EAST OTTER
HAZARDOUS FUELS REDUCTION
PROJECT

WATER RESOURCES REPORT
AFFECTED ENVIRONMENT

Ashland Ranger District
Custer National Forest
Region 1 Forest Service

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APPLICABLE LAWS, REGULATIONS AND POLICY

a. Federal

Clean Water Act (CWA)

This Act requires Federal Agencies to comply with all Federal, State, and local requirements, administrative authority, process and sanctions related to the control and abatement of water pollution (CWA, Sections 313(a) and 319(k)). The CWA gives authority to individual States to develop, review, and enforce water quality standards under Section 303. This section also requires the States to identify existing water bodies that do not meet water quality standards, and develop plans to meet them. These plans are commonly called TMDLs (total maximum daily load) and are discussed further below. Section 404 of the Act gives authority to the Corps of Engineers to review and permit activities that may impact navigable waters of the U.S., similar to the Montana Stream Protection Act discussed below.

Forest and Rangeland Renewable Resource Planning Act of 1974 and National Forest Management Act of 1976

In response to requirements set forth in these two Acts, final rules on National Forest System Land and Resource Management Planning established specific minimum management requirements to be met in accomplishing the goals and objectives for National Forest System lands. These requirements were intended to guide the development, analysis, approval, implementation, monitoring, and evaluation of forest plans. Requirements specific to soils, water and fish habitat are found in 36 CFR 219.27, volume 47, #190, 09/30/82 (Federal Register 1982) as follows:

(a) Resource protection. "All management prescriptions shall:
(1) Conserve soil and water resources and not allow significant or permanent impairment of the productivity of the land;
(2) Consistent with the relative resource values involved, minimize serious or long-lasting hazards from flood, wind, wildfire, erosion.
(4) Protect streams, streambanks, shorelines, lakes, wetlands, and other bodies of water...;
(6) Provide for adequate fish and wildlife habitat to maintain viable populations of existing native vertebrate species...."

(e) Riparian areas.
"Special attention shall be given to land and vegetation for approximately 100 feet from the edges of all perennial streams, lakes, and other bodies of water. This area shall correspond to at least the recognizable area dominated by the riparian vegetation. No management practices causing detrimental changes in water temperature or chemical composition, blockages of water courses, or deposits of sediment shall be permitted within these areas that seriously and adversely affect water conditions or fish habitat. Topography, vegetation type, soil, climate conditions, management objectives, and other

factors shall be considered in determining what management practices may be performed within these areas or the constraints to be placed upon their performance."

(f) Soil and Water Conservation.
"Conservation of soil and water resources involves the analysis, protection, enhancement, treatment, and evaluation of soil and water resources and their responses under management and shall be guided by instructions in official technical handbooks."

Multiple Use Sustained Yield Act of 1960

It is the policy of the Congress that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes (16 USC 2 (I); Sec 528). The terms multiple use and sustained yield are defined as:

"The management of all the various renewable surface resources of the national forests so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some land will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output." (multiple use)

"The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the national forests without impairment of the productivity of the land." (sustained yield)

b. State - Montana Water Quality Law

As directed by the Clean Water Act, the State of Montana developed a water quality classification system, developed water quality standards to be applied to various water classes, and identified water bodies that do not meet standards.

The Montana Department of Environmental Quality (MTDEQ) has classified all waters within the analysis area as C-3 waters. The beneficial uses associated with this classification include; bathing, swimming, and recreation; growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl, and furbearers. The quality of these waters is naturally marginal for drinking, culinary and food processing purposes, agricultural and industrial water supply. Degradation which will impact established beneficial uses will not be allowed. (Administrative Rules of Montana (ARM) 17.30.611 2007a).

Surface Water Quality Standards

The Montana Water Quality Act, Surface Water Quality Standards require that land management activities must not generate pollutants in excess of those that are naturally occurring, regardless of the stream's classification. Under ARM 17.30.623 (2) (f) "No increases are allowed above naturally occurring concentrations of sediment, settleable solids, oils, or floating solids, which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife." Naturally occurring is defined in ARM 16.20.602 (19) as: "the water quality condition resulting from runoff or percolation, over which man has no control, or from developed lands where all reasonable land, soil and water conservation practices have been applied". Reasonable land, soil and water conservation practices are similar to Best Management Practices (BMPs). BMPs are considered reasonable only if beneficial uses are fully supported. BMPs are further discussed in a following section.

Total Maximum Daily Load Waterbody List

Riparian and stream conditions are assessed by the Montana Department of Environmental Quality to determine the level of beneficial uses support. Streams that do not fully support their uses do not fully meet water quality standards. The status of water quality assessments and Total Maximum Daily Load (TMDL) development of streams are identified in a biennial report from MTDEQ. Beaver Creek is listed on the 2006 Montana 303(d) List under Water Quality Category 3: Insufficient data to assess any use (MTDEQ 2006). No probable causes or sources are identified. East Otter Creek is not listed specifically on the 303(d) List, however, Otter Creek is. It falls under the same category as Beaver Creek, i.e., insufficient data to assess any use. The Tongue and Powder River basins are scheduled for TMDL development from 2007 through 2009.

It is important to understand that the State of Montana has the authority to develop TMDLs. On streams with multiple ownership, the Forest Service cooperates with the State and other adjacent landowners in the development process. Additionally, the fact that a particular stream is listed does not preclude management activities from taking place. Montana Code Annotated (MCA) 75-5-703(10)(c), states: (10) Pending completion of a TMDL on a water body listed pursuant to 75-5-702: (c) new or expanded non-point source activities affecting a listed water body may commence and continue their activities provided those activities are conducted in accordance with reasonable land, soil, and water conservation practices.

Streamside Management Zone (SMZ) Law and Rules

The Montana Legislature passed the SMZ Law in 1991 and it became effective in 1993. This law prohibits certain forestry practices, e.g., equipment operation and broadcast burning, within 50 to 100 feet of streams. It specifies other criteria, e.g., retention tree requirements and road construction limitations, for this management zone (ARM 2007b). Refer to section on BMPs for discussion of the SMZ Law in relation to this project.

Stream Protection Act – SPA 124

The Montana legislature enacted The Stream Protection Act in 1965. It requires all government agencies (Federal, State and local) to notify the State of all planned activities that will alter the bed or banks of any intermittent or perennial stream. (MCA 85-5-502 2007). The Montana Department of Fish, Wildlife and Parks administers this Act on Federal land through the SPA 124 permit process. Refer to the section on BMPs for a discussion of potential permits specific to this project.

c. Forest Service

Custer National Forest Land and Resources Management Plan

Management goals for soil, water and riparian resources are identified in the Forest Plan under Chapter II - Forest Wide Management Direction and Chapter III – Management Area Direction (USDA-FS 1986).

The Forest Plan goal for watershed management is to: "[E]nsure that soil productivity is maintained and that water quality is maintained at a level which meets or exceeds state water quality standards." (page 4)

Forest Plan objectives for soil and water resources are: "Continue to produce water that meets State water quality standards. National Forest System lands will be managed so that the soil and watershed conditions are in a desirable condition and will remain in that condition for the foreseeable future. Soil and water quality objectives are designed to assure that these resources meet State water quality objectives and BMP's (Best Management Practices) are incorporated to assure this." (page 5)

Forest Plan goal for riparian areas include: "[M]anage for water quality, provide diverse vegetation, and protect key wildlife habitat in these areas from conflicting uses and uses and activities that adversely impact these areas will be mitigated." (page 3)

Forest Plan objectives for riparian areas include recognition of their unique values, and management direction is to be designed to protect these key wildlife habitats and improve water quality: "[T]hese areas will be managed in relation to various legally mandated requirements including, but not limited to, those associated with floodplains, wetlands, water quality, dredged and fill material, endangered species, and cultural resources." (page 5)

Goals for Management Area M (Riparian) are: "Manage to protect from conflicting uses in order to provide healthy, self-perpetuating plant and water communities that will have optimum diversity and density of understory and overstory vegetation." (page 80)

d. Best Management Practices

As identified above under Surface Water Quality Standards, soil and water conservation practices (or BMPs) are the primary mechanism to minimize water quality impacts from non-point source pollution and still allow dispersed land management activities to occur on National Forest land. To reach these objectives the Forest Service developed a handbook; R1/R4 Forest Service Soil and Water Conservation Practices Handbook (USDA Forest Service 1988, major revision in progress). Region 1 Forest Service has also embraced the Montana Forestry Best Management Practices (MTDNRC 2002) and the Montana Streamside Management Zone (SMZ) Rules (ARM 2007b) when planning and implementing timber harvest operations.

Montana Forestry BMPs

The minimum criteria to meet the definition of a stream under the Montana Forestry BMPs is the same as for Class 3 streams under the SMZ Law, i.e., dry scoured or partially scoured channels that flow less than six months per year and generally do not conduct water to the next order drainage downslope. Class 3 streams can be dry one year and flowing for a short duration the next year. Natural drainage features that do not meet these minimum criteria are still addressed through BMPs.

Skidding and Road Construction Along Natural Drainage Features

Skidding along the bottom of intermittent or ephemeral drainages that do not fall under the SMZ rules should be avoided, especially where long skid lengths (>100 feet) and multiple passes are anticipated. Montana Forestry BMP IV.A.5. states "Locate skid trails to avoid concentrating runoff and provide breaks in grade. Locate skid trails and landings away from natural drainage systems and divert runoff to stable areas." Dry, vegetated draw bottoms are natural drainage systems and it is nearly impossible to divert runoff from skid trails that are located along the bottom of dry draws.

Similarly, construction of temporary roads along the bottom of intermittent or ephemeral drainages should be avoided. Montana Forestry BMPs which provide direction on this issue include III.A.4 ("Avoid …natural drainage channels."), III.B.4 ("Design roads to minimize disruption of natural drainage patterns."), III.C.7 ("Route road drainage through adequate filtration zones…"), V.B.1 ("Cross streams at right angles to the main channel if practical."), and V.B.2 ("Avoid unimproved stream crossings."). Again, natural drainage channels include dry, non-scoured, vegetated draws that rarely flow. With respect to planning, design and construction BMPs, temporary roads are treated the same as permanent roads. Temporary road construction along mid or lower slopes, and out of the very bottom of drainages (non- SMZ streams), should meet BMP's mentioned above.

Temporary roads proposed in the bottom of narrow draws which may conflict with the above BMPs include T7, T10, T13, T16, T20, T21, T22, T23 and T24.

Maintenance of System Roads

Maintenance of some existing roads to allow suitable access for log trucks may result in new soil disturbance. Many roads on the west side of the project area have had significant conifer encroachment over the years. This has substantially limited vehicular access along miles of existing road. Road prisms, including cut and fill slopes are completely vegetated and stable. Grading activities should ensure that adequate drainage and proper location of drainage features in relation to stream crossings is incorporated into the road template. There a number of Montana Forestry BMPs that pertain to this concern and close adherence should be given to the following three: III.C.1 – Provide adequate road surface drainage for all roads, III.C.7 – Route road drainage through adequate filtration zones before entering a stream, V.B.1.b – Direct road drainage away from stream crossing site. These three BMPs have continually resulted in departures during the State biennial BMP audit process over the last 16 years. Minor departures occur where road generated sediment is delivered to draws (dry, non-scoured drainage features), but not streams. Major departures occur where sediment is delivered to streams (not necessarily perennial) or annual floodplains. The quantity of sediment does not affect the departure rating (one shovel full same as one dump truck load), but the duration does (temporary or one season, versus prolonged or more than one season).

Obliteration of Temporary Roads

To ensure effective rehabilitation and long term stabilization of temporary roads, ensure road prisms are not passable by 4x4 vehicles. To the extent practical, place logging slash (cull logs, rootwads, large limbs) along the road prism, especially at points of entrance to the road. Rip overly compacted segments as needed, and seed prior to placing slash. Pull all culverts and restore crossing sites to match adjacent topography. For temporary roads on existing non-system routes, ensure accessibility has not been improved over pre-project conditions, thereby ensuring traffic related sediment production/transport is not increased over pre-project conditions.

Prescribed Fire

Where practical, minimize high intensity fire within densely vegetated draws by allowing fire to back down into draws rather than allowing fire to build in intensity as it moves upslope through the draws. This will provide for minimal soil exposure, allow for rapid regeneration of ground cover, and maintain drainage bottom stability and resistance to high intensity rain events.

Streamside Management Zone Law and Rules

The majority of the drainage bottoms are dry vegetated draws without scour or defined banks and therefore, do not meet the definition of a stream course per the Montana SMZ Rules. However, there are intermittent and localized areas of scour that do result in defined channel banks, and there are intermittent segments of flow. Criteria that further complicate the classification include whether or not flow contributes to the next order stream down valley, and whether flow occurs more or less than six months a year. Current years precipitation levels significantly influence both of these criteria.

It is important to note that Class 1 streams do not necessarily support fish, nor are they always perennial. Class 1 streams generally flow more than 6 months and always contribute surface flow to the next order stream down valley. Class 2 streams do not support fish. Either they flow less than six months of the year or more and do contribute surface flow to perennial streams down slope, or they flow more than six months but do not contribute surface flow. Class 3 streams do not support fish, normally flow less than 6 months and rarely contribute surface flow. If economics do not play a significant role, it is better to be conservative in the classification. That is, when in doubt, treat non-streams as Class 3, Class 3 as Class 2, and Class 2 as Class 1 streams.

SMZ classification has a significant influence on road locations in the bottom of dry draws that could be Class 3 streams. SMZ width, equipment operations and tree retention requirements also vary considerably between Class 3 streams, and Class 1 and 2 streams. If SMZ classification will influence economics and a conservative approach is not practical, it will be important to obtain concurrence from MT-DNRC for SMZ classification prior to implementation. SMZ stream classes and applicable rules are best determined during unit layout after unit boundaries are flagged. The forest hydrologist will be available to assist timber staff in SMZ delineation and flagging.

Proposed treatments may conflict with two SMZ prohibited practices, although approval to implement alternative practices could likely be obtained from MT-DNRC. SMZ Rule 3 prohibits broadcast burning in an SMZ. It appears that all burn prescriptions in commercial units involve jackpot burning, not broadcast burning. However, since non-commercial units are located adjacent to, and in some cases surround commercial units, it will be important for personnel involved in implementation of the prescribed burns to be aware of the potential for SMZ violations by allowing broadcast burns to encroach into commercial units where SMZ's exist. The other way to handle this situation is to obtain approval for an alternative practice to broadcast burn with in an SMZ. It is unlikely that approval would be granted on a project area scale and site-specific SMZ's would have to be identified prior to application.

Rule 5 prohibits clearcutting in an SMZ and provides criteria for tree retention. This rule requires that 1) species and sizes left be representative of the original stand (class I and II), and 2) submerchantable trees and shrubs be protected and retained to the fullest extent possible (all stream classes). This is potentially in conflict with the prescriptions identified for thinning in aspen and woody draw stands (special cut treatment). Hardwoods and snags can be counted towards retention requirements, but only in the same proportions as the original stand. The best way to handle this situation is to obtain approval to implement the proposed prescriptions where they overlap with SMZs.

Stream Permits

When locating and constructing temporary roads and skid trails, avoid crossing drainage bottoms below spring sources where wetland plant communities occur, or where intermittent or perennial stream courses exist. If crossings cannot be avoided, incorporate

appropriate BMPs into the crossing design and ensure that appropriate permits are obtained prior to implementing the project, i.e., 124 permits from the Montana Department of Fish, Wildlife and Parks, and 404 permits from the US Army Corps of Engineers. Permits generally require at least 30 days for processing applications prior to implementation. Discussion with the Miles City Regional Office of MTDFWP indicates that 124 permits will be required for crossing perennial streams and riparian/wetland corridors that do not exhibit defined channel features. The forest hydrologist can coordinate this effort as needed.

AFFECTED ENVIRONMENT

INTRODUCTION

Both natural events and human activities have the potential to impact soil, water and riparian resources across both forest and range land. Significant natural events include wildfire and floods, while the most significant human activities include livestock grazing, agriculture, transportation systems, floodplain development, timber harvest and recreation. The degree of impact depends upon the soil and hydrologic characteristics of the watershed and how sensitive and resilient they are to these disturbances. Soil and hydrologic characteristics vary extensively across landscape and are dictated by local landform, geologic material and climate.

NATURAL CHARACTERISTICS

Perennial stream systems of significant length are rare in the project area and where they occur, they have low discharge. They are either spring fed or are surface expressions of high water tables with very minimal flow. Defined channels are rare due to 1) flow regimes being insufficient to create bankfull features, and 2) livestock trailing tends to obliterates natural channel features where they develop. Riparian vegetation, comprised mainly of sedge and rush species, is generally dense and also obscures flow paths in most of these systems. The linear extent of perennial systems is highly dependent on precipitation levels during recent years. Known perennial systems occur in the Beaver Creek springs area, a short tributary to Beaver Creek below the springs.

The majority of the drainage bottoms are dry grassy swales or woody draws with extensive litter cover. Intermittent channel scour is present along some intermittent and ephemeral reaches resulting in defined banks, but the scour is generally a result of infrequent natural disturbance events (stand replacing wildfire followed by high intensity summer rain events), not annual spring runoff and erosion events. High magnitude spring runoff events are rare and do not play a significant role in channel morphology in these watersheds. Active floodplains and wetlands not associated with the perennial stream systems are not known to exist within the project perimeter.

HUMAN INFLUENCES

Livestock grazing on and below the Forest is widespread and therefore, potentially the main influence on water resources within the Upper Beaver and East Otter Creek watersheds. Grazing has occurred for many decades and is expected to continue well into the future. All perennial streams receive some level of grazing pressure, but the total effect on water resources has not been fully documented. The 2006 Montana Integrated 303(d)/305(b) Water Quality Report (MTDEQ 2006) indicates that grazing in riparian or shoreline zones is the source of impairment for 34 percent of the total impaired stream miles (37% of impaired segments) in the state.

Except for a small number of localized impacts, the existing transportation system within the project area has minimal influence on water quality. Most road segments are located along ridges or mid slopes, or are well vegetated with minimal vehicle use.

Past vegetation management activities have also occurred both within the project area and on adjacent state and private land below the Forest. Timber stands have also been influenced by past wildfire events. On Forest Service land, approximately 2,693 acres of vegetation treatments (mostly salvage) and 4,718 acres of wildfire have occurred since 1950 with the far majority occurring in the late 1980's. Timber harvest is also planned within the upper Beaver Creek (approx. 3,315 acres) watershed under the Whitetail Timber Sale. All of these activities are further summarized by 6 hydrologic unit code (HUC) watersheds in the table below (Table 1). Six HUC watersheds are the standard analysis areas used for most water resource cumulative effects analyses in Region 1 Forest Service.

Management on other public land (State) and on private land is mainly forage production for livestock. However, a review of 1996 aerial photos suggests that timber harvest and crop production has occurred across some private land in both watersheds. None of this management has not been quantified by watershed, nor have any associated effects to water resources been documented.

Table 1 - SUMMARY OF PAST, PRESENT AND FORESEEABLE ACTIVITIES BY 6HUC WATERSHED

Watershed ID	Watershed Name	Watershed Acres	Percent of watershed NFS land	Vegetation Treatment Acres[1] (harvest and Rx burn)	Wildfire Acres[1]	Road Miles[2]
100901020601	Upper Beaver Creek	14,298	90	4,021	1,118	37
100901020304	East Otter Creek	29,127	35	1,995	3,600	59

[1]Activity acres on National Forest System land only. Includes proposed vegetation treatments under the Whitetail TS.
[2]Not all roads on or across private land are accounted for.

These existing activities are incorporated into the cumulative effects analysis for water resources by converting acres and miles to equivalent clearcut acres (ECA). This procedure allows past, present and reasonably foreseeable timber management and road activities to be summarized to a single value for effects determination by 6 HUC watersheds.

ENVIRONMENTAL EFFECTS

INTRODUCTION

The project will treat approximately 3,819 acres in the headwaters of Beaver and East Otter Creek 6 HUC watersheds to reduce fuel accumulations and reduce the risk of stand replacement wildfire. Vegetation treatments include regeneration harvest, commercial and pre-commercial thinning and prescribed burning. Prescribed broadcast burning accounts for the majority of the treatment; 56 percent or 2,124 acres. Mechanized equipment will be used, but only in commercial harvest units (969 acres). Approximately 2.6 miles of reconstruction is proposed on the Cook Mountain Road and approximately 6.7 miles of temporary road will be constructed. Assuming Alternative B of the Ashland Travel Management Plan is implemented, all temporary roads will be decommissioned.

ISSUES

What are the effects of the proposed activities on hydrologic processes and water resources; specifically water yield, sedimentation, channel and floodplain function, and riparian habitat? Units of measure: equivalent clearcut area acres (ECA), number of stream crossings, miles of new system or temporary roads.

EFFECTS OF THE NO ACTION ALTERNATIVE

Watersheds, undisturbed by human influences, are not static systems. Deep snowpacks and heavy spring rains can cause significant flooding. Wildfire, wind, or insect and disease mortality can drastically alter the vegetative composition of a watershed. Depending on the extent of mortality and rate of stand decomposition, impacts to stream systems can be significant. Beneficial uses, including aquatic and riparian habitat, can be negatively affected by these natural events. However, watersheds left undisturbed after natural events, can and do recover rapidly, and ultimately provide conditions that fully support all beneficial uses within a relatively short period of time. These natural disturbances occur infrequently, which allows for significant and generally rapid recovery of hydrologic and erosional processes prior to the next major disturbance event. This results in pulse effects, which are moderate to high in magnitude, but low in frequency. Within the current climatic regime and prior to significant human influence, aquatic systems have developed under pulse type disturbances.

Direct Effects

There are no directs effects associated with the no-action alternative.

Indirect Effects

Natural disturbance events will continue to influence hydrologic and erosional processes within the project area. Given the current vegetative conditions and associated fuel accumulations, there is potential for wildfires to occur that may be outside the range of conditions (intensity and duration) that have occurred over the last few hundred years. If actions are not undertaken to reduce the risk of catastrophic wildfire, the risk of impact to soil and hydrologic functions will continue to increase as fuel loads increase. Depending on the intensity and area burned, accelerated soil erosion is likely, particularly if hydrophobic soils are formed. Significant channel adjustments could be expected, especially during high precipitation/runoff events. Stream systems will however stabilize as vegetative recovery occurs during post-fire years.

Cumulative Effects

Livestock grazing on and below the Forest, along with crop production on private lands are widespread and therefore the major influence on water resources within the Beaver and East Fork Otter Creek watersheds. These activities have occurred for many decades in the past and are expected to continue well into the future. The direst and indirect effects of these activities on water resources have not been fully documented.

Past timber management activities have also occurred both within the project area and on private land below the Forest. Timber stands have also been influenced by past wildfire events. On Forest Service land, approximately 2,693 acres of vegetation treatments (mostly salvage) and 4,718 acres of wildfire have occurred since 1950 with the far majority occurring in the late 1980's. Timber harvest is also planned within the upper Beaver Creek (approx. 3,315 acres) watershed under the Whitetail Timber Sale. Neither, human or natural influences on timber stands appear to have had long term effects to water resources. The lower reaches of main drainage bottoms in the project area are all dry, vegetated draws with little indication of deposition or channel scour caused by past harvest activities or wildfire events.

Quantification of activities or effects (ECA calculations) are not possible at this time because acreages of past activities or reasonable future activities have not been compiled across all ownerships within the 6 HUC watersheds. However, due to the low potential for timber harvest and prescribed fire to influence spring runoff events and the fact that past activities do not appear to have had lasting effects on mainstem reaches, the risk of cumulative effects from past, proposed and reasonable foreseeable management activities on water quality or quantity are anticipated to be low.

The potential for large scale stand replacement wildfire events followed by high intensity rain events will continue within the Beaver and East Otter Creek 6 HUC watersheds. Similar situations have occurred on the District in the past and have resulted in significant surface runoff, and subsequent scour and deposition in drainage bottoms within the

Forest boundary and below. Effects to water quality and quantity in perennial systems below the Forest can be expected, but are generally outside human control.

In the event wildfire occurs within the project area, existing roads and grazing will compound the effects of post-fire precipitation events. Roads will increase surface and subsurface drainage efficiency, routing upslope waters to natural channels at higher rates, thereby increasing floodwater levels. Roads that restrict floodwater access to floodplains will also result in higher flood stage. Concentrated livestock trampling and trailing along water courses can also increase drainage efficiency, and also destabilize stream banks. The combination of these conditions will increase the risk of more flood damage to streams and adjacent human developments following a wildfire. The effects are expected to be highest in those drainages or subdrainages that burn with high intensity over a large area, and where road and livestock densities are high.

EFFECTS OF THE ACTION ALTERNATIVE

Direct Effects

Construction of new stream crossings, i.e., bridges, culverts or fords, is the only action that is considered a direct effect to water resources. This is due to the immediate sediment delivery and flow disruption that generally occurs during the construction period. Approximately xx miles of temporary roads will be located within valley bottoms and may cross intermittent or ephemeral channels. Although the type of crossings are not known at this time, they would meet the requirements of a MT-DFWP 124 permit and would likely be in place only for the duration of the harvest activities. Impacts to water quality and adjacent riparian area will be short term (1-2 yrs) and recovery rapidly due to high resiliency of the site.

Indirect Effects

In contrast to direct effects, indirect effects occurs at a later time and/or distance from the activity. Indirect effects concerning water resources generally result from changes in soil and hydrologic processes, i.e., increases in either water or sediment yield across a landscape, and the subsequent effects of these increases on channel, floodplain and wetland functions and habitats.

Water Yield

The influence of vegetation treatments on water yield is typically measured by the degree of crown reduction in the mature timber stand. Reductions in crown cover were estimated for the proposed vegetation treatments and converted to an equivalent clearcut area (ECA). Equivalent clearcut area calculations reflect different harvest prescriptions that remove different levels of forest canopy. The results standardize these harvest areas to a percentage of a clearcut acre. For example, 10 acres of a 2-story harvest that removes 60 percent of the canopy is equal to 6 ECA acres, and 10 acres of commercial thinning that removes 40 percent of the canopy is equal to 2.5 ECA acres. The relationship of percent

canopy removal to ECA acre is nonlinear as presented in Forest Hydrology Part II (USDA Forest Service 1973).

As suggested in Forest Hydrology Part II, treatments that remove less than 17 percent of the overstory canopy have no effect on water yield. The majority of the treatment type will be prescribed understory burning. This type of burning is expected to result in minor consumption of the duff layer and only localized exposure of surface soils. Mortality of older aged trees can be expected, but the effect on overall crown canopy will be minimal. Commercial harvest treatments will also occur and will require mechanized equipment, including tracked equipment which increases the risk of soil disturbance. Reductions in crown canopy of 70 percent or greater can be expected across 421 acres of commercial treatment.

Stream flow increases from a reduction in timber canopy have been documented in forests throughout the west where deep snowpacks and snowmelt runoff play a significant role in the overall hydrology of a watershed (Troendle 1983, Stednick 1996, and Bosch and Hewlett 2001). Documentation of streamflow increases from low elevation watersheds across eastern Montana where spring snowpack depths are usually minimal and snowmelt runoff is generally not significant, is limited.

According to Trondle (1983), 20 to 30 percent ECA in a watershed is required to initiate measurable changes in streamflow. Stednick (1996) suggests that 15 percent is sufficient to detect changes in annual water yield in the Rocky Mountain region, while 50 percent is necessary for the Central Plains.

The ECA calculations for the proposed treatments result in 303 total ECA acres, or less than one percent of either Beaver or East Otter Creek 6HUC watersheds. Therefore, the influence of the proposed vegetation management activities on water yield and streamflows (timing, duration and magnitude) are not expected to be measurable and would result in a very low risk of affecting channel/floodplain processes and water quality downstream. Stream systems and associated riparian habitat in these watersheds would actually benefit from increases in water yield and flow (magnitude or duration).

Sediment Yield

The proposed management activities have the potential to increase upslope sediment production and downslope sediment transport to water courses. The level of risk is a function of the degree of soil disturbance, soil erodibility, slope, slope distance and slope filter capacity. Sediment yield in Region 1 Forest Service is typically modeled using the R1/R4 Guide for Predicting Sediment Yields from Forested Watersheds. This project analysis however, does not utilize sediment yield models for the following reasons. Natural surface erosion rates have not been validated for the Custer National Forest and management related erosion rates have not been developed for activities other than wildfire, road construction and harvest of green timber stands. These types of models cannot provide precise quantification of erosion rates due to high degree of error inherent in the modeling process and therefore are useful only for alternative comparison. This

project involves only one action alternative. Additionally, existing models are not capable of adequately quantifying to a single cumulative value, the effects of other, non-timber management activities in the project area including recreation, grazing, and agricultural activities. The only way to address all of these activities cumulatively, is to address each activity individually and then qualify, in general terms, the cumulative effects between specific activities where appropriate.

Approximately four miles of temporary roads will be located on lower slopes or within valley bottoms and may cross intermittent or ephemeral channels. These include road T7, T10, T13, T16, T20, T21, T22, T23 and T24. These actions have the greatest potential to produce and route runoff and sediment downslope from the proposed project due to direct soil displacement during construction and the potential for direct delivery of road drainage to water courses. However, these effects will be short-term as temporary roads are closed and obliterated after vegetation management activities have been completed. Reconstruction of approximately 2.6 miles of the Cook Mountain Road will improve road drainage and should reduce sediment production and downslope delivery to water courses. Additionally, road maintenance on approximately 20 miles of haul routes should also reduce sediment production and downslope delivery.

Vegetation treatments also have the potential to route runoff and sediment to drainage bottoms. The majority of the treatment type will be prescribed understory burning. This type of burning is expected to result in minor consumption of the duff layer and only localized exposure of surface soils. Mortality of older aged trees can be expected, but the effect on overall crown canopy will be minimal. Commercial harvest treatments will also occur and will require mechanized equipment, including tracked equipment which increases the risk of soil disturbance.

Sediment delivery to dry vegetated draws with intermittent or ephemeral flow regimes from these proposed activities can be expected. Forestland erosion hazards (FOR-2) identified for the soils within the proposed treatment units have slight to severe hazards for both on and off trail erosion (USDA-SCS, 1971). The majority of the soils lean towards a severe hazard due to the high percentage of the Ca map unit within the project area. However, as noted in the soils report, this map unit may have been over represented.

Although on-site sediment production is anticipated, the majority of this sediment will be deposited and stabilized within intermittent and ephemeral drainage bottoms. Adhering to Streamside Management Zone (SMZ) regulations and Best Management Practices (BMPs) will help mitigate sediment production from the proposed vegetation treatments and road construction/reconstruction, and transport to drainage bottoms.

Channel, Floodplain and Wetland Functions

Perennial stream courses are rare, disconnected and of limited length within the project area. Perennial systems are generally found below spring sources in open meadow landscapes and have low discharge, spring (groundwater) dominated flow regimes. These types of systems were observed in three areas; Beaver Creek springs area, a short

tributary to Beaver Creek below the springs, and Sheep Creek. There may be other short perennial stream segments that were not found, but do however exist. Most drainage bottoms are dry grassy swales or woody draws with extensive litter cover. Intermittent channel scour is present along some reaches resulting in defined banks, but the scour is generally a result of infrequent natural disturbance events (stand replacing wildfire followed by high intensity summer rain events), not annual spring runoff and erosion events. Annual peakflow events are rare and do not play a major role in the morphology of these water courses. Active annual floodplains do not exist within the project perimeter and therefore no effects are anticipated. The risk of impacting water quantity or quality in these perennial reaches, or lower mainstem reaches of either Beaver Creek or Otter Creek below the Forest boundary from direct or indirect effects of the proposed treatments is low.

However, short, localized riparian systems do exist and do support wetland plants and associated habitat. The risk of sediment delivery to these systems is low due to adequate filter distances and implementation of BMP's. The risk of affecting riparian or wetland function is also low as these systems are able to absorb high levels of sediment.

As discussed under direct effects, one temporary stream crossing would be necessary for this project and would meet permit requirements under the MT-DFWP 124 process. Additionally, yarding activities across perennial or intermittent stream courses would require prior approval through the Montana Streamside Management Zone rules and approval would only be granted when the design of the yarding activities would be shown to maintain the six SMZ functions. Therefore, long term indirect effects to localized channel and floodplain function, or wetland habitat is not anticipated.

Cumulative Effects

Livestock grazing on and below the Forest, along with crop production on private lands are widespread and generally concentrated along valley bottoms and therefore, potentially the major influence on water resources within the Beaver and East Otter Creek watersheds. These activities have occurred for many decades in the past and are expected to continue well into the future. However, the direct and indirect effects of these activities on water resources have not been fully documented on or below the forest boundary.

Past and planned timber management activities have also occurred both within the project area and on private land below the forest boundary. Timber stands have also been influenced by past wildfire events. On Forest Service land, approximately 2,693 acres of vegetation treatments (mostly salvage) and 4,718 acres of wildfire have occurred since 1950 with the far majority occurring in the late 1980's. Timber harvest is also planned within the upper Beaver Creek (approx. 3,315 acres) watershed under the Whitetail Timber Sale.

Cumulative vegetation treatments and wildfire have been quantified by estimating ECA acres for past, present and proposed activities on National Forest System land and are

displayed in Table 2. Past or reasonable future activities have not been quantified for other ownerships within the 6 HUC watersheds.

TABLE 2 - CUMULATIVE ECA ACRES – PAST, PRESENT AND FUTURE

WATERSHED ID	WATERSHED NAME	TOTAL ACRES	ECA acres – vegetation treatments and wildfire[1]	ECA acres – roads[2]	ECA percent of watershed
100901020601	Upper Beaver Creek	14,298	1,292	83	9.6
100901020304	East Otter Creek	29,127	2,942	132	10.6

[1]Activity acres on National Forest System land only. Includes proposed vegetation treatments under the Whitetail and East Otter TS.
[2]Not all roads on or across private land are accounted for.

The cumulative ECA estimates suggest that vegetation management and road density in all watersheds are too low to cause measurable increases in water yield or streamflows. Ten percent of the watersheds affected are well under the 50 percent that Stednick (1996) suggests may be sufficient to detect changes in annual water yield for the Central Plains.

The potential for large scale stand replacement wildfire events followed by high intensity rain events will continue within the Beaver and East Otter Creek watersheds, although the proposed vegetation treatments should limit the extent and intensity of such events. This in turn should reduce the effects of post-fire landscape response on soil and water resources within and downslope of the project area.

In the event wildfire occurs within the project area, existing roads and grazing will compound the effects of post-fire precipitation events. Roads will increase surface and subsurface drainage efficiency, routing upslope waters to natural channels at higher rates, thereby increasing floodwater levels. Roads that restrict floodwater access to floodplains will also result in higher flood stage. Concentrated livestock trampling and trailing along water courses can also increase drainage efficiency, and also destabilize stream banks. The combination of these conditions will increase the risk of more flood damage to streams and adjacent human developments following a wildfire. The effects are expected to be highest in those drainages or subdrainages that burn with high intensity over a large area, and where road and livestock densities are high. Proposed road reconstruction and maintenance should reduce these cumulative effects over the no action alternative.

MITIGATION (incorporated into effects analysis**)**

Implement BMP's and SMZ Rules as recommended.

MONITORING

Schedule and complete a Forest level BMP Audit on select treatments and roads within 2 years of full project implementation (could exclude pile burning, but should include temporary road obliteration).

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