Engineering Resource Assessment

I. OBJECTIVES

The purpose of this report is to summarize the findings of a field investigation of existing forest service roads and related infrastructure within the boundary of the Twitchell Canyon Wildfire located on the Beaver Ranger District of the Fishlake National Forest. The field investigation was conducted to identify the condition of the roads following the wildfire event and to assess potential impacts from the post-fire landscape to roads, bridges, culverts, and stream crossings. The investigation also included an assessment of gates and signage to determine their adequacy in protecting the public from hazards posed by the burned landscape and to minimize disturbance to the sensitive watersheds.

This report will identify emergency conditions related to the road infrastructure and recommend actions to protect this infrastructure and the values it supports including public safety, property and natural resources.

II. ISSUES

64 roads with a cumulative total of 36.56 miles of road exist within the boundary of the Twitchell Canyon Wildfire. Of these, two roads are classified as maintenance level 3 routes and the remaining are maintenance level 2 routes. The roads provide access to private property, overhead power lines, water resource development, and public recreational opportunities. They also support administrative access to forest lands. The increased runoff volumes and sediment and debris that will flow from the post-fire watersheds will threaten the continued stability of the roads and their associated values. Specific direct risks to the road system include: plugged culverts, washed-out roads, sediment and debris deposits on roads, blown-out stream crossings, and significant rutting from poor road drainage. Resultant risks to supported values include: threatened access to private property and public utilities, public safety hazards, reduced water quality, harm to sensitive aquatic resources, diminished public recreational opportunities, and compromised forest administrative access.

III. OBSERVATIONS

A. Field Investigation

A field investigation was conducted between the dates of October 7 - 12, 2010 by an engineering team. Each road, culvert and stream crossing within the wildfire boundary, along with several other drainage structures located outside of the boundary but along impacted drainages, was investigated by the engineering team during the reconnaissance. The condition of burned watersheds and general fire intensity within specific watersheds was evaluated to predict the likely future runoff behavior and the resultant probability of damage or loss. The engineering team also collaborated with hydrologists, scientists, and other environmental professionals to identify threatened values, assess risks, share observations, and discuss conclusions.

B. Findings and Recommendations

18 roads were identified as requiring emergency treatment measures. It was determined that the conditions of the remaining roads do not warrant emergency treatment measures at the time of this writing. The majority of proposed measures are located within the wildfire boundary. Those measures that are not located within this boundary are placed at key locations where high runoff and debris flows will require emergency action outside of the burned perimeter.

In general, the most expensive treatment recommendations are proposed for those roads supporting the most significant critical values. Less expensive solutions are proposed for those routes supporting less

critical values. A discussion of each of the roads for which emergency treatment measures are proposed is provided below, with the roads listed in order of priority.

Road # 113 - Mill Creek Canyon Road (Maintenance Level 3)

Mill Creek Canyon Road is a major access to the northern portion of the Beaver Ranger District and is a critical component to the travel network on this portion of the Forest. In addition, it provides access to private property and to overhead power line utilities. Only a portion of this road is threatened by post-fire runoff, but the probability of damage within this portion of road is very likely due to expected high flood and debris flows through Sevier Canyon and into Mill Creek. One emergency treatment is proposed for this road: the replacement of an existing culvert at the mouth of the Sevier Canyon drainage. A 72" squash culvert is proposed for this location.

Road # 119 – Indian Creek Road (Maintenance Level 3)

Indian Creek Road is a very popular road that provides access to Manderfield Reservoir, some private property, and dispersed recreation. The probability of damage for this road varies from likely to very likely. It is anticipated that a high volume of sediment and debris will be conveyed from the burned watersheds into Indian Creek, and there is significant concern that unless the road infrastructure is improved, substantial road damage requiring extremely expensive repairs will be required. The road features four existing concrete low water crossings installed along its length. These crossings have been highly successful at conveying high flood flows without compromising the integrity of the stream channel or the adjacent roadway; however, they are highly susceptible to being compromised by large debris flows. For this reason, two cross vanes are proposed at each low water crossing in order to keep the anticipated flood flows entering into the crossings at the correct angle and grade in order to protect the integrity of these structures.

One existing culvert at the base of Twitchell Canyon is undersized with respect to the flood flows that are predicted for the area. Therefore, this culvert is proposed to be replaced with a 60" squash culvert with a flared end section. Other emergency actions proposed for this road consist of installing hardened crossings at existing drainage swale locations and importing fill material in two locations to raise the road surface elevation and provide greater vertical separation between the road surface and adjacent drainages. Proposed grader road reconditioning will also be required to help preserve the road's integrity.

The existing gate at the forest boundary is inadequate and proposed for replacement. One additional gate is proposed in order to prevent traffic from route 589 from accessing the upper reaches of the road. Locking and unlocking of these gates will be coordinated by District personnel as deemed necessary.

Road # 114 – Shingle Creek Road (Maintenance Level 2)

In addition to serving as a popular route for recreationists, Shingle Creek Road is proposed as a key access route for seeding and mulching slope stabilization efforts due to its strategic location in relation to a large portion of the Twitchell Canyon Wildfire. As a result, this route is proposed for significant emergency treatments in order to support the stabilization efforts and to prevent the road from falling into significant disrepair, thereby requiring significant funds to bring it back into service. Furthermore, this route was heavily utilized by fire traffic during fire suppression efforts. Fire traffic significantly impacted the road and fire funds were expended to grade the road to help bring it back up to standard. Additional emergency measures are needed to further improve the road's drainage and protect the investment that has been placed in maintaining this road as a functional component of the forest travel network. The probability of damage for this road is very likely due to steep slopes and high fire intensity.

The first 1.5 miles of Shingle Creek Road is proposed for the installation of gravel surface material to support the heavy delivery truck traffic that will support the aforementioned slope stabilization efforts. This stretch of road is in very poor condition and in need of significant improvement in order to allow passage by heavy traffic. The proposed gravel surface will fix the worst stretch of the road and allow the delivery trucks to reach their proposed destination towards the end of the road.

The road features a single crossing of Shingle Creek not far from the road's origin. A concrete low water crossing has been installed at this location. This structure functioned admirably for quite some time but has recently fallen into disrepair, primarily due to the heavy fire equipment that utilized it during suppression efforts. It is anticipated that the compromised state of this structure will not hold up under the anticipated high flood flows, and therefore the structure is proposed for emergency replacement. If the structure fails, the entire crossing location will likely be compromised and the road will become impassable until additional, more expensive repairs are made.

Other emergency measures proposed to protect the integrity of this road and ensure that it remains navigable consist of the installation of one new culvert, one sediment basin, excavator work to improve drainage ditches, and road grading. There is an existing gate on the road that is in disrepair and proposed for replacement.

Road # 116 – Sevier Canyon Road (Maintenance Level 2)

Sevier Canyon Road is a highly-traveled route that provides access to private property and mining claims. The probability of damage for this route is very likely due to its unfavorable location roughly paralleling the stream that drains the Sevier Canyon watershed. This watershed is expected to deliver high flood flows, and in several locations there is inadequate vertical and horizontal separation between the road and the stream. The emergency measures proposed for this road consist of the minimum amount of work needed to keep the route functional; continuing observation and monitoring will be needed in future years to identify additional measures needed to protect the road and the values it supports.

In addition to dozer road reconditioning, the proposed emergency actions for Sevier Canyon Road consist o installing riprap along the roadbed to armor it against high flood flows and some excavator work to improve the drainage at one critical location along the road. Proposed gates at two ends of the road will allow a portion of the road to be isolated as necessary should road conditions further deteriorate.

Road # 591 - North Fork of North Creek Road (Maintenance Level 2)

The North Fork of North Creek Road provides access to a unique dendritic fern rock quarry at its terminus. The creek itself holds a unique strain of sensitive Bonneville Cutthroat trout. The road is popular with recreationists and provides dispersed recreational opportunities. The road's probability of damage is very likely due to extreme fire conditions combined with the area's steep slopes. It is expected that if emergency actions are not taken to protect this road from the predicted high volume flood and debris flows, it will fall into significant disrepair requiring extensive repairs at a very high cost. For this reason, a significant amount of emergency measures are proposed for this road, bearing in mind that if action is not taken and the road falls into disrepair, the cost of bringing it back into service will be substantially greater than the cost of the proposed preventative measures. Furthermore, the proposed treatments will help protect the unique strain of Bonneville Cutthroat trout from diminished water quality that would result from portions of the road washing away into the creek.

There are 11 stream crossings along the North Fork of North Creek Road. Concrete low water crossings are proposed for three of these crossing locations. These structures will help preserve the integrity of the road crossings, which otherwise are destined for certain failure under high runoff and debris flows. The proposed adjacent cross vanes will help hold the stream grade at key locations along the streambed, in

addition to helping preserve important aquatic habitat. Imported fill and riprap will be needed to protect several stretches of the road from flooding and erosion. Several sediment basins are proposed to prevent sediment from depositing upon the road and from washing into the creek. Grader road reconditioning is proposed to improve the overall road drainage, and some additional excavator work is proposed to improve roadside ditches along the upper reaches of the road. One gate is proposed to be installed on road 471at its intersection with the North Fork of North Creek Road and another is proposed for the North Fork of North Creek Road just past its intersection with road 654.

Road # 115 – Mud Flat Road (Maintenance Level 2)

The Mud Flat Road provides access to overhead power line utilities and to some private property. It is also an integral connecting route to access Fish Creek, which was nominated at one time to be set apart as a wild and scenic river. Mud Flat Road parallels I-70 and has several existing culverts that empty onto the I-70 right-of-way. The probability of damage for this road is likely.

The overall condition of Mud Flat Road is marginal due to poor native material and generally poor drainage. However, the road is highly traveled and is a key component to the travel network in this portion of the forest. Therefore, several emergency actions are proposed for the road in order to ensure that it will continue to function as needed to support several critical values. Sediment basins are proposed to be installed just upstream of existing culverts in order to help prevent the culverts from plugging and to ensure that the runoff transported down gradient to the I-70 corridor is free from large sediment deposits. And several new culverts are proposed in order to improve the road drainage at several locations and prevent the road from washing out during the anticipated flood flows. Grader reconditioning work will also be necessary to keep the road functional. One gate is proposed for this road near its intersection with the Mill Creek Road.

Road # 1020 (Maintenance Level 2)

Road 1020 connects Sevier Canyon Road to road 2051, which intersects Mud Flat. This road receives significant traffic from recreationists during the summer months and the road's probability of damage is likely. Several emergency stabilization measures are proposed to protect those portions of the road that are at risk of being severely compromised from high runoff and debris flows. Specifically, several hardened crossings, sediment basins, and additional excavator work to improve drainage will protect the road's integrity from high runoff and debris flows.

Roads 608, 471, 543, 2141, 2342, 1026, 2343, 2003, 2344, 1037, and 480 (Maintenance Level 2)

Road 608 connects Mud Flat to road 1020 and several hardened crossings are proposed for this road due to its likely probability of damage and susceptibility to washouts in several locations.

Road 471 intersects the North Fork of North Creek Road and will be significantly impacted from flood flows stemming from a severely burned watershed. The probability of damage is very likely. This road is in rough condition and is proposed for grader road reconditioning to help keep the road from washing out under high flows.

Road 543 intersects Indian Creek Road and has a very likely probability of damage. Dozer road reconditioning is proposed for this route to prevent erosion of the road into the Indian Creek drainage.

Roads 2003, 2344, 2341, 2342, 1026, and 2343 intersect Shingle Creek and are all in areas of likely to very likely damage probability. Grader and/or dozer road reconditioning is proposed for these routes to improve drainage and prevent erosion of the roads which could potentially remove the roads from the landscape completely.

Roads 1037 and 480 intersect Sevier Canyon Road and are in areas of very likely damage probability. Dozer work will be required to prevent the roads from washing away under high flood and debris flows.

C. Route Obliterations

The proposed emergency actions also include the obliteration of several unauthorized routes that were identified during the field investigation. In the post-fire landscape, the potential for unauthorized use of these routes has increased significantly as they are much more apparent since the vegetative cover has burned away. Use of these routes presents a public safety hazard, and work will be needed to close the routes from future use.

D. Signage

In order to help protect the public from the hazards associated with burned areas, several Burned Area Warning Signs are proposed. These signs will warn the public of the potential hazards of the burned landscape. The proposed sign locations include all entries into the fire perimeter and at other popular destination locations inside the fire perimeter.

IV. SUMMARY

Many of the roads threatened by the post-fire landscape of the Twitchell Canyon Fire support critical values that merit emergency actions to protect the roads and their associated values. The intent of the proposals provided herein was to prioritize emergency actions based on the probability of damage and the magnitude of consequences for these road systems. The recommended actions will protect the integrity of the threatened roads, their related infrastructure, and the values that depend on them.

V. CONSULTATIONS

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