Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment -- including your personal identifying information -- may be made publicly available at any time. While you can ask us in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

U. S. Department of the Interior
Bureau of Land Management
Lewistown Field Office

Montana Department of Natural Resources and Conservation
Northeastern Land Office

ENVIRONMENTAL ASSESSMENT
For the
Musselshell Breaks Fuels Treatment

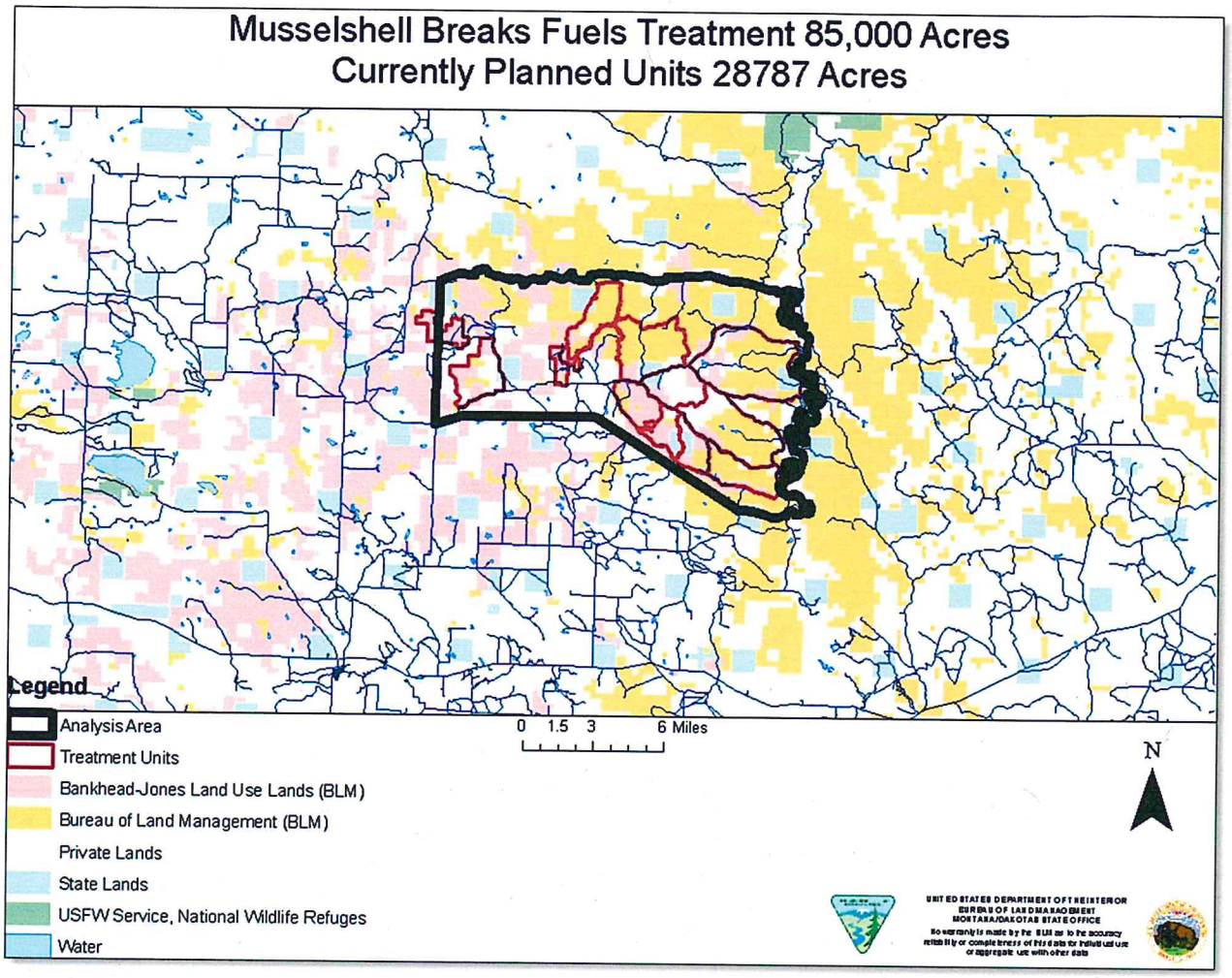
EA NUMBER: DOI-BLM -L060-2012-0019-EA

DATE OF PREPARATION: 1/11/13

Chapter 1 Purpose and Need for Action

Purpose and Need: The purpose of the proposed action is to shift the vegetation structure and composition in the Musselshell Breaks project area to fall within the historical fire regime, and to create defensible space around the private structures adjacent to the BLM lands. The current condition is an abundance of conifer saplings, pole-sized trees 5 – 9 inches diameter at breast height (dbh) and 9 – 21 inches dbh. The need for action is for a healthy diverse forest that is within the historical fire regime and to reduce overstocked fuels adjacent to WUI lands that would contribute to extreme uncontrollable fire behavior. Timber stands are overstocked pole and saplings sized trees are encroaching on adjacent sage and grass lands due to departure from historical fire frequency. Improvements to the overall condition class within the project area will likely result in benefits to wildlife habitat through an increase in the diversity and production of herbaceous vegetation and decreased fire severity. The Bureau of Land Management (BLM) is proposing to utilize prescribed fire and mechanical thinning, which may include grinding/masticating, chipping, hand slashing, in order to improve or maintain Fire Regime Condition Class (FRCC), reduce fuel loadings, and to create defensible space on BLM lands adjacent to wildland urban interface (WUI) in the project area. Early proactive treatments would be more efficient and cost effective if done before the conifer saplings and pole sized trees mature and further depart from historic conditions. Generally speaking prescribed fire is more cost effective per acre than wildfire suppression. The Montana Department of Natural Resources and Conservation proposes to cooperate in the proposed action through the inclusion of state land located within the project boundary.

Location of Proposed Action: Musselshell Breaks Fuels Treatment project area is in eastern Petroleum County, approximately 14 miles northeast of Winnett Montana. The size of the analysis area is approximately 85,000 acres. Within that analysis area there are eleven units that have already been designated. This includes 22,590 acres of Bureau of land Management (BLM) land administered out of the Lewistown Field office, 1,681 acres of Department of Natural Resource and Conservation (DNRC)/state lands, and 4,514 acres of private land, totaling 28,785 acres to be treated (See Map Below and Maps in Appendix 1). Treatment of the state land will be reviewed by the DNRC and approved by the Northeastern Land Office area manager. Treatment of private lands will be coordinated with individual participating landowners.



Unit B is located at T17N R28E E1/2 Sec 22, Sec 23, Sec 24, Sec 26, Sec 25, Sec 35, Sec 36; T17N R 29E S1/2 Sec 31, Sec 30 W1/2 Sec 29, Sec 19 (allotment #15115 River Ranch, #04849 Blood Creek-Marty, #04870 Lower Blood Creek) and is 3853 acres. It includes 394 acres of state land and 266 acres of private land. This unit has been treated with prescribed fire in the past and maintenance burning is needed to continue shifting it to a FRCC 1.

Unit C is located at T17N R28E E ½ Sec 32, NW ¼ Sec 33, S ½ Sec 29 (allotment #4849 Blood Creek-Marty) and is 709 acres. This unit has been covered on another environmental assessment (EA) as a mechanical unit and over laps into prescribed fire units therefore this EA will cover burning the unit.

Unit D is located at T16N R29E Sec 8, Sec 9, Sec 17, Sec 16, Sec 15, NE ¼ Sec 20, N ½ Sec 21, Sec 22 (allotment #15082 Tin Can Hill, allotment # 4852 Idhe ranch) and is 1361 acres. It includes 321 acres of state land and 172 acres of private land. This unit has been treated with prescribed fire in the past and maintenance burning is needed to continue shifting it to a FRCC 1.

Unit E is located at T17N R28E S ½ Sec 10, SW ¼ 11, W ½ Sec 14, Sec 15, SE ¼ Sec 16, SE ¼ Sec 20, Sec 21, Sec 22, NW ¼ Sec 27, Sec 28, E ½ Sec 29, NW ¼ Sec 32, NW ¼ Sec 33 (allotment # 4849 Blood Creek-Marty) and is 2363 acres. It includes 60 acres of state and 23 acres of private.

Unit F is located at T16N R29E NE ¼ Sec 3, N ½ Sec 2, N ½ Sec 1; T16N R30E N ½ Sec 5, N ½ Sec 6; T17N R29E Sec 21, Sec 22, S ½ Sec 23, S ½ Sec 24, Sec 25, Sec 26, Sec 27, Sec 28, Sec 29, Sec 32, Sec 33, Sec 34, Sec 35, Sec 36 (allotment #1515 River Ranch, #01518 Winter Pasture, and #15082 Tin Can) and is 6657 acres. It includes 478 acres of state land and 1056 acres of private land.

Unit G is located at T16N R27E Sec 1, E ½ Sec 2, N ½ Sec 12; T16N R28E Sec 6; T17N R27E Sec 26, Sec 34, Sec 35, E ½ Sec 36 (allotment # 4849 Blood Creek-Marty , # 15016 Breaks, and Twin Buttes 15063) and is 2353 acres. It includes 96 acres of state land and 923 acres of private land.

Unit H is located at T16N R29E S ½ Sec 14, E ½ Sec 15, E ½ Sec 22, Sec 23, Sec 24, N ½ Sec 25, N ½ Sec 26; T16N R30E Sec 19, Sec 30 (allotment #4841 Hailey Coulee and #2540 Deep Coulee) and is 2305 acres. It includes 242 acres of private land. This unit is being proposed for the purpose of WUI.

Unit I is located at T16N R29E S ½ Sec 2, Sec 10, Sec 11, Sec 12, Sec 13, N ½ Sec 15, N ½ Sec 24; T16N R30E S ½ Sec 7, 1 Sec 8, NW ¼ Sec 19 (allotment #4841 Hailey Coulee, #2540 Deep Coulee, #1518 Winter Coulee) and is 3531 acres. It includes 1642 acres of private land. This Unit is being proposed for the purpose of WUI.

Unit J is located at T16N R29E Sec 9, Sec 15, Sec 16, N ½ Sec 21, Sec 22 (allotment #4852 Idhe Ranch, # 15082 Tin Can, and #4841 Hailey Coulee) and is 1368 acres. It includes 323 acres of state land and 194 acres of private land.

Unit K is located at T17N R27E E ½ Sec 20, Sec 21, SW ¼ Sec 22, Sec 27, N ½ Sec 28 (allotment # 15058 Gardner Ind. E) and is 1131 acres.

Unit L (Cottonwood) is located at T16N R28E E ½ Sec 1, NE ¼ Sec 11; T16N R29E S ½ Sec 5, Sec 6, Sec 7, 8 Sec; T17N R28E S ½ Sec 35, SW ¼ Sec 36 (allotment # 15082 Tin Can Hill) and is1787 acres. It includes 9 acres of state land. This unit has been treated with prescribed fire in the past and maintenance burning is needed to continue shifting it to a FRCC 1.

The majority of the analysis area lies within the Lewistown Field Office (LFO) Breaks Fire Management Unit (FMU) with small portions of the west and southwest corners extending into the Prairie Forest FMU. Goals and objectives for the Breaks and Prairie Forest FMUs are identified in the Lewistown Field Office Fire Management Plan. The Fire/Fuels Management Plan Environment Assessment Plan Amendment for Montana and the Dakotas further categorizes the Breaks FMU into the Breaks Fire Management Zone – C1. The Prairie Forests FMU extends into the Range/Grasslands Fire Management Zone – B2. The B2 designation identifies areas where unplanned ignitions would have negative effects on the ecosystem unless mitigated. The C1 designation identifies areas where fire is desired to manage ecosystems. Both categories allow for the use of fire and non-fire fuels treatments for ecosystem management.

Fire Regimes and Condition Classes

One of the tools used to make the assessment of the area's condition is Fire Regime Condition Class (FRCC), which is an interagency, standardized tool based on scientific and peer reviewed literature for determining the degree of departure from a reference vegetative condition within a given biophysical setting (Bps). More information regarding this tool can be found at the following website http://www.frcc.gov. Assessing FRCC can help guide management objectives and set priorities for treatments. The classification is based on a relative measure describing the degree of departure from the historical natural disturbance regime for a given biophysical setting. This departure is described as changes to one or more of the following ecological components: vegetation characteristics (species composition, structural stages, stand age, canopy closure and mosaic pattern); fuel composition; fire frequency, severity and pattern; and other associated disturbances (e.g. insects and disease mortality, grazing and drought).

There are three FRCC classes used to describe the departure from reference Bps conditions. The following table provides descriptions of the three FRCC classes:

Fire Regime Condition Class (FRCC) Characteristics	
Condition Class	***Description***
1	Less than 33 percent departure from the central tendency of the historical range of variation (HRV): Fire regimes are within the natural or historical range and risk of losing key ecosystem components is low. Vegetation attributes (composition and structure) are well intact and functioning.
2	33 to 66 percent departure: Fire regimes have been moderately altered. Risk of losing key ecosystem components is moderate. Fire frequencies may have departed by one or more return intervals (either increased or decreased). This departure may result in moderate changes in fire and vegetation attributes.
3	Greater than 66 percent departure: Fire regimes have been substantially altered. Risk of losing key ecosystem components is high. Fire frequencies may have departed by multiple return intervals. This may result in dramatic changes in fire size, fire intensity and severity, and landscape patterns. Vegetation attributes have been substantially altered.

Biophysical setting (Bps) models have been developed for most major vegetation types. These models describe the vegetation, geography, biophysical characteristics, succession stages, disturbance regimes, and assumptions for each vegetation type (Havlina et al, 2010). Reference conditions described in the Bps models are compared to actual conditions for purposes of determining the current FRCC rating. A FRCC rating is determined for the entire project by determining the weighted average of all major vegetation FRCC ratings. FRCC 1 is desired for each Bps and for the entire project. A departure from FRCC 1 (reference condition) to FRCC 2 or FRCC 3 serves as an indicator that changes need to be affected.

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human intervention but including the possible influence of aboriginal fire use (Agee 1993; Brown 1995).

Approximately 30,000 acres of the 85,000 acre analysis area are occupied by ponderosa pine woodland. The forested settings within the project area have 20,000 acres which have been assessed at Condition Class 3. Appendix 6 contains the FRCC worksheet report which displays the reference and current compositions for the successional stands in both conifer strata.

FRCC Landscape Report for Musselshell Breaks				
Biophysical Setting (Bps Code)	**Condition Class 1 (Acres)**	**Condition Class 2 (Acres)**	**Condition Class 3 (Acres)**	**Total Acres**
Ponderosa Pine-Northern Great Plains (R0PIPOnp)	5,058	5,355	19,338	29,750
Wyoming Big Sagebrush (R0SBWYwy)	14,025	32,725	0	46,750
Northern Prairie Grassland (R0PGRn)	425	2,975	5,100	8,500
TOTAL ACRES	19,508	41,055	24,438	85,000

As compared to reference conditions, open structured, middle-aged and late stands, as well as early succession stands, are under-represented or at trace levels on the landscape. Closed structure stands are overly abundant on the landscape compared to reference conditions. Current fire severity has increased compared to reference conditions; and about five fire cycles have likely been missed. The understory vegetation in the closed stands is dominated by small-diameter mixed conifer regeneration and juniper, and species diversity and herbaceous biomass production is limited. Conifer encroachment is expanding into the edges of rangelands adjacent to forested sites.

Implementing prescribed fire in the project area would decrease conifer encroachment and increase the acres of open-structured forest stands to levels that are similar to reference conditions. With the reduction in natural fuel loadings and stand densities, fire severity would also become similar to reference conditions. This would change the Ponderosa stratum FRCC rating from a FRCC 3 to a FRCC 2 or even a FRCC 1. The biomass and species diversity of herbaceous and deciduous understory vegetation would likely increase. Reducing natural fuel loadings and ladder fuels may decrease the severity of a wildfire in the future and improve fire fighter and public safety.

Conformance With Applicable Land Use Plans: This proposed action is in conformance with the *Judith Valley Phillips Resource Management Plan (RMP)* approved in September 1994. The approved plan states on page 28, under the Fire Management section, that "prescribed burning will be administered on an individual basis in grassland, sagebrush, and/or conifer types to improve wildlife habitat and vegetation production".

The Fire /Fuels Management Plan EA /Plan Amendment for Montana and the Dakotas (2003) provides for fuel treatments that include prescribed burns and mechanical (including manual) methods on page 12. Page 25 states that "fuels treatments would focus on improving Condition Class 2 or 3 attributes, and would be refined for the project / watershed level."

The Musselshell Breaks Watershed plan (approved August 2005) states on page 69 that "mechanical thinning in the forested areas would be proposed in the River Ranch and Blood Creek-Marty allotments using chainsaws and or low impact mechanized equipment." And on page 75, the selected alternative, that "Implementation of Alternative 2 would initiate a prescribed fire program of work that would include burning for increased wildlife forage, range improvement, forest health, and protection of the scattered intermix communities."

This Plan is in conformance with the Montana Environmental Policy Act (MEPA) 75-1-101 MCA et seq.

Chapter 2 Description of Alternatives

Alternative Eliminated from further analysis

Commercial Sale of Timber: At the current time there is not a market for the timber in the area, due to the size of merchantable timber, distance from pulp mills and cost of fuel. It does not appear that there will be a market any time in the future.

Alternative 1 –Proposed Action: The proposed action would treat Musselshell Breaks fuels treatment units B–J (see map Appendix 1) with a combination of prescribed fire and/or mechanical methods. Unit K would be a mechanical treatment only due to Greater sage-grouse habitat. Proposal of undefined units in the future would require a determination of NEPA adequacy and consultation with the permitte of the allotment the unit occurs in. Ponderosa pine stands, which have been identified for treatment, are mostly condition class 3 with some condition class 2. Adjacent to these stands the saplings have spread into sagebrush/grassland sites. Most of the trees in the understory are small enough that mechanical treatments in combination with prescribed fire would be effective in reducing stand density and rangeland encroachment with minimal risk to the mature overstory while maintaining the open nature of the stand. Treatments would be implemented over the course of several years, including maintenance burning on all units and previously burned units (Tin Can Unit B, D, Cottonwood/unit L), in coordination with other resource management program needs such as range, wildlife, and cultural resources.

Prescribed fire will be used to reduce fuel loadings and maintain or improve condition class by reducing areas of dense pine regeneration while preserving the mature overstory and leaving a mosaic of burned and unburned areas. Currently, fuel loadings and stand conditions are such that prescribed fire is likely to be an effective and efficient means of maintaining or improving condition classes. Prescribed fire treatments would be implemented when environmental conditions would allow low to moderate fire behavior and intensity (typically spring or fall), and create a mosaic of burned and unburned areas. Small trees and those encroaching on open areas would be reduced while minimizing the risk to the mature overstory. The conditions under which prescribed fire would be used and implemented would be addressed in a project-specific burn plan.

The prescribed fire objectives of this project would be to:

1. Under burn a minimum 75 percent of the ponderosa stands.

2. Top-kill 30-60 percent of conifers less than 3" dbh (diameter at breast height)

3. Limit mortality in trees 8" dbh and larger to 30 percent.

Densely stocked mature and middle-aged pine stands with continuous ladder fuels are overly abundant on the landscape and contribute to a FRCC 3 rating. There is typically little vegetative diversity in the understory and these stands would be susceptible to a high severity wild fire, should an ignition occur. These areas will generally require mechanical treatments in order to meet objectives and allow a controllable prescribed fire. Reducing the stand density through a combination of mechanical treatments and prescribed fire would lower the risk of high severity wildfire as well as reducing conifer encroachment of open rangelands and would provide the opportunity for increased production and diversity of forbs, shrubs, and grasses. The primary purpose of mechanical treatment would be to thin overstocked areas where the prescribed fire is not a viable treatment option. Mechanical treatments would be implemented when conditions are favorable for minimal soil disturbance. Mechanized equipment will be limited to slopes of 40% or less with an emphasis on reducing dense areas of pine regeneration as a means of removing ladder fuels and promoting a more open stand. Hand treatments would include sawing and piling or lop and scatter treatments. All mechanical treatments will be based on the silvicultural prescription (see appendix 3). Patches of conifer stands will be left untreated as dictated by terrain and the need to retain security cover for big game.

Treatments will be coordinated with the appropriate range management specialist, archeologist, and wildlife biologist prior to implementation.

Control lines for prescribed fire would consist of existing roads, natural barriers such as areas of sparse fuels or cow trails, hand lines, and lines made with an ATV towing a mechanical device to clear vegetation down to mineral soil. The masticator/grinder may be used for prepping control lines, in areas where terrain lends itself to its use. Off-road travel by engines and ATV/UTV's would be required during prescribed fire operations.

All treatments would adhere to the Water Quality Best Management Practices (BMPs) for Montana Forests (MSU Extension, 2001).

Existing fences, pipelines, stock tanks and water savers would have fuels removed from around them as necessary prior to implementing prescribed fire operations, and would be protected during the operation.

Design Criteria:

Cultural Resources: Any known cultural resources would be avoided during project implementation. Protective measures, including but not limited to black/wet lining, hand removal of vegetation, etc. will be completed around the known cultural sites. Any cultural resources discovered as a result of, or during implementation of the project, will be protected as appropriate based on the type of site and values at risk. Post-burn inventory will be completed at known and protected sites to determine the effectiveness of the protective measures.

Range Land Vegetation: A rest period from livestock grazing of two growing seasons would generally be required after any major vegetative disturbance. Requirements for resting or deferring areas from livestock grazing following prescribed fire or maintenance burning would depend on a variety of factors including resource objectives, the type of fuel, time and intensity of burn, accessibility of the burned area to livestock, and post-burn climactic factors.

Consultation with permittees would be required prior to respective turnout dates in affected allotments to ensure removal of livestock during burning operations and implement short and long-term, post-burn grazing management strategies.

Noxious Weeds: Noxious weed infestations will continue to be monitored and treated using an integrated weed management approach. New infestations will be mapped and treated either by the grazing permittee through cooperative agreements or the BLM. If noxious weeds, such as Canada thistle, become wide spread throughout the treatment area, as a result of the fire and thinning operation, the BLM will assume the primary control responsibilities and may be treated by a contracted party. The BLM will approve any chemicals used and specify application rates. Control measures will be monitored and control applications will continue until weed eradication is achieved.

Wildlife: Prescribed burning during nesting, big game calving/fawning and active vegetation growth causes mortality and direct effects to wildlife species. After May 1 no prescribed burning would occur without the documented concurrence of the field office wildlife biologist and assigned rangeland management specialist.

Known raptor nests would be buffered for treatments.

Soils: All project associated operations shall not be performed during periods when the soil is too wet to adequately support equipment/vehicles. If such equipment/vehicles create ruts in excess of 3 inches deep, operations must cease as the soil will be deemed too wet to adequately support equipment/vehicles.

Limit prescribed burning of all areas to ensure low to low end moderate severity. Suggested prescription conditions that would promote low to moderate severity include:

1) Implement burning at a time of year when litter, duff, and soil moisture conditions are favorable for minimizing the loss of litter and duff and excess soil heating.

If grinding is used as a mechanical treatment, then mulch thickness shall be no greater than 7.5 cm in areas where prescribed fire will be implemented after grinding. Also, prescriptions for masticated (grinded) fuels should emphasize burning when soils are near saturation (Busse et al. 2005).

Leave 5 to 10 tons per acre of downed coarse woody material greater than 4 inches in diameter following slash reduction on all treatment areas to help re-establish soil productivity (Graham et al. 1994).

All mechanically disturbed areas will be reclaimed and stabilized using the appropriate measures. These measures may include water bars, straw wattles, mulch, seeding, etc.

Air Quality: If smoke dispersal is inadequate burning would be halted if at all possible. No burning would occur without approval from the Smoke Monitoring Unit of the Montana / Idaho state air shed group.

Alternative 2 No Action: Prescribed fire or mechanical treatments would not be implemented. For more information on the no action alternative see chapter 4 page 20.

Chapter 3 Affected Environment

Affected Environment: Proposed Action

Fire and Fuels Management: Ponderosa pine stands within the unit display a wide variety of age classes and structure with the majority of the unit falling into condition class 3. Fire regimes have been moderately to significantly altered from their historical ranges because: 1) fire return frequencies have departed from historical frequencies by up to five intervals, 2) vegetation attributes such as stand density and structural stage have been significantly altered from their historical ranges, and 3) current fire severity includes more stand-replacement than historical reference severities. With respect to wildfire, these alterations in the landscape could result in increased fire size, intensity, and severity, which would further alter the landscape's structural diversity.

Cultural Resources: A records search of the State of Montana's CRABS/CRIS databases and the Central Montana District site and survey atlas was conducted on December 7, 2012. A more comprehensive examination of historic prehistoric and paleontological resources in the analysis area can be found in the Class I Overview of the BLM Central Montana District (Walker-Kuntz, et al. 2010). The Lewistown Field Office has cultural resource inventory records for the analysis area dating back to 1977. Most of the inventories are for specific projects that cover forty acres or less. Inventories specifically for fuels projects began in 2008; 5137 acres have been inventoried by contractors since then, and an additional 500 acres was surveyed by BLM archaeologists. The BLM has awarded a contract for an additional 7376 acres of cultural resource inventory for the identification of historic properties in the analysis area; results are forthcoming. Compared to other areas in the field office, the project area has a low site density. Fewer than twenty sites have been documented in the analysis area; they are a combination of historic sites associated with homesteading efforts (building ruins, dumps, stone-carved graffiti, cemeteries), and prehistoric/aboriginal sites consisting of fire cracked rock and lithics.

Grazing Administration and Livestock Grazing: The proposed action contains the following grazing allotments:

GR# 2506397

Allt.#	Allt. Name	No.	Kind	Begin	End	% P.L.	Type Use	AUMs
04849	Blood Creek Marty	547	Cattle	05/01	09/30	59	Active	217

The Blood Creek-Marty Allotment is used season-long as permitted. This allotment is not meeting Standards and Guidelines for Rangeland Health, however, this is primarily due to distribution problems which concentrate livestock along Blood Creek. Upland areas encompassing the project areas were determined to be in conformance with upland standards. The project area is located in the southeastern end of the pasture which is situated far from stock water sources and contains topography that restricts the majority of livestock use.

GR# 2506397

Allt.#	Allt. Name	No.	Kind	Begin	End	% P.L.	Type Use	AUMs
04870	Lower Blood Creek	140	Cattle	05/01	12/31	79	Active	892

The Lower Blood Creek Allotment is used season-long. The allotment is not meeting Standards and Guidelines for Rangeland Health, however, this is primarily due to distribution problems which concentrate livestock along Blood Creek. Upland areas encompassing the project areas were determined to be in conformance with upland standards. The project area is located in the southwestern end of the pasture which is situated far from stock water sources and contains topography that restricts the majority of livestock use.

GR# 2506543

Allt.#	Allt. Name	No.	Kind	Begin	End	% P.L.	Type Use	AUMs
15115	River Ranch	198	Cattle	05/01	10/31	57	Active	683

The Van Hemp Pasture which contains the proposed action is used in conjunction with the Tin Can Hill and Raundall Pasture in a three pasture, deferred rotation grazing system within the River Ranch Allotment. Permitted dates of use are between May 1 and October 31. Use is described in the in accordance with the River Ranch Allotment Management Plan 1981. In August 2005, the allotment was determined to be in conformance with Standards and Guidelines for Rangeland Health.

GR# 2506555

Allt.#	Allt. Name	No.	Kind	Begin	End	% P.L.	Type Use	AUMs
15018	Winter Pasture							
	Winter Pasture	58	Cattle	05/01	11/30	43	Active	175
	Brownie's Pasture	4	Cattle	3/1	2/28	100	Custodial	49
							TOT	225

Typically, the Winter Pasture Allotment is used between August 1 and October 31 in conjunction with the Tin Can Hill Allotment rotation. In August 2005, the allotment was determined to be in conformance with Standards and Guidelines for Rangeland Health.

GR# 256370

Allt.#	Allt. Name	No.	Kind	Begin	End	% P.L.	Type Use	AUMs
15082	Tin Can Hill							
	Williams Coulee A	73	Cattle	05/01	10/31	92	Active	406
	Williams Coulee B	8	Cattle	03/01	02/28	100	Custodial	102

Terms and Conditions: Grazing use shall be in accordance with the final environmental assessment for the Musselshell Breaks Watershed Plan, August 2005. The current rest rotation system will continue to be utilized as outlined in the Tin Can AMP.

The Williams Coulee pastures are used in a rest-rotation grazing system in conjunction with the School Section Biggett and Winnett D Pastures existing in the Winnett Cooperative State Grazing District. These pastures are permitted to receive various treatments including deferment, rest and early season use. The Tin Can Hill Allotment was determined to be in conformance with Standards and Guidelines for Rangeland Health.

GR# 2506379

Allt.#	Allt. Name	No.	Kind	Begin	End	% P.L.	Type Use	AUMs
04852	Idhe Ranch	190	Cattle	05/15	10/15	63	Active	606

The Idhe Ranch is primarily used for season-long grazing due to water shortages in the West Pasture and disrepair of the Idhe Fence #449347. This allotment is not in conformance with Standards and Guidelines for Rangeland Health due to distribution patterns which concentrate livestock to the Cottonwood Creek bottoms and adjacent uplands. However, the project area, is located in the northeast corner of the eastern pasture which is situated far from stock water sources and contains topography that restricts the majority of livestock use.

GR# 2506368

Allt.#	Allt. Name	No.	Kind	Begin	End	% P.L.	Type Use	AUMs
04841	Hailey Coulee	368	Cattle	5/15	10/15	80	Active	1491

The Haley Coulee Allotment is used in a modified rotation due to salinated reservoir contamination as a result of 2011 flooding. This allotment is not in conformance with Standards and Guidelines for Rangeland Health due to distribution patterns which concentrate livestock to the drainage bottoms and adjacent uplands. However, due to the recent water shortages, the allotment has received limited use.

GR# 2506368

Allt.#	Allt. Name	No.	Kind	Begin	End	% P.L.	Type Use	AUMs
02540	Deep Coulee	12	Cattle	4/1	9/13	100	Active	1491

GR# 2506368

The Deep Coulee Allotment is used in a modified rotation with private pastures in the Musselshell River bottoms. This allotment is in conformance with Standards and Guidelines for Rangeland Health.

Outside of units B-L within the project there are an additional six allotments. Those include:

GR# 2506424

Allt.#	Allt. Name	No.	Kind	Begin	End	% P.L.	Type Use	AUMs
15089	Dunn Ridge	96	Cattle	6/01	9/30	67	Active	258

GR# 256409

Allt.#	Allt. Name	No.	Kind	Begin	End	% P.L.	Type Use	AUMs
15081	C.K. Cattle		Cattle	5/01	12/31	77	Active	242

GR# 250

Allt.#	Allt. Name	No.	Kind	Begin	End	% P.L.	Type Use	AUMs
04896	Blood Creek	188	Cattle	5/15	11/01	78	Active	824

GR# 250

Allt.#	Allt. Name	No.	Kind	Begin	End	% P.L.	Type Use	AUMs
15016	Breaks	169	Cattle	5/15	10/15	80	Active	685

Riparian/Water Resources: The Cottonwood Creek and Blood Creek watersheds were chosen for direct, indirect, and cumulative effects analysis because these are the watersheds that could be affected by the proposed vegetative treatments. Vegetative treatments are also proposed within Biggett, Raundal, and Haley Coulees. These coulees were excluded from cumulative effects analysis because they drain immediately into the Musselshell River, and the size of the Musselshell River watershed is too large to provide a meaningful analysis of the proposed project's effects. The direct and indirect effects would be the same or less as those identified for the Cottonwood and Blood Creek watersheds, but the cumulative effects would be immeasurable on the Musselshell River.

Watershed	Watershed Size (acres)	Acres within Watershed Proposed for Treatment
Cottonwood Creek	32,880	3,090
Blood Creek	152,469	9,320

Riparian and stream channel conditions are variable. There are roughly 14.3 miles of stream on BLM administered lands on Cottonwood Creek and approximately 20 miles of stream on BLM administered lands on Blood Creek. The 14.3 miles on Cottonwood Creek are physically functional although most miles lack a sufficient water table to support obligate riparian-wetland vegetation. On Blood Creek, 16.4 miles are functional, but there are 3.6 miles that are non-functional because of the lack of streambank vegetation, which has resulted in over-widened channels. Streams in poor condition are less able to process changes in streamflow and sediment.

Stream channels and associated riparian-wetland condition are also affected by water availability. A large percentage of the mean annual yield in both watersheds is stored in pits/dams/reservoirs. While not an exact estimate of mean annual yield stored, the following table does give an indication of the level of storage within the watersheds.

Watershed	Claimed Volume Stored in Pits/Dams/Reservoirs (acre-feet)	Pre-Treatment Mean Annual Yield (acre-feet)	Percent of Pre-Treatment Mean Annual Yield Stored
Cottonwood Creek	494	1,144	43
Blood Creek	5,444*	4,843	112

*Removed 6,000 acre-feet of claimed volume from a reservoir that did not appear to exist on the 2009 NAIP photos. The remaining claimed volumes also seem suspect, but there is no way to quickly prove the validity of the claims on private land.

Coniferous Forest: Ponderosa pine is the dominant overstory species within the project area. Historical stand densities (measured in basal area) ranged from 10 – 80 square feet per acre with an overall average of less than 40 square feet per acre. Currently, numerous timbered draws average upwards of 80-100 square feet with some areas approaching 160 square feet. Along forest margins and on some ridge tops, a dense ponderosa pine understory has become established under areas with scattered, large diameter overstory trees; with seedling numbers approaching 1,200 trees per acre (TPA). Due to the lack of natural fire, these ponderosa pine seedlings, coupled with increasing amounts of Rocky Mountain juniper, are contributing to high fuel loadings and are providing ladder fuels that may result in high intensity wildfire. Additionally, in areas of dense canopy, the understory is lacking in overall vegetative diversity.

Rangeland Vegetation: The allotments are all characterized by sharply defined rough, "breaks" topography. Ponderosa pine and common juniper cover is substantial throughout the project area. Bluebunch and western wheatgrass, junegrass, threadleaf sedge, blue grama and Sandberg's bluegrass occur in the understory and open areas. Green needlegrass has been identified as a key species of primary range in the majority of these ecological sites. Rubber rabbitbrush, big sagebrush, skunkbrush sumac, chokecherry, yucca, western snowberry, and broom snakeweed are common shrubs. Western yarrow, aster spp., scarlet globemallow, white penstemon, American vetch, fringed sagewort, hood's phlox, dandelion and goatsbeard are forbs known in the vicinity. There are no documented BLM sensitive plant species within or near the project area. Double bladderpod and dwarf woolly-heads are known in Petroleum County. Double bladderpod is limited to sparsely vegetated, steep, eroding, south-facing slopes of highly dissected breaklands. Substrate parent materials include sandstone and shale. These habitat requirements exist within the affected area. Associate species are also known within the area. Japanese brome is persistent throughout the area.
Noxious weeds: Russian knapweed, Leafy spurge Canada thistle and Houndstongue are known to occur in the area, with Russian knapweed, Leafy Spurge and Canada thistle identified and mapped in the proposed treatment area. No other noxious weeds have been identified, but may occur.

Visual Resource Management (VRM): The BLM uses a Visual Resource Management (VRM) system to inventory and manage visual resources on public land. The primary objectives of VRM are to help identify visual (scenic) values and to minimize visual impacts on BLM land from proposed projects and management activities. The VRM classification system uses four classes to describe the different degrees of modification allowed to the landscape. VRM classes are based on a process that considers scenic quality, sensitivity to changes in the landscape and distance zone. The four VRM classes are numbered I to IV; the lower the number the more sensitive and scenic the area.

The project area is located in Class III and IV visual resource management areas which allow for moderate contrasts to the environment that are subordinate to the existing landscape.

The objective of VRM III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The objective of VRM IV is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance and repeating the basic elements.

Recreation: The project area is a fairly large block of public land with county road access and is south of a popular Block Management Area (Chain Buttes BMA) that allows public access on private and public lands. Other BMA units are also in the surrounding area. There are three Special Recreation Permits (SRP) overlapping all or portions of the units. All three SRPs are outfitters for primarily big game. The area is used by the general public for hunting, primarily during the spring turkey season and the fall big game seasons. Other activities include dispersed camping, wildlife viewing, and driving for pleasure.

Lands with Wilderness Characteristics: The Federal Land Policy and Management Act of 1976 (FLPMA) directed the BLM to manage the public lands and their resources under principles of multiple use and sustained yield. Wilderness is one of the multiple use values. Section 2(c) of the Wilderness Act of 1964 requires that in order to be considered to have wilderness characteristics, an area must meet all of the following criteria:

(1) "generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable"; commonly referred to as naturalness.
(2) "has outstanding opportunities for solitude or a primitive and unconfined type of recreation;"
(3) "has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition;"
(4) "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value"

The Musselshell Breaks fuel treatment project area is located within contiguous blocks of BLM land. Based on a wilderness characteristics inventory completed in 1980, all of the treatment units within the project are located within three inventoried areas as shown in the figure below. The three units are: Cottonwood Creek/West Cottonwood Creek (MT-068-221 and 222), Blood Creek (MT-068-223), and Dovetail Creek (MT-068-224). Cottonwood Creek Unit and West Cottonwood Creek Unit were combined and totaled 12,650 acres (BLM, p 243). Blood Creek Unit has a total of 11,600 acres (BLM, p 245). And Dovetail Creek Unit has approximately 24,380 acres (BLM, p 247).

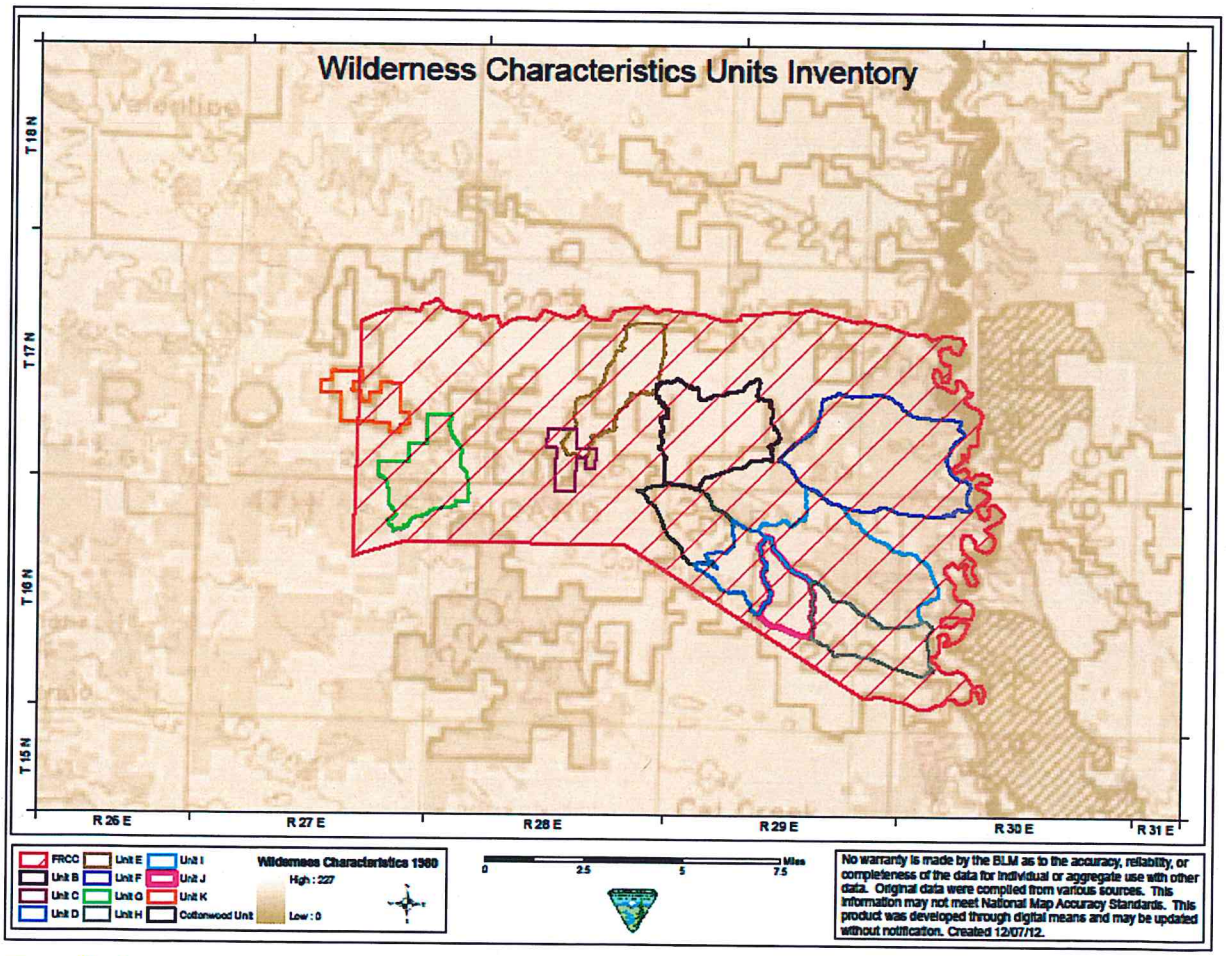


Figure 1: 1980 Wilderness Characteristics Inventory with FRCC and B through K and Cottonwood treatment units

Even though the 5,000 acres criterion was met in all three units, other factors have created a noticeable affect by the imprint of man's work. These contributing factors were created by the early development of range improvement projects. Thirteen grazing allotments exist within this area for purposes of livestock management. The BLM and permittees have constructed several dams, reservoirs and pipelines with stock tanks. In conjunction with the constructed watering facilities associated with range improvement projects, came mechanically constructed roads for building, accessing, and maintaining these sites. Based on the 1980 wilderness characteristics findings, all three units were dropped from wilderness consideration since the units clearly lack wilderness characteristics as described in FLPMA.

Wildlife:
Wildlife - General:

Wildlife species within the project area include species typically associated with the Missouri River Breaks habitat. Mule deer, elk, raptors, furbearers, reptiles and amphibians are common throughout the analysis area. The entire project area is within mapped elk and mule deer winter range and along the eastern boundary of antelope range (MFWP 2008). A northern goshawk was detected during call surveys in August, 2010, but no nest was located. Suitable goshawk nesting habitat occurs within the project area. A greater short horned lizard was also observed near the southwestern boundary of the project.
Threatened, Endangered, Candidate, and Species Proposed for Listing:
There are no threatened or endangered wildlife species present in the area of the proposed action. There is no designated critical habitat for any species within the project area. Greater sage-grouse and Sprague's pipit are both candidate species, with small amounts of potential habitat within the project area. Mountain plover is proposed for listing and could also occur in the project area. Appendix 4 contains the TES species that may occur in the project area and rationale for excluding remaining TES species from further analysis.

BLM Montana Designated Sensitive Species:
Great Plains toad, northern leopard frog, Plains spadefoot, greater short-horned lizard, milk snake, Baird's sparrow, bald eagle, Brewer's sparrow, chestnut-collared longspur, Dickcissel, Ferruginous hawk, greater sage-grouse, loggerhead shrike, long-billed curlew, marbled godwit, McCown's longspur, mountain plover, sage thrasher, Sprague's pipit, Swainson's hawk, three-toed woodpecker, Northern goshawk, golden eagle, fringed, long-legged and long-eared myotis and Townsends big-eared bats all have potential habitat within the project area.

Soils: Soils were identified from the Natural Resources Conservation Service's (NRCS) Soil Survey Geographic (SSURGO) dataset (Soil Survey Staff, 2012) and the Soil Data Mart (SDM) website (http://soildatamart.nrcs.usda.gov/). Soil surveys were performed by the NRCS according to National Cooperative Soil Survey (NCSS) standards. Pertinent information for review and analysis is from the SDM and the National Soils Information System (NASIS) database for the area.

Soils within the Analysis area developed mostly from sedimentary residuum parent materials (sandstone, siltstone, and shale) and from lesser amounts of alluvium. Soil depths range from shallow (10 to 20 inches) to very deep (>60 inches). Water erosion hazard, dependent on slope and erodibility, ranges from slight to severe. The potential for damage to the soils by fire ranges from low to high; dependent on texture, slope, surface depth, and rock fragments. There are areas of exposed bedrock.

The primary Soil Map Units (SMUs) within the proposed treatment units are listed in the following table. Appendix 2 (Soils) provides a description of the major soils that occur in a SMU. Descriptions of non-soil (miscellaneous areas) and minor SMU components are not included.

Primary SMUs within each Treatment Unit.

Treatment Unit	SMU
B	14, 16, 17, 21, 23, 32
C	17, 18, 21, 23, 31, 32, 36, 98
D	9, 17, 18, 19, 22, 23, 36, 64
E	16, 17, 21, 23, 31, 32, 36, 64, 66, 98
F	14, 16, 17, 21, 23, 29, 32, 39, 62, 63, 66, 98
G	16, 17, 23, 79, 98
H	9, 21, 23, 33, 34, 52, 62, 63, 64, 66, 70
I	8, 9, 16, 17, 21, 23, 32, 34, 62, 63, 66
J	9, 17, 21, 23, 32, 48, 64
K	17, 18, 23, 32, 34, 36, 79, 80, 81
L	16, 17, 20, 21, 22, 23, 32, 36

Air Quality: Air quality in the area is generally considered good to excellent, meeting air quality standards set forth by the Clean Air Act. The project area is within a class II airshed. Spring and fall typically have atmospheric conditions that are favorable for smoke/particulate dispersal. The area is sparsely populated with few smoke receptors. Lightly travelled county roads can be found within the project area.

Climate: Ongoing scientific research has identified the potential impacts of anthropogenic "greenhouse gas" (GHG) emissions and their effects on global climatic conditions. These anthropogenic GHGs include carbon dioxide; methane; nitrous oxide; and several trace gases, as identified by the Intergovernmental Panel on Climate Change (IPCC). The general consensus is that as GHG emissions continue to rise, average global temperatures and sea levels will raise, precipitation patterns will change, and climatic trends will change and influence earth's natural resources in a variety of ways.

Montana's GHG emissions were recently updated and a forecast was made of expected emissions through 2020 (Montana DEQ 2007). The inventory indicates that Montana's electricity generation, heating needs, commerce, agriculture practices, and transportation needs accounted for 0.6% of the GHG emissions in the United States in 2005, or about 37 million metric tons of gross consumption-based carbon dioxide equivalents. The state's forests, cropland, and rangeland provide a vast terrestrial carbon sink that helps balance the state's emissions; however, a 14% increase in GHG emissions from 1990 to 2005 moved Montana from a net carbon sink to a net carbon emitter.

Chapter 4 Environmental Consequences

Alternative 1 Proposed Action:

Fire and Fuels Management: The fire regime/condition class of conifer stands and adjacent sagebrush/grasslands would improve with treatment, which would move parts of the landscape toward historic vegetation patterns and fire severity. Reduced fuel loadings and arrangement would lower the risk of high severity wildfire and improve fire fighter and public safety. Maintaining areas of FRCC1 or FRCC2 will be more efficient and effective than allowing continued departure from historic fire regimes. Private residences adjacent to treatments would be better protected from sever wild fire.

Cultural Resources: Vegetation treatment projects have the potential to affect historic properties. Prehistoric sites can have their setting modified, subsurface artifacts can suffer from compaction, surface artifacts can be broken, displaced, and be affected by intense heat (cracking, spalling, discoloration). Historic sites, particularly wooden buildings and associated features, can be lost during firing activities. To prevent such effects from occurring, cultural resource inventories of the analysis area have been initiated, and will continue in a phased approach through the life of the project as different areas are proposed for treatment.

The units identified below show some level of inventory. Those units shown with Class II inventory had multiple parcels scattered within each unit surveyed intensively.

Unit	Inventory
Cottonwood	Class II – Sample
B	Class II – Sample
C	Class III - Intensive
D	Class II – Sample
E	Class III – Intensive
F*	Class III – Intensive
G**	Class III - Intensive
H***	Class III – Intensive
I	Class III – Intensive
J	Class II – Sample
K****	Class III - Intensive

** The north half of this unit has been inventoried.*
*** The east half of this unit has been inventoried.*
**** The northeast end of this unit has been inventoried.*
***** 160 acres of this unit has been inventoried.*

Following prescribed burning and vegetation management (analyzed in prior year's environmental analyses) those same parcels received intensive inventory to determine fire effects as well as the adequacy of our stratified sampling strategy. Past fuels treatments in the area had no effect on cultural resources. The activity proposed in this alternative will be comparable to that analyzed in the Cottonwood and earlier Tin Can Hill prescribed burns/vegetation treatments.

Mitigation incorporated in the proposed action includes completing cultural resource inventories to define the area of potential effect (APE), to identify cultural resources within the APE, to determine which cultural resources are eligible for listing in the National Register of Historic Places (NRHP), and to assist in redesigning the project if the protection of eligible historic properties warrants such action. Based on this mitigation, and the inventory results and current site eligibility determinations, no historic properties will be affected by this undertaking.

Grazing Administration and Livestock Grazing: Conifer expansion along forest margins would be reduced. Reductions in forest canopy would promote growth of bunchgrasses, forbs and deciduous shrubs, particularly skunk brush sumac. There may be an increase in the abundance and diversity of shrubs, forbs, and grasses. Annual grasses such as Japanese brome could increase significantly in the short term depending on intensity and duration of the burn and post-burn environmental conditions such as rainfall and timing of rain events. These short-term consequences would be expected to diminish over time as late seral species re-establish. In addition, a low to moderate intensity prescribed fire will minimize the amount of bare mineral soil which is exposed and limit the potential for the establishment of undesirable species. Recent prescribed fire in the Tin Can Hill vicinity with similar post-burn grazing treatments did not exhibit increases in Japanese brome or other invasive and noxious weeds.

Riparian/Water Resources: For direct effects analysis, a small watershed within the proposed treatment area was selected for analysis that had relatively heavy forest canopy cover compared to the rest of the project area. The purpose of choosing one with heavy forest canopy cover was that the effects of prescribed fire and tree removal on similar watersheds or watersheds with less forest cover within the project area would either be similar or less. This provides an estimate of the effects for a worst-case scenario so to speak. Also, the watershed chosen for analysis does not contain substantial storage (i.e. pits/dams/reservoirs), so the effect of the prescribed fire within the watershed could be separated from other effects, such as the runoff hydrograph being routed through a reservoir.

A 2-year, 24-hour precipitation event was chosen for analysis because a storm event of this frequency would be the most likely to possibly occur while the immediate effects of the burn are present on the ground. These estimates provide peak flows and runoff associated with a 2-year storm event (calculated using the NRCS curve number

approach). An analysis of change in mean annual yield (calculated using Omang and Parrett, 1984) was completed to give an idea of the possible changes in the amount of water yield available on an annual basis.

Variables that remained constant include the watershed size (1392 acres), watershed hydrologic length (11,352'), average watershed slope (13.2 %), and the hydrologic soil groups within the watershed (C and D). For the curve number approach, changes include the amount of acres in vegetative cover types of pine/juniper and woods-grass combination as well as post-fire curve numbers calculated using a ratio of pre-fire to post-fire curve numbers based upon the level of wildfire hydrologic impact, which are low, moderate, or severe (Livingston and others, 2005). Because the fire would be a prescribed fire, a low wildfire hydrologic impact was chosen. This generally shifted curve numbers from a good condition to poor condition within the same cover type. For the change in vegetative covers, the analysis assumed a 70% kill on trees in the woods-grass combination cover type and a 50% kill on the pine-juniper cover type. The high end of the burn objectives were chosen to provide a worst-case scenario, and anticipated effects would more than likely actually be less than those disclosed.

The immediately post-burn scenario assumes the change in vegetative covers, with a decrease in forest on the pine/juniper and woods-grass combination cover types as well as a shift in curve numbers from a good to poor condition. The two years post-burn scenario assumes recovery of the curve numbers from poor to good condition, but 50 percent of the pine/juniper cover -type and 70 percent of the tree cover in the woods-grass combination has shifted to herbaceous cover type.

For evaluating the changes in mean annual yield, the variable changed for analysis was the percent forest cover within the watershed.

Curve Number Approach	Existing Conditions	Immediately Post-Burn	2 Years Post-Burn (percent increase from existing conditions)
Peak Flow (cfs)	40	52	52 (30)
Runoff (in)	0.12	0.13	0.13 (8)
Runoff (acre-feet)	13.92	15.08	15.08 (8)
Omang and Parrett, 1984	Existing Conditions		2 Years Post-Burn (percent increase from existing conditions)
Mean Annual Yield (cfs)	0.027		0.033 (22)
Mean Annual Yield (acre-feet)	19.55		23.89 (22)

The direct and indirect impacts are insignificant because the existing fire regime condition class and percent forest cover are outside of the range appropriate for the landscape, and the vegetative treatments are intended to return the landscape to conditions found historically. Furthermore, studies conducted in the Missouri River Breaks (Marlow and others, 2006) found positive effects on water yield and riparian process in small order drainages following implementation of prescribed fire and vegetative treatments. So, although peak flow and water yield would likely increase following vegetative treatment, the indirect effect of downstream stream channel erosion could possibly be less in the small order drainages below treatment units. A shift from upland or facultative plant species to obligate riparian-wetland species (with high streambank stability ratings) in channel bottoms would decrease erosion.

Coniferous Forest: Conifer densities would be reduced to levels within the historical range of variation using appropriate silvicultural prescriptions (see appendix 3). The proposed vegetation treatments and subsequent maintenance actions will also mimic the stand improvement effects of the natural fire cycle and promote a more fire tolerant forest consisting of open stands of mature ponderosa pine. Forest health would also improve by decreasing overall stand densities creating a more vigorous forest which will be less susceptible to future insect and disease problems. Conifers that are expanding onto ridge tops and rangeland areas would be eliminated or slowed, thus decreasing fuel loadings and the potential for high intensity wildfire. Open pine stands with mature trees would be maintained, and the overall reduction in conifer density and canopy continuity would provide the opportunity for increased production and diversity of shrubs, forbs, and grasses within the understory.

Rangeland Vegetation: Conifer expansion along forest margins would be reduced. Reductions in forest canopy would promote growth of bunchgrasses, forbs and deciduous shrubs, particularly skunk brush sumac. There may be an increase in the abundance and diversity of shrubs, forbs, and grasses. Annual grasses such as Japanese brome could increase significantly in the short term depending on results of the burn and post-burn environmental conditions such as rainfall and timing of rain events. These short-term consequences would be expected to diminish over time as late seral species re-establish, in addition a low to moderate intensity prescribed fire will minimize the amount of bare mineral soil which is exposed and limit the potential for the establishment of undesirable species. Recent prescribed fire in the Tin Can Hill vicinity with similar post-burn grazing treatments did not exhibit increases in Japanese brome or other invasive and noxious weeds.

Noxious weeds: After treatment, the infested areas will be surveyed and mapped to establish a post treatment base line. This base line will be used to evaluate weed expansion and treatments. The burn area will be monitored for new infestations by the Resources and Fuels staff and treated when new infestations are found. Noxious weeds will be treated using an integrated control approach with chemical, biological or mechanical methods, approved by the BLM, at appropriate rates.

VRM: Any negative impacts would be of short duration. Reduction in conifer density and increases in herbaceous cover may actually improve the appearance of the project area in the long term.

Recreation: Any negative impacts would be temporary and would likely be offset by the long-term benefits. Hunting is the primary recreational use within the project area and may be disrupted during operations. However, long-term benefits to forest and rangeland health may improve wildlife habitat and make the area more attractive to wildlife species such as turkey, deer, and elk. Improved wildlife habitat may increase opportunities for hunting and wildlife viewing in the future.

Wildlife: Threatened, Endangered, Candidate, and Species Proposed for Listing, BLM Designated Sensitive Species, and Migratory Birds:

Objectives for the prescribed burn are to reduce ponderosa pine understory and regeneration, while maintaining most overstory trees. The prescribed burn would reduce competition for the remaining ponderosa pine, increasing growth rate and vigor. Reduced canopy cover and needle cast would also increase herbaceous vegetation production (until the canopy begins to close again (15-20 years)) and nutrition (approximately 3 years). Wyoming sagebrush would not be targeted for treatment, but small acreages (<20 acres) could be consumed incidentally adjacent to ponderosa pine treatments. Silver sagebrush occurs adjacent to forested habitat in many of the drainages and unlike Wyoming sagebrush, responds favorably to disturbance.

Elk populations in the Missouri River Breaks Elk Management Unit are approximately 7,750 elk, above the objective of 4,725 (MFWP 2004). The objective of the project is not to increase the elk population, but would help meet the state's habitat objective to "promote conservation and improvement of habitats that support the state's elk populations".

Resident wildlife species would be displaced short-term during implementation until suitable habitat establishes. Similar habitats exist in immediate proximity to the project area that will remain unburned following the project and the outlying areas contain a larger amount of similar habitats. Only approximately 3,000 to 4,000 acres are prescribed burned annually in the Malta and Lewistown Field Offices and UMRBNM, so species preferring habitat conditions that exist currently would still have the opportunity to select those habitats. Additionally, all areas within the project area would not be treated; unburned pockets would remain and the targeted areas only cover ~50 -70% of the forested areas. Mortality could result from treatment activities, especially if burns are initiated later in the spring when migratory birds begin returning to breeding habitat. Given the significant decline in some grassland bird species over the last 40 years, treatments should not occur during the breeding season. These detrimental impacts would be short-term and would be mitigated by the long-term benefits to the species using the habitat and species drawn to the habitat created by prescribed fire.

BLM Designated Sensitive Species:
Birds and bats would be temporarily displaced during spring burning operations and for that year's nesting season. There may be mortality of less mobile individuals. These are short-term impacts and will not affect the populations of any species. The detrimental impacts would be mitigated by the long-term benefits to the species using the habitat and species drawn to the habitat created by the prescribed fires (remaining snags). Some greater short-horned lizard individuals would be subject to loss during burning operations if the fire were to burn into sagebrush/grassland plant communities. Losses could also occur from incidental mortality from vehicle use during follow-up monitoring. These short-term impacts would not affect the stability of the local population for this species. The proposed action would remove and open up more of the timber habitat providing minor increases in habitat for this species. The impacts from the proposed project would not affect the state or regional populations of any of these species or contribute to the need for listing under the Endangered Species Act.

Migratory Birds: Excerpt from Saab et. al 2007
The effect of fire on birds can be beneficial, neutral, mixed, or adverse depending on the species, length of time since fire, and burn severity. Generalizing the effect of fire on birds in western forests is challenging: short-term responses may differ from long-term responses, responses by resident bird species may differ from migratory species, and effects observed at the stand scale may differ from those at the regional or landscape scale. Also, fire that benefits one species may harm another. Ultimately, managing for particular fire conditions—including wildland fire, prescribed fire, or fire exclusion—entails ecological tradeoffs among selected wildlife species and habitats. In the combined study areas (NW and SW), all but one of the eight resident species had a positive or neutral response to burning treatments. The one exception, the pygmy nuthatch (in the SW study area), showed a negative response the year of burning, but showed a neutral response the following year. Migrants showed mixed responses. Some, like western bluebirds, experienced positive changes in density, whereas others, such as yellow-rumped warblers, showed declines in response to fire treatments. Overall, at both study sites, a greater percentage of birds, both migrants and residents, showed some decline during the same year as the fire, but were back to prefire abundances (i.e., neutral to prescribed burns) 1 year after the fire. These preliminary results suggest that the effects of prescribed fire on birds may be short term. However, monitoring for additional years after treatments is needed to fully address this issue of short-term losses for long-term gains (Saab et al. 2006b). This is particularly important because we also observed several migratory species that showed no response during the year of prescribed fire, but showed a decline in the year after treatment. These were the gray flycatcher (in the SW), and the red-breasted nuthatch and Townsend's solitaire (in the NW).

Figure 6—Example of bird species associated with burn severity in dry coniferous forests of the interior Western United States (photos by Evelyn Bull, Catherine Raley, and Charlie Chrisafulli).

Table 1—Preliminary results for species population density responses to prescribed fire at the Birds and Burns Network northwest sites

Species	Year of burning	One year after burning	Guild		
			Foraging	Nest layer	Nest type
Migrant					
Northern flicker (short-distance migrant)	+	0	OM	CA	C
Hammond's flycatcher	-	-	AI	CA	O
Gray flycatcher	0	+	AI	SH	O
Dusky flycatcher	+	+	AI	SH	O
Cassin's vireo	0	0	FI	CA	O
Red-breasted nuthatch	0	-	BI	CA	C
Western bluebird	+	0	AI	CA	C
Townsend's solitaire	0	-	AI	GR	O
American robin	+	0	GI	CA	O
Yellow-rumped warbler	-	-	FI	CA	O
Western tanager	0	0	FI	CA	O
Chipping sparrow	0	0	OM	SH	O
Dark-eyed junco	0	0	OM	GR	O
Brown-headed cowbird (short-distance migrant)	+	0	OM	Various	P
Cassin's finch	0	0	OM	CA	O
Pine siskin	-	0	OM	CA	O
Resident					
Hairy woodpecker	0	+	BI	CA	C
Mountain chickadee	0	0	FI	CA	C
White-breasted nuthatch	+	0	BI	CA	C

Note: Statistically significant changes in population densities are indicated by the signs + (positive) or – (negative). All zeros indicate no statistical change in population densities from pre- to posttreatment. Columns represent foraging guild (AI = aerial insectivore, GI = ground insectivore, FI = foliage insectivore, OM = omnivore, BI = bark insectivore), nest layer (CA = canopy, SH = shrub, GR = ground), and nest type (C = closed, O = open, P = parasitic). Species are listed in taxonomic order, an order that reflects the evolutionary relationships among birds.

Soils: Prescribed fire and mechanical treatment would expose mineral soil and have the potential to alter physical, chemical and biological soil properties; disrupt nutrient cycles; displace soil; and, compact and rut soil. Exposed and/or compacted soils would be susceptible to erosion. Soil compaction and erosion can impact soil quality by reducing water infiltration/permeability; reducing the exchange of gases; reducing or eliminating the most productive and highly biologically active layer of soil and limiting plant growth and health. Implementing and adhering to the Water Quality BMPs for Montana Forests (MSU Extension, 2001) would mitigate the amount of soil disturbances, the potential for prolonged compaction and erosion, and long-term effects to soil quality. In time, organic matter would gradually re-accumulate from litter, woody debris, forbs, and grasses. Nutrients would gradually accumulate due to inputs (in precipitation, dry deposition, weathering of parent material, and nitrogen fixation) and retention. Erosion would return to natural rates overtime as vegetation re-establishes.

Prescribed fire has not only physical effects on soils, but also chemical and biological effects (Hungerford et al. 1991). Physical changes include reduction in soil cover, loss of duff and litter layers, loss of organic matter from mineral soil, and erosion. These changes influence texture, bulk density, and porosity of soils. Chemical changes occur as nutrients are volatilized (nitrogen, phosphorus, and sulfur), ashed, and redistributed. Some nutrients are lost or reformed, pH is changed (typically increased due to ash), cation exchange capacity is changed (generally the greater the heating, the greater the chances of ion deficiencies), and displaced hydrocarbons may coat soil particles causing water repellency. Biological effects include microorganism population increases or decreases (typically a decrease due to heating, loss of moisture, and reduced gas exchange followed by an increase attributed to an improved environment with respect to soil physical characteristics over time) and changes in activity which can influence nutrient cycling. Generally, the greater the burn severity the greater the negative effects to soils. Low intensity burning, as proposed, may cause short-term increases in the availability of plant nutrients, reduction in disease or pathogens, and thinning of over-crowded stands of trees, all of which can promote healthy systems (Neary et al. 1999).

Hatchett et al. (2006) found that mechanical mastication (grinding) to be an effective thinning treatment for overstocked forests with few discernable negative effects on soil compaction and increased erosion. The same researchers' results suggest that erosion is slight to insignificant following mastication, provided that a layer of woodchip mulch is left on the forest floor and the mastication equipment is operated in an environmentally effective manner. Busse et al. (2005) found that soil temperatures can surpass the biologically lethal threshold of 60 degrees Celsius if masticated residues burn. Mulch depths of 7.5 cm or greater are generally required to generate peak temperatures above 60 degrees Celsius at 10-cm soil depth (Busse et al. 2005); therefore, mulch thickness shall be no deeper than 7.5 cm. in areas where prescribed fire would be implemented after grinding.

Air Quality: Due to light fuels and the small size of the project area, combined with a lack of receptors in the area, any negative impacts to air quality or visibility are expected to be minor and of short duration. Although emissions such as fine particulate matter and carbon monoxide may be released by the prescribed fire, these emissions would likely be less than that of a wildfire and would help to prevent large releases of these pollutants during future wildfires.

Climate: Potential impacts to natural resources due to climate change are likely to be varied. For example, if global climate change results in a warmer and drier climate, increased particulate matter impacts could occur due to increased windblown dust from drier and less stable soils. Cool season plant species' ranges could potentially move north and due to the potential loss of habitat, or from competition from other species whose ranges shift northward, the population of some animal species could change. While many existing climate prediction models are global or regional in nature, the lack of scientific tools designed to predict climate change on local scales limits the ability to project potential future impacts of climate change on the specific area for this project. It is not possible to predict with any certainty site-specific effects on climate change relative to the proposed action.

Increased forest health as a result of the proposed action may result in a greater capacity to absorb greenhouse gases such as carbon dioxide over the long term. According to the National Center for Atmospheric Research (2010), prescribed fires may help reduce the U.S. carbon footprint. Prescribed fires generally burn underbrush and smaller trees, which give off substantially less emissions than stand-replacing, high-intensity wildfires. Furthermore, large trees that sequester a significant amount of carbon are left.

Alternative 2 No Action:

Fire and Fuels Management: The fire regime condition class of conifer stands will continue to decline due to increasingly long fire return intervals and departure from historic conditions. Postponing treatments would allow the existing ponderosa pine seedlings to increase in size and density, making future treatments more difficult and expensive, with further departure from historic fire return intervals. With continued fire suppression and lack of prescribed fire, vegetation health in the project area would continue to decline due to excessive fuel buildup and departure from historical conditions. Conifer stands would continue increasing in stand density and into sage/grassland areas, and would be at risk of high severity wildfire. The risk of losing key ecosystem components would increase and vegetation species and age class diversity would decline. Additionally the structures/improvements and future development of the WUI within the project area would continue to be at a risk.

Cultural Resources: Under current management (No Action alternative), the condition of cultural sites that may be present would remain static to slightly deteriorating. No further inventory would be done in the area unless other undertakings are proposed. We could see the gradual buildup of fuels in and around existing historic properties, that, without vegetation management, could be affected directly by the fire or indirectly by suppression activities should a wildfire burn through the area.

Grazing Administration and Livestock Grazing: There would be no changes in grazing administration.

Riparian/Water Resources: No immediate increases in the quantity of runoff and sediment would occur. Wildfire burning through larger fuel loads would have greater burn intensity. This would lead to a temporary larger increase in runoff and sediment than a lower intensity prescribed burn.

Coniferous Forest: Multistoried stands would continue to develop across the project area, increasing the possibility of a stand-replacing wildfire while large patches of stagnant, co-dominant trees will continue to be highly susceptible to insects and disease. Rangelands would continue to be impacted as increased conifer encroachment continues to shift existing plant communities to late seral stages, which typically limits the amount of grasses and forbs and overall vegetative diversity.

Rangeland Vegetation: Conifer encroachment of rangelands would continue under the No Action alternative. Production of forbs and shrubs would remain the same or may decrease in the long-term.

Noxious weeds: The No Action alternative would have no effect on noxious weeds. Any noxious weeds identified within the treatment area will be treated by the grazing permitees through the use of cooperative agreements. An integrated control approach using chemical, biological and mechanical methods will be utilized when applicable. Chemicals applied to noxious weeds will be approved by the BLM and at rates approved for public land.

VRM: Implementation of the No Action alternative would have no effect on VRM resources within the project area.

Recreation: Implementation of the No Action alternative would have no effect on recreational resources within the project area.

Wildlife: Dense, multistoried ponderosa pine stands would continue to develop across the project area and continue to provide habitat for the suite of wildlife species that utilize these habitats. These conditions would persist until some disturbance takes place. Fire suppression is expected if a wildfire occurs. No drastic change in condition is predicted in the foreseeable future in the absence of the proposed actions. Large wildfires have occurred in the vicinity, with the most recent being the Raven-Rat-Patch fire in 2010 that burned approximately 30,000 acres along the CMR wildlife refuge and Lewistown FO.

Soils: Prescribed fire and mechanical treatment would not take place; therefore, effects described above in Alternative 1 would not occur. If the proposed units and surrounding areas were to be burned by wildfire in the future, a mix of burn severities would be anticipated depending on topography, fuels and climatic conditions. High and moderate soil burn severities would likely result where there is heavy fuel buildup. This would result in an increased amount of bare soil, accelerated erosion, slow recovery of effective vegetative cover and loss of soil nutrients and soil microbes. Areas of low soil burn severity may benefit from a short term release of nutrients available to plant growth and a change in the types and amounts of vegetation.

Air Quality: The No Action Alternative would have no impact on air quality.

Climate: Healthy forests act as a carbon sink. Under the No Action alternative forest health is likely to decline, resulting in reduced capacity to absorb greenhouse gases such as carbon dioxide from the atmosphere in the event of a stand-replacing wildfire. "When trees burn down or die, much of that carbon is returned to the atmosphere. It can take decades for forest regrowth to sequester the amount of carbon emitted in a single fire" (National Center for Atmospheric Research, 2010).

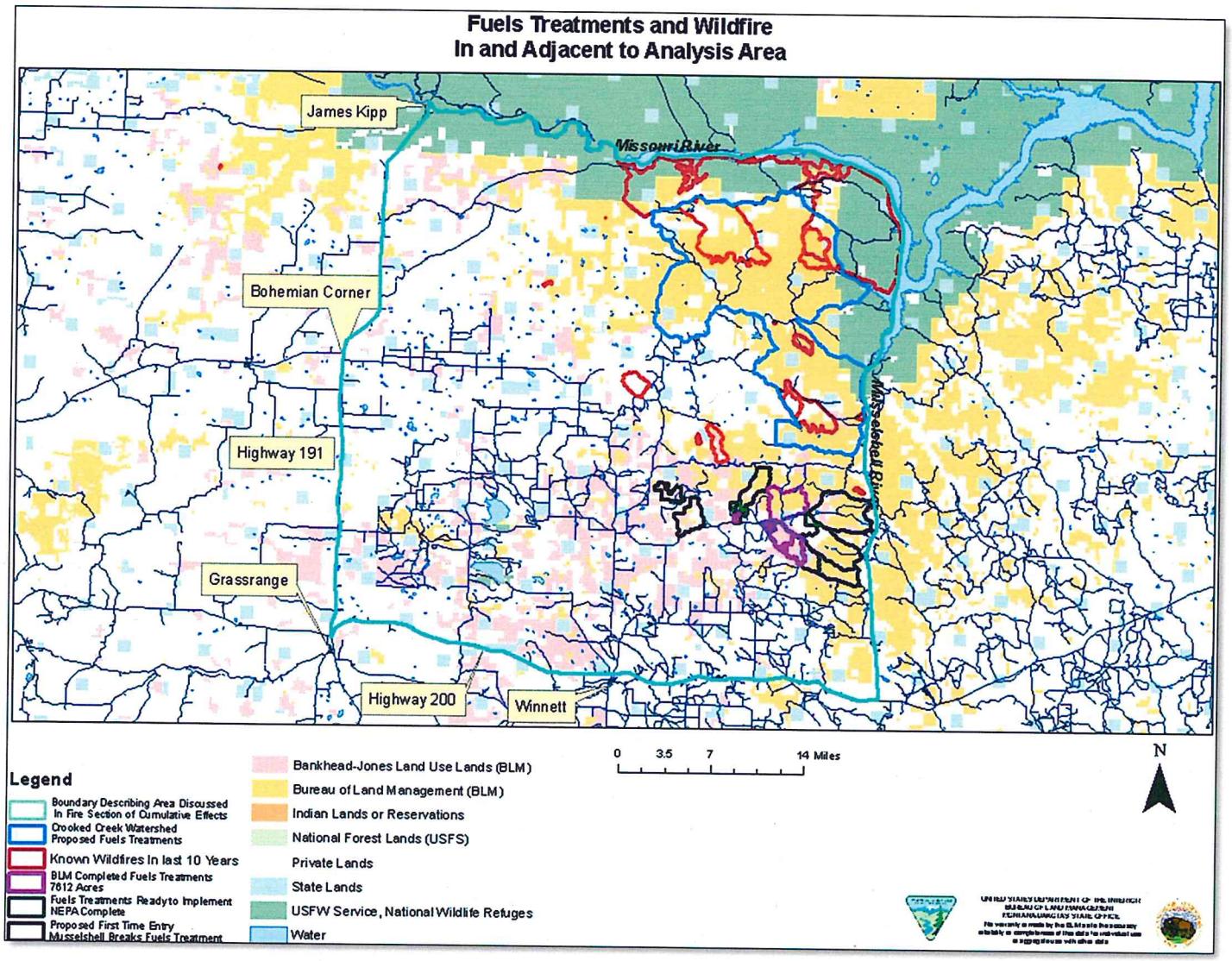
Cumulative Impacts:

Fire Management: Historically the project area was likely open short grass prairie and sagebrush rangelands with some areas of ponderosa pine savannah or woodland (fire regime condition class 1). Open pine stands would have been maintained by naturally occurring wildfires and pine encroachment of rangelands would have been minimal. Increasing density of pine stands and percent conifer cover is likely a result of fire exclusion and past management practices.

The project area has had three successful prescribed fires implemented in the recent past with positive results meeting the objectives. The proposed action has the same objectives as the past prescribed fire objectives. Soils, within these prescribed treatment units, were affected and have responded as described above in the Environmental Consequence. Implementation of the proposed action would reduce fuel loadings and improve or maintain condition class of conifer stands. Existing pine savannah would be maintained and pine encroachment of open rangelands would be reduced. Large scale wildfires have also occurred in the recent past in adjacent watersheds which sustained more severity and mortality. Reduced fuel loading would result in a lowered risk of high severity wildfire.

Looking at a larger area of approximately 1,003,498 acres as described in map below, an estimated that eight percent (84,997 acres) have been burned by wild fire in the last 10 years. Currently within that block approximately 10,000 acres have had fuels treatments between BLM and Charles M Russell National Wild Life Refuge (CMR). With the proposed action of Musselshell Breaks Fuels Treatments, Crooked Creek Watershed Plan, and past fuels treatments, an estimated fourteen percent (144,666 acres) would be treated with in that large block. This area has the heaviest wildfire load (highest frequency of starts and most acres burned) for the Central Montana Fire Zone. Continuing treatments could lower costs of wildfire suppression efforts, and increase safety to residence, public land users and fire fighters in the area.

Note that CMR fuels treatments are not on the map.



As forest/rangeland health improves there would be an increase in healthy soils, vegetative diversity and production of shrubs, forbs, and grasses which may initially result in increased use from wildlife such as elk and mule deer. As additional projects are completed in the area resulting improvements in herbaceous cover and composition over a larger portion of the landscape could potentially spread out the grazing pressure from wildlife. Noxious weed infestations have the potential to expand throughout the past, current and future prescribed burn areas through ground and vegetative disturbance. Monitoring for new infestations and applying appropriate treatments as described in the proposed action will minimize the cumulative impacts of noxious weeds. An increase in soil nutrients as short term result from low to moderately intense fires may cause increased production of noxious weeds within the project areas.

Water Resources/Riparian: Water and riparian resources within the project area have been affected by man's fire suppression efforts, which have allowed for an increase in canopy cover and density of conifers. These trees affect water yield by increasing interception loss and evapotranspiration. As a result, less water is available for overland flow and infiltration. Water developments within the area also trap overland flow that would normally reach stream channels.

The Cottonwood Creek and Blood Creek watersheds were chosen for cumulative effects analysis because these are the watersheds that could be affected by the proposed vegetative treatments. Vegetative treatments are also proposed within Biggett, Raundal, and Haley Coulees. These coulees were excluded from cumulative effects analysis because they drain immediately into the Musselshell River, and the watershed size is too large to provide a meaningful analysis. The direct and indirect effects would be the same or less as those identified above, but the cumulative effects would be immeasurable on the Musselshell River.

The cumulative effects analysis was also completed as a worst-case scenario evaluation of effects. The total number of acres treated within the watersheds was evaluated for changes in mean annual yield based upon the percent change that occurred for the heavily forested watershed in the direct/indirect analysis (22 percent). One, not all of the acres proposed for treatment would be burned, and two the percent forest cover is often less than the watershed chosen for the direct/indirect analysis. The effect on peak flow was not considered for the cumulative effects analysis because the vegetative treatments would be carried out over a number of years allowing for substantial recovery, and the effect of any one individual burn on watersheds the size of Cottonwood Creek and Blood Creek would be immeasurable.
The treated acres in this cumulative effects analysis include acres approved under a previous decision that have not been implemented yet. However, they would be implemented in the reasonable foreseeable future, so they were included in the acreage figures for the cumulative effects analysis.

Watershed	Watershed Size (acres)	Acres within Watershed Proposed for Treatment	Treated Acres Mean Annual Yield		Watershed Mean Annual Yield	
			Pre-Treatment	Post-Treatment	Pre-Treatment	Post-Treatment
Cottonwood Creek	32,880	3,090	0.17 cfs (123 acre-feet)	0.21 cfs (152 acre-feet)	1.58 cfs (1,144 acre-feet)	1.65 cfs (1,195 acre-feet)
Blood Creek	152,469	9,320	0.48 cfs (348 acre-feet)	0.59 cfs (427 acre-feet)	6.69 cfs (4,843 acre-feet)	6.90 cfs (4,995 acre-feet)

Water developments within the area also trap overland flow that would normally reach stream channels.

Watershed	Claimed Volume Stored in Pits/Dams/Reservoirs (acre-feet)	Pre-Treatment Mean Annual Yield (acre-feet)	Percent of Pre-Treatment Mean Annual Yield Stored	Post-Treatment Mean Annual Yield (acre-feet)	Percent of Post-Treatment Mean Annual Yield Stored
Cottonwood Creek	494	1,144	43	1,195	41
Blood Creek	5,444*	4,843	112	4,995	109

*Removed 6,000 acre-feet of claimed volume from a reservoir that did not appear to exist on the 2009 NAIP photos. The remaining claimed volumes also seem suspect, but there is no way to prove the validity of the claims on private land.

The cumulative effects are insignificant because the existing conditions are outside of an appropriate range considering percent forest cover and fire regime condition class, and the effect size is attenuated by the percent of water stored in the watersheds as well as the watershed size. The key message is that smaller order streams would likely see some positive effects in water yield and riparian conditions, but the larger streams such as Cottonwood Creek and Blood Creek would unlikely see any effect because of the size of the watersheds as well as the amount of water stored in the watersheds.

Approximately 3,760 acres of fuels treatments have been completed in the Cottonwood Creek drainage. Evaluation of these burned areas in 2011 showed complete recovery of herbaceous conditions. The disturbance from these areas would no longer be vulnerable to intense precipitation events or runoff above natural conditions. Therefore, the cumulative effects from these treatments would be negligible.

Recent inventories of the riparian and stream channel conditions within the analysis area indicate poor stream channel condition on 3.6 miles of Blood Creek area because of the lack of streambank vegetation, which has resulted in over widened channels. Streams in poor condition are less able to process changes in streamflow and sediment, and these areas would be vulnerable to cumulative effects because of their sensitivity to disturbance. In regards to the interaction of livestock grazing and the proposed vegetative treatments, Fuhlendorf and Engle (2004) found that livestock spent 75% of their grazing time in areas that had been burned the previous year. This would imply that the proposed vegetative treatments would result in less livestock grazing in riparian areas leading to a small, cumulative positive effect on riparian and stream channel conditions.

Oil and Gas: Only six townships in Fergus and Petroleum Counties have high development potential for oil and gas. The rest of the area is moderate potential for oil and gas. The validation included a review of the drilling and production histories for both counties for the prior 20 years using the Montana Board of Oil and Gas Conservation online database. Between 1990 and 2010, about 19 wells were drilled in Fergus County, with eight completed as shut-in gas wells; the remainder were dry holes. Existing natural gas production is steadily declining; there is no oil production. During the same time frame, the drilling of approximately 15 wells occurred in Petroleum County. One completion is a shut-in oil well in the Cat Creek Field; the others were dry holes. Production in Petroleum County is oil and associated gas. No wells 10,000 feet or greater were drilled in either of the two counties. Historically, approximately 17 wells in Fergus County and 22 wells in Petroleum County were drilled to a depth greater than or equal to 5,000 feet.

It is unknown when, where, how, or if future surface disturbing activities associated with oil and gas exploration and development such as well sites, roads, facilities, and associated infrastructure would be proposed. It is also not known how many wells, if any, would be drilled and/or completed, the types of technologies and equipment would be used and the types of infrastructure needed for production of oil and gas. Thus, the types, magnitude and duration of potential impacts cannot be precisely quantified at this time, and would vary according to many factors. The potential impacts from exploration and development activities would be analyzed after receipt of an APD or sundry notice. Typical impacts to resources from oil and gas exploration and development activities such as well sites, roads, facilities, and associated infrastructure are described in the Fergus Management Framework Plan (approved January 1978), the Petroleum Management Framework Plan (approved November 1977), and the Lewistown District Oil & Gas Environmental Assessment of the BLM Leasing Program (approved September 1981).

List of Persons, Groups, and Agencies Consulted:
Clive Rooney - Montana DNRC North Eastern Land Office
Montana Fish, Wildlife & Parks
Petroleum County Commissioners
Williams Coulee Grazing District
William Hand - Base Property Owner
Jeff Smith - Base Property Owner
Brian Becker – Base Property Owner
Tina Balsley - Base Property Owner
Rod Hoibakk - Base Property Owner
Lyle Chamberlin - Base Property Owner
Don Spragens- Base Property Owner
Mike Owens- Base Property Owner
Tim Browining - Base Property Owner/Permittee
Tom Browning - Base Property Owner/Permittee
Ted Browning - Base Property Owner/Permittee
Vince Murnion - Base Property Owner/Permittee
Raymond Gardner - Base Property Owner/Permittee
Evert Brady- Base Property Owner/Permittee
Jim Brady - Base Property Owner/Permittee

Scoping letters were mailed to land owners in and adjacent to the project area with no additional communication made.

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Zane Fulbright, Cultural Resources
Rich Byron, Forest Resources
Chad Krause, Hydrology
Mike Barrick, Noxious Weeds
Kelly McGill, Outdoor Recreation Specialist
Abel Guevara, Wildlife Biologist
Josh Sorlie, Soil Scientist
Cathy Barta, Fire Ecologist

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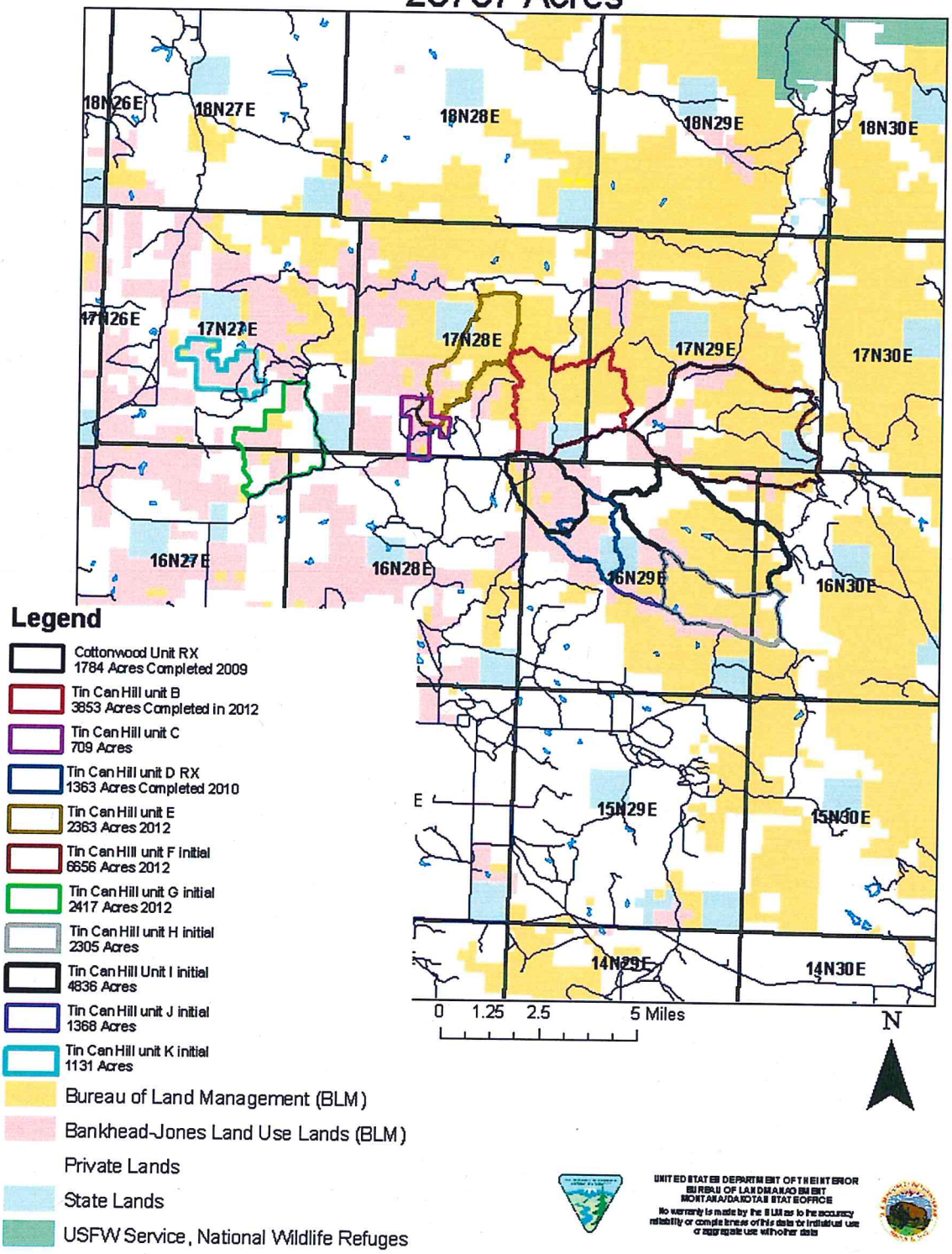
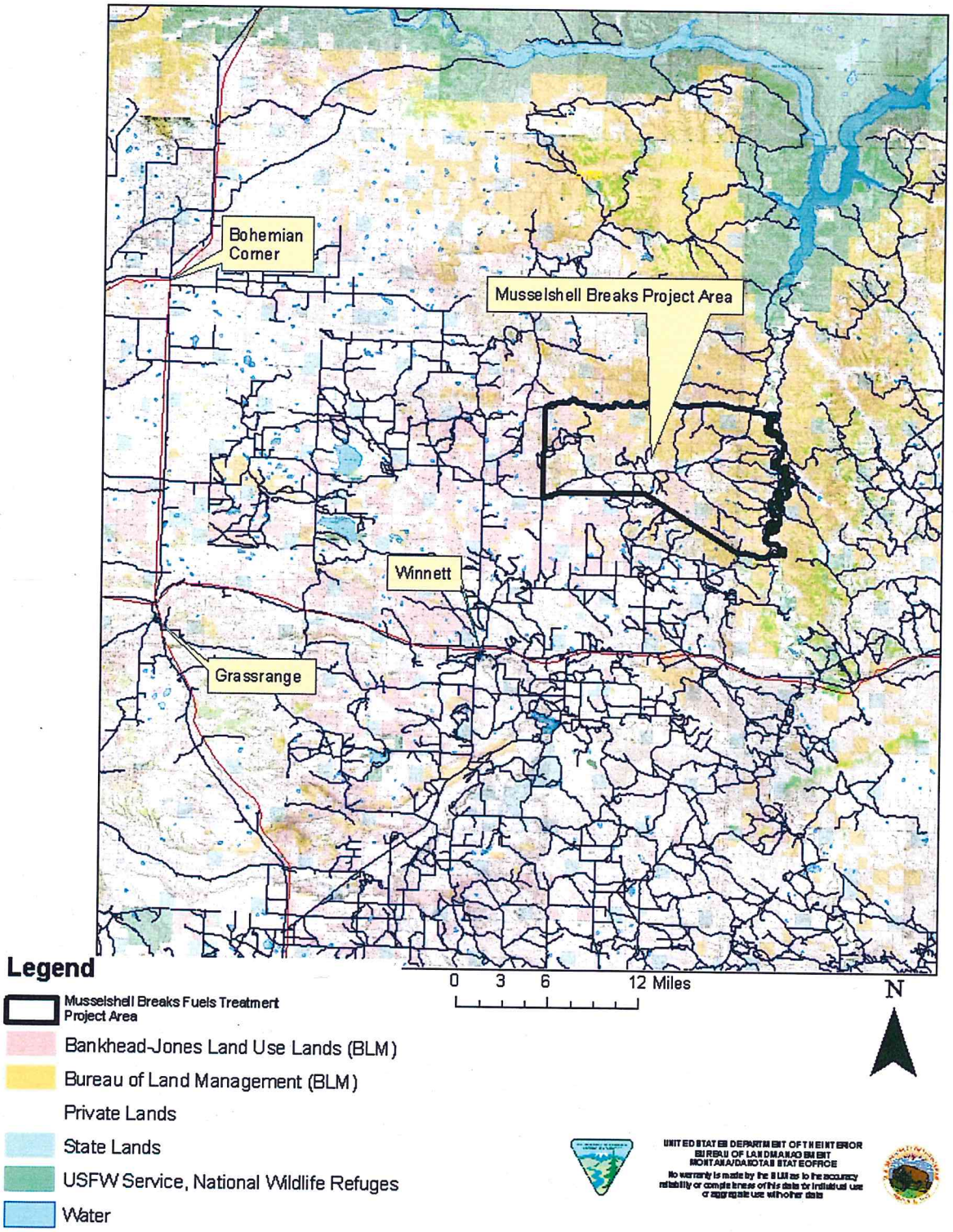
Appendix 1

Musselshell Breaks Treatment Units
28787 Acres



Appendix 1

Musselshell Breaks Fuels Treatments Vicinity



Map Unit Description (Brief, Generated)

Petroleum County, Montana

[Minor map unit components are excluded from this report]

Map unit: 8 - Bascovy-Neldore silty clays, 2 to 15 percent slopes

Component: Bascovy (55%)

The Bascovy component makes up 55 percent of the map unit. Slopes are 2 to 15 percent. This component is on hills, plains. The parent material consists of residuum weathered from shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC041MT Clayey (cy) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

Component: Neldore (35%)

The Neldore component makes up 35 percent of the map unit. Slopes are 2 to 15 percent. This component is on hills, plains. The parent material consists of residuum weathered from clayey shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC059MT Shallow Clay (swc) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: 9 - Bascovy-Neldore-Neldore, moist, silty clays, 6 to 60 percent slopes

Component: Bascovy (40%)

The Bascovy component makes up 40 percent of the map unit. Slopes are 6 to 15 percent. This component is on hills, plains. The parent material consists of residuum weathered from shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC041MT Clayey (cy) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

Component: Neldore (25%)

The Neldore component makes up 25 percent of the map unit. Slopes are 6 to 60 percent. This component is on hills, plains. The parent material consists of residuum weathered from clayey shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC059MT Shallow Clay (swc) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Neldore (25%)

The Neldore component makes up 25 percent of the map unit. Slopes are 6 to 60 percent. This component is on hills, plains. The parent material consists of residuum weathered from clayey shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map Unit Description (Brief, Generated)

Petroleum County, Montana

Map unit: 14 - Cabbart loam, 8 to 15 percent slopes

Component: Cabbart (90%)

The Cabbart component makes up 90 percent of the map unit. Slopes are 8 to 15 percent. This component is on plains, hills. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC057MT Shallow (sw) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 16 - Cabbart-Delpoint loams, 4 to 15 percent slopes

Component: Cabbart (50%)

The Cabbart component makes up 50 percent of the map unit. Slopes are 8 to 15 percent. This component is on plains, hills. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC057MT Shallow (sw) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Delpoint (40%)

The Delpoint component makes up 40 percent of the map unit. Slopes are 4 to 8 percent. This component is on hills, plains. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC040MT Silty (sl) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Map unit: 17 - Cabbart-Delpoint-Cabbart, moist, loams, 4 to 35 percent slopes

Component: Cabbart (35%)

The Cabbart component makes up 35 percent of the map unit. Slopes are 4 to 35 percent. This component is on plains, hills. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC057MT Shallow (sw) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Delpoint (30%)

The Delpoint component makes up 30 percent of the map unit. Slopes are 4 to 15 percent. This component is on hills, plains. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC040MT Silty (sl) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Map Unit Description (Brief, Generated)

Petroleum County, Montana

Map unit: 17 - Cabbart-Delpoint-Cabbart, moist, loams, 4 to 35 percent slopes

Component: Cabbart (20%)

The Cabbart component makes up 20 percent of the map unit. Slopes are 4 to 35 percent. This component is on plains, hills. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 18 - Cabbart-Delpoint-Rock outcrop complex, 8 to 45 percent slopes

Component: Cabbart (40%)

The Cabbart component makes up 40 percent of the map unit. Slopes are 8 to 45 percent. This component is on plains, hills. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC057MT Shallow (sw) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Delpoint (25%)

The Delpoint component makes up 25 percent of the map unit. Slopes are 8 to 15 percent. This component is on hills, plains. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC040MT Silty (si) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Component: Rock outcrop (25%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 19 - Cabbart-Rock outcrop-Blackhall complex, 8 to 45 percent slopes

Component: Cabbart (45%)

The Cabbart component makes up 45 percent of the map unit. Slopes are 8 to 45 percent. This component is on plains, hills. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC057MT Shallow (sw) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Rock outcrop (25%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map Unit Description (Brief, Generated)

Petroleum County, Montana

Map unit: 19 - Cabbart-Rock outcrop-Blackhall complex, 8 to 45 percent slopes

Component: Blackhall (20%)

The Blackhall component makes up 20 percent of the map unit. Slopes are 8 to 25 percent. This component is on plains, hills. The parent material consists of residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC057MT Shallow (sw) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Map unit: 20 - Cabbart-Yawdim-Delpoint complex, 15 to 35 percent slopes

Component: Cabbart (40%)

The Cabbart component makes up 40 percent of the map unit. Slopes are 15 to 35 percent. This component is on plains, hills. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC057MT Shallow (sw) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Yawdim (25%)

The Yawdim component makes up 25 percent of the map unit. Slopes are 15 to 35 percent. This component is on plains, hills. The parent material consists of residuum weathered from shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AC059MT Shallow Clay (swc) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Component: Delpoint (20%)

The Delpoint component makes up 20 percent of the map unit. Slopes are 15 to 25 percent. This component is on hills, plains. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC046MT Silty-steep 11-14" P.z. Deleted. Refer To Site: R058ac049mt ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Map unit: 21 - Cabbart-Yawdim-Rock outcrop complex, 4 to 35 percent slopes

Component: Cabbart (45%)

The Cabbart component makes up 45 percent of the map unit. Slopes are 4 to 35 percent. This component is on plains, hills. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC057MT Shallow (sw) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map Unit Description (Brief, Generated)

Petroleum County, Montana

Map unit: 21 - Cabbart-Yawdim-Rock outcrop complex, 4 to 35 percent slopes

Component: Yawdim (25%)

The Yawdim component makes up 25 percent of the map unit. Slopes are 4 to 35 percent. This component is on plains, hills. The parent material consists of residuum weathered from shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AC059MT Shallow Clay (swc) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Component: Rock outcrop (15%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 22 - Cabbart, high precipitation-Cabbart, moist, complex, 15 to 60 percent slopes

Component: Cabbart (45%)

The Cabbart component makes up 45 percent of the map unit. Slopes are 15 to 60 percent. This component is on plains, hills. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Cabbart (40%)

The Cabbart component makes up 40 percent of the map unit. Slopes are 15 to 60 percent. This component is on plains, hills. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 23 - Cabbart, moist-Blackhall-Delpoint complex, 6 to 60 percent slopes

Component: Cabbart (40%)

The Cabbart component makes up 40 percent of the map unit. Slopes are 15 to 60 percent. This component is on plains, hills. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. The soil has a slightly saline horizon within 30 inches of the soil surface.

Map Unit Description (Brief, Generated)

Petroleum County, Montana

Map unit: 23 - Cabbart, moist-Blackhall-Delpoint complex, 6 to 60 percent slopes

Component: Blackhall (25%)

The Blackhall component makes up 25 percent of the map unit. Slopes are 6 to 60 percent. This component is on plains, hills. The parent material consists of residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC057MT Shallow (sw) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Component: Delpoint (20%)

The Delpoint component makes up 20 percent of the map unit. Slopes are 6 to 15 percent. This component is on hills, plains. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC040MT Silty (si) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Map unit: 29 - Creed-Gerdrum complex, 1 to 6 percent slopes

Component: Creed (60%)

The Creed component makes up 60 percent of the map unit. Slopes are 1 to 6 percent. This component is on fans, terraces, plains. The parent material consists of alluvium. Depth to a root restrictive layer, natric, is 4 to 10 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC054MT Claypan (cp) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

Component: Gerdrum (30%)

The Gerdrum component makes up 30 percent of the map unit. Slopes are 1 to 6 percent. This component is on fans, terraces, plains. The parent material consists of alluvium. Depth to a root restrictive layer, natric, is 2 to 4 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC054MT Claypan (cp) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a moderately saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

Map unit: 31 - Delpoint-Cabbart loams, 2 to 8 percent slopes

Component: Delpoint (65%)

The Delpoint component makes up 65 percent of the map unit. Slopes are 2 to 8 percent. This component is on hills, plains. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC040MT Silty (si) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Map Unit Description (Brief, Generated)

Petroleum County, Montana

Map unit: 31 - Delpoint-Cabbart loams, 2 to 8 percent slopes

Component: Cabbart (25%)

The Cabbart component makes up 25 percent of the map unit. Slopes are 2 to 8 percent. This component is on plains, hills. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC057MT Shallow (sw) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 32 - Delpoint-Cabbart-Yamac loams, 4 to 15 percent slopes

Component: Delpoint (50%)

The Delpoint component makes up 50 percent of the map unit. Slopes are 4 to 15 percent. This component is on hills, plains. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC040MT Silty (si) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Component: Cabbart (25%)

The Cabbart component makes up 25 percent of the map unit. Slopes are 8 to 15 percent. This component is on plains, hills. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC057MT Shallow (sw) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 20 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Yamac (15%)

The Yamac component makes up 15 percent of the map unit. Slopes are 4 to 8 percent. This component is on fans, terraces, plains. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC040MT Silty (si) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 33 - Ethridge clay loam, 0 to 2 percent slopes

Component: Ethridge (95%)

The Ethridge component makes up 95 percent of the map unit. Slopes are 0 to 2 percent. This component is on fans, terraces, plains. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC041MT Clayey (cy) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map Unit Description (Brief, Generated)

Petroleum County, Montana

Map unit: 34 - Ethridge clay loam, 2 to 8 percent slopes

Component: Ethridge (90%)

The Ethridge component makes up 90 percent of the map unit. Slopes are 2 to 8 percent. This component is on fans, terraces, plains. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC041MT Clayey (cy) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 36 - Evanston loam, 2 to 8 percent slopes

Component: Evanston (90%)

The Evanston component makes up 90 percent of the map unit. Slopes are 2 to 8 percent. This component is on plains, terraces, fans. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC040MT Silty (si) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Map unit: 39 - Gerdrum-Creed complex, 1 to 6 percent slopes

Component: Gerdrum (50%)

The Gerdrum component makes up 50 percent of the map unit. Slopes are 1 to 6 percent. This component is on fans, terraces, plains. The parent material consists of alluvium. Depth to a root restrictive layer, natric, is 2 to 4 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC054MT Claypan (cp) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a moderately saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

Component: Creed (40%)

The Creed component makes up 40 percent of the map unit. Slopes are 1 to 6 percent. This component is on fans, terraces, plains. The parent material consists of alluvium. Depth to a root restrictive layer, natric, is 4 to 10 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC054MT Claypan (cp) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

Map unit: 48 - Havre loam, 0 to 2 percent slopes

Component: Havre (85%)

The Havre component makes up 85 percent of the map unit. Slopes are 0 to 2 percent. This component is on plains, terraces, flood plains. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is rarely flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AC040MT Silty (si) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 2e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Map Unit Description (Brief, Generated)

Petroleum County, Montana

Map unit: 52 - Havre-Harlem complex, 0 to 2 percent slopes, occasionally flooded, channeled

Component: Havre (50%)

The Havre component makes up 50 percent of the map unit. Slopes are 0 to 2 percent. This component is on plains, terraces, flood plains. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AC045MT Overflow (ov) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 6w. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Component: Harlem (40%)

The Harlem component makes up 40 percent of the map unit. Slopes are 0 to 2 percent. This component is on flood plains, terraces, plains. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is high. This soil is occasionally flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AC045MT Overflow (ov) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 6w. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface.

Map unit: 62 - Neldore-Abor silty clays, 4 to 15 percent slopes

Component: Neldore (50%)

The Neldore component makes up 50 percent of the map unit. Slopes are 4 to 15 percent. This component is on hills, plains. The parent material consists of residuum weathered from clayey shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC059MT Shallow Clay (swc) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

Component: Abor (35%)

The Abor component makes up 35 percent of the map unit. Slopes are 4 to 15 percent. This component is on hills, plains. The parent material consists of colluvium derived from shale and/or residuum weathered from shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC041MT Clayey (cy) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 63 - Neldore-Abor silty clays, 15 to 45 percent slopes

Component: Neldore (55%)

The Neldore component makes up 55 percent of the map unit. Slopes are 15 to 45 percent. This component is on hills, plains. The parent material consists of residuum weathered from clayey shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC059MT Shallow Clay (swc) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map Unit Description (Brief, Generated)

Petroleum County, Montana

Map unit: 63 - Neldore-Abor silty clays, 15 to 45 percent slopes

Component: Abor (30%)

The Abor component makes up 30 percent of the map unit. Slopes are 15 to 25 percent. This component is on hills, plains. The parent material consists of colluvium derived from shale and/or residuum weathered from shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC047MT Clayey-steep (cystp) Rru 58a-c 11-14" P.z. Deleted. Refer To Site: R058a ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 64 - Neldore-Bascovy-Rock outcrop complex, 6 to 60 percent slopes

Component: Neldore (50%)

The Neldore component makes up 50 percent of the map unit. Slopes are 6 to 60 percent. This component is on hills, plains. The parent material consists of residuum weathered from clayey shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC059MT Shallow Clay (swc) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Bascovy (20%)

The Bascovy component makes up 20 percent of the map unit. Slopes are 6 to 15 percent. This component is on hills, plains. The parent material consists of residuum weathered from shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC041MT Clayey (cy) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 66 - Neldore-Rock outcrop complex, 15 to 45 percent slopes

Component: Neldore (55%)

The Neldore component makes up 55 percent of the map unit. Slopes are 15 to 45 percent. This component is on hills, plains. The parent material consists of residuum weathered from clayey shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC059MT Shallow Clay (swc) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Rock outcrop (30%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map Unit Description (Brief, Generated)

Petroleum County, Montana

Map unit: 70 - Neldore, moist-Bascovy-Neldore, south, silty clays, 6 to 60 percent slopes

Component: Neldore (50%)

The Neldore component makes up 50 percent of the map unit. Slopes are 6 to 60 percent. This component is on hills, plains. The parent material consists of residuum weathered from clayey shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Bascovy (20%)

The Bascovy component makes up 20 percent of the map unit. Slopes are 6 to 15 percent. This component is on hills, plains. The parent material consists of residuum weathered from shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC041MT Clayey (cy) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

Component: Neldore (15%)

The Neldore component makes up 15 percent of the map unit. Slopes are 6 to 60 percent. This component is on hills, plains. The parent material consists of residuum weathered from clayey shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 79 - Twilight-Blackhall sandy loams, 2 to 15 percent slopes

Component: Twilight (60%)

The Twilight component makes up 60 percent of the map unit. Slopes are 2 to 15 percent. This component is on plains, hills. The parent material consists of residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC042MT Sandy (sy) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Component: Blackhall (25%)

The Blackhall component makes up 25 percent of the map unit. Slopes are 2 to 15 percent. This component is on plains, hills. The parent material consists of residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC057MT Shallow (sw) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Map Unit Description (Brief, Generated)

Petroleum County, Montana

Map unit: 80 - Twilight-Blackhall-Rock outcrop complex, 4 to 25 percent slopes

Component: Twilight (40%)

The Twilight component makes up 40 percent of the map unit. Slopes are 4 to 15 percent. This component is on plains, hills. The parent material consists of residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC042MT Sandy (sy) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Component: Blackhall (25%)

The Blackhall component makes up 25 percent of the map unit. Slopes are 4 to 15 percent. This component is on plains, hills. The parent material consists of residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC057MT Shallow (sw) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map unit: 81 - Ustic Torriorthents, 15 to 45 percent slopes

Component: Ustic Torriorthents (85%)

The Ustic Torriorthents component makes up 85 percent of the map unit. Slopes are 15 to 45 percent. Depth to a root restrictive layer is greater than 60 inches. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. This soil does not meet hydric criteria.

Map unit: 98 - Yamac-Delpoint loams, 2 to 8 percent slopes

Component: Yamac (50%)

The Yamac component makes up 50 percent of the map unit. Slopes are 2 to 8 percent. This component is on fans, terraces, plains. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC040MT Silty (si) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Delpoint (40%)

The Delpoint component makes up 40 percent of the map unit. Slopes are 2 to 8 percent. This component is on hills, plains. The parent material consists of residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AC040MT Silty (si) Rru 58a-c 11-14" P.z. ecological site. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Appendix 3

Forest Resources

DATE: 11 / 15 / 2012 PREPARED BY: R. Byron

SILVICULTURAL PRESCRIPTION

TWP 17N RNG **28E** **SEC Multiple** **FORVIS OR STAND #** Musselshell Breaks Fuels treatment **FIELD OFFICE** Lewistown

AVG ELEV. & RANGE 2,800-3,000 ft. **ASPECT** Varied **SLOPE (AVERAGE) 25%**

HABITAT TYPE PIPO/AGSP and PIPO/JUSC **ACRES** **85,000** **PRODUCTIVITY** Low

PRIMARY OBJECTIVE Forest Health

SECONDARY OBJECTIVE(S) Wildlife Habitat Enhancement

DESCRIPTION OF EXISTING STAND:

The unit consists of overstocked stands of ponderosa pine with stocking levels currently approaching 120 square feet of basal area per acre in some areas. There are scattered clumps and single tree remnants ranging in size from 16" to 20" DBH along with stands of 6" + DBH co-dominants. Extremely dense (in some cases over 3,500 TPA) pockets of advanced ponderosa pine regeneration can also be found throughout the unit due to recent fire exclusion.

CONSTRAINTS TO MEETING OBJECTIVES:
The rugged terrain will make ignition operations difficult and expensive. Additionally, if mechanized equipment is needed, the rugged terrain will make equipment operation difficult.

TARGET STAND: STRUCTURE Multi-aged **% SPP MIX** 60 10"+DBH; 30 6"+DBH; 10% advanced regeneration 1-3" DBH

DESIRED STOCKING LEVELS: BASAL AREA 20-40 square feet

DESCRIPTION OF TARGET STAND:
The unit would consist of timbered draws with open ridges having a few, large ponderosa pine. A majority of the trees would be greater than 10" DBH and resistant to fire mortality. Basal areas ranging from 20-40 square feet will allow for the establishment of grasses and shrubs in the understory. Leave trees will have a mix of 3 age classes and should occur as scattered clumps and groups; along with single trees with varied spacing between individual trees and/or groups and clumps of trees.

CONSTRAINTS TO MEETING TARGETS:
Once target stand is achieved, natural fire and or man-made disturbances should occur on a 15-30 year rotation to avoid future overstocking and to maintain open, mature stand of ponderosa pine.

PRESCRIBED TREATMENT:
Once the prescribed fire treatment has been evaluated, possible mechanical treatments would include hand thinning, and or grinding, utilizing a rubber tracked bob cat in order to reduce ponderosa pine regeneration. These pockets will be treated using a "thin from below" prescription in which trees less than 4" DBH will be removed. This will create a more open, fire-resistant stand by removing ladder fuels and will improve overall forest health by reducing stand densities. Mechanical treatments will be limited to slopes less than 40% and halted when ruts greater than 3" occur.

CONSTRAINTS TO IMPLEMENTING TREATMENTS:

If prescribed fire does not completely meet stocking level objectives, the rugged terrain and equipment constraints may leave large areas essentially untreated.

Appendix 4

Threatened, endangered, candidate/proposed, and BLM sensitive wildlife and fish species with the potential to occur within the Analysis Area on the Lewistown Field Office (FO). NOTE: The U.S. Fish and Wildlife Service species list (US Fish and Wildlife Service 2010), Montana and Dakotas sensitive species list (BLM 2009) were reviewed.

[1]**Status Codes: E**=federally listed endangered; **T**=federally listed threatened; **C**=federally proposed/candidate for listing; and **S**=BLM sensitive

[2]**Exclusion Rationale Codes: ODR**=outside known distributional range of the species; **HAB**=no habitat present in Analysis Area; **SEA**=species not present/affected during season.

Species Common and Scientific Name	Status[1]	Potential to Occur?	Rationale for Exclusion[2]	Brief Habitat Description and Range in Montana
INVERTEBRATES				
Dakota skipper *Hesperia dacotae*	S		ODR	Native tallgrass prairie in Eastern Dakotas
FISH				
Arctic grayling *Thymallus arcticus montananus*	S		ODR	small, cold, clear lakes with tributaries suitable for spawning. They do not coexist well with other fishes except cutthroat trout and others with which they evolved. Sun River along Rocky Mtn. Front.
Bull trout *Salvelinus confluentus*	T		ODR	Sub-adult and adult fluvial bull trout reside in larger streams and rivers and spawn in smaller tributary streams, whereas adfluvial bull trout reside in lakes and spawn in tributaries. They spawn in headwater streams with clear gravel or rubble bottom
Northern redbelly dace x Finescale dace *Phoxinus eos x Phoxinus neogaeus*	S		HAB	Northern redbelly dace prefer quiet waters from beaver ponds, bogs and clear streams. The finescale dace likes similar habitat but is also found in larger lakes. Known in Big Coulee Ck in Judith Basin Co.
Paddlefish *Polyodon spathula*	S		HAB	slow or quiet waters of large rivers or impoundments. They spawn on the gravel bars of large rivers during spring high water. Paddlefish tolerate, or perhaps seek, turbid water
Pallid Sturgeon *Scaphirhynchus albus*	E		HAB	large turbid streams including the Missouri and Yellowstone rivers. They use all channel types, primarily straight reaches with islands. They primarily use areas with substrates containing sand (especially bottom sand dune formations) and fines (93% of observations)
Pearl dace *Margariscus margarita*	S		ODR	small cool streams, either clear or turbid (Brown 1971). They spawn in clear water at depths of 1 to 2 feet over a gravel or sand bottom. N/E MT.
Sauger *Stizostedion canadense*	S		HAB	larger turbid rivers and the muddy shallows of lakes and reservoirs. They spawn in gravelly or rocky areas in shallow water and seem to prefer turbid water.
Sturgeon chub *Macrhybopsis gelida*	S		HAB	turbid water with moderate to strong current over bottoms ranging from rocks and gravel to coarse sand
Westslope cutthroat trout *Oncorhynchus clarki lewisi*	S		ODR	gravel substrate in riffles and pool crests for spawning habitat. Cutthroat trout have long been regarded as sensitive to fine sediment
Yellowstone cutthroat trout *Oncorhynchus clarki bouvieri*	S		ODR	relatively clear, cold streams, rivers, and lakes. Optimal temperatures have been reported to be from 4 to 15 degrees C., with occupied waters ranging from 0 to 27 degrees C.
AMPHIBIANS AND REPTILES				
Coeur d'Alene salamander *Plethodon idahoensis*	S		ODR	primary habitats are seepages and streamside talus; W. MT near Libby, MT
Great Plains toad *Bufo cognatus*	S	✓		sagebrush-grassland, rainwater pools in road ruts, in stream valleys, at small reservoirs and stock ponds, and around rural farms; breeding has been documented in small reservoirs and backwater sites along streams appears to prefer stock tanks and roadside ponds rather than floodplains. Eggs and larvae develop in shallow water, usually clear or slightly turbid, but not muddy.
Northern leopard frog	S	✓		wetland habitats of relatively fresh water with moderate salinity, including springs, slow streams, marshes,

Lithobates pipiens				bogs, ponds, canals, flood plains, beaver ponds, reservoirs, and lakes, usually in permanent water with rooted aquatic vegetation.
Species Common and Scientific Name	**Status[1]**	**Potential to Occur?**	**Rationale for Exclusion[2]**	**Brief Habitat Description and Range in Montana**
Plains spadefoot *Spea bombifrons*	S	✓		soft sandy/gravelly soils near permanent or temporary bodies of water. lives largely inactive in burrows of its own construction or occupies rodent burrows, and enters water only to breed. Following heavy rains, adults have been reported in water up to 30 centimeters deep in flooded wagon wheel ruts, temporary rain pools formed in wide flat-bottom coulees, water tanks, and badland seep ponds, and tadpoles and toadlets have been observed in stock ponds and small ephemeral reservoirs, usually in sagebrush-grassland habitats
Western toad *Anaxyrus boreas boreas*	S		ODR	utilize a wide variety of habitats, including desert springs and streams, meadows and woodlands, mountain wetlands, beaver ponds, marshes, ditches, and backwater channels of rivers where they prefer shallow areas with mud bottoms
REPTILES				
Greater short-horned lizard *Phrynosoma hernandesi*	S	✓		ridge crests between coulees, and in sparse, short grass and sagebrush with sun-baked soil. limestone outcrops in canyon bottoms of sandy soil with an open canopy of limber pine-Utah juniper, and are also present on flats of relatively pebbly or stony soil with sparse grass and sagebrush cover
Milk snake *Lampropeltis triangulum*	S	✓		open sagebrush-grassland habitat and ponderosa pine savannah with sandy soils, most often in or near areas of rocky outcrops and hillsides or badland scarps, sometimes within city limits.
Snapping turtle *Chelydra serpentine*	S		HAB	backwaters along major rivers, at smaller reservoirs, and in smaller streams and creeks with permanent flowing water and sandy or muddy bottoms
Spiny softshell *Apalone spinifera*	S		HAB	primarily a riverine species, occupying large rivers and river impoundments, but also occurs in lakes, ponds along rivers, pools along intermittent streams, bayous, irrigation canals, and oxbows. open sandy or mud banks, a soft bottom, and submerged brush and other debris. Spiny Softshells bask on shores or on partially submerged logs. They burrow into the bottoms of permanent water bodies, either shallow or relatively deep (0.5 to 7.0 meters), where they spend winter. Eggs are laid in nests dug in open areas in sand, gravel, or soft soil near water
Western hog-nosed snake *Heterodon nasicus*	S		HAB	apparent preference for arid areas, farmlands, and floodplains, particularly those with gravelly or sandy soil, has been noted. They occupy burrows or dig into soil, and less often are found under rocks or debris, during periods of inactivity
BIRDS				
Baird's sparrow *Ammodramus bairdii*	S	✓		nest in native prairie, but structure may ultimately be more important than plant species composition. (nesting has been observed in crested wheat, while smooth brome is avoided) areas with little to no grazing activity are required.
Bald eagle *Haliaeetus leucocephalus*	S	✓		near open water including rivers, streams & lakes, nesting & roosting in large ponderosa pine, Douglas-fir, or cottonwood trees in proximity to open water and rivers.
Black tern *Chilodonias niger*	S		HAB	wetlands, marshes, prairie potholes, and small ponds. 30%-50% of the wetland complex is emergent vegetation. Vegetation within known breeding colonies includes alkali bulrushes, canary reed-grass, cattail spp., sedge spp., rush spp., reed spp., grass spp., *Polygonum* spp., *Juncus* spp. and *Potamogeton* spp., indicating a wide variety of potential habitats are usable by Black Terns. Water levels range from about 0.5 m to greater than 2.0 m with most having depths between 0.5 m and 1.0 m (MTNHP 2003).
Black-backed woodpecker *Picoides arcticus*	S		HAB	early successional, burned forest of mixed conifer, lodgepole pine, Douglas-fir, and spruce-fir, although they are more numerous in lower elevation Douglas-fir and pine forest habitats than in higher elevation subalpine spruce forest habitats

Black-crowned night heron *Nycticorax nycticorax*	S		HAB	shallow bulrush or cattail marshes, most often within a grassland landscape. also nest in cottonwoods, willows, or other wetland vegetation that allows them to nest over water or on islands that may afford them protection from mammalian Most colonies are located in large wetland complexes, typically with a one-to-one ratio of open water and emergent vegetation
Species Common and Scientific Name	**Status[1]**	**Potential to Occur?**	**Rationale for Exclusion[2]**	**Brief Habitat Description and Range in Montana**
Blue-gray gnatcatcher *Polioptilia caerulea*	S		ODR	brush, scrub, or chaparral are intermixed with taller vegetation (e.g., forest edge, riparian corridors); nesting often occurs near water. Nests are built on branches or forks of trees or shrubs, usually 1 to 25 meters above ground—S. Central MT
Bobolink *Dolichonyx orysivorus*	S		HAB	Nests built in tall grass and mixed-grass prairies. Prefers "old" hay fields with high grass-to-legume ratios.
Brewer's sparrow *Spizella breweri*	S	✓		Sagebrush, mountain meadows, and mountain shrub habitats. nested in sagebrush averaging 16-inches high. The cover (concealment) for the nest provided by sagebrush is very important
Burrowing owl *Athene cunicularia*	S		HAB	open grasslands, where abandoned burrows dug by mammals such as ground squirrels, prairie dogs and badgers are available. Black-tailed Prairie Dog and Richardson's Ground Squirrel colonies provide the primary and secondary habitat for Burrowing Owls in the state
Chestnut-collared longspur *Calcarius ornatus*	S	✓		Species prefers short-to-medium grasses that have been recently grazed or mowed. Prefers native pastures.
Common loon *Gavia immer*	S		HAB	13+ acre lake <5000 feet in elevation. Small islands preferred for nesting, but herbaceous shoreline areas, also selected. Nursery areas are very often sheltered, shallow coves with abundant small fish and insects. relatively oligotrophic and have not experienced significant siltation or other hydrological changes.
Dickcissel *Spiza americana*	S	✓		grasslands, meadows, savanna, cultivated lands, and brushy fields. nest on ground in grass or rank herbage, or raised a little above ground, in grass tufts or tall weeds, or in low shrubs or trees, up to about 2 meters above the ground but usually low. prefer habitat with dense, moderate to tall vegetation (particularly with some forbs) and moderately deep litter. moderately grazed and idle prairie. A high abundance of forbs provides perches, nesting cover, nest support, and possibly increased invertebrate abundance.
Ferruginous hawk *Buteo regalis*	S	✓		mixed-grass prairie, shrub-grasslands, grasslands, grass-sagebrush complex, and sagebrush steppe.
Flammulated owl *Otus flammeolus*	S		ODR	old-growth or mature ponderosa pine, ponderosa pine, & Douglas-fir forests, often mixed with mature aspen, nesting in cavities, feeding on insects.
Franklin's gull *Larus pipixcan*	S		HAB	Preferring large, relatively permanent prairie marsh complexes, the Franklin's Gull builds its nests over water on a supporting structure of emergent vegetation. Nesting is noted to occur in cattails and bulrushes
Golden eagle *Aquila chrysaetos*	S	✓		nest on cliffs and in large trees (occasionally on power poles), and hunt over prairie and open woodlands. Cliff nests selected for south or east aspect, less than 200 in. snowfall, low elevation, availability of sagebrush/grassland hunting areas
Great gray owl *Strix nebulosa*	S		ODR	dense coniferous and hardwood forest, especially pine, spruce, paper birch, poplar, and second-growth, especially near water. forage in wet meadows, boreal forests and spruce-tamarack bogs in the far north, and coniferous forest and meadows in mountainous areas. nest in the tops of large broken-off tree trunks in old nests of other large birds, or in debris platforms from dwarf mistletoe, frequently near bogs or clearings. Nests are frequently reused and the same pair often nests in the same area in successive years.
Greater sage-grouse *Centrocercus urophasianus*	C	✓		tall dense stands of sagebrush; 6 to 18 inch high sagebrush covered benches in June to July (average 213 acres); move to alfalfa fields (144 acres) or greasewood bottoms (91 acres) when forbs on the benches dry out; and move back to sagebrush (average 128 acres) in late August to early September (Peterson 1969).

Harlequin duck *Histrionicus histrionicus*	S		ODR HAB	fast moving, low gradient, clear mountain streams. birds in streams on the Rocky Mountain Front were seen in pole-sized timber.
Least tern *Sternula antillarum*	E		HAB	nest on unvegetated sand-pebble beaches and islands of large reservoirs and rivers in northeastern and southeastern Montana, specifically the Yellowstone and Missouri river systems.
LeConte's sparrow *Ammodramus leconteii*	S		ODR	wet meadows within peatlands, often with a strong sedge (*Carex*) component
Species Common and Scientific Name	**Status[1]**	**Potential to Occur?**	**Rationale for Exclusion[2]**	**Brief Habitat Description and Range in Montana**
Loggerhead shrike *Lanius ludovicianus*	S	✓		open riparian areas, montane meadows, agricultural areas, grasslands, shrublands, & piñon/juniper woodlands
Long-billed curlew *Numenius americanus*	S	✓		Nests primarily in short-grass or mixed-prairie habitat with flat to rolling topography Habitats with trees, high density of shrubs (e.g., sagebrush [*Artemisia* spp.]), and tall, dense grass generally. Taller, denser grass used during brood-rearing when shade and camouflage from predators are presumably more important for chicks, but may also reflect decline in availability of shorter habitats with season.
Marbled godwit *Limosa fedoa*	S	✓		Breeds in short, sparsely to moderately vegetated landscapes that include native grassland and wetlands. ephemeral ponds, as well as temporary ponds and alkali wetland. Semi permanent ponds used as well. Upland habitat during breeding season primarily idle grassland and pastures
McCown's longspur *Calcarius mccownii*	S	✓		breeding habitat is a matrix of perennial shortgrass species (e.g., *Bouteloua gracilis*, *Buchloe dactyloides*) interspersed with cactus, and limited cover of midgrasses (e.g., *Aristida longiseta*, *Agropyron smithii*, *Stipa comata*) and shrubs (e.g., *Gutierrezia sarothrae*, *Chrysothamnus nauseosus*, *Artemesia frigida*).
Mountain plover *Charadrius montanus*	S/P	✓		prairie dog colonies and other shortgrass prairie sites are confirmed as preferred breeding habitat. Strong preference was also given to sites with slopes less than 5% and grass height of less than 6 cm (3 inches)
Nelson's sharp-tailed sparrow *Ammodramus nelson*	S		ODR	freshwater wetlands with dense, emergent vegetation or damp areas with dense grasses
Northern goshawk *Accipiter gentilis*	S	✓		primarily forest habitat, especially in mountains, nesting in lower portions of mature Douglas-fir, ponderosa pine, lodgepole pine, or aspen canopies; prefers mature or old-growth forest structure.
Peregrine falcon *Falco peregrinus anatum*	S		HAB	wide variety of habitats, selects cliff ledges or rock outcroppings for nesting, preferring high, open cliff faces that dominate the surrounding area.
Red-headed woodpecker *Melanerpes erythrocephalus*	S		HAB	along major rivers having riparian forest. open savannah country w/ ground cover, snags and canopy cover. Large burns also utilized. nest in holes excavated 2 to 25 meters above ground by both sexes in live trees, dead stubs, utility poles, or fence posts. Individuals nest in the same cavity in successive years.
Sage sparrow *Amphispiza belli*	S		ODR	Prefers semiopen habitats with evenly spaced shrubs 1–2 m high. Vertical structure, habitat patchiness, and vegetation density may be more important in habitat selection than specific shrub species, but this sparrow is closely associated with big sagebrush throughout most of its range. Historical records w/i FO 20+ years old. Extreme S. Central MT
Sage thrasher *Oreoscoptes montanus*	S	✓		sagebrush obligate in Montana. abundance is generally positively correlated with the amount of sage cover and negatively correlated with grass cover.
Sedge wren *Cistorthorus platensis*	S		ODR	areas that are highly susceptible to flooding and drying caused by annual and seasonal variation in rainfall.
Sprague's pipit *Anthus spragueii*	C	✓		native, medium to intermediate height prairie and in a short grass prairie landscape, can often be found in areas with taller grasses. more abundant in native prairie than in exotic vegetation; area sensitive, requiring relatively large areas of appropriate habitat; the minimum area requirement in a Saskatchewan study was 470 acres. known to utilize and breed in alkaline meadows and around the edges of alkaline lakes

Swainson's hawk *Buteo swainsoni*	S	✓		nest in river bottom forests, brushy coulees, and shelterbelts. hunt in grasslands and agricultural land, especially along river bottoms.
Three-toed woodpecker *Picoides dorsalis*	S	✓		mature or old-growth spruce-fir forest, but also occurs in ponderosa pine, Douglas-fir, & lodgepole pine forests with abundant snags and insect populations are present due to outbreaks from disease or fire.
Trumpeter swan *Cygnus buccinators*	S		HAB	Along the Rocky Mountain Front the breeding habitat is small pothole lakes, generally with sufficient water to maintain emergent vegetation through the breeding season. Habitat requirements for breeding include room to take off (~100 m), shallow, unpolluted water with sufficient emergent vegetation and invertebrates, appropriate nest sites (i.e. Muskrat lodges), and areas with little human disturbance
Species Common and Scientific Name	**Status[1]**	**Potential to Occur?**	**Rationale for Exclusion[2]**	**Brief Habitat Description and Range in Montana**
White-faced ibis *Plegadis chihi*	S		HAB	freshwater wetlands, including ponds, swamps and marshes with pockets of emergent vegetation. also use flooded hay meadows and agricultural fields as feeding locations. nest in areas where water surrounds emergent vegetation, bushes, shrubs, or low trees. use old stems in cattails (*Typha* spp.), hardstem bulrush (*Scirpus acutus*) or alkali bulrush (*S. paludosus*) over shallow water as their nesting habitat
Yellow rail *Coturnicops noveboracensis*	S		ODR	Breeding habitat consists of wet sedge meadows and other wetlands containing grasses, rushes and bulrushes. Presence of the Yellow Rail is most commonly dictated by water depth, specifically one that fluctuates throughout the breeding season, i.e. wet in the early part of the breeding season and relatively dry (no standing water) by July or September. NE MT and Flathead Valley.
Yellow-billed cuckoo *Coccyzus americanus*	S		HAB	tall cottonwood and willow riparian woodlands. Nests are found in trees, shrubs or vines, an average of 1 to 3 meters above ground. Western subspecies require patches of at least 10 hectares (25 acres) of dense, riparian forest with a canopy cover of at least 50 percent in both the understory and overstory. Nests are typically found in mature willows
MAMMALS				
Black-footed ferret *Mustela nigripes*	E		HAB	intimately tied to prairie dogs and only found in association with prairie dogs. limited to habitat used by prairie dogs: grasslands, steppe, and shrub steppe. rely on abandoned prairie dog burrows for shelter. Only large complexes (several thousand acres of closely spaced colonies) can support and sustain a breeding population. estimated that 40 to 60 hectares of prairie dog colony is needed to support one Black-footed Ferret, and females with litters have never been found on colonies less than 49 hectares
Black-tailed prairie dog *Cynomys ludovicianus*	S		HAB	colonies are found on flat, open grasslands and shrub/grasslands with low, relatively sparse vegetation. The most frequently occupied habitat in Montana is dominated by western wheatgrass, blue grama and big sagebrush. Colonies are associated with silty clay loams, sandy clay loams, and loams and fine to medium textured soils are preferred, presumably because burrows and other structures tend to retain their shape and strength better than in coarse, loose soils.
Canada lynx *Lynx canadensis*	T		HAB	dense spruce-fir, Douglas-fir, early seral lodgepole pine, mature lodgepole pine with developing understory of spruce-fir & aspen in subalpine zone & timberline, using caves, rock crevices, banks, logs for denning, closely associated with snowshoe hare.
Fisher *Martes pennanti*	S		HAB ODR	When inactive, they occupy dens in tree hollows, under logs, or in ground or rocky crevices, or they rest in branches of conifers (in the warmer months). Fishers occur primarily in dense coniferous or mixed forests, including early successional forests with dense overhead cover. Optimal conditions for Fishers are forest tracts of 245 acres or more, interconnected with other large areas of suitable habitat.
Fringed myotis *Myotis thysanodes*	S	✓		rocky outcroppings in mid-elevation ponderosa pine, piñon/juniper, oak, & mixed conifer woodlands, grasslands, deserts, & shrublands;
Fringe-tailed myotis *Myotis thysanodes pahasapensis*	S		ODR	occurs primarily in caves in the Black Hills and Badlands. occurs only in certain montane (mountainous) areas of South Dakota and Wyoming

Gray wolf *Canis lupis*	T		ODR	no particular habitat preference except for the presence of native ungulates within its territory on a year-round basis. Gray Wolves establishing new packs in Montana have demonstrated greater tolerance of human presence and disturbance than previously thought characteristic of this species.
Great Basin pocket mouse *Perognathus parvus*	S		ODR	arid and sometimes sparsely vegetated. They include grassland-shrubland with less than 40% cover, stabilized sandhills, and landscapes with sandy soils, more than 28% sagebrush cover, and 0.3 to 2.0 meters shrub height. Extreme SW MT.
Grizzly bear *Ursus arctos horribilis*	T		ODR	primarily use meadows, seeps, riparian zones, mixed shrub fields, closed timber, open timber, sidehill parks, snow chutes, and alpine slabrock habitats. Habitat use is highly variable between areas, seasons, local populations, and individuals. Historically, the Grizzly Bear was primarily a plains species occurring in higher densities throughout most of eastern Montana.
Species Common and Scientific Name	**Status[1]**	**Potential to Occur?**	**Rationale for Exclusion[2]**	**Brief Habitat Description and Range in Montana**
Long-eared myotis *Myotis evotis*	S	✓		found in wooded and rocky areas. It has been located hibernating in a mine in riverbreaks habitat in northeastern Montana
Long-legged myotis *Myotis volans*	S	✓		typically occupy mountainous or relatively rugged areas. They often live in coniferous forest, although they are sometimes found in oak or streamside woodlands, and even deserts. They feed mostly on moths, but are opportunistic, eating whatever soft-bodied insects are most abundant.
Meadow jumping mouse *Zapus hudsonius*	S		ODR	dense, tall and lush grass and forbs in marshy areas (sometimes with standing water), riparian areas, woody draws, and grassy upland slopes, sometimes within or near forested sites of ponderosa pine. E/SE MT.
Northern myotis *Myotis septentrionalis*	S		ODR	located hibernating in an abandoned mine in riverbreaks habitat in Richland County. prefers cooler hibernacula than *Myotis lucifugus* and selects narrow crevices in which to hibernate. NE MT.
Pallid bat *Antrozous pallidus*	S		ODR	arid deserts, juniper woodlands, sagebrush shrub-steppe, and grasslands, often with rocky outcrops and water nearby. arid and semi-arid regions throughout northern Mexico and the western United States. Pallid bats eat beetles, grasshoppers, and moths, and they forage for slow-moving prey, such as scorpions, flightless arthropods, and sometimes lizards, at and near ground level. visit flowers in their hunt for insects, and are natural pollinators of several species of cactus. S. Central MT.
Pygmy rabbit *Brachylagus idahoensis*	S		ODR	shrub-grasslands on alluvial fans, floodplains, plateaus, high mountain valleys, and mountain slopes, where suitable sagebrush cover and soils for burrowing are available. Some occupied sites may support a relatively sparse cover of sagebrush and shallow soils, but these usually support patches of dense sagebrush and deeper soils. Big sagebrush was the dominant shrub at all occupied sites, averaging 21.3 to 22.6% coverage; bare ground averaged 33% and forbs 5.8%. SW MT.
Swift fox *Vulpes velox*	S		HAB	open prairie and arid plains, including areas intermixed with winter wheat fields in north-central Montana. They use burrows when they are inactive; either dug by themselves or made by other mammals (marmot, prairie dog, badger). The burrows are usually located in sandy soil on high ground such as hill tops in open prairies, along fencerows, or occasionally in a plowed field. Suitable habitat generally extensive in size (preferably over 100,000 acres), with relatively level topography, and with greater than 50% of the area undisturbed by agriculture. A total of 8,000,000 suitable acres were identified in Montana
Townsend's big-eared bat *Plecotus townsendii*	S	✓		associated with caves & abandoned mines for day roosts & hibernacula, will also use abandoned buildings in western shrubland, piñon/juniper woodlands, & open montane forests in elevations up to 9,500 ft.
White-tailed prairie dog *Cynomys leucurus*	S		ODR	xeric sites with mixed stands of shrubs and grasses. habitats dominated by two types of vegetation: areas with Nuttall saltbrush with lesser amounts of big sage, and areas with poverty sumpweed and winter fat. Extreme S. Central MT
Wolverine *Gulo gulo*	S		HAB	alpine & subalpine mature/intermediate timbered areas around natural openings, including cliffs, slides, basins, & meadows, dependant on ungulates, range extending the length of the Rocky Mts.

Bureau of Land Management (BLM). 2009. 2009 Montana/Dakotas Special Status Species List. Instruction Memorandum No. MT-2009-039 (April 24, 2009). (effective until 9/30/2011 per Instruction Memorandum No. MT-2011-006) **http://www.blm.gov/mt/st/en/res/public_room/efoia/2009/IMs/09mtm039.html**

U.S. Fish and Wildlife Service (FWS). 2012. Endangered, Threatened, Proposed and Candidate Species Montana Counties. Ecological Services Montana Field Office (June, 2010). **http://www.fws.gov/montanafieldoffice/Endangered_Species/Listed_Species.html** accessed 6/22/12.

Appendix 4

Determination Summary for the Tin Can Hill Prescribed Burn Project.

Species	No Action	Proposed Action
Great Plains toad	NI	MIIH
Northern leopard frog	NI	NI
Plains spadefoot	NI	MIIH
Greater short-horned lizard	NI	MIIH
Milk snake	NI	MIIH
Baird's sparrow	NI	MIIH
Bald eagle	NI	NI
Brewer's sparrow	NI	MIIH
Chestnut-collared longspur	NI	MIIH
Dickcissel	NI	MIIH
Ferruginous hawk	NI	MIIH
Golden eagle	NI	MIIH
Greater sage-grouse	NI	MIIH
Loggerhead shrike	NI	MIIH
Long-billed curlew	NI	MIIH
Mabled godwit	NI	MIIH
McCown's longspur	NI	MIIH
Mountain plover[1]	NI/NE	MIIH/NLJ
Northern goshawk	NI	MIIH
Sage thrasher	NI	MIIH
Sprague's pipit	NI	MIIH
Swainson's hawk	NI	MIIH
Three-toed woodpecker	NI	MIIH
Fringed myotis	NI	MIIH
Long-eared myotis	NI	MIIH
Long-legged myotis	NI	MIIH
Townsend's big-eared bat	NI	MIIH

[1]**Species Proposed For Listing**

NE – No Effect

NLJ – Not likely to Jeopardize the continued existence of the species or result in adverse modification of proposed critical habitat

***LJ** – Likely to Jeopardize the continued existence of the species or result in or adverse modification of proposed critical habitat

Sensitive Species

NI – No Impact

MIIH – May Impact Individuals or Habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species

***WIFV** – Will Impact Individuals or habitat that is likely contribute to a trend toward federal listing or cause a loss of viability to the population or species

BI – Beneficial Impact

Appendix 5

Fire Regime Condition Class
Landscape Report

version 3.0.3.0

Landscape

Registration Code: BLMC Landscape Code: TinCan Characterization Date: 09/21/2012

Examiner: cbarta@blm.gov Landscape Name: Musselshell Breaks Area: 85000 Acres

Lat: 47.183316 Lon: -108.173683 Datum: WGS84

Comment:

Biophysical Stratification

Num	Life-form	BpS	Species		Land-form	Slope Class	Insol Class	Elevation Low	Elevation High	Stratum Comp (%)	Ref Freq	Curr Freq	Ref Sev	Curr Sev	Strata Depart	Strata FRCC
1	SU	R0SBWYwy	ARTRW8		BRK	GENTL	MOD			55	92	90	63	75	12	1
2	CF	R0PIPOnp	PIPO		BRK	MOD	MOD			35	15	15	5	50	59	2
3	HU	R0PGRn	AGROP2 STIPA	BOUTE	BRK	MOD	MOD			10	12	15	55	80	50	2
										100						

Appendix 5

Fire Regime Condition Class
Landscape Report - Stratum Data

Registration Code: BLMC Landscape Code: TinCan Characterization Date: 09/21/2012

Stratum Num: 1 Biophysical Setting: ROSBWYwy Stratum Name: Wyoming Big Sagebrush

Stratum Composition (% of area): 55 BpS Lifeform: SU Landform: BRK Avg Slope Class: GENTL Insol Class: MOD

Stratum Area: 46750 Acres Species: ARTRW8 Low Elevation: High Elevation:

Reference Frequency: 92 Current Frequency: 90 Latitude: Longitude: Datum: WGS84

Reference Severity: 63 Current Severity: 75 Reference Composition Source: D Current Composition Source: R

Comments:

Uncharacteristic S Class Codes	Uncharacteristic S Class Descriptions
UFUS	Uncharacteristic: Fuel/Succn/Lack Fire Effects - Conifer encroachment onto the sageland

Succession Classes

Code	Upper Layer Lifeform	Majority Size	Dominant Species				Ref Comp	Curr Comp	Acres	Sim	Diff	Relative Amount	Stand FRCC	Stand Depart	S-Class Acres Departed from Reference
A		NNNN	STCO4	ORHY	AGSM	BOGR	20	5	2337	5	-75	TRACE	1	0	-7012
B		NNNN	ARTRW8	OPUNT	STCO4	AGSM	30	35	16362	30	14	OVER REP	2	14	2337
C		NNNN	ARTRW8	STCO4	AGSM	ORHY	25	25	11687	25	0	SIMILAR	1	0	0
D		NNNN	ARTRW8	STCO4	AGSM	OPUNT	25	35	16362	25	29	OVER REP	2	29	4675
E		NNNN					0	0	0	0	N/A				0
						Total	100	100		85					

Stratum Vegetation Departure: 15 Stratum Fire Frequency Departure: 2 Stratum Regime Departure: 9

Stratum Vegetation Condition Class: 1 Stratum Fire Severity Departure: 16 Stratum Regime Condition Class: 1

Stratum Fire Regime: III - Infrequent Mixed and Surface Stratum Departure: 12 Stratum Fire Regime Condition Class: 1

Appendix 5

Fire Regime Condition Class
Landscape Report - Stratum Data

Registration Code: BLMC Landscape Code: TinCan Characterization Date: 09/21/2012

Stratum Num: 2 Biophysical Setting: ROPIPOnp Stratum Name: Ponderosa Pine-Northern Great Plains

Stratum Composition (% of area): 35 BpS Lifeform: CF Landform: BRK Avg Slope Class: MOD Insol Class: MOD

Stratum Area: 29750 Acres Species: PIPO Low Elevation: High Elevation:

Reference Frequency: 15 Current Frequency: 15 Latitude: Longitude: Datum: WGS84

Reference Severity: 5 Current Severity: 50 Reference Composition Source: D Current Composition Source: R

Comments:

Uncharacteristic S Class Codes	Uncharacteristic S Class Descriptions
UFUS	Uncharacteristic: Fuel/Succn/Lack Fire Effects

Succession Classes

Code	Upper Layer Lifeform	Majority Size	Dominant Species		Ref Comp	Curr Comp	Acres	Sim	Diff	Relative Amount	Stand FRCC	Stand Depart	S-Class Acres Departed from Reference
A		NNNN	NAM	PASY	6	13	3867	6	54	OVER REP	2	54	2082
B		NNNN	PIPO		2	65	19337	2	97	ABUNDANT	3	97	18742
C		NNNN	PIPO		20	15	4462	15	-25	SIMILAR	1	0	-1487
D		NNNN	PIPO		70	2	595	2	-97	TRACE	1	0	-20230
E		NNNN	PIPO		2	5	1487	2	60	OVER REP	2	60	892
				Total	100	100		27					

Stratum Vegetation Departure: 73 Stratum Fire Frequency Departure: 0 Stratum Regime Departure: 45

Stratum Vegetation Condition Class: 3 Stratum Fire Severity Departure: 90 Stratum Regime Condition Class: 2

Stratum Fire Regime: I - Frequent Surface and Mixed Stratum Departure: 59 Stratum Fire Regime Condition Class: 2

Appendix 5

Fire Regime Condition Class
Landscape Report - Stratum Data

Registration Code: BLMC Landscape Code: TinCan Characterization Date: 09/21/2012

Stratum Num: 3 Biophysical Setting: ROPGRn Stratum Name: Northern Prairie Grassland

Stratum Composition (% of area): 10 BpS Lifeform: HU Landform: BRK Avg Slope Class: MOD Insol Class: MOD

Stratum Area: 8500 Acres Species: AGROP2 STIPA BOUTE Low Elevation: High Elevation:

Reference Frequency: 12 Current Frequency: 15 Latitude: Longitude: Datum: WGS84

Reference Severity: 55 Current Severity: 80 Reference Composition Source: D Current Composition Source: R

Comments:

Uncharacteristic S Class Codes	Uncharacteristic S Class Descriptions
UINP	Uncharacteristic: Invasive Plants
UFUS	Uncharacteristic: Fuel/Sucn/Lack Fire Effects

Succession Classes

Code	Upper Layer Lifeform	Majority Size	Dominant Species				Ref Comp	Curr Comp	Acres	Sim	Diff	Relative Amount	Stand FRCC	Stand Depart	S-Class Acres Departed from Reference
A		NNNN	AGROP2	STIPA	BOUTE	ANDRO2	15	5	425	5	-67	TRACE	1	0	-850
B		NNNN	GUSA2	ARIST	FEOC3	OPPO	1	5	425	1	80	OVER REP	2	80	340
C		NNNN	AGSM	BOGR2	KOMA	POSE	4	60	5100	4	93	ABUNDANT	3	93	4760
D		NNNN	AGROP2	STIPA	BOUTE	ANDRO2	15	30	2550	15	50	OVER REP	2	50	1275
E		NNNN	AGROP2	STIPA	BOUTE	ANDRO2	65	0	0	0	-100	TRACE	1	0	-5525
						Total	100	100		25					

Stratum Vegetation Departure: 75 Stratum Fire Frequency Departure: 20 Stratum Regime Departure: 25

Stratum Vegetation Condition Class: 3 Stratum Fire Severity Departure: 31 Stratum Regime Condition Class: 1

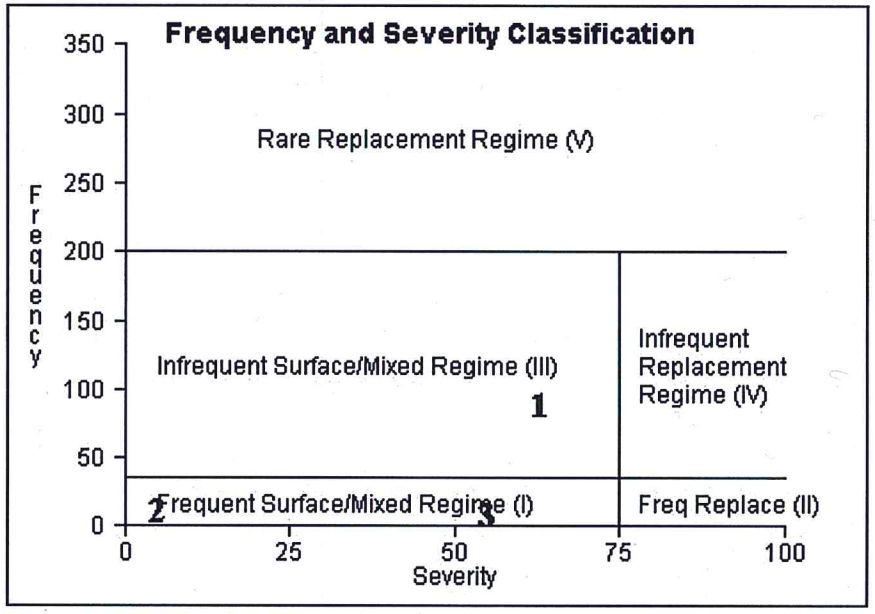
Stratum Fire Regime: I - Frequent Surface and Mixed Stratum Departure: 50 Stratum Fire Regime Condition Class: 2

Appendix 5

Fire Regime Condition Class
Landscape Report - Reference Fire Regime Summary

Registration Code: BLMC Landscape Code: TinCan Char Date: 09/21/2012

Stratum #	Reference Frequency	Reference Severity	Fire Regime Group
1	92	63	III
2	15	5	I
3	12	55	I



Appendix 5

Fire Regime Condition Class
Landscape Report - FRCC Summary

Registration Code: BLMC Landscape Code: TinCan Char Date: 09/21/2012

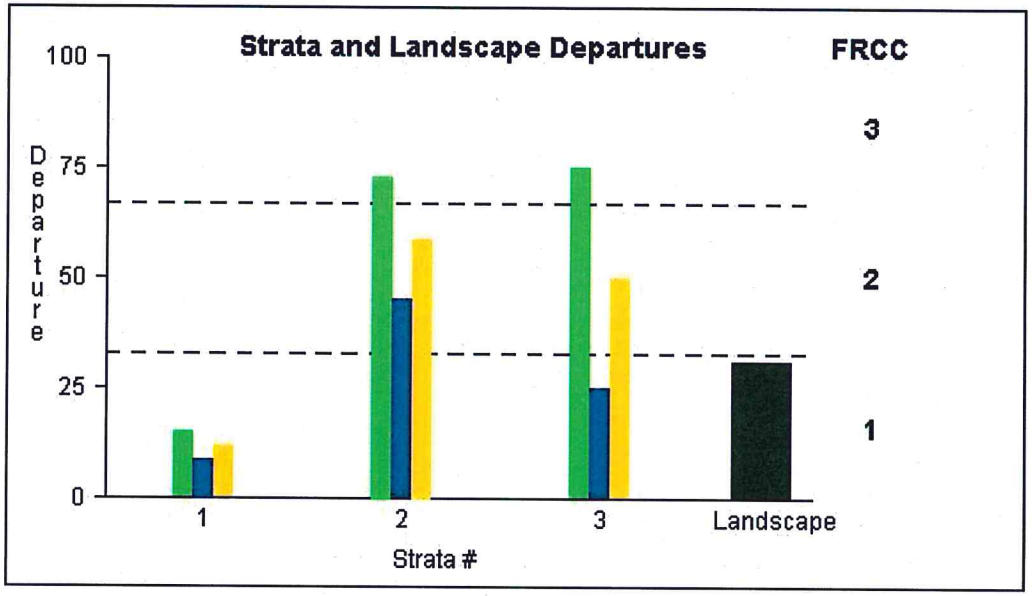
Stratum #	Stratum Depart (%)	Stratum Comp (%)	Weighted Depart (%)
1	12	55	6
2	59	35	20
3	50	10	5
Sum		100	31

Landscape Departure: 31

Landscape FRCC: 1 (0-33%)

Legend

- Vegetation Departure
- Regime Departure
- Stratum Departure
- Landscape Departure
- No Departure *



Appendix 5

FRCC Landscape Report for Musselshell Breaks						
Biophysical Setting (BpS Code)		FRG (I-V)	Condition Class 1 (Acres)	Condition Class 2 (Acres)	Condition Class 3 (Acres)	Total Acres
Wyoming Big Sagebrush	(R0SBWYwy)	III	14025	32725	0	46750
Ponderosa Pine-Northern Great Plai...	(R0PIPOnp)	I	5058	5355	19338	29750
Northern Prairie Grassland	(R0PGRn)	I	425	2975	5100	8500
Total Acres			19508	41055	24438	85000

Appendix 5

Fire Regime Condition Class
Landscape Report - Code Summary

Stratum Biophysical Land Unit(BpS)

ROSBWY Wyoming Big Sagebrush

ROPIPOn Ponderosa Pine-Northern Great Plains

ROPGRn Northern Prairie Grassland

Lifeforms

SU	Shrub dominated upland -- Sagebrush, bitterbrush
CF	Coniferous upland forest -- Pine, spruce, hemlock
HU	Herbaceous dominated upland -- grasslands, bunchgrass

Landform

BRK	Breaklands - river breaks - badlands

Average Slope

GENTL	Gentle (0-10 degrees)
MOD	Moderate (11-30 degrees)

Reference Composition Source

D	coarse-scale default values from lit. review/modeling workshops

Current Composition Source

R	walk through and visual estimate

Insolation Class

MOD	Flat(<+10% slope) or all aspects

Upper Layer Majority Lifeform

Species

STCO4	Stipa comata (Stipa comata)
ORHY	Oryzopsis hymenoides (Oryzopsis hymenoides)
AGSM	Agropyron smithii (Agropyron smithii)
BOGR	Boerhavia gracillima (slimstalk spiderling)
ARTRW8	Artemisia tridentata ssp. wyomingensis (Wyoming big sagebrush)
OPUNT	Opuntia (pricklypear)
NAVI	Navarretia viscidula (sticky pincushionplant)
PASY	ERROR-No description found
PIPO	Pinus ponderosa (ponderosa pine)
AGROP2	Agropyron (wheatgrass)
STIPA	Stipa (Stipa)
BOUTE	Bouteloua (grama)
ANDRO2	Andropogon (bluestem)
GUSA2	Gutierrezia sarothrae (broom snakeweed)
ARIST	Aristida (threeawn)
FEOC3	Festuca octoflora (Festuca octoflora)
OPPO	Opuntia polyacantha (plains pricklypear)
BOGR2	Bouteloua gracilis (blue grama)
KOMA	Koeleria macrantha (prairie Junegrass)
POSE	Poa secunda (Sandberg bluegrass)

Size

NNNN	Does not fit any category, Unable to Asses

Appendix 5

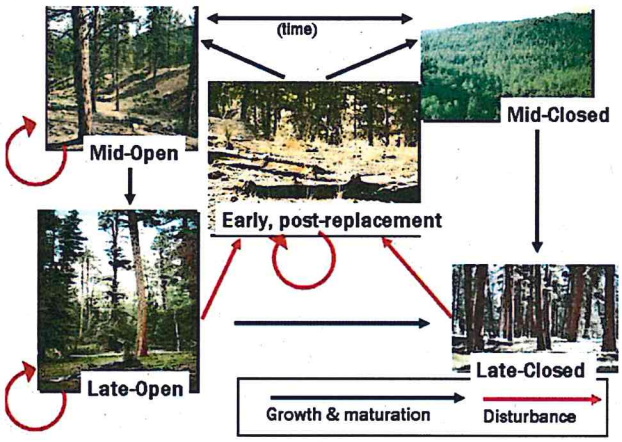
Musselshell Breaks EA Project Area Composition

Sagebrush Steppe (R0SBWYwy) 55%

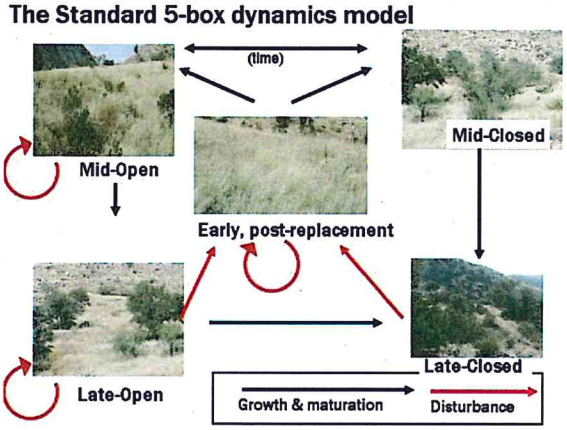
Ponderosa Pine Woodland (R0PIPOnp) 35%

Northwestern Great Plains Mixed-grass Prairie (R0PGRn) 10%

The Standard 5-box dynamics model



The Standard 5-box dynamics model



Succession Classes for a forest ecosystem. **Succession Classes for a rangeland ecosyster**

Bps		Project % Composition	Reference Conditions	Current Values
R0SBWYwy	Sagebrush Steppe	55%	%	%
	AESP: Early, post-replacement		20	5
	BMSC: Mid-development, closed		30	35
	CMSO: Mid-development, open		25	25
	DLSO: Late-development, open		25	35
	ELSC: Late-development, closed		0	0
			100	100
R0PIPOnp	Ponderosa Pine Woodland	35%		
	AESP: Early, post-replacement		6	13
	BMSC: Mid-development, closed		2	65
	CMSO: Mid-development, open		20	15
	DLSO: Late-development, open		70	2
	ELSC: Late-development, closed		2	5
	Uncharacteristic			
	(Succession, lack of fire effects)		100	100
R0PGRn	Northwestern Great Plains Mixedgrass Prairie	10%		
	AESP: Early, post-replacement		15	5
	BMSC: Mid-development, closed		1	5
	CMSO: Mid-development, open		4	60
	DLSO: Late-development, open		15	30
	ELSC: Late-development, closed		65	0
			0	
			100	100

U. S. Department of the Interior
Bureau of Land Management
Lewistown Field Office
and
Montana Department of Natural Resources and Conservation
Northeast Land Office
Lewistown, MT

FINDING OF NO SIGNIFICANT IMPACT
for
Musselshell Breaks Fuels Treatment

ENVIRONMENTAL ASSESSMENT NUMBER: DOI-BLM -L060-2012-0019-EA

Finding of No Significant Impact

On the basis of the information contained in the environmental assessment for Musselshell Breaks Fuels Treatment, I find that the proposed action will not have a significant effect on the human environment. Therefore, an environmental impact statement will not be prepared.

This finding is based on the following reasons. Known historic properties within the area of potential effects will be avoided during implementation. Protective measures including but not limited to black lining, hand removal of vegetation, etc. will be completed around known cultural sites; the permitted use for livestock grazing will not change; fuel loadings will be reduced and the potential for high severity wildfire will be lowered; changes to the visual landscape would not attract the attention of the casual observer once green up and revegetation occurs; there will be no significant or long-term effect to recreation values; and wildlife habitat will be enhanced.

Mitigation Measures

Existing noxious weed infestations will be monitored and treated using an integrated weed management approach, cooperative agreements with grazing permittees, and contracts with approved applicators may be used to control existing and new infestations. Surveys, for new infestations, will be conducted for 3 to 5 years or until the vegetation completely recovers from the treatment and provides competition from new infestations. Any new infestations will be monitored and treated as an existing infestation. Weed surveys will continue throughout the area, on a regular basis, by the BLM and grazing permittees.

Mitigation measures as outlined it the Design Criteria section of the Musselshell Breaks Fuels Treatment environmental assessment will be implemented.

Jeff Bugenstaf
Lewistown Field Manager

January 11, 2013
Date

Area Manager, Northeast Land Office
Department of Natural Resources and Conservation

1-22-13
Date