

**COLVILLE AND OKANOGAN-WENATCHEE NATIONAL FORESTS
BURNED AREA EMERGENCY STABILIZATION PLAN**

NORTH STAR FIRE

ENGINEERING RESOURCE ASSESSMENT – ROADS

I. OBJECTIVES

A field investigation of existing forest roads within the boundaries of the North Star Fire located mainly on the Republic Ranger District of the Colville National Forest and Tonasket Ranger District of the Okanogan-Wenatchee National Forests was conducted between the dates of September 20 - 22, 2015.

The purpose of the engineering investigation was to assess potential negative effects on roads, bridges, culverts and other hydraulic structures attributable to the post-fire condition of the watersheds. The investigation also looked at those safety and warning structures required to provide safer passage to motorists accessing the Forest on authorized roads within the burn area. Also a cursory look was done on some of the roads owned and maintained by other federal and local agencies for the purpose of informing these groups of the possible threats that can attribute to these roads within and proximity to the fire perimeter. This report will provide a general summary of the issues, findings and recommendations resulting from the investigation.

II. ISSUES

The watersheds burned in the North Star Fire will show the effects of the fire due to increased runoff rates, erosion, sediment, and debris transport creating a future concern for roads, culverts, bridges, and channels along the drainage paths of the burned watersheds in that they may be plugged, overtopped or washed away more frequently than in its pre-fire condition. There is also increased danger to structures that remain in the flood path due to the increased risk for debris slides and flooding.

This report identifies roads and structures that will continue to be impacted by post-fire debris flows and flooding, assesses their current condition and vulnerability, and where necessary, recommends treatments to minimize the risks to public safety and protect the investment of the transportation system from the expected increased post-fire runoff.

III. OBSERVATIONS

A. Background

The North Star Fire contains segments of forest system roads; the total mileage per maintenance levels for each forest is shown below:

Colville National Forest

- 2.3 miles of Maintenance Level (ML) 5 road
- 0.50 miles of ML 4 road
- 11.0 miles of ML 3 road
- 46.0 miles of ML 2 road
- 37.6 miles of ML 1 road

Okanogan-Wenatchee National Forest

- 14.1 miles of ML 3 road
- 48.3 miles of ML 2 road
- 36.2 miles of ML 1 road

Other non-forest system road that was viewed during the investigation included county road Scatter Creek Road (CR53) from CR21 to Swan Lake.

Unauthorized roads are also contained within the fire perimeter but were not assessed.

B. Reconnaissance Methodology and Results

The engineering team was able to field visit most of the Forest's maintenance level two thru five roads within the fire perimeter. Priority was given to roads that traversed areas showing high burn severity. The roads that were not examined were blocked by large downed trees, not in high burn severity areas and/or behind locked gates (non-Forest Service).

The roads that were examined included the following:

- NFSR 3115100 (West Fork Sanpoil Creek)
- NFSR 5300 (Scatter Creek)
- NFSR 5300500
- NFSR 5300400
- NFSR 5300460
- NFSR 5320 (Rattle Snake) segments that were accessible
- NFSR 5320100
- NFSR 5320800
- NFSR 5320830
- NFSR 5330 (Swan Lake Road)
- NFSR 5330450
- NFSR 5314
- NFSR 5314040
- NFSR 3120 (north of 5314)

The results of the field investigation identified threats to public safety, loss of government property, threats to downstream property and deterioration of the roadway system due to increased runoff and sedimentation.

A more detailed description of the proposed treatments and corrective action for the road infrastructure, as well as for the critical drainage crossings that were observed on these roads, is included in this report.

C. Findings

The reconnaissance of the roads and upstream drainages during the field investigations identified several issues pertaining to road stabilization and public safety. The major road stabilization issues identified were debris flows that will potentially plug culverts, damage road infrastructure, and wash heavy debris and sediment into the surrounding drainages. The main issue identified with public safety was the risk of adjacent hazard trees falling across the roads.

Table-1 contains a list of the roads that were examined during the field investigations along with their associated issues.

Table-1 Issues identified during field investigations

Road No., Name, & Maintenance Level	Issues / Observations
3005100; Lower Lost Creek; M.L. 2	<ul style="list-style-type: none"> • Burnt cattle guard. Bottom timber block on the upstation side of the cattle guard is over 50% burned. • Location of cattle guard is: 48.49201, -118.95713
3005140; Lower West Fork Sanpoil River; M.L. 1	<ul style="list-style-type: none"> • Road is not closed. • Culverts in road. • Two 24 inch culverts next to each other in the curved road. Each has a perennial stream flowing through it. Small drainage area above, 3.5 feet maximum fill over culvert. Low spot in road. Location: 48.49201, -118.95713.
3115100; Upper West Fork Sanpoil River; M.L. 3	<ul style="list-style-type: none"> • Road within the fire runs along the bottom of a steep canyon and in some places it is just above the same elevation as the creek. The burn severity of the slopes above is moderate to high. • Heavily rutted suggesting the road is driven on when wet from spring thaw and/or heavy rain storms. • No drainage features just found one culvert. (was unable to drive the whole road due to down trees) • Many burnt hazard trees along the route.
5300500; Scatter Creek; M.L. 2	<ul style="list-style-type: none"> • Road is well above the creek elevation so no concern of overtopping or scouring. • Contains several culverts and is ditched. • Very little burn on the upper slopes of the road.

5300460; Scatter Creek- Sanpoil River; M.L. 2	<ul style="list-style-type: none"> • Road leads to recreational lakes and campgrounds. • Slopes above have very little burns. • No real drainage concerns.
5320000; Thirteenmile Creek-Sanpoil River; M.L. 2	<ul style="list-style-type: none"> • Due to down tree only able to access approximately 2 miles from the Scatter Creek side. • Minimal burned area damage, down trees appear to be due to natural weakening or earlier fuels project.
5320800; Lower West Fork Sanpoil River; M.L. 2	<ul style="list-style-type: none"> • Majority of the slopes above the road are not overly steep and the severity of the burn is mostly moderate and some high. • Not many culverts in the road, only counted two. Some ditches • Large sum of hazard trees, had to cut through some that were already across the road. • No drain dips in the road. • Some ditches
5320830; Lower West Fork Sanpoil River; M.L. 2	<ul style="list-style-type: none"> • Short spur road off of 532800 which is located high on the ridge line. • All sides of road lie within a high severity burn. • Road is mainly out sloped with no drain dips. • Many hazard trees along the route.
5330 (Swan Lake Road)	<ul style="list-style-type: none"> • Thirty inch culvert with 30% rust line passing a perennial stream at: 48° 31' 52", 118° 50' 23". Drainage above contains a large area of high severity burn. Potential for woody debris to potentially block culvert inlet. • Burned slopes above in segments of road. • Hazard trees along routes.
5314000; Scatter Creek- Sanpoil River; M.L. 2	<ul style="list-style-type: none"> • East end burned slopes above. • Burned areas contributing to culverts. • Less hazard trees. • West end of road well maintained.
3120040;	<ul style="list-style-type: none"> • Road in good shape. • Drainage below is burned, above is spotty burned area, the burned drainage heads under 5314. • Hazard trees.
Scatter Creek Road (CR53)	<ul style="list-style-type: none"> • Minimal Impact, saw one drainage that had burned area at culvert, patches of burned slope above and below road, not contiguous, minimal to no damage

IV. RECOMMENDATIONS

A. Fire Suppression Rehabilitation: None Recommended.

B. Emergency Stabilization: Emergency stabilization treatments should be implemented as quickly as possible to protect public safety and minimize negative impacts to roads and identified values from expected debris flows and flooding.

1. Road Stabilization

a. Reconstruct Road Drainage to Accommodate Expected Runoff Flows

Situation: Historically, roads within burned areas have been impacted by debris flow and flash floods causing roads to be overtopped and culverts to become clogged with sediment and debris. This has also caused roads to become damaged, resulting in channeled runoff and deposition of sediment into adjacent streams unless reconstructed and stabilized. There are 15 miles in high and moderate severity burn areas.

Segments of roads within the North Star Fire were noted to be vulnerable to this type of impact. For these segments, we observed existing culverts and drainage structures that are undersized and/or are insufficient for the expected increase in sediment and flows.

Recommendation: There are several methods of reconstructing roads to ensure the impacts from increased flows next to, and over the roads can be minimized. The following is a list of some of the methods that have been shown to be the minimum treatments necessary to stabilize roads for expected increased runoff:

- Clean culverts, ditches, low points of rolling drain dips of sediment and debris. Rolling drain dips or sloping roads inward or outward should be installed on the down slope side of culverts where culvert failure is possible or likely. These road grade changes will assist in removing water from the roadbed that has become trapped on the road surface causing erosion and travel hazards. Low water crossings can be used when existing culverts need to be removed because of damage or being undersized. Low water crossings can also be used when large drainages cross the road and no engineering control is in place.
- Large culverts with high fills under higher level roads (Level 3 roads) will be very expensive to replace and should therefore be regularly maintained after each storm event. Where indicated, construct an armored rolling dip above or just downgrade of the culvert crossing in anticipation of storm and/or debris flows overtopping the road. Attach trash racks across the inlets of culverts where it is expected to receive boulder and woody debris flows.

b. Culvert Removals/Installation

Situation: During the field observation, several culverts underneath roads within high severity burn areas were identified as being at high risk of being plugged and overtopped due to the expected increase in runoff and sediment.

Recommendation: On road systems where only high clearance vehicle (ML2) access is required, remove the culverts identified as being at risk and construct an armored road crossing if the subgrade is highly erodible. Maintain under Storm Patrols described below.

Where an armored road crossing is not appropriate, use a replacement culvert designed to pass the estimated post-fire flows.

c. Patrols for Storm Induced Road Hazards

Situation: The roads at burned areas have increased potential for rolling and falling rock and trees from uphill burned slopes and increased potential for sediment flows and drainage issues. With the loss of vegetation, normal storm frequencies and magnitudes can more easily initiate erosion on the slopes and it is likely that this runoff will cover the roads or cause plugging and/or washouts at drainage facilities (culverts) or stream crossings. These events make for hazardous access to forest roads and put the safety of users and employees at risk.

Recommendation: Monitor road drainage (i.e. culverts, drain dips, etc.) and roadbed conditions after significant storm events to ensure the maximum drainage capacity is maintained until the natural re-vegetation of the burned area has occurred. Maintain and/or repair any damage to road surfaces. Remove sediment and debris from ditches and entrances to culverts.

2. Public Safety

a. Install Warning Signs

Situation: The severity of burn in some watersheds, combined with road location, high possibility of flash flooding and debris flows has increased the risk to road users.

Recommendation: Install warning signs for flash flooding and potential debris flows. Install “Burn Area Warning” (see example to the right) signs where necessary to properly alert the travelers of the dangers ahead. Install “Road Closed” signs where necessary to temporarily close roads that have received extensive damage. “Road Closed” signs should also be used in conjunction with gated closures.



30"X36"

b. Road Closures

Situation: Slopes within the burned watersheds have been made unstable due to the severity of burned soils. Increased flows from these slopes will likely cause road damage. The burn also increased the risk of adjacent hazard trees falling across the road. These issues are very apparent to the 3115100 Road which runs closely along the W. Fork Sanpoil Creek and is at the bottom of an extremely steep canyon that received high to moderate severity burn.

Recommendation: Install closures (special order) on all roads where travel has been determined to be unsafe or where culverts are being removed on roads previously open to the public.

Close road 3115100 just past the last private residence and consult with the Colville Indian Reservation on where to place a gate closure on their end.

c. **Repair Timbers Supporting Cattle Guard Crossing**

Situation: FSR 3005100 contains a cattle guard which had a portion of the bottom timber support on the up station side of the structure over 50% gone due to being consumed in the fire. Without this support the cattle guard will eventually slump into the roadway creating a hazard in the roadway.

Recommendation: . Remove the cattle guard and install another timber beam of the same size that was loss in the fire.

C. **Rehabilitation:** None Recommended.

D. **Management Recommendations (non-specification related)**

1. **Area closure along Forest Roads Receiving Treatments This Fall and Winter of 2015**

Situation: A significant amount of work will be ongoing during implementation causing roads within the fire perimeter to be blocked.

Recommendation: Continue with road closures on the roads until the work has been completed.

2. **Patrols for Storm Induced Road Hazards**

Situation: Storm inspection and response is only funded by BAER funds for the initial year of implementation.

Recommendation: Continue storm inspection and response until vegetation has reestablished in affected watersheds or for at least a total of two years.

3. **Gated Closures**

Situation: Some water sheds may require multiple year seasonal closures until the watershed has recovered. Second and third year storms can produce debris flows and floods as extreme as first year flows.

Recommendation: Monitor first year activity and watershed rehabilitation to determine if a second or third year road closure would be required.

V. CONSULTATIONS

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VI. REFERENCES

Burned Area Emergency Response Treatments Catalog December 2006 National Technology & Development Program Watershed, Soil, Air Management 0625 1801-SDTDC

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