Date of Report: 10/24/2022

Kootenai River Complex

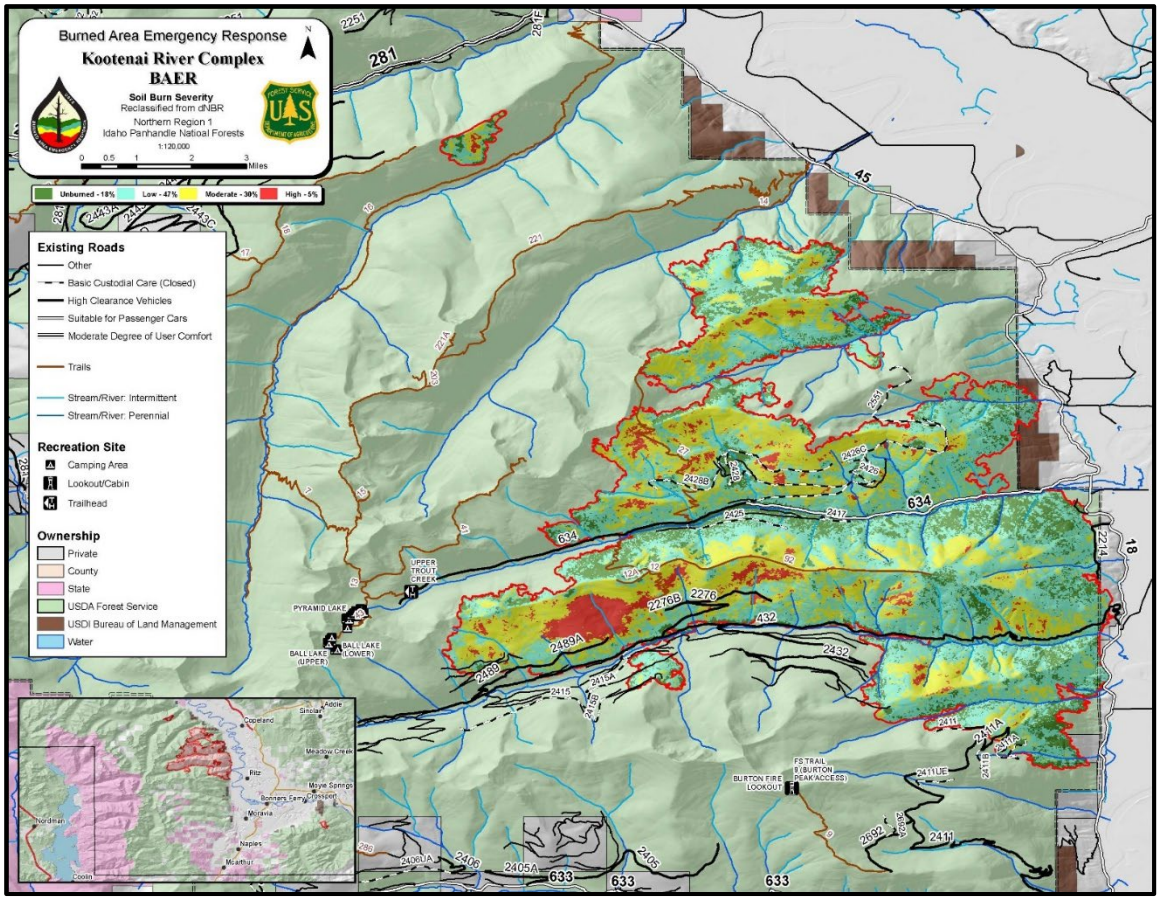
Burned Area Emergency Response Assessment
October 2022
Boundary County, Idaho
Bonner's Ferry Ranger District: Idaho Panhandle National Forest

Introduction/Background

The Kootenai River Complex includes several fire ignitions that started during lightning storms that occurred in August 2022, all on the Bonners Ferry Ranger District of the Idaho Panhandle National Forest. The first fire that was detected, Eneas Peak, was confirmed on August 13th, followed by the Trout Fire, the Russell Mountain Fire, the Scotch Fire, and the Katka fire. All fires burned in the Selkirks Northwest of Bonners Ferry, except for the Katka Fire which is located in the Cabinet Mountain Range approximately 8 miles east of Bonners Ferry. On September 2, 2022, the Eneas Peak, Katka, Russell Mountain, Scotch Creek, and Trout Fires were officially grouped into the Kootenai River Complex. Fires burned in overly steep and rocky terrain, resulting in mostly indirect fire suppression tactics along the eastern flank. Direct fire suppression tactics were utilized occasionally in the form of aerial operations with water bucket drops.

By the time of the BAER assessment, the Eneas Peak, Russell Mountain, Scotch Creek and Trout fires had merged into one fire perimeter. While the Katka and Long Canyon Fires were managed as a part of the complex, the geographic isolation from the bulk of the fire, as well as the size of these fires were suspected to not be a priority of this BAER assessment. A helicopter flight on October 12th by the BAER team lead confirmed that an in-depth analysis of the Katka and Long Canyon fires were unnecessary due to the low overall severity of the fire, size, and lack of BAER critical values proximal to these fires.

The BAER assessment began on October 11, using a BARC image that utilized a post-fire image for the dNBR dating October 1, 2022. The fire was still active and flanking at the time of the BAER assessment, and access to field verify the affected trail systems was compromised due to personnel safety concerns from fire-weakened trees. An interim BAER assessment may be utilized after a more thorough field evaluation of trail infrastructure.



Watersheds Affected:

Table 1: Acres Burned by Watershed. Perimeter used for analysis is the same as the date the post-fire image was taken for the BARC, October 1, 2022.

Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
Long Canyon Creek	19,281	224	1.2%
Parker Creek	10,523	993	9.4%
Burton Creek-Kootenai River	16,079	1,661	10.3%
Lower Smith Creek	9,675	7	0.1%
Brush Creek-Kootenai River	25,092	3,009	12.0%
Dobson Creek-Kootenai River	16,409	233	1.4%
Sand Creek-Kootenai River	15,932	65	0.4%
Ball Creek	17,171	6,989	40.7%
Lower Boulder Creek	18,276	54	0.3%
Hall Creek-Kootenai River	33,287	310	0.9%
Rock Creek-Kootenai River	18,876	1404	7.4%
Trout Creek	12,444	8,260	66.4%

Total Acres Burned: 23,177 (as of 10/1/2022)

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
NFS	22,996
BLM	84
STATE	0
PRIVATE	97
TOTAL	23,177

*__NOTE:__ Variations in geoprocessing tools and approaches may result in slightly different acreage totals among this report.

Vegetation Types:
Undisturbed vegetation in the burn area consisted of three main forest types: mixed subalpine, mixed coniferous forest, and dry open, mixed coniferous forest types. Mixed subalpine and mixed coniferous forests are characterized by elevation. Mixed subalpine forests are comprised of subalpine fire, Engelmann Spruce and lodgepole pine with menziesia and beargrass as a dominant understory component. Transitions into mixed conifer forest types see western hemplock, western redcedar, douglas fir lodgepole pine, and grand fir. Dry open mixed coniferous forests are predominantly present on southern and heavily scoured aspects and are less pervasive within the burn area. Dry, open, mixed coniferous forest dominated by Douglas-fir and ponderosa pine, and a robust understory of shrubs, forbs and grasses. Presence of shallow, rocky soils, talus and rock outcrop on a dry aspect are present, and are largely associated with the steep terrain.

Whitebark pine is proposed to be federally listed species under the Endangered Species Act. Whitebark pine habitat is present in the burn perimeter, and included two Plus trees. These plus trees are selected for desirable genetic traits that are used to grow blister rust resilient saplings for restoration throughout the northern region.

Dominant Soils: Soils data was downloaded from NRCS Web Soil Survey and derived from the Boundary County and Idaho Panhandle National Forest Soil Survey Areas. Soils within the burn area are predominately Volcanic Ash cap influenced with varying degrees of ash cap thickness, coarse fragment content, and mixing. Such surface horizons range from sandy loam to silt loam textures. Subsoils are typically formed in glaciated granitic parent materials which consist of glacial till and colluvium derived from granitic bedrocks. To a much lesser extent, some subsoils within the burn area are formed in glacial lacustrine deposits. Soil productivity in the burn area is primarily a function of ash cap thickness, coarse fragment content, soil depth, and slope aspect.

Miles of Stream Channels by Order or Class:

Table 3: Miles of Stream Channels by Order or Class within the fire perimeter

STREAM TYPE	MILES OF STREAM
PERENNIAL	28
INTERMITTENT	23
EPHEMERAL	0
OTHER (DEFINE)	

Transportation System within fire perimeter:
Trails: *National Forest (miles):* 11.9 *Other (miles):* 0
Roads: *National Forest (miles):* 41.6 *Other (miles):* 0.3

WATERSHED CONDITION

Soil Burn Severity (acres):

The ability to produce an accurate and rapid assessment of post-wildfire effects on the environment depends on accurate soil burn severity (SBS) mapping. SBS data is an essential metric to understanding and quantifying post-wildfire watershed responses such as loss of soil productivity, accelerated erosion, increased overland flow and subsequent sediment delivery, debris flows, flooding, etc. and how those watershed responses may impact adjacent and dependent BAER Critical Values.

Determining SBS involves evaluating fire-derived changes to soil properties and landscape characteristics such as the amount and condition of ground cover, condition of residual fine roots, fire-induced water-repellency, soil physical factors (texture, structural stability, porosity, restricted drainage), soil chemical factors (oxidation, altered nutrient status), and topography (slope gradient, length, and profile) (Parsons et al. 2010). The degree to which soil properties are affected varies depending on a variety of site-specific factors such as soil type, surface soil texture, and the time that heat has been in contact with the soil (residence time), which is a product of fire behavior and fuel type.

Low soil burn severity: Typically, less than 50 percent of the pre-fire ground cover is consumed. Generally, surface organic layers may exhibit some degree of consumption, but are still recognizable. Soil structure is not changed from its unburned condition. Roots and seedbank are generally unchanged because the heat pulse below the soil surface was not great enough to consume or char any underlying organics. The ground surface, including any exposed mineral soil, may appear brown or black (lightly charred) and the majority of the canopy / understory vegetation will likely appear green.

Moderate soil burn severity: Approximately 50 –80 percent of the pre-fire ground cover is consumed. Fine roots (~0.1 inch or 0.25 cm diameter) may be scorched but are rarely completely consumed over the entire area. The prevailing color of the site is often dull gray and white for the ash component intermixed with brown and black organic material that was not completely consumed. Soil structure is generally unchanged, but may be slightly weakened. There may be potential for recruitment of effective ground cover from scorched needles or leaves remaining in the canopy that will soon fall to the ground.

High soil burn severity: All or near complete (greater than 80 percent) consumption of the pre-fire ground cover and surface organic matter (litter, duff, and fine roots) is typically consumed, and charring may be visible on larger roots. Bare soil or ash is exposed and susceptible to erosion, and soil structure is less stable. White or gray ash up to several centimeters in depth indicates that considerable ground cover or fuels were consumed. Sometimes very large tree roots (> 3 inches or 8 cm diameter) are entirely burned and charred. Soil is often gray, orange, or reddish at the ground surface where large fuels were concentrated and consumed.

Table 4: Soil Burn Severity Acres by Ownership

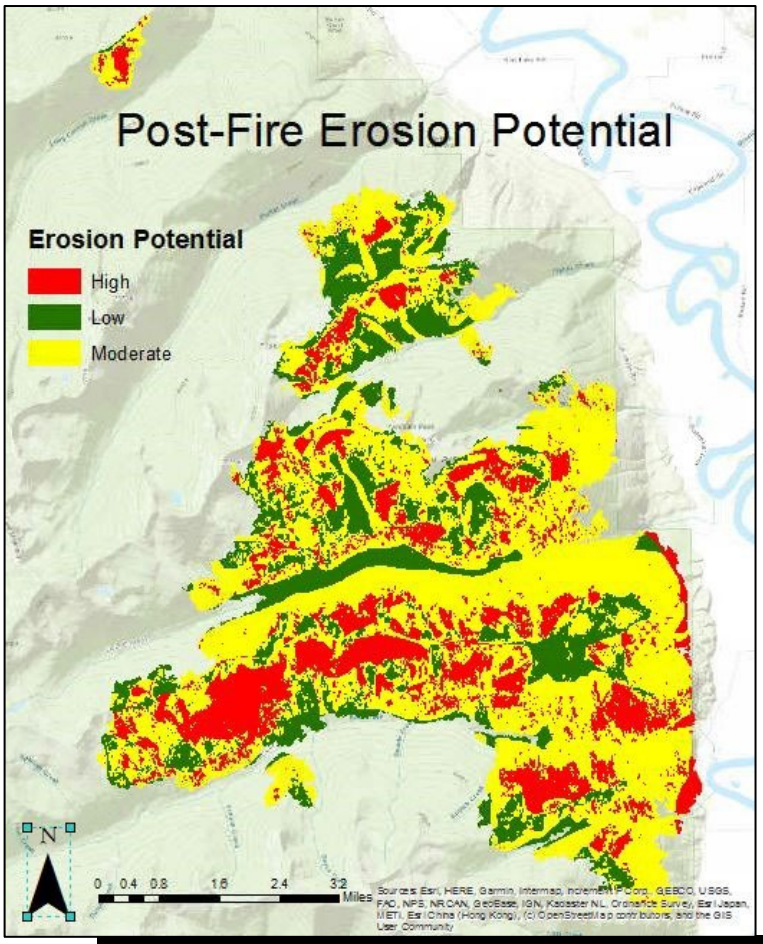
Soil Burn Severity	NFS	BLM	State	Private	Total	% within the Fire Perimeter
Unburned	4,139	20		47	4,206	18
Low	10,859	63		80	11,002	47
Moderate	6,933	1		7	6,941	30
High	1,068	0		0	1,068	5
Total	22,999	84		134	23,217	100

Water-Repellent Soil (acres): Fire-induced water repellency, or hydrophobicity, is the repulsion of water as it is in contact with the mineral soil matrix. Water repellent soils have the potential to reduce infiltration rates and facilitate the overland flow of stormwater runoff, accelerating soil erosion and water delivery to stream channels. Water repellency occurs when organic matter within or on the soil surface burns at high intensity. As organic matter is vaporized, gasses can travel through pore spaces and voids within the mineral soil, coating soil particles with hydrophobic compounds.

Hydrophobicity was measured using the water-drop method and various depths for each observation point. Field observations were limited to directly off of road systems due to hazardous field hiking conditions. Background hydrophobicity in the area is pervasive due the volcanic ash influence which affects most land types across the burned area. As such, whether due to background water repellency or a result of the burn's influence, strong hydrophobicity was present at each observation point. Due to these observations, the soils specialist is assuming that all fire affected areas within the burn area exhibit strong hydrophobicity at the mineral soil surface.

Erosion Potential: Erosion Potential Included two separate analyses:
Post-fire erosion potential ratings are a product of the inherent erosion hazard modified by soil burn severity. In the post-fire environment, changes to hillslope erosion potential can be attributed primarily to changed condition as described by soil burn severity (SBS). Moderate and High SBS result in a loss of forest floor, majority of understory vegetation, and will impact soil structure and infiltration to varying degrees. The erosion potential map provides a visual for relative erosion hazard which would be compounded by moderate and high SBS.

Hillslope erosion potential was also modelled in WEPP PEP and is reported is lbs/ac/yr by watershed, for both undisturbed and post-fire conditions. It should be noted that modelling outputs are only as good as the input data. The soil burn severity map is a rapid assessment product that was constructed off of limited field observations due to limited access to the fire and overall safety concerns. Therefor model results should be used to identify areas with elevated erosion rates in the post fire environment to highlight areas of concern, and not used directly as a predictive tool. Ball Creek displayed the highest magnitude of modelled erosion potential change; however, erosion rates are still nominal within the watershed.



Post-Fire Erosion Potential Rating		
Erosion Potential	**Acres**	**Percent**
High	4,915	21
Low	4,731	20
Moderate	13,433	58
Total	23,079	100

Modelled Hillslope Erosion Potential by Watershed			
Watershed	**Undisturbed (lbs/ac/yr)**	**Post-Fire (lbs/ac/yr)**	**% Change post-fire**
Trout Creek	5	26	520%
Ball Creek	5	1212	24,240%

Sediment Potential: Sediment potential was determined using WEPP PEP. Undisturbed and post-fire runs were done on both major watersheds and reported as tons/year sediment discharge from pour points just downstream of the burn boundary. Sediment discharge includes sediments derived from both channel and hillslope erosion. Model results should be used to identify areas with elevated erosion rates in the post fire environment to highlight areas of concern,

and not used directly as a predictive tool. The modelling shows elevated relative sediment potential in the Ball Creek watershed as compared to Trout Creek. The extent of moderate and high burn severity along Russell Ridge and along tributaries to Ball creek are expected to produce elevated sediment in this drainage until the area revegetates.

Modelled Sediment Potential by Watershed			
Watershed	**Undisturbed (tons/yr)**	**Post-Fire (tons/yr)**	**% Change post-fire**
Trout Creek	4900	5500	112%
Ball Creek	6600	16000	242%

Estimated Vegetative Recovery Period (years): Vegetative recovery periods are largely dependent on soil burn severity, as well the size and spatial distribution of patches of moderate and high soil burn severity. Areas with low soil burn severity maintain forest floor cover, as well as soil structure and live root mass. It is expected that these areas will recover relatively quickly (1-3 years). Vegetative recovery will be negatively affected in areas of moderate or high soil burn severity where the consumption of the forest flow may have also consumed the seed bank. In areas of expansive moderate and high soil burn severity, proximity to live plants will determine the ability of that site to repopulate with vegetation. If more severely burned areas are within about a quarter of a mile of live, reproducing native vegetation, revegetation may take longer but is expected to occur naturally (2-5 years). If mass sheet erosion were to occur, resulting in loss of topsoil, that site would lose many of the plant available nutrients that are concentrated generally in the top 6 inches of soil, and vegetative recovery would be severely inhibited.

Estimated Hydrologic Response (brief description): Removal of forest canopy through stand-consuming fires can increase water yield and modify hydrographs (i.e. increased peak flows). Fire affects hydrology through the removal of aboveground canopy, removal of litter, and occasionally by creating a water repellent (hydrophobic) soil layer. Subsequently, soil water storage, interception and evapotranspiration are reduced when vegetation is killed and organic material on the soil surface is consumed by fire. Normal patterns of snow accumulation and melt are likely also modified. The changes caused to these processes by the Kootenai River Complex Fire will likely cause increased peak flows and altered runoff timing and base flows. These potential changes would be most likely within the Ball and Trout Creek watersheds where 41% and 66% of the total watershed area, respectively, has been burned. All of the other fire-affected watersheds have less than 12% of the area burned, which would not produce measurable changes to water yield or other hydrologic processes. Water yield typically increases significantly in the first year following fire then decreases with time as vegetation reoccupies a watershed (Peterson et al. 2009). However, many researchers have documented high variability in discerning relationships of the percent of watershed canopy removed and changes in peak flows and have concluded that at least 20 percent of the basal area must be removed before increases in water yield are detectable (Thomas and Megahan 1998, Grant et al. 2008).

Water quality in streams that drain the burned area will be impaired during runoff events, particularly in the peak flow season of May to June or during Rain-On-Snow (ROS) events which can occur mid-to-late winter during the months of December to early March. An initial flush of ash and fine sediment is expected during and following the first large rain events of the fall season or ROS events during the winter and spring. ROS events are low probability events that tend to occur infrequently correlating with 25 year or greater return interval storms.

Suspended sediment loading and turbidity levels in streams within and below the burned area will be elevated during runoff season until groundcover becomes re-established. Even after groundcover stabilizes burned area hillslopes, eroded fine sediment that is deposited in stream channels and floodplains in the next few years will continue to move through the system for many years to come.

SUMMARY OF ANALYSIS

Describe Critical Values/Resources and Threats (narrative):

Table 5: Critical Value Matrix

Probability of Damage or Loss	**Magnitude of Consequences**		
	Major	Moderate	Minor
	RISK		
Very Likely	**Very High**	**Very High**	**Low**
Likely	**Very High**	**High**	**Low**
Possible	**High**	**Intermediate**	**Low**
Unlikely	**Intermediate**	**Low**	**Very Low**

1. **Human Life and Safety (HLS):**

Value	Probability	Consequence	Risk Rating	Threat
Human Life and Safety on trails and roads	Possible	Major	High	Fire weakened trees (snags) are at risk of falling and causing serious harm or loss of life to forest employees and visitors.

2. Property (P):

Value	Probability	Consequence	Risk Rating	Threat
NFSR 432 and 634 (Open Roads- Trout and Ball Creek)	Likely	Major	Very High	Road damage from elevated runoff and debris flow at stream crossings
NFSR 432 and 634 (Open roads- Trout and Ball Creek)	Very likley	Moderate	Very High	Damage from sluffs and ravelling debris.
Ham creek roads 2426 and 2428	Likely	Minor	Low	Road damage from elevated runoff and debris flow at stream crossings. Damage from sluffs and ravelling debris.
English creek roads 2276 and 2276B	Likely	Moderate	High	Road damage from elevated runoff and debris flow at stream crossings. Damage from sluffs and ravelling debris
Forest Service trails: 12 (Russell Peak) and 27 (Fisher Peak)	Likely	Moderate	High	Burnt out root masses undermine the structural integrity of the trail. In areas of moderate to high burn severity, damage to trail prisms possible due to erosion, washouts, and/or debris flows.
Forest Service Trail 92 (Russel Ridge)	Possible	Low	Intermediate	Burnt out root masses undermine the structural integrity of the trail. In areas of moderate to high burn severity, damage to trail prisms possible due to erosion, washouts, and/or debris flows.

3. Natural Resources (NR):

Value	Probability	Consequence	Risk Rating	Threat
Native plant communities already moderately to highly impacted (high mortality) from the Kootenai River Complex, particularly those plant communities in lower elevation, dry site communities in the Ball Creek, Trout Creek, and Cascade Creek areas.	Likely	Moderate	High	Non-native Invasive Species (NNIS)- particularly "new" (not widespread) invasive species. Areas of moderate to high soil burn severity are highly susceptible to invasive species spread. Mechanical suppression lines were not utilized in most of the fire area due to steep terrain, therefore the primary risk of NNIS spread on NFS lands is along roads and some off-road dry sites in the lower elevations of Ball Creek, Trout Creek, and Cascade Creek drainages. NNIS spread due to suppression acitivities is low risk on NFS lands but the threat of NNIS spread onto private and other federal land (KWR and BLM) due to suppression activities is moderate.
Whitebark pine populations and habitat along ridges, saddles	Likely	Moderate	High	Mortality of existing populations or delayed mortality of mature, cone-producing whitebark pine trees

and high elevation southern aspects within the fire perimeter above 4,500′				resulting from crown/bole/root scorch-related stress and/or increased mountain pine beetle activity.
Whitebark pine plus trees	Likely	Moderate	High	Mortality of existing populations or delayed mortality of mature, cone-producing whitebark pine trees resulting from crown/bole/root scorch-related stress and/or increased mountain pine beetle activity.
Soil Productivity	Possible	Moderate	Low	Post-fire conditions can reduce infiltration and increase overland flow, subsequently resulting in soil erosion and potentially mass soil loss from hillslopes. This fire resulted in a mosaic burn, with low connectivirty from high severity patches to stream delivery. Though most of the forest floor was consumed in the moderate burn, there is ample needlecast in areas to provide ground cover.
Hydrologic Function	Possible	Moderate	Intermediate	Fire affects hydrology through the removal of aboveground canopy, removal of litter, and occasionally by creating a water repellent (hydrophobic) soil layer. Subsequently, soil water storage, interception and evapotranspiration are reduced when vegetation is killed and organic material on the soil surface is consumed by fire
Water quality	Possible	Moderate	Intermediate	Suspended sediment loading and turbidity levels in streams within and below the burned area will be elevated during runoff season until groundcover becomes re-established.
Bull trout	Possible	Moderate	Intermediate	Bull trout and bull trout critical habitat in Trout Creek and Ball Creek may incur some level of negative impacts associated with post fire effects primarily due to sedimentation from hillside erosion, debris flows, and possibly road and culvert failures. Increased levels of fine sediment deposition in these streams may impact efficient feeding and the quantity and quality of pool habitat.

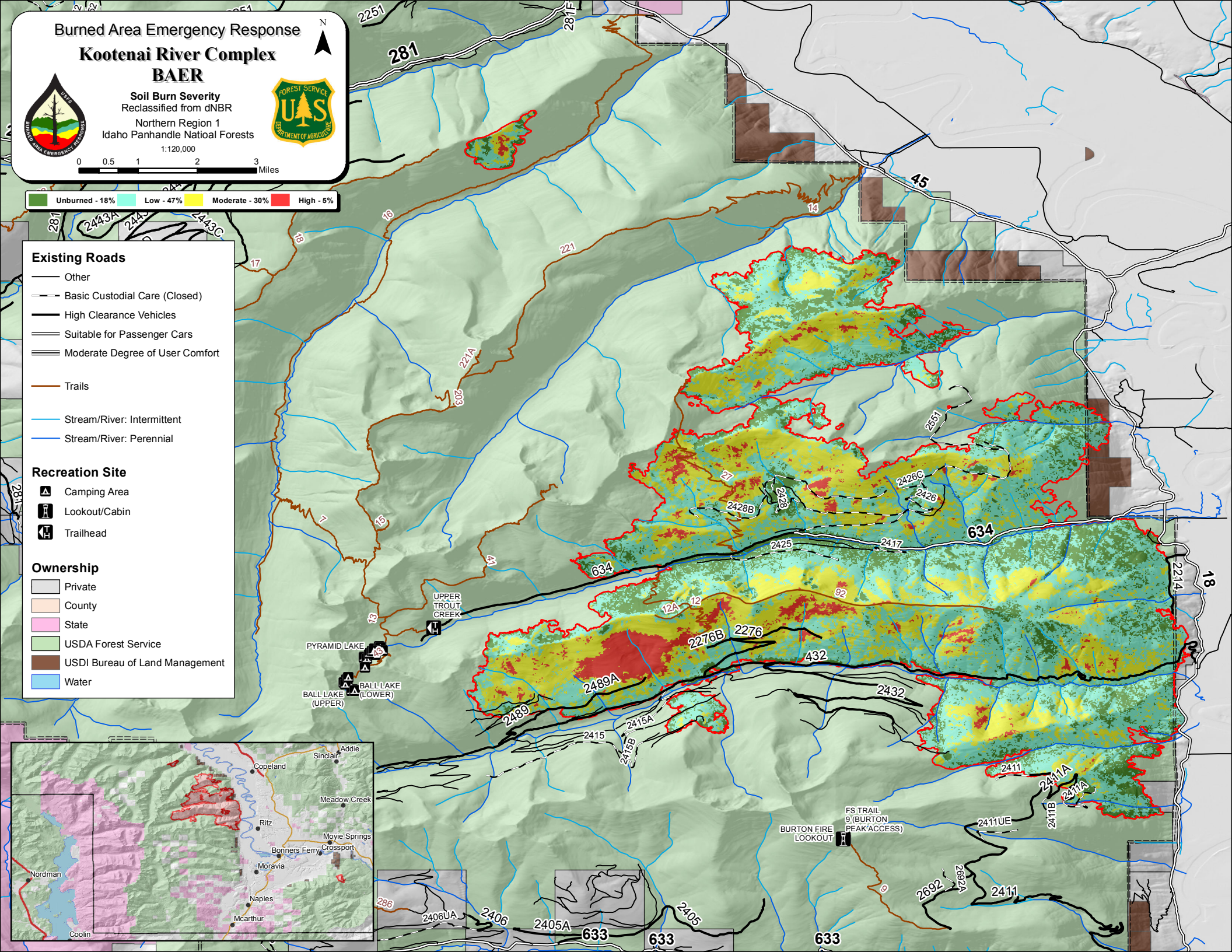
A. Emergency Treatment Objectives:

- Human life and safety on roads and trails in high and moderate severity burn areas by installing warning signs and utilizing area closures.
    - It is recommended that Trout Creek (FSR 634) and Ball Creek (FSR 432) be closed until BAER treatments are implemented, hazard trees are felled (non-BAER), and slopes revegetate to mitigate post-fire watershed response (flash-flooding or debris flows).
    - Hazard signage will be placed at the entrance to Trout Creek (FSR 634) and Ball Creek (FSR 432) to inform public about elevated risk of visiting the Forest within the burn perimeter. Additional signage will be placed at key locations for Fisher Peak (Trail #27) and Russell Peak (Trail #92), and potential dispersed camping sites withing the fire perimeter.
- Reduce road damage from increased runoff and sediment by installing critical dips at crossings with a likely probability of damage. Stormproof other areas of road to facilitate proper drainage of water from prism. Limited storm inspection and response to be used as necessary to maintain road drainage after large precipitation events.

- The watersheds burned in the Kootenai River Complex Fire will show the effects of the fire via increased runoff rates, erosion, sediment, and debris transport creating a future concern for roads and associated drainage structures. The effects could result in filling the ditches, plugging culverts and potentially overtopped or washed away road surfaces and fill slopes. Water bars and rolling dips can become filled with material until they are no longer functioning properly. Removing the material from these structures will allow them to continue to move water across the road instead of allowing it to overtop the structure and potential run down them. Installation of critical dips at stream crossings would facilitate water flow over and off of the road prism during peak flow events.

- Trails from increased runoff and sediment through cleaning drainage and install waterbars in high and moderate burn severity areas.
    - The purpose of the trail stabilization treatments is to allow water to (1) sheet flow across the trail, and (2) where water does collect, to shed off the trail as soon as possible.
- Protect human life and safety from hazard trees at select locations where treatment implementation would put workers at risk (I.e. storm inspection and response and trail drainage installation). Felling of hazard trees would be performed by hand (not machine) and limited in scope to worker risk.
    - Felling and/or removal of hazard trees to the standard for public safety would be performed under a separate action.
- Reduce or prevent negative impacts to native plant communities and facilitate native plant recovery by reducing the spread invasive plants within the area, especially along and adjacent to Forest roads and in areas with localized invasive plant species within and adjacent moderate and high intensity burns the first year following containment of the fire. Treatments will focus in areas with a high likelihood of new infestations due to moderate to high soil burn severity along common weed vectors (roads).
    - : Roadside treatments along NFSR432 and 634, small portions of the NFSR2411, and potentially small off-road areas in lower elevations of Ball and Trout Creek drainages where invasive annual grasses were observed.
    - Invasive species would be treated with NEPA approved herbicides according to IPNF design features and chemical label instructions

Further questions about the Burned Area Emergency Response Program or the Kootenai River Complex BAER assessment may be addressed to the Idaho Panhandle National Forest's BAER Coordinator, Jori Johnson at jori.a.johnson@usda.gov or (208)277-8790.


Burned Area Emergency Response
Kootenai River Complex
BAER
Soil Burn Severity
Reclassified from dNBR
Northern Region 1
Idaho Panhandle Natioal Forests
1:120,000
0 0.5 1 2 3 Miles
N
Unburned - 18%
Low - 47%
Moderate - 30%
High - 5%
Existing Roads
Other
Basic Custodial Care (Closed)
High Clearance Vehicles
Suitable for Passenger Cars
Moderate Degree of User Comfort
Trails
Stream/River: Intermittent
Stream/River: Perennial
Recreation Site
Camping Area
Lookout/Cabin
Trailhead
Ownership
Private
County
State
USDA Forest Service
USDI Bureau of Land Management
Water
UPPER TROUT CREEK
PYRAMID LAKE
BALL LAKE (LOWER)
BALL LAKE (UPPER)
BURTON FIRE LOOKOUT
FS TRAIL 9 (BURTON PEAK ACCESS)
Addie
Sinclair
Copeland
Meadow Creek
Ritz
Moyie Springs
Crossport
Bonners Ferry
Moravia
Nordman
Naples
Mcarthur
Coolin
281
2251
45
2443A
2443C
2426C
2426
2428B
2428
2551
634
2425
2417
2214
18
2276B
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