with this bald eagle territory include the Clark Fork River, Allen Creek, Donovan Creek and numerous smaller streams and wetlands. Aquatic and terrestrial prey species are fairly common in the home range. The terrestrial habitat incorporated by the territories is a coniferous/deciduous mixture along the riparian areas, with coniferous forests and grasslands in the upland areas. Within the home range, black cottonwood is the deciduous tree of primary importance to bald eagles; however large emergent conifers also provide important nesting, roosting, and perching habitats.

Human disturbance, including timber harvesting, the Highway 90 corridor, agricultural activities, Montana Rail Link railroad, numerous human residences and various forms of winter and summer recreation are potential sources of disturbance to the nesting territory. Numerous large emergent trees are available across portions of the home range, but logging and other human developments in the last 100 years has likely reduced some of these attributes while others have experienced mortality and are declining in quality.

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

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

Action Alternative: Direct and Indirect Effects
No activities would occur in the nest area or primary use areas associated with the bald eagle territory. Proposed harvesting on 109 acres (5% of proposed units) would occur in the home range associated with the bald eagle territory. Proposed activities could occur when soils are dry, frozen, or snow covered. Thus, the proposed activities could occur during the nesting season (February 1 –August 15), or the non-nesting (August

16-February 1) season, but would be most likely to occur either during later phases of the nesting period or the non-nesting period. Negligible disturbance to bald eagles could occur should any activities be conducted during the nesting period due to the distance from the territory and the other disturbance present in the home range. Conversely, should those activities be conducted during the non-nesting period, no disturbance to bald eagles would be anticipated. Minor reductions in the availability of large snags or emergent trees that could be used as nest or perch trees could occur in the home range. Proposed planting within a portion of the home range would not be expected to disturb bald eagles, even if conducted during the nesting period; no pre-commercial thinning would occur in the bald eagle home range. No changes to human access to the home range would occur, thereby limiting potential for introducing additional human disturbance to the territory. Thus, a negligible risk of direct and indirect effects to bald eagles would be anticipated since: 1) disturbance could be slightly elevated within the home range during operations, should they occur during the nesting period; 2) no appreciable change in human access within the home range would occur; and 3) minor reductions in the availability of large, emergent trees could occur in the home range, but none in the high use areas along the Clark Fork River.

Action Alternative: Cumulative Effects
Nesting bald eagles would continue to experience varying levels of disturbance. Any potential disturbance and/or noise from the proposed harvesting would be additive to any of these other forms of disturbance, however no changes in bald eagle behavior would be anticipated. Negligible reductions in emergent trees or snags could occur on a small portion (<1%) of the home range. Thus, a negligible risk of cumulative effects to bald eagles would be anticipated since: 1) disturbance could be slightly elevated within the territory during harvesting operations; 2) no changes in human access within the territory would occur; and 3) negligible changes in the availability of large, emergent trees would be expected.

FISHER

Issue
Proposed activities could reduce the amount and/or quality of fisher habitats, which could alter fisher use of the area.

Introduction
Fishers are a mid-sized forest carnivore whose prey includes small mammals such as voles, squirrels, snowshoe hares, and porcupines, as well as birds (Powell and Zielinski 1994). They also take advantage of carrion and seasonally available fruits and berries (Foresman 2012). Fishers use a variety of successional stages, but are disproportionately found in stands with dense canopies (Powell 1982, Johnson 1984, Jones 1991, Heinemeyer and Jones 1994) and avoid openings or young forested stands (Buskirk and Powell 1994, Weir and Corbould 2010). However, some use of openings may occur for short hunting forays or if sufficient overhead cover (shrubs or saplings) is present. Fishers appear to be highly selective of stands that contain resting and denning sites and tend to use areas within 150 feet of water (Jones 1991). Resting and denning sites are found in cavities of live trees and snags, downed logs, brush piles, mistletoe brooms, squirrel and raptor nests, and holes in the ground. Forest-management considerations for fisher involve providing for resting and denning habitats near riparian areas while maintaining travel corridors.

Analysis Area
Direct and indirect effects were analyzed for activities conducted in the 4,523-acre project area. Cumulative effects were analyzed on the 44,589-acre cumulative effects analysis area described above in the Analysis Areas portion of this analysis. This scale includes enough area to approximate overlapping home ranges of male and female fishers (Heinemeyer and Jones 1994).

Existing Environment
There are approximately 951 acres (21%) of potential upland fisher habitats and 50 acres (1%) of potential riparian habitats in the project area. Within the cumulative effects analysis area, there are roughly 41,542 acres that would be classified as upland (more than 100 ft from Class 1 and more than 50 feet from Class 2 streams) and 2,183 acres that would be classified as riparian that are associated with the 153 miles of streams in the cumulative effects analysis area. On DNRC-managed lands, 81% of the potential riparian fisher habitats in the cumulative effects analysis area are providing structural habitat attributes that would facilitate use by fisher. Potential fisher habitats likely exist on a portion of the 6,974 acres (24% of non-DNRC lands) of forested stands with a reasonably closed canopy that are below 6,000 feet in elevation across the cumulative effects analysis area, including roughly 328 acres that are in close proximity to the streams in the cumulative effects analysis area. Within the cumulative effects analysis area, fisher habitats are largely absent from the 16,124 acres (54% of non-DNRC lands) of shrubs, herbaceous, and non-forested habitats and is likely fairly limited on the other 6,542 acres (22% of non-DNRC lands) of sparsely stocked and young forest habitats in the cumulative effects analysis area. Ongoing timber management with the Beavertail Beetles project on DNRC-managed lands in the cumulative effects analysis area would continue, but is not altering fisher habitats.

Environmental Effects-Fisher
No Action Alternative: Direct and Indirect Effects
No direct and indirect effects to fishers would be anticipated since: 1) no changes to existing habitats would be anticipated; 2) landscape connectivity would not be further altered; 3) no appreciable changes to snags, snag recruits, and coarse woody debris levels would be anticipated; and 4) no changes to public access or the potential for trapping mortality would be anticipated.

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

Action Alternative: Direct and Indirect Effects
Approximately 3 acres (6%) of riparian habitats associated with the Class 1 portions of Game and Arkansas creeks would be altered with this alternative; within these riparian habitats, proposed activities would retain all shrubs and sub-merchantable trees as well as a minimum of 50 percent of the merchantable trees, which could continue to be potentially suitable for fisher. No other riparian habitats within 50 feet of class 2 or 100 feet of class 1 streams would be altered with the proposed activities. Approximately 636 of the 951 acres (67%) of upland fisher habitats in the project area would receive treatments that would reduce canopy closure and would likely be too open to be used by fisher. Proposed planting and thinning in fisher habitats would improve future fisher habitats by decreasing the time until those stands provide structural attributes needed by fisher. No changes in open roads would be anticipated and proposed activities would improve an existing, ineffective closure which would discourage unapproved access to a portion of the project area; a slight increase in non-motorized access could occur with the proposed construction of 7 miles of restricted road, but would be partially offset by the abandonment of 8 miles of old, historic road. Trapping pressure and the potential for fisher mortality could remain similar to present levels or decrease slightly. Minor reductions in landscape connectivity could occur with the proposed activities, but activities would avoid riparian areas commonly used by fisher. Thus, a moderate risk of adverse direct and indirect effects to fisher would be anticipated since: 1) harvesting would largely avoid riparian areas, but would modify a small amount of riparian habitats and a sizeable amount of upland fisher habitats; 2) minor reductions in landscape connectivity would occur, but those areas associated with riparian areas would largely remain unaffected; 3) harvesting would reduce snags and snag-recruitment trees while increasing coarse woody debris levels; however, some of these resources would be retained; and 4) no changes in legal motorized human-access levels would be anticipated and a potential

slight decrease in motorized access could be possible with the proposed improvement to an existing, ineffective closure.

Action Alternative: Cumulative Effects
Approximately 3 acres of riparian habitats would be modified and, should they end up too open for use by fisher, the amount of the preferred riparian fisher cover types meeting structural requirements for fishers at the cumulative-effects analysis area would drop to 79%, which would still be above the 75% requirement. Reductions in upland habitats on DNRC-managed lands (636 acres) would further reduce the amount of suitable upland fisher habitats in the cumulative effects analysis area. These reductions would be additive to the losses associated with past timber harvesting in the cumulative-effects analysis area as well as any ongoing harvesting. No appreciable changes to landscape connectivity would be anticipated, and activities would avoid riparian areas commonly used by fisher. No changes in legal, motorized public access would occur and slight decreases in overall motorized access would occur with the proposed improvement of a currently, ineffective closure allowing some motorized access to portions of the cumulative effects analysis area. Minor increases in non-motorized access could occur, but would be partially offset by the abandonment of roughly 8 miles of old, historic road. Overall no appreciable changes in human disturbance and potential trapping mortality would be anticipated. Thus, a moderate risk of adverse cumulative effects to fisher would be anticipated since: 1) harvesting would modify some upland fisher habitats, but upland habitats would persist; 2) no appreciable changes in landscape connectivity would be anticipated and connectivity in riparian areas would not be appreciably altered; 3) harvesting in a relatively small portion of the cumulative-effects analysis area would partially reduce snags and snag recruits, while increasing the coarse woody debris levels, largely in the smaller-sized pieces; and 4) no changes to legal, motorized public access would occur and slight decreases in overall motorized access would be possible with the proposed improvement of an ineffective closure providing motorized access to a small portion of the cumulative effects analysis area.

FLAMMULATED OWLS

Issue
Proposed activities may alter flammulated owl habitat by reducing canopy closure and increasing tree spacing, and could remove snags needed by flammulated owls for nesting.

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

Analysis Area
Direct and indirect effects were analyzed for activities conducted in the 4,523-acre project area. Cumulative effects were analyzed on the 18,555-acre cumulative effects analysis area described above in the Analysis Areas portion. This area includes enough area to support several pairs of flammulated owls (McCallum 1994).

Existing Environment
There are approximately 2,052 acres (45%) of potential flammulated owl habitats in ponderosa pine and dry Douglas-fir stands across the project area. Within the cumulative effects analysis area, approximately 5,285

acres (61% of DNRC-managed lands) managed by DNRC contain potential flammulated owl habitats. Some suitable habitats likely exist on a portion of the 5,123 acres (52% of non-DNRC-managed lands) of open and closed forested habitats on other ownerships in the cumulative effects analysis area; however, like the project area, portions of these forested areas are not likely preferred flammulated owl habitat types. A sizable portion of the cumulative effects analysis area has been harvested in the recent past, potentially improving flammulated owl habitat by creating foraging areas and reversing a portion of the Douglas-fir encroachment and opening up stands of ponderosa pine; however retention of large ponderosa pine and/or Douglas-fir was not necessarily a consideration in some of these harvest units, thereby minimizing the benefits to flammulated owls. Modern fire suppression has allowed Douglas-fir in-growth to create denser stands of ponderosa pine and Douglas-fir in portions of the cumulative effects analysis area, which has reduced habitat quality for flammulated owls.

Environmental Effects-Flammulated Owl

No Action Alternative: Direct and Indirect Effects

Existing flammulated owl habitats in the project area would persist. Thus, a negligible risk of adverse direct and indirect effects to flammulated owls would be anticipated since: 1) no disturbance to flammulated owls would be anticipated; and 2) no changes to potential nesting habitats would be anticipated.

No Action Alternative: Cumulative Effects

Existing flammulated owl habitats would persist. Thus, a negligible risk of adverse cumulative effects to flammulated owls would be anticipated since: 1) no disturbance to flammulated owls would be anticipated; and 2) no changes to potential nesting habitats would be anticipated.

Action Alternative: Direct and Indirect Effects

Flammulated owls can be tolerant of human disturbance (McCallum 1994), however the elevated disturbance levels associated with proposed activities could negatively affect flammulated owls should activities occur when flammulated owls are present. Proposed activities could overlap the nestling and fledgling period. Since most snags would be retained, loss of nest trees would be expected to be minimal. Proposed activities on 904 acres of potential flammulated owl habitats (44% of the habitats in the project area) would open the canopy while favoring western larch, ponderosa pine, and Douglas-fir. Elements of the forest structure important for nesting flammulated owls, including snags, coarse woody debris, numerous leave trees, and snag recruits would be retained in the proposed units. The subsequent regeneration in the existing habitats would likely be beneficial for flammulated owls as potential foraging habitats. The more open stand conditions, the retention of fire adapted tree species, and the maintenance of snags would move the project area toward historical conditions, which is preferred flammulated owl habitat. The proposed pre-commercial thinning on 97 acres of warmer ponderosa pine and Douglas-fir types could improve flammulated owl foraging habitats, while contributing to an increased representation of ponderosa pine in the future in those stands, which would improve potential flammulated owl habitat quality. Similarly, proposed planting on roughly 252 acres within flammulated owl habitat types could improve future habitat quality, and proposed planting on another 87 acres of largely Douglas-fir stands that are not presently providing flammulated owl habitats could contribute to future habitat availability. Thus, a minor risk of adverse direct and indirect effects would be expected to flammulated owls since: 1) the potential exists to disturb flammulated owls; 2) proposed thinning and planting could lessen the duration before these affected stands are again suitable for flammulated owl use; and 3) harvesting would open denser stands up while retaining elements of forest structure used for foraging and nesting by flammulated owl, improving overall flammulated owl habitat conditions in the project area.

Action Alternative: Cumulative Effects

Disturbance in flammulated owl habitats would be possible on a small portion of the cumulative effects analysis area. Proposed harvesting would increase the amount of the cumulative effects analysis area that has been recently harvested, which would add to the amount of foraging habitats available, but possibly at the expense of losing snags and large trees important for nesting. Overall no change in the amount of potential flammulated owl habitats would exist on DNRC-managed lands or any other ownerships; a slight improvement in habitat

quality at the cumulative-effects analysis level could be realized with this alternative and the more historic conditions likely after proposed activities. Thus, a negligible risk of adverse cumulative effects to flammulated owls would be expected since: 1) harvesting could disturb flammulated owls in a small portion of the cumulative effects analysis area should activities occur during the period when flammulated owls are in the vicinity; and 2) harvesting would improve the quality and sustainability of flammulated owl habitat on a portion of the cumulative effects analysis area by making this area more representative of historic conditions.

GRAY WOLF

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

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

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

Analysis Area
Direct and indirect effects were analyzed for activities conducted in the 4,523-acre project area. Cumulative effects were analyzed on the 44,589-acre area described above in the Analysis Areas portion of this analysis. This scale includes enough area to support at least 1 pack of wolves.

Existing Environment
The project area is in the vicinity of the suspected Union Peak wolf pack. In general, some wolf use of the project area is possible. Several landscape features commonly associated with denning and rendezvous sites occur in the project area, such as areas with gentle terrain near a water source (valley bottoms), areas that are close to big game winter ranges, and areas that are close to meadows or other openings. No known den or rendezvous sites occur in the project area, but some use of the project area by wolves could occur for breeding, hunting, or other life requirements. Big game species exist in the vicinity of the project area much of the non-winter period. Big game winter range exists in the project area.

Within the cumulative-effects analysis area, big game species are fairly common and winter range for deer and elk are fairly widespread in the lower elevation areas of the cumulative effects analysis area. Roughly 22,567 acres of winter range (51%) exist in the cumulative effects analysis area; at least 16,385 acres (37%) of the cumulative effects analysis area appears to have sufficient canopy closure to provide thermal cover and snow intercept for big game. Numerous landscape features commonly associated with denning and rendezvous sites, including meadows and other openings near water, near big game winter range, and in gentle terrain, occur in the cumulative-effects analysis area. Past timber management and human developments have altered big game and wolf habitats in the cumulative effects analysis area. Ongoing timber management with the

Beavertail Beetles project on DNRC-managed lands in the cumulative effects analysis area would continue altering potential gray wolf and big game habitats.

Environmental Effects-Gray Wolf

No Action Alternative: Direct and Indirect Effects

Negligible direct and indirect effects would be expected to gray wolves since: 1) no changes in human disturbance levels would occur; and 2) no appreciable changes to prey availability would occur.

No Action Alternative: Cumulative Effects

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

Action Alternative: Direct and Indirect Effects

Wolves using the area could be disturbed by harvesting activities and are most sensitive at den and rendezvous sites, which are not known to occur in the project area or within 1 mile of the project area. If a den or rendezvous site were identified within 1 mile of the project area, a DNRC biologist would be consulted to determine if additional mitigations would be necessary. Although no seasonal operational constraint would be implemented, it would be fairly unlikely that any activities would occur during the spring period due to the anticipated snow levels/soil moisture limitations, limiting potential disturbance at den sites and reducing the potential for disturbing rendezvous sites. No changes in legal, motorized public access would occur and improvements to an ineffective closure could slightly decrease overall motorized access. After proposed activities, human disturbance levels would likely revert to pre-harvest levels; however increases in restricted roads could increase non-motorized human access and thus a slight increase in potential for disturbance to wolves in the project area. After proposed activities, wolf use of the project area for denning and rendezvous sites would likely revert to pre-harvest levels. In the short-term, the proposed harvesting could lead to slight shifts in big game use, which could lead to a shift in wolf use of the project area. Proposed harvesting activities on approximately 1,989 acres (44% of the project area) would alter canopy closure, summer big game habitat, and big game winter range habitat; proposed pre-commercial thinning on 380 acres (8% of the project area) would alter canopy closure and summer habitat. The modifications to summer range could alter some big game use of the project area, and subsequently could alter the use of the project area by wolves. Proposed activities would occur on roughly 7 acres (43%) of white-tailed deer winter range, 90 acres (28%) of mule deer winter range, and 238 acres (69%) of elk winter range; proposed activities would reduce canopy closure and potential winter use by big game on roughly 1,896 acres (58% of existing stands) that likely have attributes facilitating considerable winter use by big game. Collectively, reductions in big game winter range habitats could redistribute big game, but would not be expected to appreciably alter wolf prey abundance. Thus, a low risk of direct and indirect effects would be expected to gray wolves since: 1) minor increases in human disturbance levels would occur, with no increases near known wolf den and/or rendezvous sites anticipated; and 2) changes to big game summer habitats and winter range could alter big game use of the project area, but would not appreciably alter prey availability.

Action Alternative: Cumulative Effects

Disturbance to gray wolves in a portion of the cumulative effects analysis area would be possible, but would only occur for the short-period of time that activities would be occurring. No changes in legal, motorized human access would be anticipated and slight decreases in motorized access could be realized with the improvement of an ineffective closure allowing potential motorized access to a portion of the cumulative effects analysis area; minor increases in non-motorized access would be possible. Reductions in big game winter range would

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

PILEATED WOODPECKERS

Issue

Proposed activities could reduce suitable nesting and foraging habitat for pileated woodpeckers, which could alter pileated woodpecker use of the area.

Introduction

The pileated woodpecker is one of the largest woodpeckers in North America and excavates the largest cavities of any woodpecker. Preferred nest trees are large diameter western larch, ponderosa pine, cottonwood, and quaking aspen trees and snags, usually 20 inches dbh and larger. Pileated woodpeckers primarily eat carpenter ants, which inhabit large downed logs, stumps, and snags. Aney and McClelland (1985) described pileated nesting habitat as "...stands of 50 to 100 contiguous acres, generally below 5,000 feet in elevation with basal areas of 100 to 125 square feet per acre and a relatively closed canopy." The feeding and nesting habitat requirements, including large snags or decayed trees for nesting and downed wood for feeding, closely tie these woodpeckers to mature forests with late-successional characteristics. The density of pileated woodpeckers is positively correlated with the amount of dead and/or dying wood in stands (McClelland 1979).

Analysis Area

Direct and indirect effects were analyzed for activities conducted in the project area (4,523 acres). Cumulative effects were analyzed on the 18,555-acre cumulative effects analysis area described above in the Analysis Areas portion of this analysis. This scale includes enough area to support several pairs of pileated woodpeckers (Bull and Jackson 1995).

Existing Environment

In the project area, potential pileated woodpecker nesting habitat exists on approximately 1,479 acres (33% of the project area). These habitats are dominated by Douglas-fir and western larch. Additionally, 1,904 acres (42% of the project area) of sawtimber stands, dominated by Douglas-fir, western larch, and ponderosa pine exist in the project area, which may be potential foraging habitats. In the cumulative effects analysis area, roughly 1,768 acres (21%) of pileated woodpecker habitats exist on DNRC-managed lands dominated by Douglas-fir, western larch and ponderosa pine. An additional 4,209 acres (49%) of potential feeding habitats exist on DNRC managed lands within the cumulative effects analysis area. Some suitable habitats likely exist on a portion of the 3,011 acres of reasonably closed forested habitats on other ownerships in the cumulative effects analysis area (31% of non-DNRC lands), and some of the 1,803 acres of moderately stocked forested stands on those other ownerships could also be suitable foraging habitats (9% of non-DNRC lands). Much of the 4,982 acres (51%) of shrubs, herbaceous areas, poorly stocked forested stands, and recently harvested stands on other ownerships in the cumulative effects analysis area is likely to open to be useful to pileated woodpeckers.

Environmental Effects-Pileated Woodpecker

No Action Alternative: Direct and Indirect Effects

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

No Action Alternative: Cumulative Effects

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

Action Alternative: Direct and Indirect Effects

Pileated woodpeckers can to be tolerant of human activities (Bull and Jackson 1995), but might be temporarily displaced by any proposed activities that could occur during the nesting period. Harvesting would reduce forested habitats for pileated woodpeckers in the project area. Roughly 992 acres (67%) of the potential nesting habitat along with 934 acres (49%) of potential foraging habitats would be largely removed with proposed treatments. Some of these acres could be dense enough to receive some use by foraging pileated woodpeckers following proposed treatments, but most of these stands would be temporarily unsuitable for pileated woodpeckers due to the openness of the stands following proposed treatments. Quality of these potential pileated woodpecker habitats would be reduced for 20-40 years, depending on the density of trees retained. Elements of the forest structure important for nesting pileated woodpeckers, including snags, coarse woody debris, numerous leave trees, and snag recruits would be retained in the proposed harvest areas. Since pileated woodpecker density is positively correlated with the amount of dead and/or dying wood in a stand (McClelland 1979), pileated woodpecker densities in the project area would be expected to be reduced on 1,989 acres. The silvicultural prescriptions would retain healthy western larch, ponderosa pine, and Douglas-fir while promoting the growth and/or regeneration of many of these same species, which would benefit pileated woodpeckers in the future by providing nesting, roosting, and foraging habitats. The proposed pre-commercial thinning and planting could improve potential pileated woodpecker habitat quality into the future. Thus, a moderate risk of adverse direct and indirect effects to pileated woodpeckers would be anticipated since: 1) harvesting would reduce the amount of continuous-forested habitats available; 2) potential nesting habitats and foraging habitats would be removed; 3) snags and snag recruits would be removed; however, mitigation measures to retain some snags and snag recruits would be included, and 4) proposed treatments would promote seral species in the project area.

Action Alternative: Cumulative Effects

Reductions in pileated woodpecker habitat quality and the amount of continuously forested habitats available for pileated woodpeckers would occur. On DNRC-managed lands, roughly 776 acres (44%) of pileated woodpecker nesting and 3,275 acres (78%) of foraging habitats would not be altered; no changes to the existing habitats on other ownerships would be anticipated. Snags, coarse woody debris, and potential nesting trees would be retained in the project area; however, future recruitment of these attributes may be reduced in a portion of the area by the proposed activities. Modifications to pileated woodpecker habitats under this alternative would be additive to habitat losses associated with past harvesting; continued use of the cumulative effects analysis area would be anticipated, but likely at a slightly reduced level. Continued maturation of stands across the cumulative-effects analysis area would provide future pileated woodpecker habitats. Thus, a moderate risk of adverse cumulative effects to pileated woodpeckers would be anticipated since: 1) harvesting would reduce the amount of continuous forested habitats available in the cumulative-effects analysis area; 2) potential nesting and foraging habitats would be modified, but some habitats would persist in the cumulative-

effects analysis area; 3) snags and snag recruits would be removed; however, mitigation measures would retain some of these attributes; and 4) proposed treatments would promote seral species in a portion of the cumulative effects analysis area.

BIG GAME

BIG GAME WINTER RANGE

Issue

Proposed activities could remove forest cover on big game winter range, which could reduce the carrying capacity of the winter range

Introduction

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

Analysis Area

Direct and indirect effects were analyzed for activities conducted in the 4,523-acre project area. Cumulative effects were analyzed on the combined winter ranges in the 44,589-acre cumulative effects analysis area described above in the Analysis Areas portion of this analysis. This scale includes enough area to support hundreds of elk.

Existing Environment

Montana Department of Fish, Wildlife, and Parks identified white-tailed deer (16 acres), mule deer (320 acres), and elk (345 acres) winter range in the project area. These winter ranges are part of larger winter ranges in the area. Mature Douglas-fir, with lesser amounts of ponderosa pine and lodgepole pine stands in the project area are providing attributes facilitating use by wintering big game. Approximately 3,273 acres of the project area (72%) appear to be providing snow intercept and thermal cover attributes for big game. Evidence of non-winter use by deer, elk, and moose was noted during field visits.

Roughly 22,567 acres of winter range (51% of the cumulative effects analysis area) exist in the cumulative effects analysis area; at least 16,385 acres (37%) of the cumulative effects analysis area appears to have sufficient canopy closure to provide thermal cover and snow intercept for big game. In the recent past, timber harvesting within this area has reduced thermal cover and snow intercept; ongoing timber management across the winter range, including activities associated with the Beavertail Beetles project on DNRC-managed lands could continue altering these attributes while potentially disturbing wintering big game. Portions of the cumulative effects analysis area are in non-forested, herbaceous, or shrub types, which would not be expected to provide thermal cover or snow intercept in the future. Human disturbance within the winter range is associated with residential development, agricultural clearing, recreational snowmobile use, commercial timber management, several roadways, including Highway 90 and Montana Rail Link railroad.

Environmental Effects-Big Game Winter Range

No Action Alternative: Direct and Indirect Effects

No direct or indirect effects to big game winter range would be anticipated since: 1) no further changes in the amount of mature-forested habitats in the winter range would be anticipated; 2) no further changes in thermal cover and snow intercept would be anticipated; and 3) human disturbance levels would not change.

No Action Alternative: Cumulative Effects

Continued winter use of the larger winter range would be expected. No further changes in thermal cover and snow intercept would be anticipated. Human disturbance levels would be anticipated to continue at current levels. No appreciable changes to big game distribution or habitat use would be anticipated. Thus, no cumulative effects to big game winter range would be expected since: 1) no further changes in the amount of mature-forested habitats in the winter range would be anticipated; 2) no further changes in thermal cover and snow intercept would occur; and 3) human disturbance levels would not change

Action Alternative: Direct and Indirect Effects

Proposed activities could occur in the winter, and disturbance created by mechanized logging equipment and trucks could temporarily displace big game animals during periods of operation for 2 to 4 years. However, winter logging provides felled tree tops, limbs, and slash piles that could concentrate feeding deer during nighttime and quiet periods when logging operations are shut down. Increasing short-term forage availability in this manner may partially offset some of the effects associated with temporary displacement caused by logging disturbance. There would be short-term added risk of disturbance and displacement of wintering animals that could result in moderate adverse effects associated with logging operations, short term road construction, and road use in the project area. However, no long-term effect to winter range carrying capacity or factors that would create long-term displacement or reduced numbers of big game would be anticipated.
Proposed activities would occur on roughly 7 acres (43%) of white-tailed deer winter range, 90 acres (28%) of mule deer winter range, and 238 acres (69%) of elk winter range; proposed activities would reduce canopy closure and potential winter use by big game on roughly 1,896 acres (58%) that likely have attributes facilitating considerable winter use by big game. Following proposed activities, canopy densities in these stands providing snow intercept and thermal cover would be reduced, reducing habitat quality for wintering big game. In general, it could take 40 to 80 years for these stands to regenerate and attain a size capable of providing thermal cover for big game. Proposed activities would not prevent big game movement through the project area appreciably in winter and could stimulate browse production in the units. Proposed pre-commercial thinning and planting would not appreciably alter winter range attributes, but could shorten the time before some of these stands provide these attributes to big game in the future. Thus, a minor risk of adverse direct or indirect effects to big game winter range would be anticipated since: 1) the relatively short-term that logging activities could create disturbance in this area; 2) harvesting would alter a moderate amount of the stands that are providing thermal cover and snow intercept habitats for big game species; and 3) portions of winter ranges for several species of big game would be altered.

Action Alternative: Cumulative Effects

Disturbance and displacement associated with this alternative could be additive to any displacement associated with ongoing activities in the cumulative effects analysis area and any other disturbances that may be affecting wintering big game. Similarly, any harvesting that may be occurring in the cumulative effects analysis area could continue altering big game winter range and/or disturbing big game. Proposed activities would reduce canopy closure on 329 acres of winter range (1.5%) and roughly 1,896 acres (12%) that appear to have attributes facilitating considerable use by wintering big game. Modifications to thermal cover and snow intercept in the project area could further alter the amount of the larger winter range providing these attributes for big game. Continued use of the larger winter range would be expected. Thus, a minor risk of adverse cumulative effects to big game would be anticipated since: 1) the relatively short-term that logging activities would create disturbance in a small portion of the cumulative effects analysis area; 2) a small percentage of the larger winter range would be altered; 3) availability of lower-quality cover in the vicinity that provides some opportunity for big game should they be displaced.

BIG GAME SECURITY HABITAT

Issue
Proposed activities could remove big game security cover, which could affect hunter opportunity and local quality of recreational hunting.

Introduction
Timber harvesting can increase vulnerability of big game animals by changing the size, structure, juxtaposition, and accessibility of areas that provide security during hunting season (Hillis et al. 1991). As visibility and accessibility increase within forested landscapes, moose, elk and deer have a greater probability of being observed and, subsequently, harvested by hunters, or they may become displaced or reduced in numbers due to lowered effective carrying capacity of the local habitat. Reduced cover attributable to logging and roads can also influence the effective use of habitat for big game species. Big game security habitat are nonlinear blocks of hiding cover that are more than 0.5 mile from open roads and are a minimum of 250 acres in size. For the purpose of this analysis, cover was considered generically as big game cover for deer, elk, and moose. Because elk are highly social, wide-ranging species, providing for their cover needs helps ensure that habitat needs for other ungulates, such as deer and moose are met as well. Because of their smaller size and behavioral differences, mule deer and white-tailed deer are able to use smaller cover patches more effectively for escape and security. Moose are a solitary, wide-ranging species capable of effectively using relatively small cover patches, and the hunting season for moose is heavily regulated, greatly reducing risk of overharvest by humans. Therefore, for this analysis it is assumed that if available security cover would provide for the needs of elk, it would also generally be adequate to meet the needs of moose, mule deer, and white-tailed deer.

Analysis Area
Direct and indirect effects were considered at the scale of the project area (4,523 acres). Cumulative effects were analyzed on the 44,589-acre area described above in the Analysis Areas portion of this analysis. This scale includes enough area to support hundreds of elk.

Existing Environment
Hiding cover is abundant in the project area. Approximately 1.3 miles/sq. mile of open roads exist in the project area, due largely to numerous historic roads that lead into the project area from private property which DNRC does not control access. Non-motorized access to the project area is also fairly high given this level of motorized access and numerous other restricted roads in the project area. Much of the project area does not contain big game security habitats due to the proximity to these open roads, however roughly 2,202 acres (49% of project area) are distant enough and contain sufficient cover to be able to contribute to larger blocks of potential security habitat that extend beyond the project area.

Hiding cover varies within the cumulative effects analysis area with the recent modifications from timber management and other human activities, but the combination of topography, distance from open roads, and the presence of vegetation likely provides adequate cover for elk during the hunting season. In the cumulative effects analysis area, access for recreational hunting is fairly high, with numerous open roads (at least 217 miles, 3.1 miles/sq. mile) that facilitate access and numerous restricted roads (at least 174 miles; 2.5 miles/sq. mile) that could be used for non-motorized use. Within the cumulative effects analysis area, 3 patches (total of 12,176 acres; 27%) of potential security habitat exist. Two of these patches extend beyond the cumulative effects analysis area and contribute to larger blocks of potential security habitats.

Environmental Effects-Big Game Security Habitat
No Action Alternative: Direct and Indirect Effects
None of the proposed forest management activities would occur in the project area. No risk of adverse direct or indirect effects to security habitat for moose, elk, mule deer, and white-tailed deer would be expected since: 1) no changes in existing security habitat would be anticipated and continued maturation of forest cover would

improve big game security habitat; 2) the level of public access to the project area would not change; and 3) no appreciable changes to big game survival would be anticipated.

No Action Alternative: Cumulative Effects
No changes in big game security habitat would be anticipated. Past harvesting has altered big game security habitat and allowed increased human access; continued maturation in previously harvested stands in the cumulative-effects analysis area would improve hiding cover in those areas. No other changes in disturbance and potential mortality due to hunting would be anticipated. Thus, no adverse cumulative effects to big game security habitat would be anticipated since: 1) no reductions in big game security habitat would occur and modest levels of security habitat and hiding cover would persist within the cumulative-effects analysis area; 2) no changes in open roads, motorized access, or public access would occur; and 3) no appreciable changes to big game survival would be anticipated.

Action Alternative: Direct and Indirect Effects
Tree density within proposed units would be reduced on roughly 1,989 acres, including roughly 1,026 acres (47% of existing security cover) of forested stands in the project area contributing to big game security habitat; following proposed activities big game security habitat would be reduced to roughly 26% of the project area. Hiding cover would be reduced within the proposed units, but would improve as trees and shrubs become reestablished in the openings over the next 10-20 years. The retention of structure within proposed units and unharvested areas between the various units would reduce the potential effects of the hiding cover reductions. Slight increases in sight distance would be anticipated. Proposed thinning would also increase sight distances while also altering hiding cover. Proposed planting could facilitate future development of hiding cover within some of the proposed units more rapidly than if left to natural regeneration. Overall, changes to sight distance and hiding cover would have minor effects to big game vulnerability risk in the project area. No changes in open roads or motorized access for the general public would occur. During all phases of the project, any roads opened with project activities would be restricted to the public and closed after the completion of project activities. Slight increases in non-motorized access would occur with the proposed construction of approximately 7 miles of restricted roads. Numerous contract stipulations would minimize the effect on the existing big game security habitat by prohibiting contractors from carrying firearms while conducting contract operations and prohibiting contractors from accessing restricted areas for other purposes, such as hunting. Collectively, a moderate risk of adverse direct and indirect effects to big game security habitat would be anticipated since: 1) reductions to existing hiding cover would reduce the quality of the big game security habitat in the project area; 2) no appreciable changes in open roads or motorized access for the general public would be anticipated and minor increases in non-motorized access would occur that would alter hunter access; and 3) negligible changes in big game survival would be anticipated.

Action Alternative: Cumulative Effects
Alterations of cover could reduce the quality of big game security habitat in a small portion of the cumulative effects analysis area. Continued maturation across the cumulative-effects analysis area would improve hiding cover and big game security habitat. No changes in public, motorized access and negligible increases in non-motorized access would be expected, which would not affect big game vulnerability in the cumulative effects analysis area. Negligible effects to big game survival would be anticipated. Thus, a minor risk of adverse cumulative effects to big game security habitat would be anticipated since: 1) quality of hiding cover in a small portion of the cumulative effects analysis area would be reduced, which would reduce the quality of the big game security habitat, but security habitat and hiding cover would persist in the cumulative-effects analysis area; 2) no changes in open roads or motorized access for the general public would be expected and only negligible increases in non-motorized access would occur that would alter hunter access; and 3) negligible changes in big game survival would be anticipated.

Wildlife Mitigations

- A DNRC biologist would be consulted if a threatened or endangered species is encountered to determine if additional mitigations that are consistent with the administrative rules for managing threatened and endangered species (ARM 36.11.428 through 36.11.435) are needed.
- Motorized public access would be restricted at all times on restricted roads that are opened for harvesting activities; signs would be used during active periods and a physical closure (gate, barriers, equipment, etc.) would be used during inactive periods (nights, weekends, etc.). These roads and skid trails would be reclosed to reduce the potential for unauthorized motor vehicle use.
- Snags, snag recruits, and coarse woody debris would be managed according to *ARM 36.11.411* through *36.11.414*, particularly favoring western larch and ponderosa pine. Clumps of existing snags could be maintained where they exist to offset areas without sufficient snags. Coarse woody debris retention would emphasize retention of downed logs of 15-inch diameter or larger.
- Contractors and purchasers conducting contract operations would be prohibited from carrying firearms while on duty.
- Food, garbage, and other attractants would be stored in a bear-resistant manner.
- Retention of patches of advanced regeneration of shade-tolerant trees, such as sub-alpine-fir and spruce, in units in lynx habitats would break-up sight distances, provide horizontal cover, and provide forest structural attributes preferred by snowshoe hares and lynx.
- In pre-commercial thinning units, retain small shade tolerant trees (such as sub-alpine fir and spruce to provide potential habitat structure for snowshoe hares by increasing the levels of horizontal cover and accelerating the development of multi-storied stands.
- Provide connectivity for fisher, Canada lynx, and a host of other species by maintaining corridors of unharvested and/or lighter harvested areas along riparian areas, ridge tops, and saddles.

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