Rapid Road Inventory of Select Roads in Deadwood Creek for BLM & Treatment Recommendations

Five Counties Salmonid Conservation Program

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www.5counties.org

Purpose and Need:
On July 23, 2018, the Carr fire began in Whiskeytown National Recreation Area and burned west towards Lewiston, CA. A back fire was set at the bottom of the watershed in order to create a fuel break between the advancing fire and the community of Lewiston. Although this fire burned with a low to moderate intensity in the lower two-thirds of the watershed, it resulted in nearly 100% tree mortality along Deadwood Road in the upper section of the watershed. The Carr Fire Burned Area Emergency Rehabilitation (BAER) Plan prepared in November 2018 indicated that 5,856 acres or 80% was burned within the Deadwood Creek watershed. Approximately 36% of the burned acres within the watershed exhibited low soil burn severity, 29% exhibited moderate soil burn severity and 14% had a high soil burn severity.

Roads within the burn perimeter and maintained by the Bureau of Land Management (BLM) receive year-round public use. Culvert failure, debris accumulations, and instances of adverse surface erosion threaten to strand motorists in relatively remote locations. Numerous areas within the fire perimeter will experience elevated rates of erosion. Where roads and culverts fail or surface erosion is concentrated, increased loss of soil and impacts to downstream watercourses are anticipated. Several salmon and steelhead species, including federally listed threatened Coho salmon, occupy drainages within the fire perimeter. Thus, the increased surface runoff and sedimentation will negatively affect these species habitats and spawning grounds.

This inventory focuses on the portion of the Deadwood Creek watershed where high intensity fire killed most of the forest stands and represents some of the steepest slopes in the watershed. The project roads are located in T11N, R8W, Sections 10-15, MDB&M. Inventoried roads are either managed by the BLM, hold a BLM right-of-way permit to cross BLM managed lands (e.g. Trinity County to manage Deadwood Road, PG&E), or originate on BLM, cross private, and terminate on BLM lands.

The purpose of the inventory, treatment design, and future implementation is to reduce sediment levels from roads, maintain roads year-round in an open and safe condition, reduce hazards and risks to users, implement BAER and BLM Carr Emergency Stabilization and Burned Area Rehabilitation Plan (ESR) recommendations for watershed stabilization and recovery[1], and follow the Decision Record for the Carr Fire Emergency Stabilization Categorical Exclusion[2]. The project will improve the aquatic, riparian, spawning, and rearing habitat for a Threatened salmon species.

Fisheries and Water Quality Risks:
Deadwood Creek is the first tributary to the Trinity River after the Trinity Dam, and is critical Coho aquatic and riparian habitat, providing important spawning and rearing habitat for Coho and Chinook salmon and steelhead. The Coho salmon is a state and federally Threatened species under the respective Endangered Species Acts. Deadwood Creek is the last available tributary from the Trinity River, which makes it more likely that Coho salmon will make this location their spawning habitat. The total length of perennial blue line streams within the watershed (from topographic maps) is approximately 18 miles.

The key fishery problems in the Deadwood Creek watershed include excessive sediment yield and turbidity, spawning gravel quality and permeability, fish passage, and considerable channelization in the

[1] Post-Fire Recovery Plan Emergency Stabilization And Burned Area Rehabilitation Plan Template 2010 Carr Fire (L1A6) BLM Northern California District Office
[2] DOI-BLM-CAN060-2018-0040-CX

upper reaches of the creek. According to USFS Habitat Reports (Weaverville Ranger District, Shasta-Trinity National Forest), Deadwood Creek has been the site of extensive mining activities in the upper section of the affected project area, causing excessive sediment yield and channelization. The report also cites Deadwood Road as the main sediment contributor to Deadwood Creek.

Deadwood Creek lies within the Shasta Bally (Lower Cretaceous) geologic unit. The area consists of highly weathered quartz diorite and granodiorite rock with erodible soils subjected to elevated surface erosion rates. Using the CalFire Technical Addendum #1- Erosion Hazard Rating (EHR) for Timber Harvests, the area has a High EHR rating.

The Carr Fire BAER modeled flows of Deadwood Creek for return periods ≤ 10 year flood events. They were estimated to increase 32% over pre-fire flows to the confluence with the Trinity River[3]; whereas, post-fire mean sediment yields using ERMiT show erosion rates of 31 tons/acre, a 1,550% increase, with a 10-year storm using local climate conditions.

The BAER debris flow hazard identified roads in Deadwood Creek as being vulnerable to debris flows:

> *"With regards to debris flow hazards, many small drainages across the burned area have high modeled hazards. To further assess risks to roads and culverts, the debris flow hazard model results are overlaid with streams and roads to highlight areas of heightened risk. Road networks extending into the Shasta Bally materials (i.e., Grass Valley and Deadwood Creek watersheds) may be especially vulnerable to debris flow hazards given the erosion potential of the parent material."*

These estimates appear to be in line and may well underestimate the observed erosion rates during the fall and winter of 2018-19. A single thunderstorm on October 4, 2018 resulted in culverts plugging on Mill Gulch and Eastman Gulch and deposited approximately 3ft of fine sediment on floodplain benches of several tributaries to Deadwood Creek. Empirical evidence at the Donnelly Gulch crossing of Deadwood Road observed up to 3ft of sediment deposits in the channel and floodplains downstream of the culvert that resulted from the single storm. The turbidity levels from this isolated thunderstorm were recorded as a 700 NTU increase in turbidity by the Town House Gulch turbidity monitoring station downstream on the Trinity River. Subsequent winter rains of 2018-19 resulted in 8 culvert failures on Deadwood Road. All of the culverts were cleaned but not upgraded.

Rapid Road Inventory

The non-profit Northwest California Resource Conservation & Development Council's 5C Program (5C)[4] undertook a rapid road inventory (RRI) within the high intensity burn areas under BLM management or crossing BLM lands (Table 1 and Map 1). The rapid road inventory followed the unusually heavy rains of the 2018-19 winter. Most areas prone to surface erosion exhibited evidence of sediment transport making site identification simple (refer to photo log).

The RRI is based on the underlying concepts of the Direct Inventory of Roads and Treatments (DIRT) methodologies (http://www.5counties.org/dirt.htm) but sites were not measured for road width,

[3] The relatively low change in peak flow is associated with the high percentage (44%) of low and moderate soil burn severity throughout the majority of the watershed. The upper headwater portion of the watershed is where the highest concentration of high soil burn severity occurs.

[4] Under its Agreement #00183 with the Bureau of Land Management.

length, cut, and fill slope factors. In addition, no estimated volumes of future sediment yields were determined, though gross magnitudes of potential sediment delivery were assessed and used to characterize the likelihood to erode.[5] However, the massive delta formed at the mouth of Deadwood Creek during the winter of 2018-19 in combination with satellite photography of sediment plumes entering the Trinity River from Deadwood Creek, observed floodplain sediment deposits in tributaries, and turbidity monitoring in the river documented the significant sediment delivery in the first post fire winter and demonstrate potential for significant future delivery. The BAER report confirms both the past and future potential sediment delivery and suggests road treatments are necessary to reduce that potential.

Treatment types, immediacy, complexity, and controllability criteria as defined in DIRT were utilized in selecting treatments and prioritizing actions.

Targeted roads included Eastman Gulch Road, Thorne Gulch Road, and historic legacy mining roads (some of which are still in use for power line access). No roads south of Deadwood Creek, except Thorne Gulch Road, were inventoried. Portions of powerline access roads were not surveyed per discussion with Laura Brodhead due to a separate anticipated analysis by PG&E.

Roads were given an arbitrary numbering system with "100" representing the ridgetop road (the 100 Road was identified as the Eastside Road) separating the Sacramento and Trinity River watersheds. Moving down Deadwood Road from the intersection with Eastside Road, BLM roads were designated as the 200 through 400 Roads traveling west of the ridge. Refer to Appendix C Map 2, 3, and 4 for the road designation.

Assessment Methodology

During the winter period of 2018-19, the 5C staff monitored roads in response to storm flows. Beginning in October 2018, the 5C staff flagged 5 HDPE culverts on Deadwood Road that were burned during the Carr Fire. During the October 4th thunderstorm, 5C staff documented the debris plugging of crossings at Mill Gulch, Tunnel Gulch, and one unnamed stream culverted crossing (Appendix A: Figures 11-17). By mid-November, the Trinity County Department of Transportation (TCDOT): 1) replaced the burned out HDPE culverts with similar sized corrugated metal pipe culverts;2) cleared the culverts that had been plugged; and 3) dug out and re-compacted voids from where wood in the road fill had burned out. In a few locations, trees fell taking out road side edges.

In February 2019, additional storm flows and debris plugged 5 culverts on Deadwood Road and 3 streams were diverted (Appendix A: Figures 15 & 16). The County reopened the culvert inlets but has not, to date, reconstructed road fill washouts or upgraded crossings.

Monitoring of BLM roads showed significant rill and gully channels down some roads, incision at some non-culverted road crossings, and diverted flows at culverted crossings.

[5] Deadwood Road was inventoried under the DIRT protocols in 2004 and will be re-inventoried using the same DIRT protocols if funding allows.

MAP 1- Project Area Location

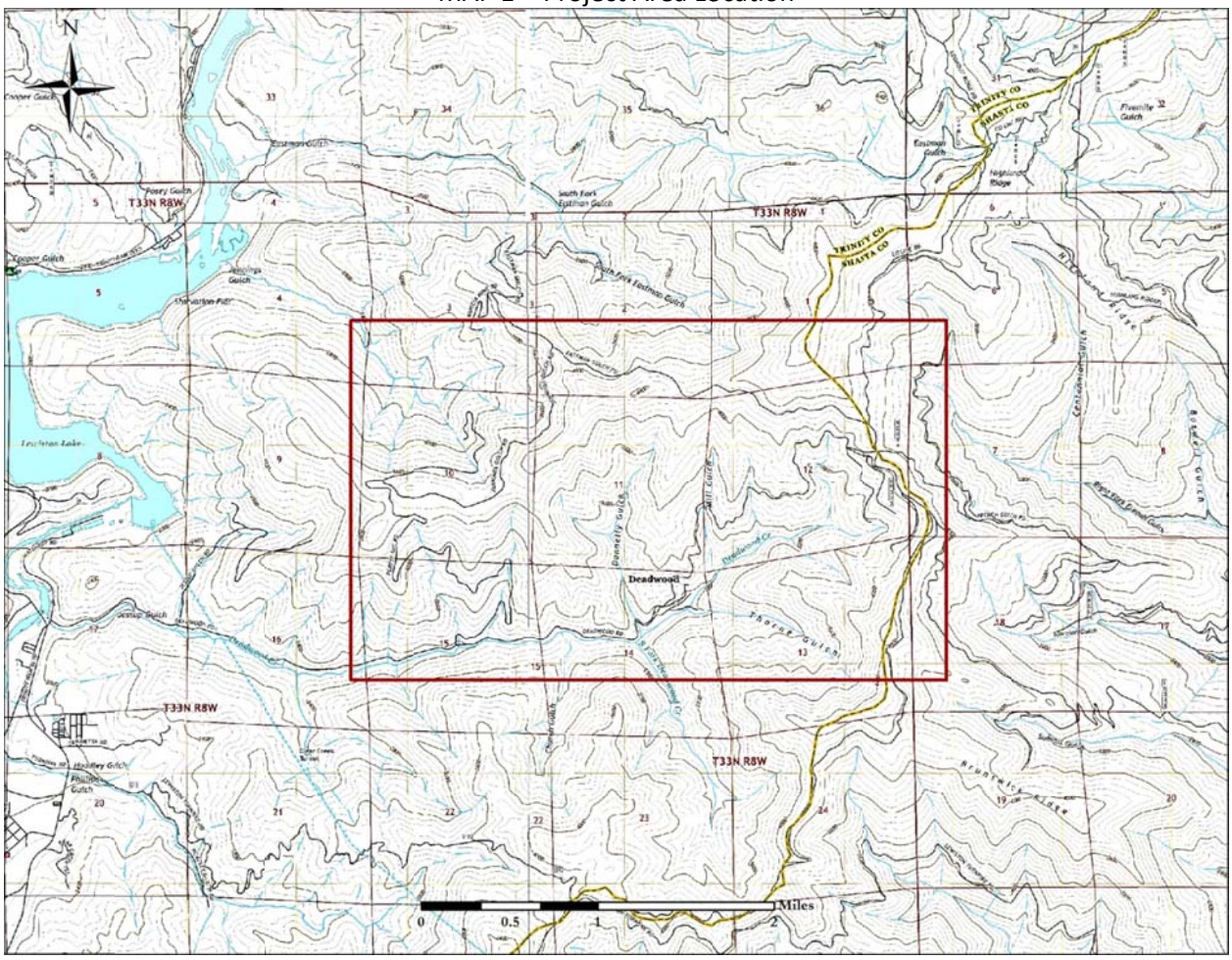


Table 1. Road Number and Distance Inventoried

Road Name	Total Road Length (mi)	BLM Road Length (mi)	Notes
Eastman Gulch Road	7.62	7.07	Jennings Gulch to Eastman Gulch Rd
Eastside Road	1.02	1.02	Designated as the 100 Road in Survey
200	1.11	0.43	
300	1.02	0.46	
350	0.30	0.30	
400	0.67	0.01	
Thorne Gulch	0.63	0.51	
Total Miles	12.37	9.8	

The rapid assessment consisted of driving and/or walking all targeted BLM roads and tracking them with Avenza GPS software. The prevalent erosion of the winter of 2018-19 made site identification straightforward. During the survey, it was noted that nearly all BLM roads segments were out sloped and that effective waterbars (WB) were installed on the 200 and 350 roads during the post Carr Fire recovery efforts (these roads provide powerline access and were drained by contract PG&E crews). The other roads had remnants of past WB installation, but many are marginally or no longer effective. Individual WB treatment sites were not given a GPS location marker, inventoried, or flagged during the assessment. Similarly, road rills and gullies were noted but not inventoried, as waterbar management are anticipated to treat these sediment sources.

Most filled stream crossings were mapped. In some locations, typical designs for a rock armored ford were determined to be appropriate but no site measurements were taken. The sites were marked with yellow flagging with the site number inscribed on the flagging. At culverted crossings and complex sites where typical designs are not adequate for treatment, site surveying was done and site treatment developed. All stream crossing flows were determined using USGS StreamStat modeling. At culverted crossings, HEC RAS was used to model flows throughout the crossing and to determine the appropriate culvert sizing.

Treatment immediacy ranking ranged from Immediate to Low. Treatment immediacy was a relatively straightforward assessment in this inventory because of the recent storms and erosion that allowed for reasonable determination of impact. In fact, more than 50% of all stream crossings exhibited failure to convey flows within the design channel.

Treatment complexity ranges from Low to High and is an assessment of factors that may: 1) limit the ability to complete a treatment; 2) result in the need for specialized equipment; or 3) create other cost or time constraints (e.g. traffic, safety, utilities, slope and other factors may raise the cost of treatment). During the project, several important treatment complexity factors were noted including:

- Deadwood Road is open to year round traffic but is too narrow for two cars to pass safely in some locations in the project area. The road will have to be closed to the public during all work;
- Underground Fiber Lines on Deadwood Road: These fiber cables will increase costs to avoid or temporarily relocate them during excavation;
- Overhead Transmission Lines: The regionally significant power lines that run from the Trinity Power House and the Carr Power House to the coast cross over all roads in the inventory. Deadwood Road, Eastman Gulch Road, Eastside Road, 200 Road, 350 Road and parts of the 400 Road must be maintained to drain runoff but allow year round maintenance access to the PG&E and TPUD lines;
- Snags and Hazard Trees: At all road locations, hazard trees exist for heavy equipment and laborers. Some snag felling or safety lookouts may be required for worker safety;
- Historic and Pre-Historic Sites: A significant number of historic and pre-historic sites have been located as a result of the fire. Work on road drainage must be coordinated with the BLM cultural staff as well as with private lands site protection;
- Legacy Roads: Portions of the 200, 300, 400, and Thorne Gulch Roads are very narrow and often located in the bottom of stream channels. These roads, in some instances, were most likely foot trails that were widened to accommodate wagons and then widened again with bulldozers to allow access to mines and logging.
- Legacy Roads in Stream Zones: In some locations (400 Road and Thorne Gulch Road), the roads are too narrow, in steep stream gorges, or run up the stream channel. Larger equipment will not

be able to access stream crossings in need of treatment. Treatments at these locations may not be as effective due to these limitations;

- Legacy Road Widths: In some instances, widening and reconstruction of legacy roads could result in more sediment being created than would be treated at a crossing site. At these locations partial treatments may be effective but equipment size limitations or inability to use some equipment (e.g. dump trucks) may limit treatment scope and effectiveness. Where narrow roads will prevent dump trucks from delivering rock to some crossing sites; localized rock sources were investigated for use. In some of these cases, partial treatment may be the most effective and practical option;
- Short Time Frame To Implement Treatments: There is a very limited time frame to implement treatments this year;
- Post Treatment Monitoring and Repairs: Some sites will not be accessible once winter precipitation occurs. The ability to check and maintain them will be minimal until the next summer;
- Treatment Limitations to Assure NEPA Compliance: All treatments were designed to be consistent with the Decision Record for the Carr Fire Emergency Stabilization Categorical Exclusion which does not include road reconstruction and widening or other significant activities.

Treatment controllability is the probability that treatments will be effective given factors other than the actual treatments. Controllability ranges from Low to High. At some sites, treatment limitations and timing can result in only reducing sediment delivery rather than fully treating the sites. In some instances, where the controllability was estimated to be so low so as to be cost ineffective, no treatment was proposed. In other instances, sites that may need treating were not evaluated as they are located on private property and not eligible for funding under the current fund sources.

Treatment controllability will be an issue in the watershed due to the fire. The near complete loss of vegetative cover in the upper watershed reduces root strength which will increase soil movement and the risk of shallow debris torrents, slides, and fill failures over the next few decades. The accumulation of downed organic debris as trees deteriorate can also increase small woody debris volumes in stream channels. Mobilized small wood debris is a common factor in plugging culvert inlets and increases the risk of crossing failures and debris torrents. The soils in the upper watershed also have a high erosion hazard rating. The loss of organics in the upper soils increases their erosion potential.

In addition, the upper watershed is evenly divided between private and BLM ownership. While the BLM may be able to replant burned hillslope, there is no assurance that the private lands can afford to invest in reforestation. The slower reforestation rate will slow new root and vegetative cover.

New root growth will not be sufficient to compensate for root loss in the first 10-20 years following the Carr Fire. Slope instability will increase for the next few decades. Barring recurring fire in the watershed, root strength and binding effects on the slopes will increase over the long term.

Results:

Surface rill and gullying (SRG) was noted on the Eastside Road, 200, 300 and 400 roads as well as Deadwood Road (refer to Figure 1). The SRG sites were not GPS recorded or shown as an inventory map feature as they will be treated as part of other site treatments. Burned out wood (BOW) in fill slopes were also noted but not recorded as sites. These BOW sites create voids and tension cracks in road fill, typically on the outside edge of the fill slope, and can increase safety hazards and fill failures. The BOW

sites were observed in road fills on the 200 Road and Deadwood Road but located in areas with a low potential for sediment to reach a stream.

Twenty-nine swales, ephemeral, and/or seasonal creek road crossings without culverts (CRX) were inventoried. At these crossing seasonal water flows over the road, not in culverts. There are CRX sites on all inventoried roads. Most of this type of crossing on Deadwood Road have minimal erosion potential as they are located in bedrock or the watershed area above them has minimal erosion potential (Figure 2). They also tend to have critical dips that prevent diversion down the road.

Some sites, particularly where past mining or logging pushed large quantities of fill into stream crossings, present a significant potential to deliver large quantities of sediment to streams (Figure 3). In most instances, these crossings have a low potential to divert down the road, but a moderate to high potential to incise up the stream channel and undercut the over steepened fill that forms the banks (Figure 4). The filled stream crossings and diversion down the road represents the highest potential sediment delivery and highest treatment immediacy. Table 2 shows proposed treatments for these crossing types

A total of 11 culverted stream crossings (CSC) occur on Deadwood Road, Eastman Gulch Road, 200 Road and Thorne Gulch Road. Many of the crossings failed in the past winter with some diverting down the road and others incising up the stream channel (Figures 1 & 5). In the case of Thorne Gulch Road, it appears that the crossing failed prior to the Carr Fire. While most sites were not measured to DIRT standards, some larger complex sites (Sites 200.5 and 300.1) were topographically surveyed to assist with modeling and treatment designs (refer to Appendix B for typical designs).

Three potential rock source sites were located on the 200, 300, and 350 Roads (Sites 200.3, 300.4 and 350.1) as well as along Deadwood Road on private ownership (Brown Bear Mine). The GPS location of these sites were recorded.

A number of recent and historic dump sites define many of the stream channels, particularly Deadwood Creek in the vicinity of the Deadwood town site and Thorne Gulch. A number of cars, large metal, glass, and wood debris features are in the channel and floodplain of these two streams.

Figure 1 (above): A rill/gully (center of photo) on the 200 Road (Site 200.4). The site also contains a diverted stream crossing and a non-functioning 24" CMP culvert crossing.

Figure 2 (below): A non-culverted stream crossing in bedrock with a critical dip and minimal future erosion potential in the road. Note the outlet of the crossing can be treated with energy dissipating rock (site 1498).

Figure 3 (above): A very large fill in a stream channel (with two logging roads entering it) with significant incision and large volumes of sediment capable of delivering to Deadwood Creek. This site also has diversion potential down the road (Site 200.5).

Figure 4 (below): The same site as Figure 3 showing ~4’ wide by 4’ deep incision at the lower edge of the fill.

The Thorne Gulch Road, which appears to have served as an alternative access to private lands in the upper portion of the watershed, is no longer drivable. This road is located in the floodplain of Thorne Gulch and should be evaluated for decommission and fill removal in the floodplain. That work is outside the scope of this project.

Figure 5 (above): Site 1490 on Deadwood Road. Plugged culvert crossing and diverted stream channel.
Figure 6 (below): Site 1490 diverted stream channel re-entering the stream downstream of the road crossing.

Figure 7 (above): Road crossing on the 400 Road showing aggraded fill and bank failure.

Figure 8 (below): Burned out wood in road fill creates a void on the road edge (Eastman Gulch). Road.

Figure 9 (below): Rock armor ford on Deadwood Road installed in 2005 showing performance post fire and high winter flows.

Treatments

Table 2 summarizes all treatments. Maps 2-4 in Appendix C show the locations of inventory sites. Table 4 in Appendix C provides designs for treatment sites and summarizes treatment by road site number. Typical and modified site designs are shown in Appendix B. Figure 9 shows a Rock Armored Ford installed on Deadwood Road in 2005, demonstrating the suitability for this treatment on low volume roads.

Table 2. Summary of all Treatments on BLM Managed Roads (does not include Deadwood Road sites).

Treatment	Total Treatment Units All Sites
Temp Reconstruct Road (LN FT) To Access Other Sites	**2,150**
Decommission Road (Ln Ft)	**2,350**
Upgrade Existing Rolling Dip(s)	**26**
Install Tank Trap	**4**
Install or Upgrade Water Bars on Side Roads/Trails Entering Crossing	**5**
Upgrade Existing Water Bar	**6**
Install Water Bar	**25**
Install Tank Trap (Side Roads or Main Road)	**4**
Pull and Stabilize BOW (yd3 Est)	**100**
Pull and Stabilize Crossing Fill (yd3 Est)	**298**
Pull and Stabilize Landing Fill (yd3 Est)	**120**
Rock Armor Crossing Inlet (yd3 Est)	**15**
Rock Armor Crossing Outlet (yd3 Est)	**117**
Rock Armor Channel (yd3 Est)	**20**
Install Critical Dip	**13**
Upgrade Existing Rock Armored Crossing	**3**
Install Rock Armored Crossing	**3**
Rock Road Surface (ft2)	**800**
Place Excess Spoil on Road Surface (yd3 Est)	**315**
Place Excess Spoils on Adjacent Road/Trail (yd3 Est)	**145**
Remove Debris/Vehicles From Stream Channel	**1**
Seed and Mulch Site (ft2)	**3,100**

Table 3. Treatment Immediacy, Complexity, and Controllability (Not Including Deadwood Road Sites)

Road	Site #	Treatment Immediacy	Treatment Complexity	Treatment Controllabilty	GPS Mapped	Notes	Site Flagged
Eastman Gulch Rd.	EM1	Low	Low	High	Yes		Yes
	EM2	Low	Low	High	Yes		Yes
Eastside Road	ES1	Low	Low	High	NO		Yes
200 (PAR)	200.1	High	Mod	Mod	Yes	Adit/very steep sideslopes	Yes
	200.2	High	Low	Mod-HIgh	Yes	Site located below possible (E) Adit	Yes
	200.3	N/A			Yes	Rock Sourcing Location	Yes
	200.4	Medium	Mod	Mod-High	Yes	Diverted Channel w/ (E) 18" CMP, Approx. Ford length = 45' Approx. Ford Width = 12'	Yes
	200.5	High	Low	Mod-High	Yes	See Site Sketch	Yes
	200.6	Medium	Low	Mod-High	Yes		Yes
	200.7	Medium	Low	Mod-High	Yes		Yes
	200.8	Medium	Low	Mod-High	Yes		Yes
	200.9	Low	Low	Mod-High	NO		Yes
	200.10	High	Low	Mod-High	NO		Yes
	300.1	HIgh	High	Moderate	Yes	See Site Sketch, narrow road with fill failures. Road will require reconstruction. On private BBM	Yes
	300.2	HIgh	High	Moderate	Yes	Private, BBM	Yes
	300.3	HIgh	Moderate	Mod-Low	Yes	Private, BBM	Yes

Road	Site #	Treatment Immediacy	Treatment Complexity	Treatment Controllabilty	GPS Mapped	Notes	Site Flagged
	300.4				Yes	Rock Sourcing Location	Yes
	300.5	High	Low	Mod-High	Yes	(E) Adit (mostly collapsed) Rock Source Location	Yes
	300.6	High	Low	Mod-High	Yes	Possible Adit (Collapsed), buried car, potential rock	Yes
	300.7	Medium	Low	Mod-High	Yes	Near Arch Site	Yes
	300.8	Medium	Low	Mod-High	Install Critical Dip		Yes
300	300.9	Medium	Low	Mod-High	Burned Out Wood in Fill		NO
	300.10	Medium	Low	Mod-High	Maintain Existing Water Bars		NO
350 (PAR)	350.1	N/A				Rock Source Location	Yes
400 (PAR)	400.1	HIgh	High	Mod-Low	Possible Decommission	Collapsed Adit	Yes
	400.2	HIgh	High	Mod-Low	Install Critical Dip, RSP at outlet	Private, BBM	Yes
	400.3	HIgh	High	Mod-Low	Install Critical Dip, RSP at outlet	Private, BBM	Yes
	400.4	HIgh	High	Mod-Low	Install Critical Dip	Private, BBM	Yes
Thorne Gulch (PAR)	TG.1	High	High	Mod-Low	Possible Decommission or Rocked Ford	Requires rebuilding Road to Reach Site, Private BBM	Yes
	TG.2	HIgh	High	Mod-Low	Possible Decommission or Rocked Ford	Requires rebuilding Road to Reach Site	Yes
	TG.3	High	High	Mod-Low	Clean Up of Debris in Channel	Numerous Abandoned Vehicle in Channel and on Bank, Past Trespass Development	Yes

Recommended Treatments Based on Current Funds Available

The 5C Program has developed four potential funding and/or in-kind sources for treating BLM, County and private roads: BLM Healthy Watershed funding agreement (#00183); Trinity River Restoration Program (TRRP) Watershed Restoration funding agreement (#00211), Trinity County Department of Transportation (DOT) Road Department in-kind services; and Brown Bear Mine (BBM) road rock sources. Table 4 shows sites proposed for treatment utilizing BLM Healthy Watershed funding and potential matching sources, however, limited funding may constrain some site selections.

Table 4: Sites Proposed For Treatment Utilizing Healthy Watershed Funding (#00183)

Road	Site #	TX Immd.	TX Comp.	TX Cont.	Road Status	Potential Match
Eastside Road	ES1	Low	Low	High	BLM Managed Road	TRRP
200 (PAR)	200.1	High	Mod	Mod	BLM Powerline Access Road	TRRP
	200.2	High	Low	Mod-HIgh	BLM Powerline Access Road. Site on BBM	TRRP
	200.3	N/A			BLM Powerline Access Road. Site on BBM	BBM
	200.4	Medium	Mod	Mod-High	BLM Powerline Access Road. Site on BBM	TRRP
	200.5	High	Low	Mod-High	BLM Powerline Access Road	TRRP
	200.6	Medium	Low	Mod-High	BLM Powerline Access Road	TRRP
	200.7	Medium	Low	Mod-High	BLM Powerline Access Road. Site on BBM	TRRP
	200.8	Medium	Low	Mod-High	BLM Powerline Access Road	TRRP
	200.9	Low	Low	Mod-High	BLM Powerline Access Road. Sitez on BLM & BBM	TRRP
	200.10	High	Low	Mod-High	BLM Powerline Access Road. Sitez on BLM & BBM	TRRP
300	300.4				BLM Legacy Road Segment	TRRP
	300.5	High	Low	Mod-High	BLM Legacy Road Segment	TRRP
	300.6	High	Low	Mod-High	BLM Legacy Road Segment	TRRP
	300.7	Medium	Low	Mod-High	BLM Legacy Road Segment	TRRP
	300.8	Medium	Low	Mod-High	BLM Legacy Road Segment	TRRP
	300.9	Medium	Low	Mod-High	BLM Legacy Road Segment	TRRP
	300.10	Medium	Low	Mod-High	BLM Legacy Road Segment	TRRP
350 (PAR)	350.1	N/A			BLM Powerline Access Road	TRRP
Deadwood Road	1483	HIgh	High	Mod	County Road on BLM & BBM	DOT, TRRP, BBM
	1484	HIgh	High	Mod	County Road on BLM & BBM	DOT, TRRP, BBM
	1490	HIgh	High	Mod	County Road on BLM & BBM	DOT, TRRP, BBM
	1496	HIgh	High	Mod	County Road on BLM & BBM	DOT, TRRP, BBM
	1499	HIgh	High	Mod	County Road on BLM & BBM	DOT, TRRP, BBM

An amendment to an existing TRRP Watershed program funding agreement that funded work on Valdor Road and Oregon Street has been submitted. If approved those funds will be used to target priority sediment sites on Deadwood Road and private roads. Trinity County Department of Transportation will provide funding to upgrade crossings on Deadwood Road. Rock sources on Brown Bear Mine lands can be utilized consistent with Chapter 9. Surface Mining and Reclamation Act of 1975 [2710-2796.5] (Chapter 9 added by Stats. 1975, Ch. 1131, Article 1. § 2714 J)[6]. Each funding source can be used independently of the others or in combination. Timing of approvals and permitting will dictate implementation schedules. The following Table lists the targeted treatments based on funding source:

The BLM Carr Emergency Stabilization and Burned Area Rehabilitation Plan (ESR)
The BLM ESR includes the following relevant road related specifications:

Pre-Storm Culvert Cleaning, Design/Construction Specifications:

- The culvert cleaning before the first October seasonal rain events begins will require that all accumulated soils, gravels, rocks, and debris be removed. A culvert inspection and cleaning needs to take place before the storm patrol team begins their rainfall culvert inspections.
- Utilization of both the USGS debris flow map illustrating the culvert points and the watershed response map illustrating the locations of known culverts should be used as an inspection guideline.
- Culverts will need to have excess sediment material and debris removed from the culvert's inlet drainage system. This removed material needs to be placed outside of the bankfull channel and floodplain where it cannot re-enter stream channels. Preferably, the material will be moved to an off-site debris staging site.
- During the culvert cleaning, every effort should be made to NOT damage the inlet of the culvert pipe. Restriction of the culvert inlet will greatly reduce the volume of water designed to pass through the pipe.
- Culverts will need to have excess sediment material and debris removed from the outlet if possible. There are many culverts identified in the Carr Fire field investigations where this may not be possible due to depth of the culvert and down slope length.
- The utilization of either a backhoe or excavator will be required to excavate the buildup of sediment, gravel, and rocks. Due to the Carr Fire and past fires, there is also the buildup of woody debris that will need to be removed.
- In some cases, the retrofitting of the inlet with a debris stand pipe may be necessary to prevent repeated accumulation of debris and clogging the culvert pipe (see diagram in Appendix 4 of Carr Fire BAER Plan).

Storm Patrol and Cleaning, Design/Construction Specifications:

[6] (j) (1) Excavations or grading for the exclusive purpose of obtaining materials for roadbed construction and maintenance conducted in connection with timber operations or forest management on land owned by the same person or entity. This exemption is limited to excavation and grading that is conducted adjacent to timber operation or forest management roads and shall not apply to onsite excavation or grading that occurs within 100 feet of a Class One watercourse or 75 feet of a Class Two watercourse, or to excavation for materials that are, or have been, sold for commercial purposes. (2) This exemption shall be available only if slope stability and erosion are controlled in accordance with subdivision (f) of Section 3704 and subdivision (d) of Section 3706 of Title 14 of the California Code of Regulations and, upon closure of the site, the person closing the site implements, where necessary, revegetation measures and post-closure uses in consultation with the Department of Forestry and Fire Protection.

- Immediately after receiving wetting rain, the BLM will send out patrols to the roads and facilities of high importance on BLM lands to identify road and other hazard conditions. Obstructions such as rocks, sediment, washouts, and plugged culverts should be identified first, so the problems can be corrected before they worsen or jeopardize motor vehicle users.
- The road patrols shall bring in heavy equipment necessary to mechanically remove any obstructions from the roads and culvert inlets and catch basins wherever necessary.
- All excess material and debris removed from the drainage system shall be placed outside of the bankfull channel and floodplain where it cannot re-enter stream channels. Preferably, the material will be moved off-site.
- After each storm event, BLM staff will identify the location(s) along roads where debris material is located and what type of debris material has been removed.
- Storm patrol and clearing will occur up to 8 times during the first winter.

Figure 10. Significant gully erosion down the PG&E power line. The location of the road on a ridge line minimizes sediment delivery to a stream.

APPENDIX A: ROAD INVENTORY PHOTOS

Figure 11 (above). Mill Gulch stream crossing at Deadwood Road**,** October 4, 2018. The culvert plugged and the channels diverted west and down the road (note the dark ash laden sediment in the middle distance and the lighter yellow road erosion sediment in the middle foreground).

Figure 12 (below): Mill Gulch crossing outlet overtopped and flow returning over road top.

Figure 13 (above): Tunnel Gulch crossing October 4, 2018. The culvert has been completely plugged and diverted both over the road and down the road.

Figure 14 (below Left): Tunnel Gulch channel was completely filled in following the October 2018 thunderstorm. **Figure 15** (Below Right). Tunnel Gulch was excavated out post storm and post winter.

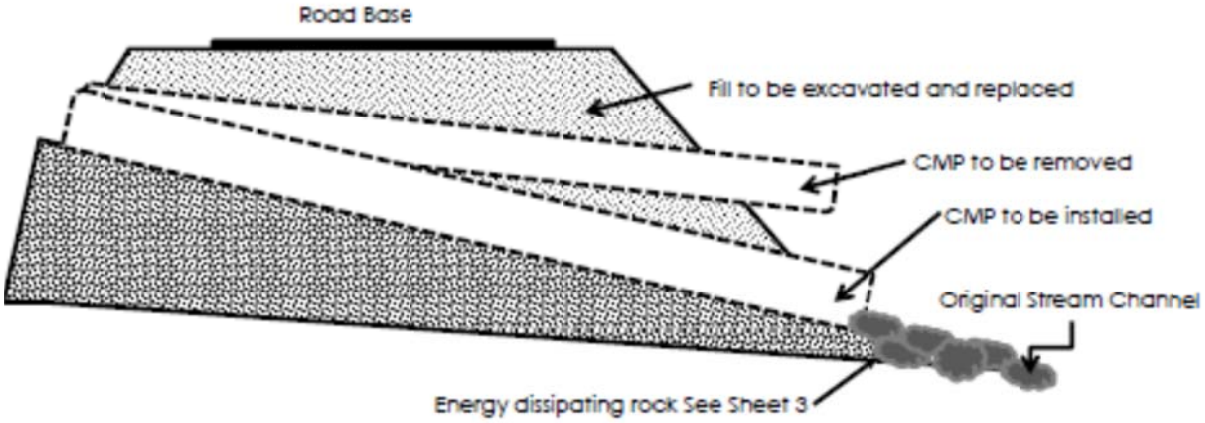
Figure 16 (above) and Figure 17 (below): Diverted streams on Deadwood Road. Site 1490 Donnelly Gulch plugged culvert and washed out fill.

APPENDIX B: TYPICAL DESIGNS

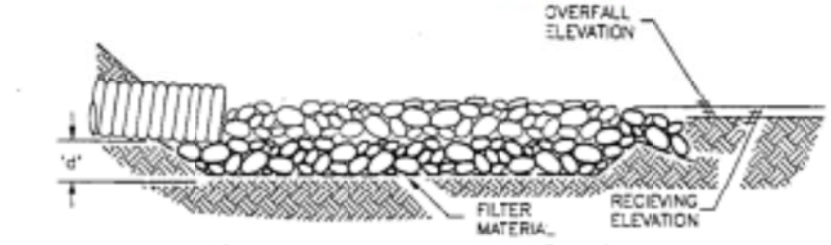
TYPICAL DRAWING:
STREAM CROSSING UPGRADE/REPLACEMENT

Not to Scale

All crossings are sized to conform to the Water Quality and Stream Habitat Protection Manual (http://www.5counties.org/docs/roadedu/rmchapter4.pdf.). Culverts were sized using USGS StreamStats for Q_{100} discharges and FHWA HY8 Hydraulic Modeling for culvert sizing.

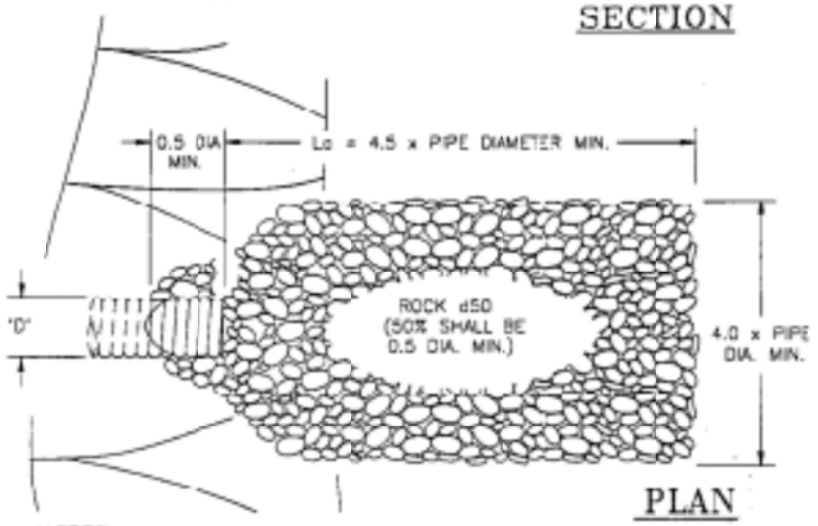


TYPICAL DRAWING: Energy Dissipaters



THICKNESS (d) = 1.5 x MAX ROCK DIAMETER (6" MIN.)

SECTION



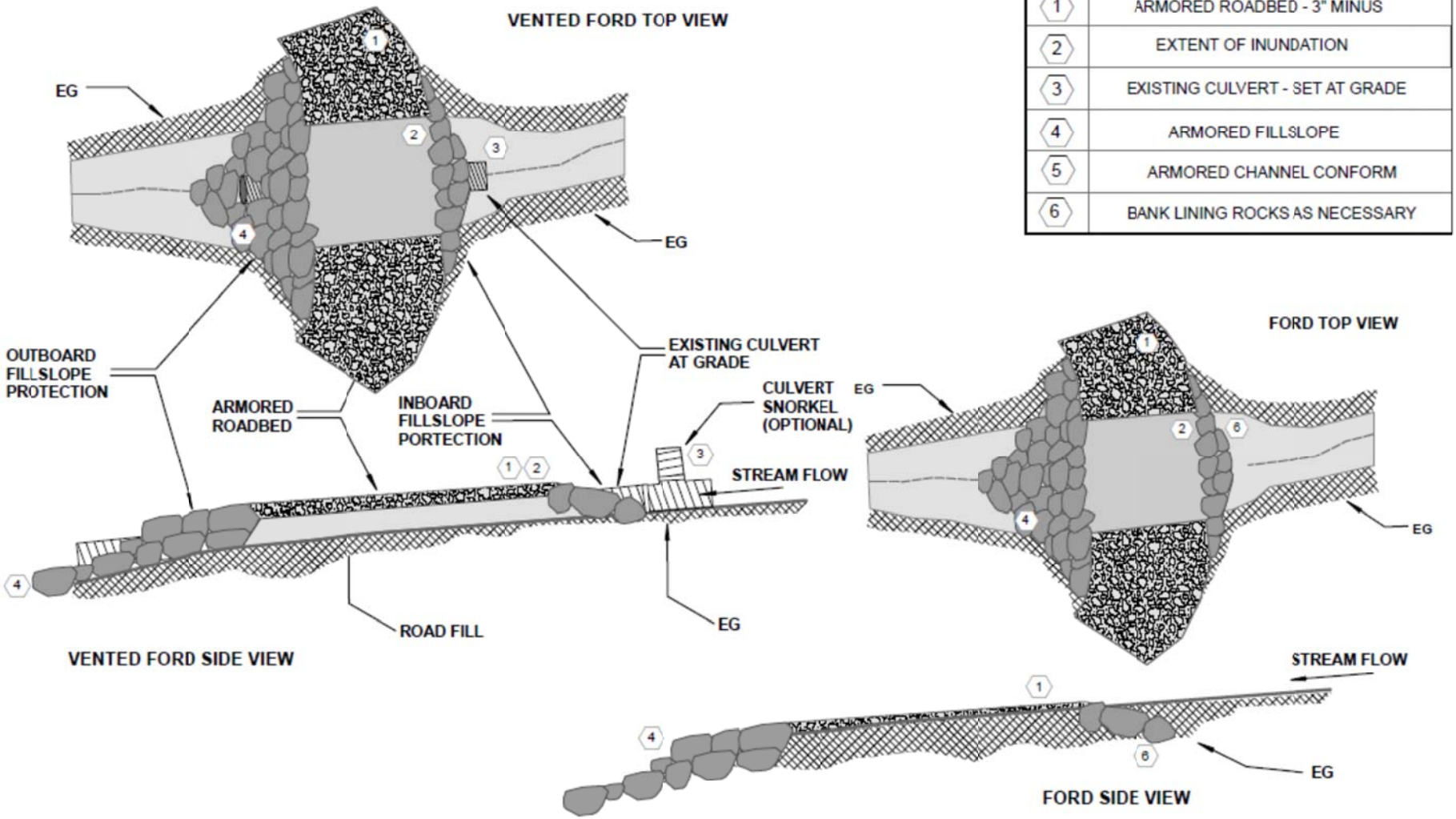
PLAN

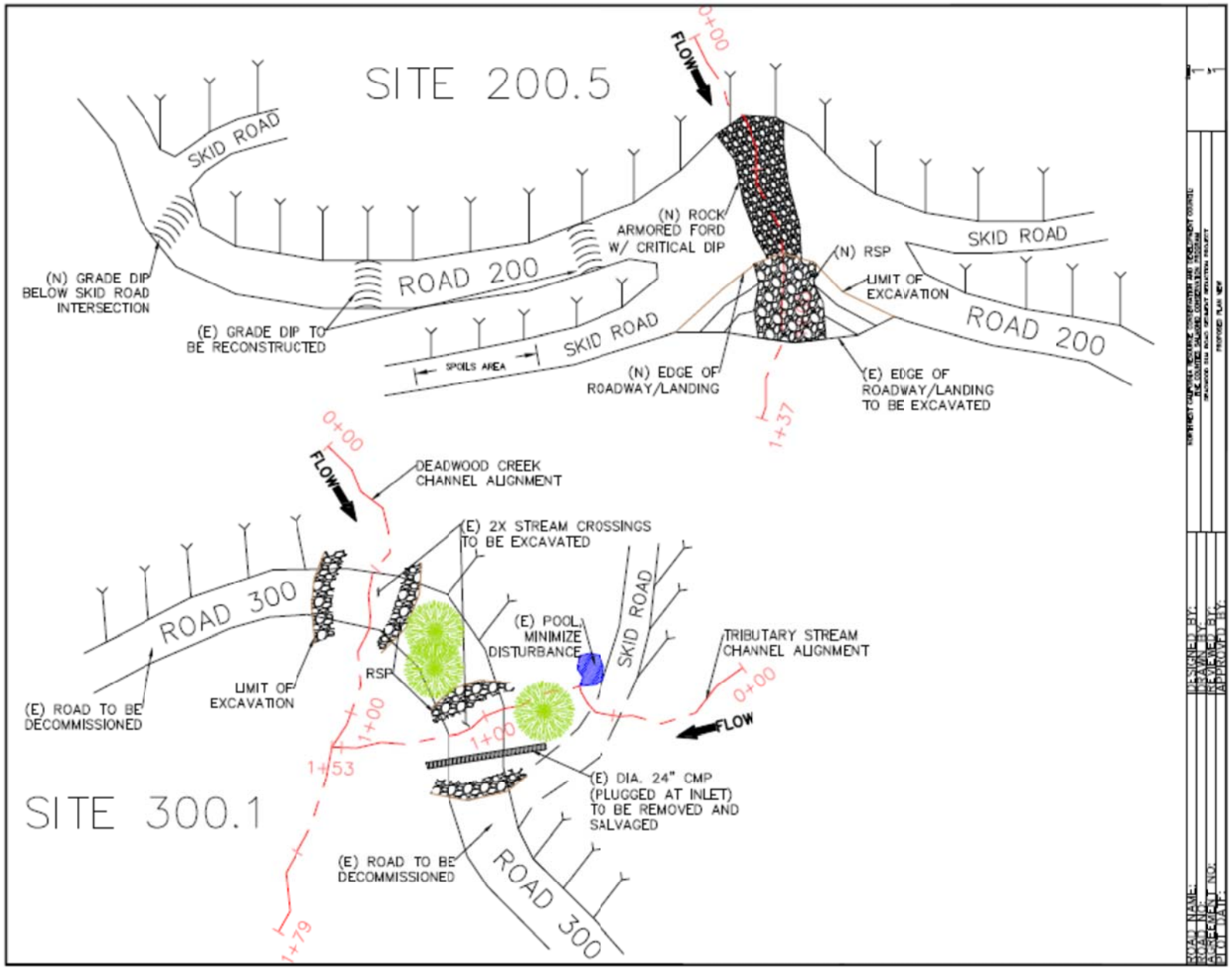
NOTES:

1. 'Lo' = LENGTH OF APRON. DISTANCE 'Lo' SHALL BE OF SUFFICIENT LENGTH TO DISSIPATE ENERGY. APRON SHALL BE SET AT A ZERO GRADE AND ALIGNED STRAIGHT.
2. FILTER MATERIAL SHALL BE FILTER FABRIC OR 6" THICK (MIN.) GRADED GRAVEL LAYER.

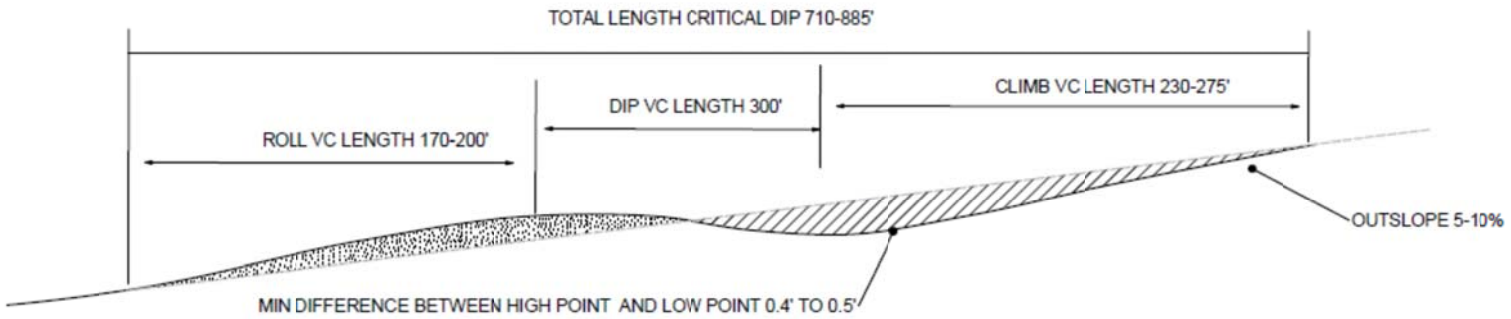
TYPICAL VENTED & UNVENTED FORD CROSSING

	DESCRIPTION
1	ARMORED ROADBED - 3" MINUS
2	EXTENT OF INUNDATION
3	EXISTING CULVERT - SET AT GRADE
4	ARMORED FILLSLOPE
5	ARMORED CHANNEL CONFORM
6	BANK LINING ROCKS AS NECESSARY



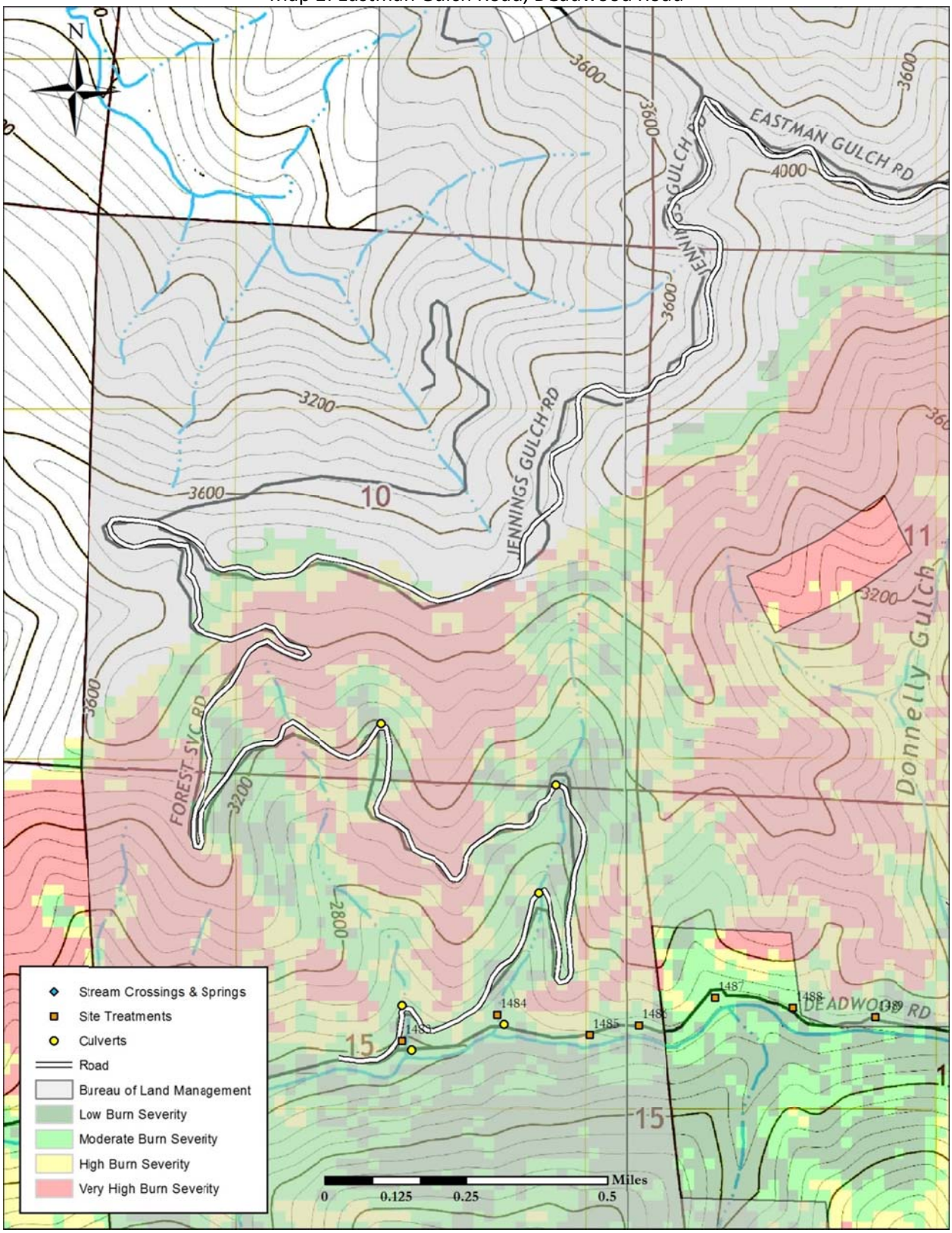

SITE 200.5
SKID ROAD
ROAD 200
(N) GRADE DIP BELOW SKID ROAD INTERSECTION
(E) GRADE DIP TO BE RECONSTRUCTED
SPOILS AREA
SKID ROAD
(N) ROCK ARMORED FORD W/ CRITICAL DIP
FLOW
0+00
(N) RSP
LIMIT OF EXCAVATION
SKID ROAD
ROAD 200
(N) EDGE OF ROADWAY/LANDING
(E) EDGE OF ROADWAY/LANDING TO BE EXCAVATED
1+37
SITE 300.1
ROAD 300
(E) ROAD TO BE DECOMMISSIONED
LIMIT OF EXCAVATION
RSP
FLOW
0+00
DEADWOOD CREEK CHANNEL ALIGNMENT
(E) 2X STREAM CROSSINGS TO BE EXCAVATED
(E) POOL, MINIMIZE DISTURBANCE
SKID ROAD
TRIBUTARY STREAM CHANNEL ALIGNMENT
0+00
FLOW
1+00
1+00
1+53
(E) DIA. 24" CMP (PLUGGED AT INLET) TO BE REMOVED AND SALVAGED
(E) ROAD TO BE DECOMMISSIONED
ROAD 300
1+79

TYPICAL CRITICAL & ROLLING DIP

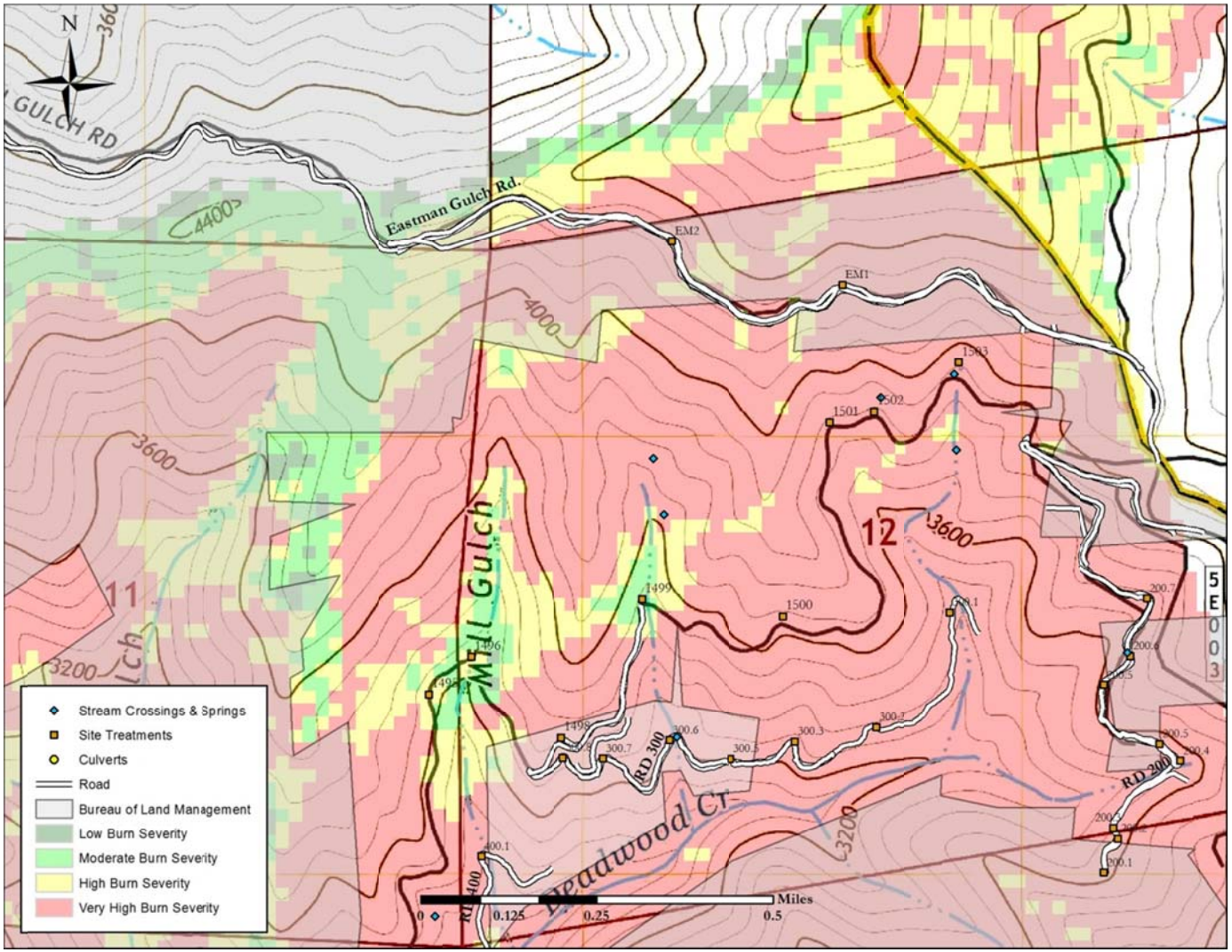


APPENDIX C: TREATMENT SITE MAPS

Map 2: Eastman Gulch Road, Deadwood Road



Map 3: Eastman Gulch Road, Deadwood Road, 200 Road and 300 Road



Map 4: Deadwood Road, 400 Road and Thorne Gulch Road

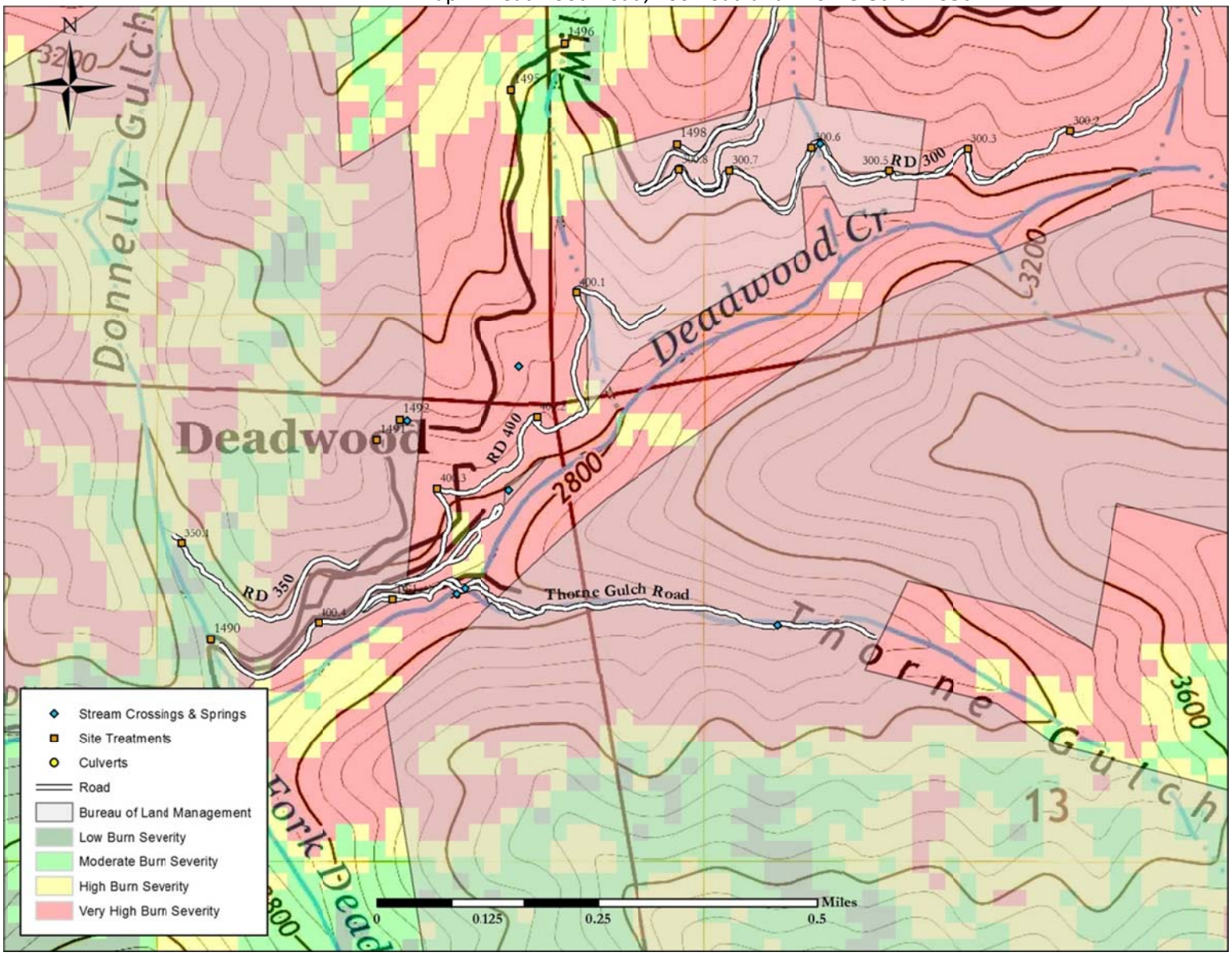


Table 4: Road Treatments by Site

Treatment	Road and Site Number											
	EM1	EM2	200.1	200.2	200.3	200.4	200.5	201	200.7	200.8	200.9	200.10
Upgrade Existing Rolling Dip(s)	2	2				2	4	2			14	
Install Rolling Dip(s)												
Install or Upgrade Water Bars on Side Roads/Trails Entering Crossing							4	1				
Upgrade Existing Water Bar			1									
Install Tank Trap							2					
Pull and Stabilize BOW (yd3 Est)												100
Pull and Stabilize Crossing Fill (yd3 Est)	5	5	15				25	3				
Pull and Stabilize Landing Fill (yd3 Est)							120					
Rock Armor Crossing Inlet (yd3 Est)							5					
Rock Armor Crossing Outlet (yd3 Est)	5	5					15	2	10	10		
Rock Armor Channel (yd3 Est)							10					
Install Critical Dip	1	1		1				1	1	1		
Upgrade Existing Rock Armored Crossing						1						
Install Rock Armored Crossing			1									
Rock Road Surface (ft2)			100	100		200	400					
Place Excess Spoil on Road Surface (yd3 Est)			10									
Place Excess Spoils on Adjacent Road/Trail (yd3 Est)							145					
Seed and Mulch Site (ft2)							800	50	50	50		100

Table 4. Road Treatments by Site (Continued)

Treatment	Road and Site Number											
	300.1	300.2	300.3	300.4	300.5	300.6	300.7	300.8	300.9	301.00		
Temp Reconstruct Road (LN FT) To Access Other Sites						150						
Decommission Site						200						
Upgrade Existing Water Bar										5		
Install Water Bar										15		
Install Tank Trap										1		
Pull and Stabilize BOW (yd3 Est)										25		
Pull and Stabilize Crossing Fill (yd3 Est)			20									
Rock Armor Crossing Inlet (yd3 Est)												
Rock Armor Crossing Outlet (yd3 Est)	20	5				15						
Rock Armor Channel (yd3 Est)						10						
Install Critical Dip		2			1	1						
Upgrade Existing Rock Armored Crossing	2											
Place Excess Spoil on Road Surface (yd3 Est)						80						
Seed and Mulch Site (ft2)	200	100	200			800						

Table 4: Road Treatments by Site (Continued)

Treatment	Road and Site Number						
	400.1	400.2	400.3	400.4	TG1	TG2	TG3
Temp Reconstruct Road (LN FT) To Access Other Sites	**500**	**500.0**	**500.0**	**500.0**			
Decommission Site					Maybe	Maybe	Maybe
Upgrade Existing Water Bar							
Install Water Bar	1	1	1	1	2	2	2
Install Tank Trap				1	1		
Pull and Stabilize Crossing Fill (yd3 Est)	100	50	75				
Rock Armor Crossing Inlet (yd3 Est)				10			
Rock Armor Crossing Outlet (yd3 Est)		10	10	10			
Rock Armor Channel (yd3 Est)							
Install Critical Dip		1	1	1			
Install Rock Armored Crossing					1	1	
Place Excess Spoil on Road Surface (yd3 Est)	100	50	75				
Remove Debris/Vehicles From Stream Channel					Yes	Yes	Yes
Seed and Mulch Site (ft2)	300	200	250				