FUTURE FISHERIES IMPROVEMENT PROGRAM GRANT APPLICATION

All sections must be addressed, or the application will be considered invalid

I. APPLICANT INFORMATION

A. Applicant Name: Clark Fork Coalition

Mailing Address: 140 S 4th St W #1

City: Missoula State: MT Zip: 59801

Telephone: 406-542-0539 est 209 E-mail: jed@clarkfork.org

B. Contact Person (if different than applicant): ______

Address: ______

City: ______ State: ______ Zip: ______

Telephone: ______ E-mail: ______

C. Landowner and/or Lessee Name (if different than applicant): United States Forest Service-Lolo National Forest

Mailing Address: 24 Fort Missoula Rd

City: Missoula State: MT Zip: 59804

Telephone: 406-329-3765 E-mail: dwalters@fs.fed.us

II. PROJECT INFORMATION

A. Project Name: Lee Creek-West Fork of Lolo Creek Fisheries Improvement Project

River, stream, or lake: Lee Creek and West Fork Lolo Creek and tributaries

Location: Township: 11N Range: 24W Section: 13,24,25,35, 36

Latitude: 46.73709 Longitude: -114.52961 *within project (decimal degrees)*

County: Missoula

B. Purpose of Project: ______

The Lee Creek-West Fork of Lolo Creek Fisheries Improvement Project is aimed at increasing the quantity and quality of spawning and cold water rearing habitat available to native trout through the removal of fish passage barriers, sediment sources, and encroachment on riparian corridors within a portion of the West Fork of Lolo Creek watershed.

C. Brief Project Description (attach additional information to end of application):

In 2009 the Lolo National Forest acquired over 32 square miles of forest lands in Upper Lolo Creek that were formerly under Plum Creek ownership through the Montana Legacy Project. Upper Lolo Creek is significantly impacted by road encroachment, sediment generated by forest roads and failing culverts, the DEQ's Upper Lolo Sediment TIE sets goals of between 33 and 65% load reductions from forest roads. The Plum Creek lands created a checkerboard pattern of land ownership in the Upper Lolo basin and until the Montana Legacy Project was finalized the Lolo National Forest was only able to carry out fish passage and sediment reduction restoration on every other square mile of the area. This project is a continuation of that long term restoration effort and focuses on removing culverts that are fish passage barriers and impediments to natural stream function, as well as reclaiming excess forest roads on the Legacy lands that are cumulatively impacting the watershed. This effort started in 2006 and has already decommissioned over 123 miles of forest roads, removed and restored 60 major culverts crossings and upgraded 10 culverts to bottomless arches or bridges for enhanced fish passage.

This grant application focuses on the West Fork of Lolo Creek, an important stream in the Upper Lolo area for Westslope cutthroat trout. Ten sections of Legacy land fall within the watershed. Working with the Lolo NF fisheries biologist as well as fisheries monitoring data generated by FWP electrofishing and eDNA studies conducted by Mike Young led to CFC prioritizing the West Fork of Lolo for a major fisheries restoration project. Permitting and design activities started this year and will be 100% paid for by other funders than Future Fisheries. All project activities are based on the recommendations stated in the Forest Service's 2013 "Conservation Strategy for Bull Trout on USFS lands in Western Montana". In addition the Upper Lolo Sediment TMDL Implementation Evaluation (Section 2.0 TMDL-Recommended Activities) and the Lolo Creek Watershed Restoration Plan (Chapter 4- needs in Lolo Creek) were used to shape the projects goals and activities.

The Lee Creek-West Fork of Lolo Creek Fisheries Improvement Project will focus on removing fish passage barriers that are blocking native fish migration and decommissioning forest roads that are impacting adjacent streams. Sites where culverts are removed will be re-countoured to match current stream geomorphology and large woody debris and boulders will be placed for grade control. Decommissioning of roads will include up to 100% recontouring (closure level 5) of topography, slash placement, and revegetation as needed. Twenty five culverts, 5 that are partial fish passage barriers are slated for removal in 2020 if funding is procured. Based on the completed WEPP modeling the completion of this activity will remove the threat of up to 6,950 of sediment (see attached report) entering the system in the next 30 years and will immediately open up 1-1.5 miles of headwater tributaries to unobstructed trout migration. In addition 11.1 miles of forest roads will be decommissioned. All roads proposed for decommissioning are non-system roads behind locked gates or barriers that have never been open to travel by public vehicles.

D. Length of stream or size of lake that will be treated: 15 miles

E. Project Budget:

Grant Request (Dollars): $ 30,500

Matching Dollars: $ 146,294

Matching In-Kind Services:* $ 0

**salaries of government employees are not considered matching contributions*

Total Project Cost: $ 176,294

F. **Attach** itemized (line item) budget – *see budget template*

G. **Attach** specific project plans, detailed sketches, plan views, photographs, maps, evidence of landowner consent, evidence of public support and fish biologist support, and/or other information necessary to evaluate the merits of the project. If project involves water leasing or water salvage complete a *supplemental questionnaire.* (http://fwp.mt.gov/fwpDoc.html?id=36110)

H. **Attach** land management & maintenance plans that will ensure protection of the reclaimed area.

III. PROJECT BENEFITS (attach additional information to end of application):

A. What species of fish will benefit from this project?

The project will primarily benefit Westslope cutthroat trout, brown trout and brook trout. Although not detected in recent electrofishing surveys (prior 2 decades), low densities of remnant bull trout may be present based on eDNA assays and historic distribution. Westslope cutthroat trout in these drainages are common and have low levels of introgression (> 90% purity).

B. How will the project protect or enhance wild fish habitat?

Roads built on granitic sediments are inherently unstable and highly susceptible to erosion – especially in areas that receive high precipitation such as the West Fork Lolo and Lee watersheds. This area has a very large road system which if left un-mitigated would continue to degrade water quality and aquatic habitat especially if there was a fire or additional forestry activities. However, this project will greatly reduce the amount of road-generated sediment reaching stream, and eliminate the risk of any stream crossing catastrophic failing in the future.

Removing fish passage impediments will open up 1-1.5 miles spawning habitat for trout, primarily for Westslope cutthroat trout which are the predominant native trout species in the drainage. The removal of the fish passage barriers will also allow wild fish access to cold water refuge during the low flow months of August-October. The removal of forest roads will reduce sediment and allow recovery of riparian buffers, thereby enhancing wild fish habitat and spawning areas.

C. Will the project improve fish populations and/or fishing? To what extent?

Yes, it is expected the project will directly and indirectly improve habitat for wild trout populations. These populations provide recruitment and angling opportunity in the main stem of Lolo Creek and the popular Bitterroot River fishery.

D. Will the project increase public fishing opportunity for wild fish and, if so, how?

The entire project area is on public land and is open to angling and the removal of upstream fish passage barriers will enhance habitat availability and movement. Wild fish populations and overall watershed function are also expected to increase as a result of the project, leading to more opportunity for angling success. All roads removed by the project are non-system roads behind barriers and have never been open to motorized travel. Even with the roads removed by the project there is public access throughout the project area.

E. The project agreement includes a 20-year maintenance commitment. Please discuss your ability to meet this commitment.

The project will not require maintenance since roads and culverts will be removed and no new infrastructure will be installed.

F. What was the cause of habitat degradation in the area of this project and how will the project correct the cause?

Under-sized and failing culverts, along with overall high road densities and unmaintained roads are causing aquatic habitat fragmentation and degradation. Montana DEQ has listed Lee Creek and the West Fork of Lolo Creek as sediment impaired streams. Included in DEQ's Improvement Strategies for this area are the following actions: "reclaim forest roads that are surplus to the needs of forest land managers" and "correct those priority fish passage barriers that are significantly affecting the connectivity of native fish habitats". This project will directly address these two causes of habitat degradation, as well as cumulative impacts of riparian roads on stream corridors.

G. What public benefits will be realized from this project?

Public benefits from this project will include: improved quantity and quality of aquatic habitat, improved water quality, enhanced fish passage, fishing opportunities and an improved tourism economy.

H. Will the project interfere with water or property rights of adjacent landowners? (explain):

The project will not interfere with the water or property rights of adjacent landowners. The entire project will take place on USFS property

I. Will the project result in the development of commercial recreational use on the site? (explain):

No, there is no planned development of commercial recreational use at the site of the project.

J. Is this project associated with the reclamation of past mining activity?

No

Each approved project applicant must enter into a written agreement with Montana Fish, Wildlife & Parks specifying terms and duration of the project. The applicant must obtain all applicable permits prior to project construction. A competitive bid process must be followed when using State funds.

IV. AUTHORIZING STATEMENT

I (we) hereby declare that the information and all statements to this application are true, complete, and accurate to the best of my (our) knowledge and that the project or activity complies with rules of the Future Fisheries Improvement Program.

Applicant Signature: Karen Knutse Date: 11/22/2019

Sponsor (if applicable): ______________________

Submittal: **Applications must be *signed and received before* December 1 and June 1 of each year to be considered for the subsequent funding period**. Late or incomplete applications will be rejected.

Mail to:	Montana FWP Fish Management Bureau PO Box 200701 Helena, MT 59620-0701	Email:	Michelle McGree mmcgree@mt.gov (electronic submissions must be signed) For files over 10MB, use https://transfer.mt.gov

Applications may be rejected if this form is modified.

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

Both tables must be completed or the application will be returned

WORK ITEMS (ITEMIZE BY CATEGORY)	NUMBER OF UNITS	UNIT DESCRIPTION *	COST/UNIT	TOTAL COST	CONTRIBUTIONS: FUTURE FISHERIES REQUEST	CONTRIBUTIONS: IN-KIND SERVICES**	CONTRIBUTIONS: IN-KIND CASH	CONTRIBUTIONS: TOTAL
Personnel* **								
Survey	1	Final survey and mapping	$8,000.00	$ 8,000.00			8,000.00	$ 8,000.00
Design	1	Final design	$1,000.00	$ 1,000.00			1,000.00	$ 1,000.00
Engineering				$ -				$ -
Permitting	1	Env. Compliance	$500.00	$ 500.00			500.00	$ 500.00
Oversight	250	hrs	$55.00	$ 13,750.00			13,750.00	$ 13,750.00
				$ -				$ -
			Sub-Total	$ 23,250.00	$ -	$ -	$ 23,250.00	$ 23,250.00
Travel								
Mileage	1800	miles	$0.58	$ 1,044.00			1,044.00	$ 1,044.00
Per diem				$ -				$ -
			Sub-Total	$ 1,044.00	$ -	$ -	$ 1,044.00	$ 1,044.00
Construction Materials******								
Straw mulch	1	acres	$1,250.00	$ 1,250.00			1,250.00	$ 1,250.00
Restoration seed	25	acres	$350.00	$ 8,750.00			8,750.00	$ 8,750.00
Culvert Disposal fees	1	LS	$600.00	$ 600.00			600.00	$ 600.00
				$ -				$ -
				$ -				$ -
				$ -				$ -
				$ -				$ -
				$ -				$ -
				$ -				$ -
			Sub-Total	$ 10,600.00	$ -	$ -	$ 10,600.00	$ 10,600.00
Equipment and Labor								
Excavator	940	hrs	$125.00	$ 117,500.00	30,500.00		87,000.00	$ 117,500.00
Track truck	40	hrs	$125.00	$ 5,000.00			5,000.00	$ 5,000.00
Laborer	120	hrs	$50.00	$ 6,000.00			6,000.00	$ 6,000.00
3/4 ton pickup w/ trailer	40	hrs	$85.00	$ 3,400.00			3,400.00	$ 3,400.00
				$ -				$ -
				$ -				$ -
			Sub-Total	$ 131,900.00	$ 30,500.00	$ -	$ 101,400.00	$ 131,900.00
Mobilization								
Mobilization	1	LS	$10,000.00	$ 10,000.00			10,000.00	$ 10,000.00
				$ -				$ -
				$ -				$ -
				$ -				$ -
			Sub-Total	$ 10,000.00	$ -	$ -	$ 10,000.00	$ 10,000.00
			TOTALS	$ 176,794.00	$ 30,500.00	$ -	$ 146,294.00	$ 176,794.00

OTHER REQUIREMENTS:

All of the columns in the budget table and the matching contribution table MUST be completed appropriately or the application will be invalid. Please see the example budget sheet for additional clarification.

*Units = feet, hours, inches, etc. Do not use lump sum unless there is no other way to describe the costs.

**Can include in-kind materials. Justification for in-kind labor (e.g. hourly rates used for calculations). Describe here or in text.

Reminder: Government salaries cannot be used as in-kind match

***The Review Panel suggests that design and oversight costs associated with a proposed project not exceed 15% of the total project budget. If design and oversight costs are in excess of 15%, applications must include a minimum of two competitive bids for the cost of undertaking the project.

****The Review Panel recommends a maximum fencing cost of $1.50 per foot. Additional costs may be the responsibility of the applicant and/or partners.

MATCHING CONTRIBUTIONS (do not include requested funds)

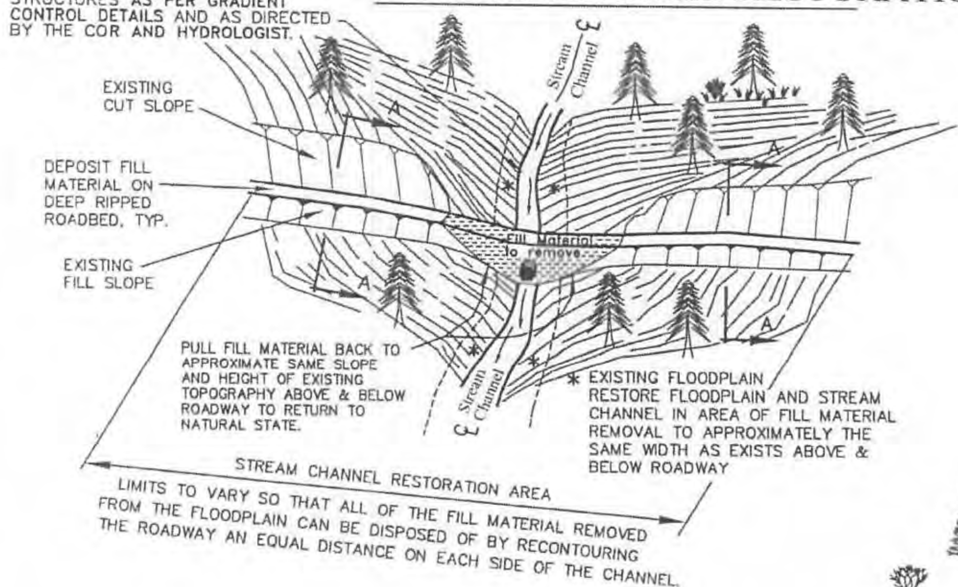
CONTRIBUTOR	IN-KIND SERVICE	IN-KIND CASH	TOTAL	Secured? (Y/N)
DEQ 319 Grant Program	$ -	$ 131,294.00	$ 131,294.00	N
Westslope Chapter Trout Unlimited	$ -	$ 5,000.00	$ 5,000.00	N
Lolo National Forest	$ -	$ 10,000.00	$ 10,000.00	Y
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
TOTALS	$ -	$ 146,294.00	$ 146,294.00	

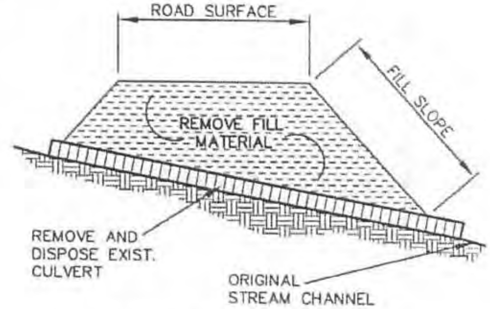
Upper Lolo Creek Sediment Reduction and Fisheries Connectivity Project

H. Land Management and Maintenance Plan

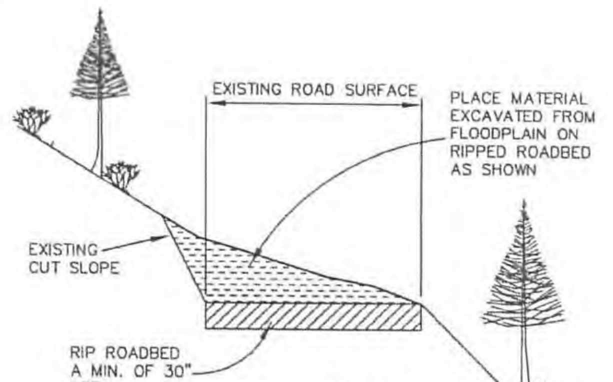
All land management and maintenance plans are addressed under mandates, standards, and guidance as required by the Lolo National Forest Plan and Inland Native Fish Strategy, in addition to other Executive Orders. These provisions require the Forest to "meet or exceed" State requirements, which manifests commonly in land management planning and implementation that far exceeds protections offered by other means. For additional and/or specific details, please reference the Forest Plan and/or Inland Native Fish Strategy. In addition, these tributaries are also delineated by the U.S. Fish and Wildlife Service within the Bull Trout Conservation Strategy as critical habitat, which also provides additional protections for current and future management. This project lies within the Lolo National Forest's Management Area 16, which is currently designated as timber harvest. There is no merchantable timber, and will not be any for the next 50 years or more, in the areas accessed by the roads proposed for decommissioning. There are no plans by the forest service to open these roads up after decommissioning occurs, especially with the level that the roads will be decommissioned to (Level 5, full recontour). In terms of maintenance there should not be any needed due to the removal of all associated culverts and complete reconstruction of the road prism back to native state.

STREAM CHANNEL RESTORATION





TYPICAL SECTION-
STREAM CHANNEL



SECTION A-A
ROAD RECONTOUR

NOTES:

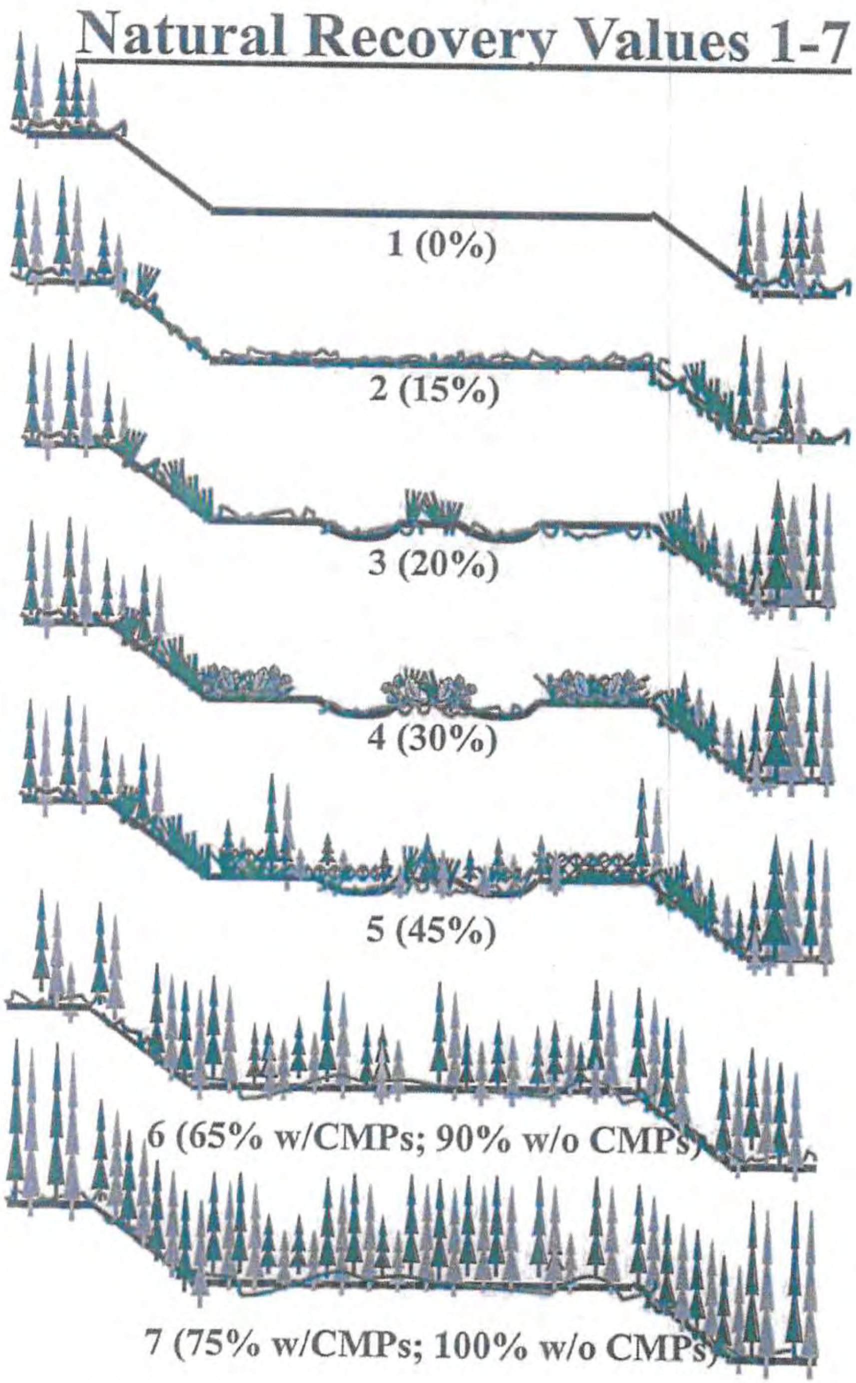
1. REMOVE ALL FILL MATERIAL FROM FLOODPLAIN DOWN TO THE ORIGINAL CHANNEL. PLACE REMOVED MATERIAL ON THE DEEP RIPPED ROADBED. DO NOT DEPOSIT MORE OF THIS MATERIAL THAN WAS ORIGINALLY IN PLACE PRIOR TO ROAD CONSTRUCTION. FULLY RECONTOUR THE ADJACENT ROADWAY WITHIN THE STREAM CHANNEL RESTORATION AREA BY PULLING UP THE ROADWAY FILL, PLACING THE FILL ONTO THE ROADWAY, AND CONTOURING IT TO THE ADJACENT ORIGINAL GROUND SLOPES. ADJUST LIMITS OF STREAM CHANNEL RESTORATION AREA SO THAT ALL EXCAVATED MATERIAL IS USED TO RECONTOUR THE ROADBED AS SHOWN ON THIS SHEET.

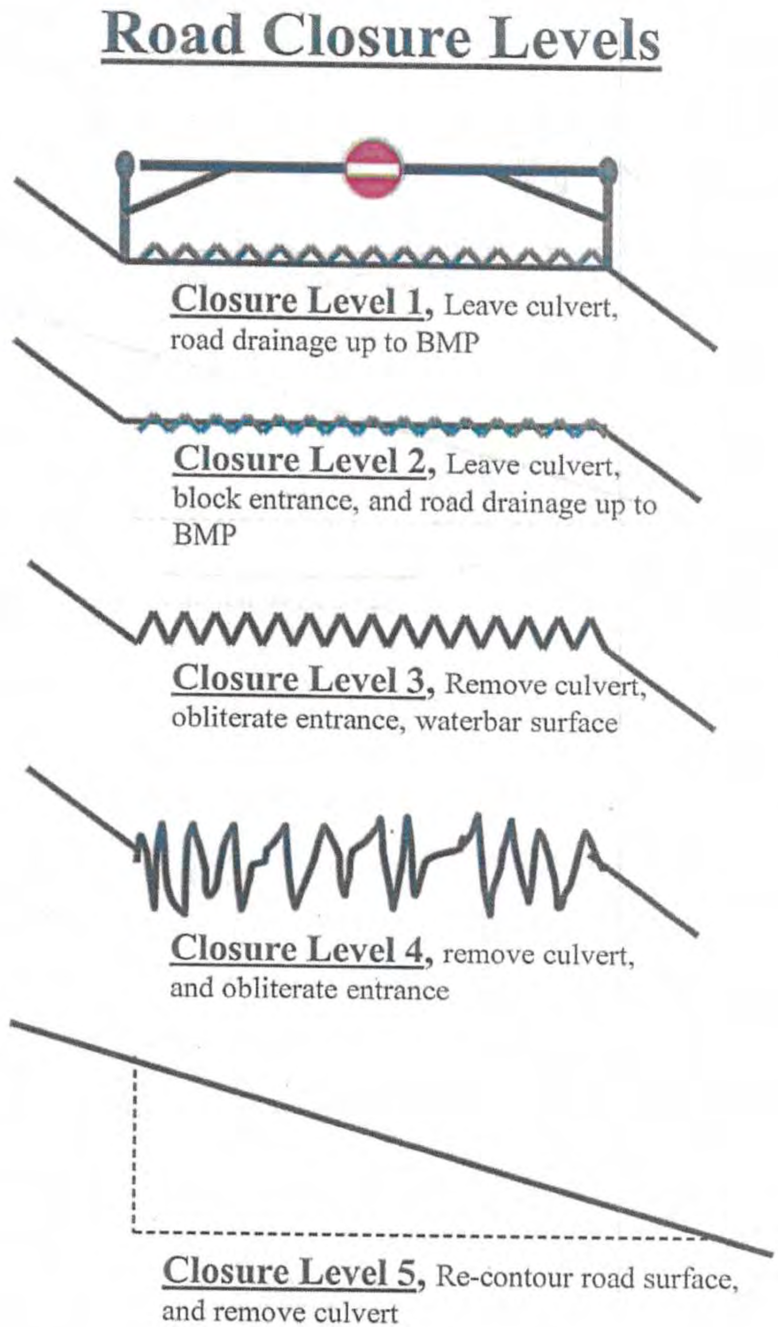
2. DISTANCES FOR STREAM CHANNEL RESTORATION MAY BE ADJUSTED TO EITHER SIDE OF THE CHANNEL TO ACCOMMODATE OVERLAPPING SECTIONS WHERE STREAMS ARE CLOSE TOGETHER.

3. SCATTER AVAILABLE WOODY DEBRIS ON THE FINISHED SLOPE. PLACE LARGER WOOD AND ROCK ON THE FLOODPLAIN.

4. TREATMENT OF RESTORED CHANNEL WILL INCLUDE FURNISHING AND INSTALLING TEMPORARY AND PERMANENT SEDIMENT CONTROL MEASURES AS DETERMINED NECESSARY BY COR, MULCHING THE DISTURBED AREA WITH WEED FREE STRAW MULCH, AND REMOVING AND DISPOSING OF THE EXTRACTED CMP FROM THE JOBSITE.

EUSTACHE CREEK REHABILITATION	SHEET	TOTAL
Road Decommissioning & Stream Channel Typical	14	17


Natural Recovery Values 1-7
1 (0%)
2 (15%)
3 (20%)
4 (30%)
5 (45%)
6 (65% w/CMPs; 90% w/o CMPs)
7 (75% w/CMPs; 100% w/o CMPs)

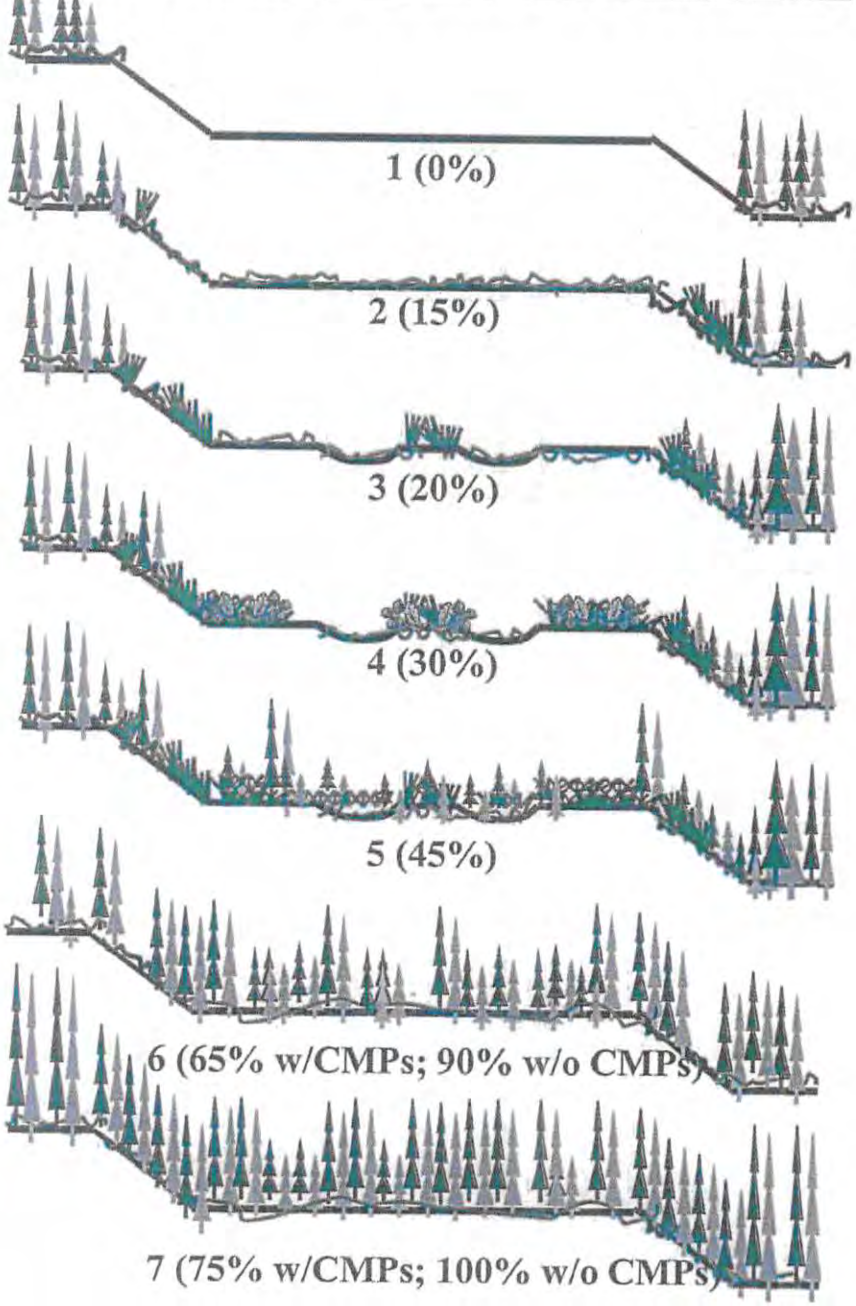

Road Closure Levels
Closure Level 1, Leave culvert, road drainage up to BMP
Closure Level 2, Leave culvert, block entrance, and road drainage up to BMP
Closure Level 3, Remove culvert, obliterate entrance, waterbar surface
Closure Level 4, remove culvert, and obliterate entrance
Closure Level 5, Re-contour road surface, and remove culvert

Road Closure Levels

Lolo Web/Program Area//Engineering Tools/References December 2010

Level Allowed Suffix /E, /P /E Entrance Oblit, /P Path	Typical Device Site specific situation dependant	Typical Treatment All treatments are as-needed.	Status
1	Gate	-Blade, seed, fertilize; Normal drainage (BMP's) -Treat noxious weeds	Remains as NFSR as either long-term or intermittent term service.
2	Gate, guardrail, concrete, earth barrier or re-contour intersection	-Type III dip, waterbars OR outslope -Scarify, seed, fertilize -May scatter slash -Treat noxious weeds	Remains as NFSR as either long-term or intermittent term service with gate, or intermittent term service with barrier.
3-SN Natural Storage	Re-contour intersection (entrance oblit) or rock/earth barrier as needed.	No physical or weed treatment needed, Naturally revegetated and stabilized.	S- Remains as NFSR as intermittent stored service.
3-S Storage		-Waterbar or outslope -Remove CMP's & restore watercourse -Ditch relief pipes can remain w/ waterbars -Light scarify, seed,as needed -Treat noxious weeds	
3-DN Natural Decommission	Re-contour intersection (entrance oblit) or rock/earth barrier as needed.	No physical or weed treatment needed, Naturally revegetated and stabilized.	D- Road is not needed for long term use. Remove from NFSR by route status change to decommissioned. Effectiveness monitored.
3-D Decommission		-Waterbar or outslope -Remove CMP's & restore watercourse -Scarify or Rip 6-12", seed, fertilize as needed -Scatter slash on slopes, -Treat noxious weeds.	
4 Decommission	Re-contour intersection (entrance oblit) or rock/earth barrier	-Waterbar, outslope or selective re-contour -Remove all CMP's & restore watercourse -Rip 12-18", seed, fertilize -Scatter slash on slopes -Treat noxious weeds	Road is not needed for long term use. Remove from NFSR by route status change to decommissioned. Effectiveness monitored.
5 Decommission	Re-contour	-Re-contour entire prism -Remove all CMP's and restore watercourses -Seed and fertilize -Scatter slash on slopes -Treat noxious weeds	Road is not needed for long term use. Remove from NFSR by route status change to decommissioned. Effectiveness monitored.

Natural Recovery Values 1-7



NRV Definitions

Natural Recovery Value 0% – Road may be driven with passenger vehicles. Road surface contains little vegetation due to routine grading and use. Cuts and fills have exposed soil, light grass, and brush with little protection against erosion.

Natural Recovery Value 15% – Road may be driven with high clearance vehicles with normal driver observation. Road surface contains grass sod or sparse brush and trees. Cuts and fills have little exposed soil, are vegetated with grass and brush and young trees, and have adequate protection against erosion.

Natural Recovery Value 20% – Road may be driven with high clearance vehicles with moderately-high driver observation. Road surface is well vegetated with grass sod. Road center and shoulders are vegetated with young brush and trees. Cuts and fills have no exposed soils and are well vegetated with brush and young trees with good protection against erosion.

Natural Recovery Value 30% – Road may be driven with high clearance vehicles or OHVs with high driver observation. Road surface is well vegetated with grass sod and brush. Wheel tracks are still compacted with only grass or sparse brush vegetation. Road center and shoulder are vegetated with mature brush and young trees. Cuts and fills have no exposed soil and are well vegetated with brush and trees with very good protection against erosion.

Natural Recovery Value 45% – Road may not be driven by any vehicles. Road surface, is well vegetated with brush and young trees. Wheel tracks are still evident yet are fully vegetated with brush and young trees. Cuts and fills have no exposed soil and are well vegetated with trees and brush with very good protection against erosion.

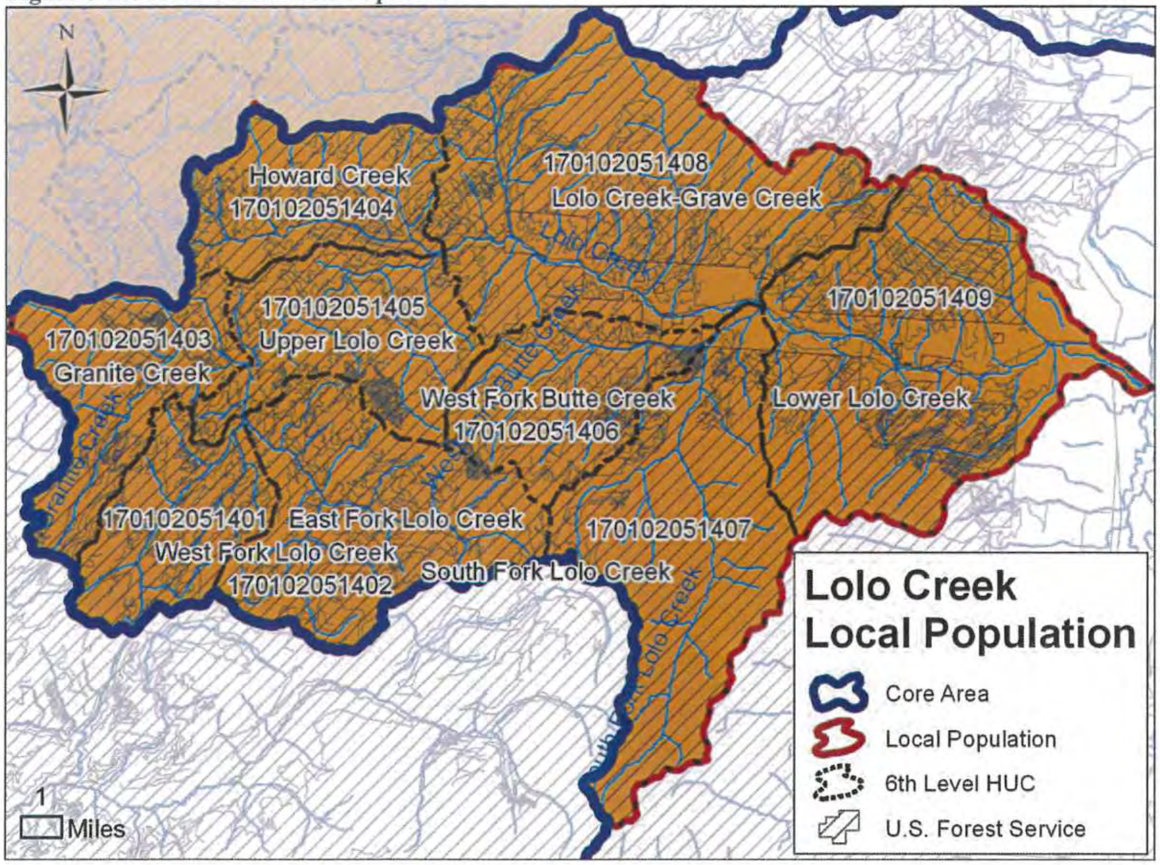
Natural Recovery Value 65 or 90% – Road may not be driven by any vehicles. Road surface is very well vegetated with trees and brush and shallow humus layer established. Road profile is deteriorating and road surface is less visually dominant. Cuts and fills have trees and other vegetation like adjacent forested environment.

Natural Recovery Value 75 or 100% – Road may not be driven by any vehicles. Road surface and cuts and fills have humus, trees and other vegetation like adjacent forested environment. Road profile has deteriorated and road profile is no longer visually dominant.

Attachment B

Local Population: Lolo Creek

Figure 6-38. Lolo Creek Local Population



Relative Importance of Population to Core Area (H,M,L): M

Table 6-14. Lolo Creek Local Population Summary

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
0-50 Migratory 250-500 Res	Stable	Resident, Connected	0 (migratory)	High. Lolo Creek and most tributaries contain brook trout, although the South Fork (one of the known tributaries containing bull trout) is relatively free of non-natives in the upper half.

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
High – Lolo Creek is the only large watershed in the lower half of the Bitterroot River. For long-term recovery of bull trout, this watershed seems to be necessary.	Low. This is a large, high elevation watershed in a high precipitation zone, with some of the colder water temperatures on the forest (in tributaries, not the mainstem).	High. The middle and upper South Fork Lolo Creek are unique in that they contain a large patch of relatively pristine habitat with no non-native fish species and high bull trout densities.

Temperature: Temperatures are elevated due to the highway and logging roads. There are opportunities to improve temperature patterns by removing logging roads and improving riparian vegetation and function. There is little opportunity to reduce the effect of Highway 12 on temperatures. However, working with the State DOT to reduce brushing may have some benefit.

Barriers: The only known barrier on streams capable of supporting bull trout is Snowshoe Falls, which is a natural waterfall. There are likely smaller barriers that affect the transport of sediment and large woody debris, but these don't directly affect bull trout connectivity or movement patterns. There is a large diversion on the mainstem of Lolo Creek downstream of the South Fork (Maclay diversion) but fish passage at this site was addressed by MTFWP and TU in 2012.

Pools: The baseline indicator call for pools is FAR. This call is probably accurate for the Lee Creek portion of the HUC. However, the West Fork of Lolo Creek has few pools due to the presence of the highway, and would be rated FUR. There are opportunities to add large woody debris and create large debris jams in many places in Lee Creek.

Sediment: There are numerous opportunities to improve the sediment baseline. A large-scale roads analysis is necessary to identify the relative impacts and benefits of road removal for each road. While sediment levels are elevated in the HUC, the main direct source is the sanding of Highway 12. Cooperative discussions should be initiated to develop alternative practices to reduce sediment from this source. .

Most important activities to improve bull trout population:

1. Add large woody debris complexes Lee Creek to create large, complex pool habitat.
2. Identify road related sediment issues and implement actions to eliminate these.
3. Coordinating with FWP to consider management that reduces numbers and distribution of non-native trout if it would benefit bull trout recovery in the Core Area.

Individual HUC6 (w/in Local Pop) attributes and strategies, based on above factors

HUC6 (name and #): East Fork Lolo Creek - 170102051402							
Strategy (Active Restoration, Passive Restoration, Conserve): Active Restoration							
% Forest Service Ownership in HUC: 100%							
Relative Contribution of Habitat in Limiting Local Population: High							
Functional Significance to Local Pop: High							
Indicator	Current Baseline Condition	Proposed Baseline Condition	Timeframe to change baseline	Recovery Priority (1,2,3)	Estimated Cost to Complete	Expectation of population response (H,M,L)	Timeliness of opps (H,M,L)
Temperature	FUR	FAR	10 years	3	$100,000	H	M
Barriers	FAR	FA	10 years	3	$100,000	M	M
Pools	FAR	FA	10 years	3	$100,000	H	H
Sediment	FUR	FAR	10 years	3	$200,000	H	M

This HUC contains the East Fork of Lolo Creek and Lost Park Creek. Lost Park Creek is a tributary to the East Fork, and supported a resident population of bull trout up until the last several years. This HUC is critical in the long-term recovery of bull trout in Lolo Creek because it contains miles of suitable spawning habitat and the stream systems are relatively large. They also maintain cold water due to the high elevation, high precipitation zone that the HUC lies in. There are extensive road networks throughout the HUC. Many of these roads have been cost-share roads with Plum Creek, and therefore opportunities to remove them have been limited in the past. However, with the Montana Legacy Project, the Lolo National Forest now owns the roads, and there is an unprecedented opportunity to remove roads and restore both aquatic and terrestrial habitats at a large scale. In addition, there are currently high densities of brook trout in the HUC, and discussions with FWP regarding brook trout suppression seem timely.

Temperature: Temperatures the East Fork are low; however, they are likely elevated above natural due to roads, past grazing, and impacts from riparian harvest. There are opportunities to improve temperature patterns by removing roads and improving riparian vegetation and function. In addition, adding large woody debris to the East Fork and Lost Park Creek would indirectly improve temperature patterns while directly improving pools.

Barriers: Known barriers on LNF administered bull trout streams have been removed over the last several years. However, it is very likely that there are barriers on old Plum Creek roads, and an intensive assessment of these, along with recommendations for removal, is necessary as a first step. Following this, removal of any critical barriers would be important in the short-term.

Pools: The baseline indicator call for pools is FAR. While there is some pool habitat available in low gradient reaches of these streams, there is an overall lack of large, debris created pools that bull trout rely on. With the change in ownership, and the remoteness of the HUC relative to main road systems, there is a prime opportunity to develop large debris jams on both the East Fork and Lost Park Creek. In addition, there are opportunities to add large wood to the channel to allow the natural process of pool formation to occur. This is a high priority project in the HUC.

Sediment: There are numerous opportunities to improve the sediment baseline. A large-scale roads analysis is necessary to identify the relative impacts and benefits of road removal for each road. It is likely that there will be significant opportunity to reduce sediment by significantly reducing road densities in the HUC.

Most important activities to improve bull trout population:

1. Add large woody debris complexes and large individual pieces to the East Fork and Lost Park Creek to create large, complex pool habitat.
2. Determine whether barriers exist on previously owned and managed Plum Creek roads and take actions to address these.
3. Undertake a large-scale roads analysis to determine the minimum road system necessary and maintainable given likely LNF road maintenance budgets. Take actions to eliminate roads that are resulting in added sediment to streams.
4. Coordinating with FWP to consider management that reduces numbers and distribution of non-native trout if it would benefit bull trout recovery in the Core Area.

6.2 East Fork, Granite Creek, Lee Creek, and Lost Park Creek Road Allocations and TMDL

The reduction in human loading for all five streams in Upper Lolo TPA is shown in Table 15. These reductions were derived using the same approach discussed in Section 6.1. As this is a non-point source TMDL, no waste load allocation is necessary. The load allocation for the East Fork, Granite Creek, Lee Creek and Lost Park Creek are based on modeled sediment delivery given planned road BMP improvements and road closures on Lolo National Forest and Plum Creek lands. These load allocations also include estimates of natural background sediment loading as discussed in Section 4.7. As discussed above in Section 6.1, the allocations in the West Fork Lolo Creek were divided between U.S. Highway 12 and forest roads.

Table 15. Load allocations, percent reductions and TMDLs for the Upper Lolo TPA (all values are in tons/year).

Granite Creek	
Natural Load	449
Existing Forest Roads Load	96
Total Load	545
Reduction from Forest Roads	50 (52%)
TMDL	495
Lee Creek	
Natural Load	95
Existing Forest Roads Load	9
Total Load	104
Reduction from Forest Roads	5 (56%)
TMDL	99
Lost Park Creek	
Natural Load	192
Existing Forest Roads Load	21
Total Load	213
Reduction from Forest Roads	9 (43%)
TMDL	204
East Fork Lolo Creek	
Natural Load	596
Existing Forest Roads Load	53
Total Load	649
Reduction from Forest Roads	19 (36%)
TMDL	630
West Fork Lolo Creek	
Natural Load	246
Existing Forest Roads Load	19
Existing Highway 12 Load	425-518
Total Load	690-783
Reduction from Forest Roads	6 (33%)
Reduction from Highway 12	140-171 (33%)
TMDL	543-605

Total Maximum Daily Load Allocations

Achievement of the targets will reduce the annual TMDLs of human-caused fine sediments in these streams by 33 to 64 percent. Through implementation and mitigation efforts outlined in this WQRP, the annual human-caused forest road/Highway 12 sediment input into West Fork Lolo Creek would be reduced by 33 percent from 690-793 tons to 531 - 593 tons. Concurrently, the annual anthropogenic load from forest roads will be reduced in the East Fork Lolo Creek by 36 percent from 53 tons to 34 tons, in Granite Creek by 52 percent from 96 tons to 46 tons, in Lee Creek by 56 percent from 9 tons to 4 tons, and by 43 percent in Lost Park Creek from 21 tons to 12 tons (see Table E –3).

Table E - 3. Upper Lolo Waterbodies' TMDL Load Allocations.

TMDL Allocations *in tons per year unless otherwise indicated*						
Stream	**Road Loads After TMDL Reduction (tons/year)**	**Percentage Reduction in Road Sediment & Traction Sand %**	**TMDL (tons/year)**	**Current Loads from Roads (tons/year)**	**Current Natural Sediment (tons/year)**	**Total Current Sediment (tons/year)**
West Fork Lolo Creek	12 (Forest roads) 285-347 (Hwy. 12)	33% 33%	**543-605**	19 (Forest roads) 425-518 (Hwy. 12)	246	690-783
East Fork Lolo Creek	34	36%	**630**	53	596	649
Granite Creek	46	52%	**471**	96	449	545
Lee Creek	4	56%	**97**	9	95	104
Lost Park Creek	12	43%	**199**	21	192	213

Improvement Strategy and Monitoring

The implementation methods include:

- upgrade remaining forest roads to meet Montana Forestry BMPs;
- reclaim forest roads that are surplus to the needs of forest land managers;
- improve inspection and maintenance of existing culverts;
- implement Montana's Forestry BMPs on all timber harvest operations;
- upgrade undersized culverts over time to better accommodate large floods;
- further reduce sediment delivery from U.S. Highway 12, through improved use and maintenance of sediment traps, plowing techniques, and guardrail cleaning; and
- correct those priority fish passage barriers that are significantly affecting the connectivity of native fish habitats.

1.0 BACKGROUND

The following impaired waterbodies are included within the boundaries of the Upper Lolo TMDL Planning Area (TPA) (**Appendix B**):

- East Fork Lolo Creek
- Granite Creek
- Lee Creek
- Lost Park Creek
- West Fork Lolo Creek

Pollutants of concern include the following (**Appendix C**):

- Sediment

Within the Upper Lolo TPA, the most significant pollutant sources include (**Appendix E**):

- Forest roads
- US Highway 12

At the time that the TMDL was written, there were only two major landowners in Upper Lolo TPA: the U.S. Forest Service (Lolo National Forest) and Plum Creek Timber Company. Between 2008 and 2010, ownership of nearly all the Plum Creek land in the Upper Lolo TPA was transferred to the Lolo National Forest through a major land purchase and transfer known as The Montana Legacy Project. The transfer was facilitated by The Nature Conservancy and The Trust for Public Land (The Montana Legacy Project, 2010).

In 2005, the Lolo National Forest signed a Decision Notice, allowing the Forest to implement an Environmental Assessment (EA) with the commitment to remove or replace 22 culverts, decommission 58 miles of roads, and do BMP upgrades on 35 miles of major roads (Greenup and Mickelson, 2010). Most of the watershed restoration that has been completed thus far was completed following the EA for Upper Lolo Watershed Restoration.

The Lolo Watershed Group (LWG) is the main non-governmental organization (NGO) dedicated to watershed restoration in the Upper Lolo TPA. The LWG currently has a Section 319 grant to develop a Watershed Restoration Plan (WRP). The WRP will outline sources of impairment, management actions, estimated load reductions, estimated technical and financial assistance that will be needed for restoration and provide an estimated time frame to complete specific projects. It is expected that this plan will be completed by June 30, 2011 (Sturgis, Wendy, personal communication 11/1/2010).

2.0 TMDL-Recommended Activities

The TMDL document recommends specific restoration activities for addressing sediment within the Upper Lolo TPA. These recommendations were made based on the TMDL load allocations for forest roads and US Highway 12 (**Appendix C**). In addition, the TMDL document made recommendations for fish passage. These recommendations are as follows:

- Upgrade remaining forest roads to meet Montana Forestry BMPs,
- Reclaim forest roads that are surplus to the needs of forest land managers,
- Improve inspection and maintenance of existing culverts,
- Implement Montana's Forestry BMPs on all timber harvest operations,
- Upgrade undersized culverts over time to better accommodate large floods,
- Further reduce sediment delivery from US Highway 12 through improved use and maintenance of sediment traps, plowing techniques, and guardrail cleaning, and,
- Correct priority fish passage barriers that are significantly affecting the connectivity of native fish habitats.

The TMDL's water quality-monitoring plan has the following objectives:

1. Document water quality trends associated with proposed implementation efforts.
2. Establish additional permanent monitoring sites and collect additional data within the TPA to help better define water quality targets.
3. Monitor progress towards meeting water quality targets.
4. Conduct an adaptive management strategy to fulfill requirements of [the TMDL].

To help achieve these objectives the TMDL document recommends the following types of monitoring activities:

- Establish permanent bench-marked cross-sections where channel pattern, dimension and profile can be tracked through time using Rosgen Level II parameters (width/depth ratios, entrenchment ratios and sinuosity) and techniques,
- Collect additional parameters (pool frequency, pool residual depth),
- Particle size distribution data should be collected using Wolman pebble count procedures through riffles at the established cross-sections,
- Conduct a road sediment assessment using the Forest Road Survey (FRS) for select watersheds in which recent forest management activities have taken place,
- Monitor for fish redds and fine sediment, and associated documentation of the results, on a yearly basis,
- Monitor population status of native salmonid species and report finding to DEQ,
- Update an assessment of channel conditions and other geomorphic indicators for the whole length of the Lolo Creek Watershed to help determine existing conditions and help track potential future impacts to this important waterbody and to tie in with future downstream TMDL development,
- Track the effectiveness of BMPs on forest roads and US Highways 12 and other mitigation measures at meeting targets. This could be done by comparing existing instream data to data following upgraded practices and mitigation measures,
- Develop a database using the Forest Service's significant amount of stream data on potential reference reaches with the TPA to help guide future target setting and evaluation for waterbodies in Lolo Creek and elsewhere in the Bitterroot Basin, and,

3.0 Indicators of Progress

Indicators of progress towards achieving Upper Lolo TMDL targets generally fall into one of three major categories: 1) Restoration, 2) Monitoring, and 3) Planning.

3.1 Restoration

The extent of completed restoration work and how it compares to the TMDL load allocations represents a significant indicator of progress towards meeting TMDL targets.

In 2006, Plum Creek demonstrated a 9% reduction in road sediment delivery to Granite Creek between 1998 and 2005 (Sugden, 2010). Reductions between 2005 and 2009, when Plum Creek sold its lands to The Nature Conservancy, were not accounted for in this evaluation. Plum Creek Timber Company completed the sale of lands in the Upper Lolo TPA to The Nature Conservancy by February 2009. At that time Plum Creek had upgraded 95% of the roads in the Granite Creek, East Fork Lolo Creek and West Fork Lolo Creek drainages to meet state BMP standards and decommissioned 0.4 miles of forest roads. Plum Creek also corrected numerous fish passage barriers in cooperation with the Lolo Nation Forest as a cost-share partner (Sugden, 2010).

The Lolo National Forest has done a significant amount of restoration in the Upper Lolo TPA. This restoration work was completed based on the commitment outlined in the 2005 Decision Notice from the Lolo National Forest. Work completed through the spring of 2010 includes the removal of 37 culverts, and decommissioning 64.89 miles of forest roads within the TPA, which exceeds the 2005 commitment for road decommissioning and culvert removal. Work yet to be completed includes BMP upgrades to an additional 35 miles of major roads and improving an additional 11 culverts (Greenup and Mickelson, 2010). The decommissioning of roads should bring forest roads closer to the designated TMDL load allocations for sediment. The removal or replacement of culverts should improve fish passage, and as of 2010, has made over 10 miles of upstream habitat accessible (Greenup and Mickelson, 2010).

The Montana Department of Transportation (MDT) has also taken action to implement the TMDLs for the West Fork Lolo Creek, by decreased application of road sand and increased sand recovery from US Highway 12 during the winter maintenance season. During the 2002-2003 winter maintenance season, MDT estimated that 1,238 tons of road sand were applied to US Highway 12 in the Upper Lolo TPA. This was compared to an estimated 3,300 tons in the 1999-2000 season (Montana Department of Transportation, 2004). In 2008, 778 tons of road sand were applied, while 480 tons were recovered, resulting in 298 net tons of road sand applied to US Highway 12 during the 2008 winter maintenance season (Montana Department of Transportation, 2009). MDT also began using ditch blocks of river cobble and coarse gravel to slow runoff and allow suspended solids to settle out (Montana Department of Transportation, 2004)(**Appendix D**).

An environmental assessment (EA) was completed in April 2010 for the Kearl Module Transport Project which would require modifications to US Highway 12, by Imperial Oil, in the Upper Lolo TPA to accommodate oversized loads (Tetra Tech, 2010). At the time of this evaluation, MDT is not anticipating using additional traction sand on US Highway 12 during the winter maintenance season due to oversized loads. In addition, Imperial Oil's contractor would be required to utilize appropriate BMPs during

4.0 Recommendations for Additional Work

Suggestions for additional restoration work are outlined below:

- Continue to implement recommendations as outlined in the TMDL and summarized in Section 2 of this evaluation; specifically, reclaiming surplus forest roads, and implementing BMPs on forest roads and timber harvest operations. After BMP implementation, consider an assessment that estimates reductions of road sediment.
- Continue implementation of the Forest Service's 2005 Decision Notice; specifically, culvert replacement and forest road BMPs.
- Increase monitoring activities as outlined in the TMDL document and summarized in Section 2 of this evaluation, and report findings to DEQ.
- Complete the watershed restoration plan for the Lolo Watershed.
- Continue implementation of BMPs from the TMDL for US Highway 12 and report findings to DEQ.
- Continue to document winter maintenance activities on US Highway 12 by MDT. Submit annual reports to DEQ summarizing these activities and specifically address any changes in management and how those compare to the maintenance activities, BMPs and loads set forth in the TMDL document.

APPENDIX C – TMDL TABLES

Table C-1: (TMDL Table E-1) Waterbodies and Pollution Sources*

Segment Name	Waterbody Number	Length (mi)	Probable Causes	Probable Sources
West Fork Lolo Creek	MT76H005_05	6.8	Other habitat alterations, Siltation	Silviculture- habitat modification-other than bank or shoreline modification hydromodification/destabilization; Highway maintenance and runoff
East Fork Lolo Creek	MT76H005_04	7.4	Other habitat alterations, Siltation	Silviculture-logging road construction/ maintenance
Granite Creek	MT76H005_03	8.5	Other habitat alterations, Siltation	Silviculture-logging road construction/ maintenance
Lee Creek	MT76H005_07	3.8	Other habitat alterations, Siltation	Silviculture- logging road construction/ maintenance; Habitat modification-other than bank or shoreline hydromodification/destabilization
Lost Park Creek	MT76H005_06	5	Other habitat alterations, Siltation	Silviculture- logging road construction/ maintenance

**TMDL Table E-1 can be found on page v of the final TMDL document.*

Table C-2: (TMDL Table 12) In-stream Targets for the Upper Lolo TPA*

Life Stage & Channel Stability	Parameter	Targets	
		Stream Type**	
Embryo Development	Percent fines < 2 mm	A	22%
		B	16%
		C	21%
Emergence	Percent fines < 6 mm	A	31%
		B	21%
		C	30%

**TMDL Table 12 can be found on page 36 of the final TMDL document.*
*** Based on Rosgen stream type classification (Rosgen, 1996).*

Table C-3: (TMDL Table 13) Performance-Based In-Stream Targets for the Upper Lolo TPA*

Life Stage & Channel Stability	Parameter	Targets
Rearing	Pool Frequency	Established following both reference and response reach data collection*
Channel Structure/Stability	V**	
Channel Structure/Stability	Entrenchment Ratio	
	Width/Depth Ratio	
	Sinuosity	

**TMDL Table 13 can be found on page 37 of the final TMDL document.*
*** Explanation of data collection is outlined in Section 8-of the TMDL document*

Table C-4: (TMDL Table 15) Load Allocations and Percent Reductions*

Pollutant: Sediment Waterbody	Source	Existing Load (tons per year)	Allocation (tons per year)	Load Reduction
West Fork Lolo Creek	Forest Roads, Highway 12	690-783	543-605	33%
East Fork Lolo Creek	Forest Roads	649	630	36%
Granite Creek	Forest Roads	545	471	52%
Lee Creek	Forest Roads	104	97	65%
Lost Park Creek	Forest Roads	213	199	43%

**TMDL Table 15 can be found on page 42 of the final TMDL document.*

Restoration opportunities for the Lolo Creek watershed include:

- Restore water to the drainages by ensuring only valid water rights users are diverting water
- Place fish screens on ditches
- Remove fish passage barriers such as irrigation dams and inadequate culverts to help restore fish movement through the drainages
- Reclaim excess logging roads
- Maintain needed roads using BMPs to reduce sedimentation.
- Ameliorate damage from the history of intensive timber management by
    - Limiting logging in heavily logged areas
    - Restricting logging in riparian zones
    - Recruiting large woody debris to increase habitat complexity in streams
- Educate landowners and developers on the risks of building too near waterways
- Encourage restoration native riparian vegetation along streambanks
- Help landowners facing streambank erosion to develop stabilization plans that do not transfer the stream's energy downstream (such as using soft stabilization techniques rather than riprap)
- Manage irrigation water more efficiently
- Encourage water rights holders who are not using the water to return water rights to instream flow through cooperation with the Clark Fork Coalition
- Restore meanders to Lolo Creek to decrease the effects of channelization on downstream property owners. (This would involve creating bridges or culverts on Highway 12,)

Restoration opportunities and recommendations

Table 4.2. Restoration opportunities (Zelazny, 2004, 2006) by subbasin/tributary/mainstem section.

Bitterroot Subbasin	*Creeks of Lolo Creek*	*Restoration Opportunities*
West Fork of Lolo Creek 1401	West Fork of Lolo Creek	1, 5, 6
	Lee Creek Separate in TMDL document only	5, 2
East Fork of Lolo Creek 1402	East Fork of Lolo Creek	2, 5, 6, 11
	Lost Park Creek	1, 2, 5, 6, 11
Granite Creek 1403	Granite Creek	1, 2, 5, 6, 11
Howard Creek 1404	Howard Creek	1, 2, 5, 6, 11
Upper Lolo Creek 1405	Davis Creek	1, 2, 5, 6, 11
	Chief Joseph Gulch	1, 5, 6, 11

Bitterroot Subbasin	***Creeks of Lolo Creek***	***Restoration Opportunities***
	Cloudburst Creek	1, 5, 6, 11
	Martin Creek	
West Fork Butte Creek 1406	West Fork Butte Creek (within South Fork of Lolo Creek)	1, 2, 5, 6
South Fork of Lolo Creek 1407	South Fork of Lolo Creek (less West Fork Butte Cr.)	3, 5, 6, 10
Lolo Creek - Grave Creek 1408	Grave Creek and East Fork of Grave Creek	1, 5, 6, 11
	Clark Creek	1, 5, 6, 11
	Bear Creek	1, 2, 5
	Camp Creek	1, 3, 4-6, 11
	Woodman Creek	1-6, 11
Lower Lolo Creek 1409	Sleeman Gulch	little influence on watershed health
	Tevis Creek	1, 2, 3, 10
	Mill Creek	1,3, 4, 9
	John Creek	3, 7, 8
	Mormon Creek	1-6

Key to codes in table:
Restoration opportunities as noted in Zelazny (2004, 2006)
1. Recruit large woody debris
2. Remove inadequate/damaged culverts
3. Maintain instream flows
4. Screen irrigation diversions
5. Reduce sedimentation through BMPs
6. Remove unneeded roads
7. Reconnect to Lolo Creek main stem
8. Repair damage to springs
9. Remove illegal diversions
10. Manage livestock grazing
11. Restrict silviculture to areas away from creek (Forest BMPs)

Table 6.1 The educational and outreach goals, objectives and proposed tasks.

GOAL:	OBJECTIVE:	TASKS / ACTIVITIES:	PROPOSED PARTNERS	POSSIBLE FUNDING SOURCES
1. Increase public awareness & knowledge of impacts of human activities on the watershed	**a.** Develop community and school-based **educational programs, events and materials** that focus on non-point source pollution, BMPs, human impacts on water quality, water quantity, stream health, weeds and wildlife	Determine priorities; define audiences; develop content & messages; decide delivery mechanisms/methods; develop evaluation & assessment plan; collaborate with partners to obtain funding & maximize resources. Examples: field trips, landowner tours, booths at local fairs, publications, newsletters, presentations at public meetings, monitoring programs.	LWG, DEQ, LNF, MslaCD, FWP, RI, CFC, WQD, WEN, BWF, Weed District	DEQ, DNRC, Msla CD WQD Private foundations
	b. Provide guidance, references, resources and technical assistance to landowners, educators, partners & local organizations to facilitate use of BMPs	Promote & publicize stakeholder agencies/partners and their available resources (permitting, funding and technical expertise) at local meetings, venues & events; provide information on permitting processes; continue to assist landowners with 310 permits, cost-share grant proposals, weed district grants, etc	LWG, DEQ, LNF, MslaCD, FWP, WQD, CFC, DNRC, Weed District	
2. Increase public participation in citizen-based stewardship and conservation activities	**a.** Develop community and school-based **stewardship programs** based on high-priority restoration projects that advance overall watershed goals	Develop volunteer recruitment, training, recognition & retention plan; utilize research & activities that foster stewardship; set targets & timeline for volunteer rates; collaborate with partners to publicize & promote activities. Examples: same as above	LWG, DEQ, LNF, FWP, RI, CFC, , Msla CD, WEN, Trout Conservancy, BWF, TU, UM Watershed Health Clinic,	DEQ, DNRC, Msla CD WQD Private foundations

Chapter 10. Technical Monitoring and Analysis Plan

EPA Element 9. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established in the chapter above.

Upper and Lower Lolo Creek TMDL Planning Areas

To help achieve the TMDL objectives, DEQ_PPA_WQPB_WPS 2010 recommends the following types of monitoring activities:

1. Establish permanent bench-marked cross-sections where channel pattern, dimension and profile can be tracked through time using Rosgen Level II parameters (width/depth ratios, entrenchment ratios and sinuosity) and techniques,
2. Collect additional parameters (pool frequency, pool residual depth),
3. Collect particle size distribution data using Wolman pebble count procedures through riffles at the established cross-sections,
4. Conduct a road sediment assessment using the Forest Road Survey (FRS) for select watersheds in which recent forest management activities have taken place,
5. Monitor for fish redds and fine sediment, and associated documentation of the results, on a yearly basis,
6. Monitor population status of native salmonid species and report findings to DEQ,
7. Update an assessment of channel conditions and other geomorphic indicators for the whole length of the Lolo Creek Watershed to help determine existing conditions and help track potential future impacts to this important waterbody and to tie in with future downstream TMDL development,
8. Track the effectiveness of BMPs on forest roads and US Highways 12 and other mitigation measures at meeting targets. This could be done by comparing existing instream data to data following upgraded practices and mitigation measures,
9. Develop a database using the Forest Service's significant amount of stream data on potential reference reaches with the TPA to help guide future target setting and evaluation for waterbodies in Lolo Creek and elsewhere in the Bitterroot Basin, and,
10. Use data and information to assist the current Clark Fork/Bitterroot model efforts that are being developed.

Additional Monitoring for Lower Lolo Creek public and private ownerships

1. Continue stream flow and temperature monitoring partnership with the Clark Fork Coalition, adding one or two additional sites to collect data below the confluence with the South Fork of Lolo Creek and above the OZ Ranch water right. Monitor for flow and temperature changes as streamside vegetation and stabilization projects are completed.
2. Establish a USGS gauging station near the historical site of the Sleeman Creek station to continue the record of output flow from Lolo Creek. Observe flow rate changes through years to observe the effects of timberland revegetation, excess road removal, stabilization and revegetation projects.
3. Develop a database of ground water quality values from public ground water wells in the Lolo Creek watershed, both historical and ongoing to monitor changes in ground water quality.

Pre-project conditions on the West Fork of Lolo Creek and Lee Creek

Summer 2019

Tributary confluence with West Fork

Sediment below project culvert

Partially blocked culvert to be removed

WestSlope Chapter
Trout Unlimited

October 24th, 2019

Re: Lee Creek/West Fork Sediment Reduction Project

To Whom It May Concern:

I am writing on behalf of WestSlope Chapter of Trout Unlimited in order to show our support of the Lee Creek/West Fork Sediment Reduction Project.

We have always been in favor of the decommissioning of roads and their associated culverts that have historically added sediment to the Clark Fork and surrounding watersheds. We have supported many such projects financially as part of our work. When a large-scale well planned project such as this one has objectives that include monitoring for project effectiveness and outreach to educate members of the community and government agencies, we couldn't be more pleased.

The main goals of WestSlope Chapter of Trout Unlimited are to conserve, protect and restore our area's cold-water fisheries and their watersheds. These goals also include educating the public on the importance of clean cold water and healthy fisheries. For these reasons WestSlope Chapter of Trout Unlimited supports the Lee Creek/West Fork Sediment Reduction Project, both philosophically and financially.

Sincerely,

Mark Kuipers
President, WestSlope Chapter of Trout Unlimited

PO Box 7165, :\1issoula, Mon1a11a 59807-7 l(iS | \Vcst.SlopcChaplcr.Tl·@gmail.m m | \VcsL5lopcChaplcrTl·.org

Lolo Watershed Group

October 21, 2019

TO: Hannah Riedl
Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901

RE: Lee Creek/ West Fork Sediment Reduction project

Dear Hannah,

Lolo Creek has been classified as impaired due to sedimentation throughout many tributaries and the main stem of Lolo Creek. In the upper reaches of Lolo Creek, sedimentation sources include forest roads, some of which are no longer needed, with failing erosion control structures, and failing or undersized culverts. The Lolo Creek Watershed Restoration Plan specifies opportunities for improving the Lolo Creek cold-water fisheries and aquatic life and for reducing sedimentation. Those opportunities include removing roads that are no longer needed and removing inadequate culverts.

The project proposed by the Clark Fork Coalition will address sedimentation and fisheries concerns identified in the Lolo Creek Watershed Restoration Plan, and works towards completing the plan's suggestions for restoration projects on forest roads by mitigating sediment on another 11 miles. The Lolo Watershed Group supports this project proposal as a means to work toward meeting goals set in the Lolo Creek WRP.

Sincerely,

Kascie Herron

Kascie Herron
Lolo Watershed Group
P.O. Box 1354
Lolo, MT 59847
kherron@lolowatershed.org

USDA United States Department of Agriculture | Forest Service | Lolo National Forest Missoula Ranger District | Building 24A, Fort Missoula Missoula, MT 59804-7297 406 329-3750

Date: 10/18/2019

Dean Yashan
Water Quality Planning Bureau
Department of Environmental Quality
1520 E. Sixth Avenue
P.O. Box 200901
Helena, MT 59620-0901

Dear Mr. Yashan,

The Lolo National Forest supports the Clark Fork Coalition's grant application for the West Fork Lolo Creek watershed restoration work. The Clark Fork Coalition is applying for grant funds from the Clean Water Act Section 319 Nonpoint Source (NPS) Program to work with the US Forest Service to reduce human-caused sediment sources and improve habitat fragmentation. Primary goals are native fish connectivity and fulfilling TMDL responsibilities to reduce sediment deliveries to these streams. The Lolo National Forest fulfilled previous work to address TMDL responsibilities with the Upper Lolo Restoration project. This included 11 culvert replacements and nearly 100 miles of road decommissioning; however, more work is necessary to address needs on newly acquired industrial forest lands.

The Clark Fork Coalition and the Lolo National Forest have been working on cooperative projects for several years, including decommissioning 22 miles of roads in the East Fork Lolo and Granite Creek drainages, establishing nearly 80 permanent temperature monitoring stations across the forest, collecting stream discharge data for instream flow management, working to understand beaver habitat feasibility and reintroduction, and a completed climate change watershed vulnerability assessment. The Lolo National Forest continues to provide funding to these efforts when possible. As such, the Clark Fork Coalition and the Lolo National Forest have a track record of proven success and are now continuing the partnership with the West Fork Lolo Creek project. Our ongoing focus in West Fork Lolo Creek is because of TMDL responsibilities and its significance to cold water native fisheries.

Funds from the NPS Program are essential to completing on-the-ground reclamation projects and will be matched by state, federal, and private funds.

Thank you for the funding opportunity and your continued work for conserving natural resources. Please do not hesitate to contact me if you have any questions.

Sincerely,

Jen Hensiek
Missoula District Ranger

West Fork Lolo and Lee Watershed Road Sediment Reduction Monitoring

October 2019

Introduction/Summary

This report summarizes the potential reduction of road-generated sediment delivered to streams following road decommissioning and stream crossing restoration efforts in the West Fork Lolo and Lee watersheds. West Fork Lolo and Lee watersheds are a checkerboard of heavily roaded and logged former industrial timberlands and Forest Service lands. Recently, the industrial timberlands were purchased by the Nature Conservancy through the Legacy Lands Program and transferred to the Lolo National Forest. This consolidation has provided opportunities for the restoration of ecologically damaging and un-needed roads which are chronically delivering sediment into streams. This restoration will significantly improve water quality and aquatic habitat West Fork Lolo and Lee Creeks.

Field data was collected in July and August 2019 and included recording characteristics of the road, an inventory of road-stream crossings, and measurements of stream crossing fill volume. The Water Erosion Prediction Project (WEPP) model was run to estimate the amount of sediment currently generated from the roads, and the amount of sediment that may potentially reach streams. Additionally, the amount of fill at each road-stream crossing was estimated. Road-stream crossings can catastrophically fail during high flow events and deliver large amounts of sediment to streams.

A total of 11.1 miles of roads were identified in the field as having high levels of stream connection and in need of restoration treatment. WEPP modeling estimated that 99.6 tons of sediment was produced along roads each year, and that 49.8 tons of sediment was leaving the road buffer each year and being delivered into West Fork Lolo and Lee Creeks.

Twenty-nine road-stream crossings with culverts were recorded including 24 perennial streams and five intermittent streams. A total of 5,519 yds^3 of road fill was present at these crossings ranging from 27 yds^3 to 655 yds^3. This is the *maximum* amount of fill that could be lost in a catastrophic failure and would be excavated during stream crossing restoration. Additionally, 11 probable log culverts were inventoried on “jammer” roads where there was no culvert present, but water was flowing under the road. Baseline photo points were taken at 14 larger, perennial stream crossings which will be re-taken after restoration treatments.

Previous road decommissioning monitoring in the region has found a 97% reduction in chronic fine sediment delivery from roads, and that road-stream crossing failure risk was eliminated (Cissel et al. 2011). Using this as a guide, **road restoration in the West Fork Lolo and Lee watersheds will result in a reduction of 48.3 tons of road sediment delivered to streams each year. Additionally, up to of 5,519 yds^3 of vulnerable fill at stream crossings will be prevented from entering West Fork Lolo and Lee Creeks.**

Sediment Load Reduction Estimates

Roads built on granitic sediments are inherently unstable and highly susceptible to erosion – especially in areas that receive high precipitation such as the West Fork Lolo and Lee watersheds. This area has a very large road system which if left un-mitigated would continue to degrade water quality and aquatic habitat especially if there was a fire or additional forestry activities. However, this project will greatly reduce the amount of road-generated sediment reaching stream, and eliminate the risk of any stream crossing catastrophic failing in the future.

While forest roads have been found to be a major source of anthropogenic stream sediment (Al-Chokhachy et al. 2016), restoring roads has been found to reduce erosion and stream sedimentation to natural levels (Madej 2001, Switalski et al. 2004; Cissel et al. 2011, Sosa Pérez and MacDonald 2017). Recontouring roads improves water quality and benefits fish and other aquatic species. For example, reducing the amount of road-generated fine sediment deposited on salmonid nests can increase the likelihood of egg survival and spawning success (McCaffery et al. 2007). In addition, strategically removing or mitigating barriers such as culverts has been shown to restore aquatic connectivity and expand habitat (Erkinaro et al. 2017). Restoring roads in riparian areas may provide further benefits to fish and aquatic organisms by permitting reestablishment of streamside vegetation, which provides shade and maintains a cooler, more moderated microclimate over the stream (Meridith et al. 2014).

Long-term monitoring of decommissioned roads in granitic geology has resulted in dramatic declines in road-generated sediment. A study on the Lolo Creek Watershed on the adjacent Clearwater National Forest has found a 97% reduction in in road/stream connectivity (Cissel et al. 2011). Using the Geomorphic Roads Analysis and Inventory Package (GRAIP), they found a reduction of fine sediments from 38.1 tonnes/year to 1.3 tonnes/year along 3.5 miles of road. Furthermore, they found that restoring road/stream crossings eliminated the risk of culverts plugging, stream diversions, and fill lost at culverts (Table 1). The amount of sediment delivered to streams after road restoration is assumed to be reduced by 97%, and WEPP results were multiplied by 0.97 to determine how much sediment was prevented from entering streams.

Table 1. Summary of GRAIP road risk predictions for a watershed on the Clearwater National Forest road decommissioning treatment project (reprinted from Cissel et al. 2011).

IMPACT/RISK TYPE	EFFECT OF TREATMENT: INITIAL GRAIP PREDICTION
Road-stream hydrologic connectivity	-97%, -2510 m
Fine Sediment Delivery	-97%, -36.8 tonnes/yr.
Landslide Risk	Reduced to near natural condition
Gully Risk	Reduced from very low to negligible
Stream Crossing Risk -plug potential -fill at risk -diversion potential	 -100% eliminated at 9 sites -100%, 268 m^3 fill removed -100%, eliminated at 3 sites
Drain Point Problems	17 problems removed, 4 new problems

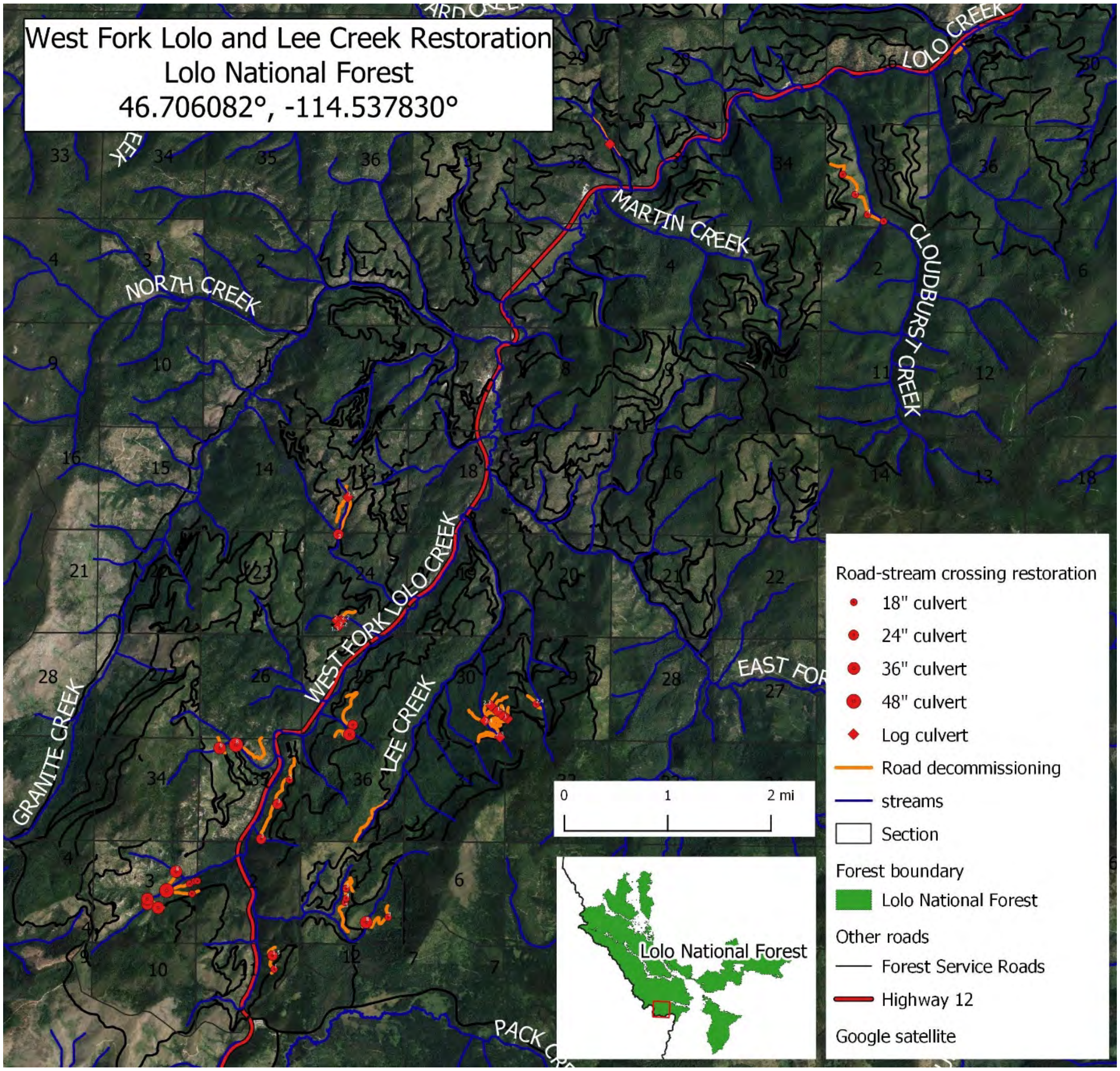


Figure 1: Overview map of the West Fork Lolo and Lee watershed restoration. Proposed roads for decommissioning are in orange while other Forest Service roads are in black. Metal culverts and log culverts proposed for restoration are in red. US Hwy 12 bisects the project and is displayed in red. The center of the project area is it roughly 46.706082°, -114.537830° at the confluence of Lee and West Fork Creeks. Maps at the 1:12,500 scale are included in Appendix B.

Modeling Road Sediment Production and Delivery to Streams Using WEPP

In order to estimate the reduction of road sediment production and delivery following restoration efforts, we used a physically-based erosion simulation model to estimate road erosion. WEPP (Water Erosion Prediction Project) predicts erosion from multiple forest road segments by inputting climate and soils information along with a number of road related characteristics (Laflen et al. 1997).

During field surveys, we identified 11.1 miles of road that were found to contribute significant amounts of sediment, or posed a high risk of road-stream crossing failure (Figure 1). Road characteristics were collected in the field and GIS (geographic information system) data was used to extrapolate the road grade and buffer grade. Data recorded on each segment included the road design, road surface, traffic level, road gradient, road segment length, road width, fill gradient, fill length, buffer gradient, buffer length, and percent of rock fragments. Some road segments on the map did not exist on-the-ground and other roads were identified during road surveys. These mapping errors were given to the Forest Service to update their INFRA road database.

Collected data was entered into the WEPP model online (http://forest.moscowfsl.wsu.edu/cgi-bin/fswepp/wr/wepproadbat.pl). A custom climate station was created at 5,409 ft elevation in the West Fork Lolo watershed which was estimated to receive 54.62 inches of precipitation (Table 2). The soil type was identified as sandy loam. Thirty years were simulated to estimate the annual sediment generated by the road (produced) and delivered beyond the road buffer - potentially delivering sediment into a stream. Conditions during log haul were modeled with insloped, bare ditch road design, and high levels of traffic.

Table 2: Summary of WEPP modeling input.

Parameter	Input
Average rainfall (in)	54.62
Elevation (ft)	5,409
Soil type	sandy loam
Years simulated	30
Total length of road (mi)	11.1

Sediment leaving the road (produced) and sediment leaving road buffer (delivered to stream) are the two main outputs for WEPP. Sediment leaving the road is an estimate of all erosion that takes place on the roadbed. Sediment leaving the road buffer is the sediment that is estimated to actually reach the stream. So while a road may be very erosive, if the buffer is big enough, very little sediment is modeled to reach the stream. Alternatively, you can have limited sediment production on a stream-side road, but the model would calculate that most of the sediment produced is being delivered to the stream. Table 3 summarizes the WEPP model output.

Table 3: Summary of WEPP modeling output for average annual sediment leaving road and buffer on 11.3 miles of roads proposed for decommissioning. Total and per mile sediment loss is reported.

	Total (tons/yr.)	Per Mile (tons/mi/yr.)
Average annual sediment leaving road	99.6	8.3
Average annual sediment leaving buffer	49.8	4.1

Estimating Road/Stream Crossing Fill Volume

Road-stream crossings create a major hazard in road systems and can be a significant source of road-derived sediment (Al-Chokhachy et al. 2016). If culverts are undersized or not maintained, they can become partially or fully blocked. During a high flow event such as a rain-on snow event they can over-top or fail entirely. When this happens, much or all of the fill over the culvert can be delivered into the stream system. Restoring road-stream crossings eliminates the risk of catastrophic stream crossing failures, has been found to significantly reduce sediment delivery to streams (Madej 2001, McCaffery et al. 2006), and restore aquatic connectivity (Erkinaro et al. 2017).

Twenty-nine culverts were measured in the field to estimate their fill volume (Table 5). This included 24 perennial streams and five intermittent streams. Fill volume was calculated to estimate the amount of fill that could erode into the stream system if the crossing fails. For restoration treatments, all of this fill will be removed and placed on a stable location, and no longer pose harm to aquatic resources. We used methods modified from Spreiter (1992) to calculate fill volume (see Appendix A).

Road-stream crossings fill volume ranged from 27 to 745 yds^3 and a total of 5,519 yds^3 of fill was found to be vulnerable to delivery to streams. This method represents the *maximum* amount of sediment that may erode if the road-stream culvert failed. Additionally, 11 probable log culverts were inventoried on "jammer" roads where there was no culvert present, but water was flowing under the road. These crossings were not included in the fill volume estimates, but would provide additional sediment reductions following full recontour.

Table 5: Estimated amount of road fill at each road-stream crossing.

Culvert #	Road #	Total fill (yds^3)	Fish Barrier
1	53442	194	
2	53442	114	
3	43119-E	655	Yes
4	43119-E	59	
5	43119-A	230	
6	43119-A	27	
7	43317	285	
8	43317	135	
9	43317	63	
10	43318	155	
11	43318	408	
12	43299	87	
13	43343	122	
14	43343	149	
15	43343	35	

Culvert #	Road #	Total fill (yds^3)	Fish Barrier
16	17903	167	Yes
17	43264	47	
18	43321	745	Yes
19	43322	156	
20	43332	126	
21	43332	231	
22	43332	255	
23	43330	98	
24	43330	125	Yes
25	43330	81	
26	43330	60	
27	43331	261	
28	43331	171	
29	43331	276	Yes
Total		**5,519**	

Fish Barriers

Five fish and other aquatic organism passage barriers were identified during road surveys (Table 5, Figure 2). Removing these culverts and restoring these road-stream crossings will restore aquatic connectivity and the length of available habitat for fish and other aquatic species (Erkinaro et al. 2017).

Photo-Points at Road/Stream Crossings

Photo-points were taken at 14 larger, perennial stream crossing adapted from Hall (2001). The smart phone application “Solocator - GPS Field Camera” was used for photo-points. This application takes photos with GPS coordinates, compass direction, altitude, and timestamp overlay. Photos were systematically taken from the downstream side of the road-stream crossing from a vantage point that clearly shows the entire restoration area (Figure 2). Photos will be re-taken after restoration efforts.

Figure 2: Examples of a road-stream crossing baseline photopoint.

QA/QC

InRoads Consulting, LLC Principal, Adam Switalski went into the field with Jed Whiteley (Clark Fork Coalition Monitoring Coordinator) and reviewed the field sites and monitoring protocol. Adam trained an InRoads Consulting, LLC field technician and two Forest Service hydrology field technicians. The data was collected on iPad tablets using ArcGIS collector. Field supervision, analysis, and reporting were conducted by Adam Switalski.

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Appendix A: Protocol for estimating stream crossing fill volume (reprinted from Bagley 1998, adapted from Spreiter 1992)

To estimate the amount of fill that could erode into the stream system if a crossing fails:

1. Measure the following with a tape measure:

- **CW1:** Natural channel width on upstream side of stream crossing fill
- **CW2:** Natural channel width on downstream side of stream crossing fill
- **W1:** Width of crossing on inside edge of road (perpendicular to stream)
- **W2:** Width of crossing on outside edge of road (perpendicular to stream)
- **L2:** Width of road bed in middle of crossing (parallel to stream)
- **S1:** Length of fillslope on upstream side of crossing
- **S2:** Length of fillslope on downstream side of crossing

2. Measure the following with a slope meter (in degrees):

(slope meters are available at outdoor gear stores)

- **FS1:** Angle of fillslope on upstream side of crossing
- **FS2:** Angle of fillslope on downstream side of crossing

3. Draw the crossing to scale on grid paper using a protractor and ruler

(use measurements acquired in the field)

4. Estimate the following from the scale drawing:

- **L1:** Horizontal distance from inside edge of road to bottom of upstream side of fill
- **L3:** Horizontal distance from outside edge of road to bottom of downstream side of fill
- **D1:** Vertical distance from inside edge of road to natural channel bottom
- **D2:** Vertical distance from outside edge of road to natural channel bottom

5. Calculate volume using the equations below:

First: Cross-sectional area calculation

$$A1 = \frac{D1\,(W1 + CW1)}{2} = \_\_\_\_\_\_ ft^2$$

$$A2 = \frac{D2\,(W2 + CW2)}{2} = \_\_\_\_\_\_ ft^2$$

Second: Volume calculation

$$V1 = \frac{A1 \times L1}{2.5} = \_\_\_\_\_\_ ft^3$$

$$V2 = \frac{(A1 + A2)\,L2}{2} = \_\_\_\_\_\_ ft^3$$

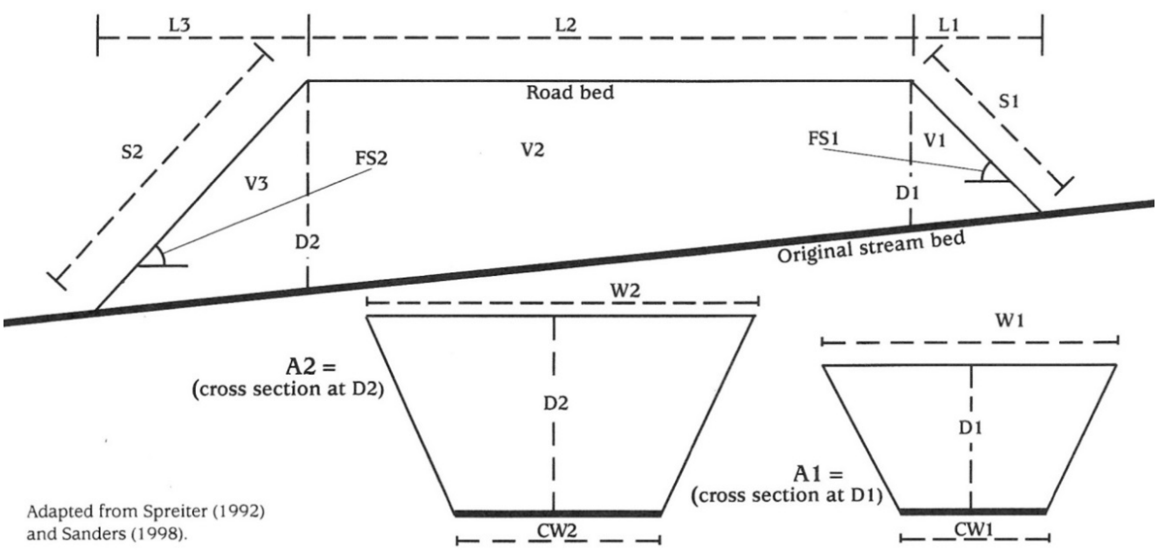
$$V3 = \frac{A2 \times L3}{2.5} = \_\_\_\_\_\_ ft^3$$

Third: Total estimated volume

$$VT = V1 + V2 + V3 = \_\_\_\_\_\_ ft^3$$

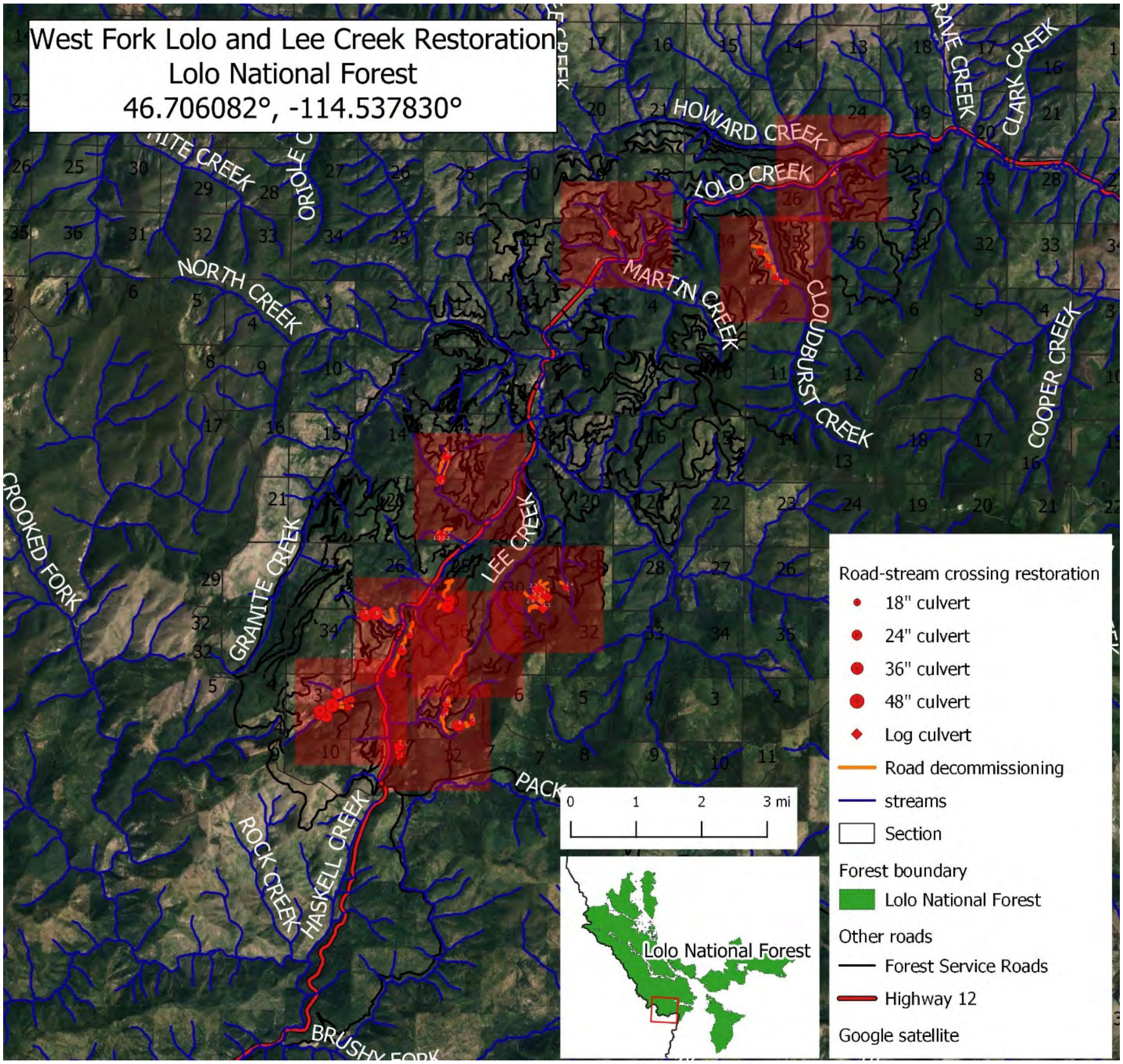
Total estimated volume in cubic yards

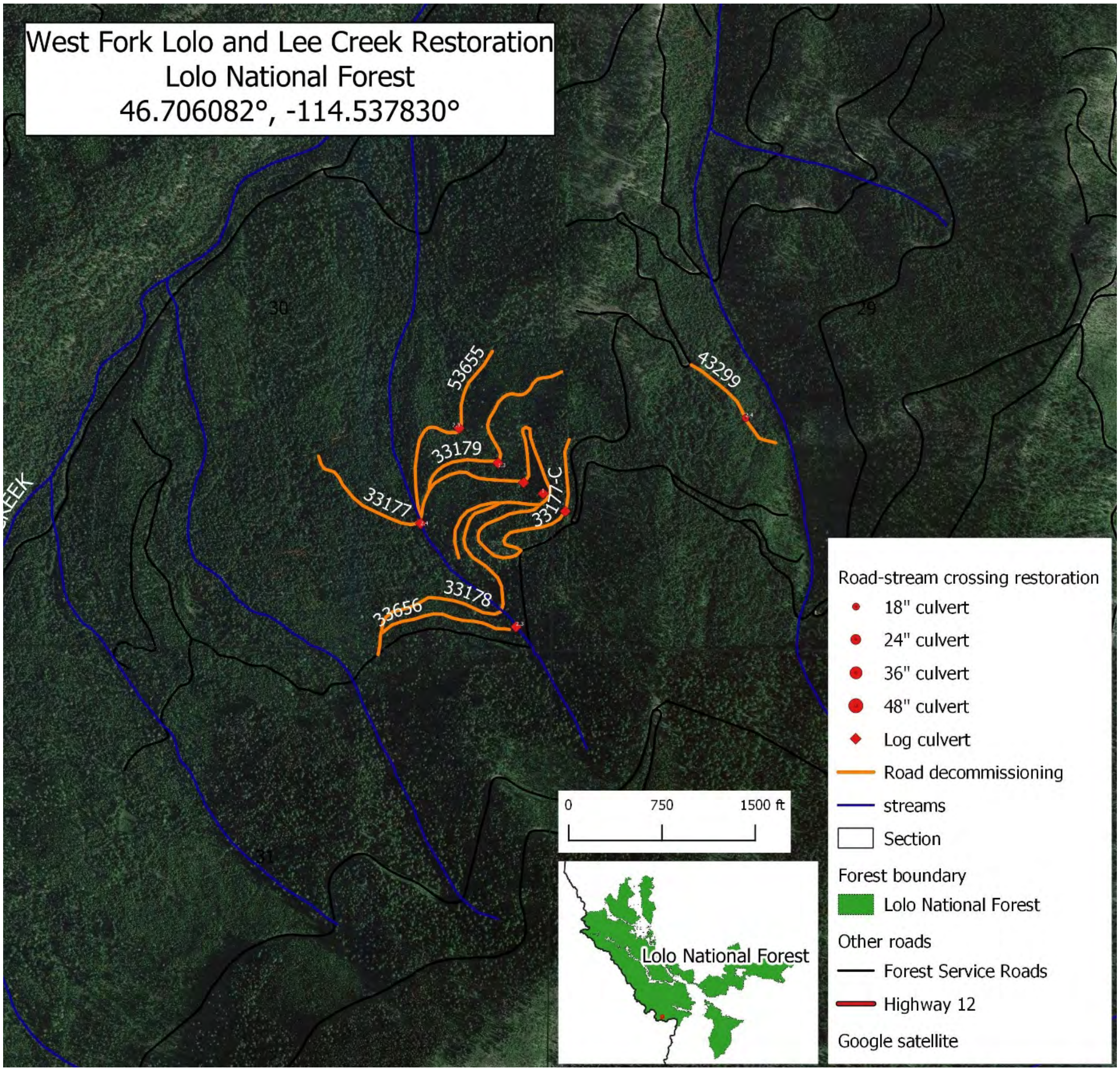
$$\frac{VT}{27} = \_\_\_\_\_\_ yds^3$$



Adapted from Spreiter (1992) and Sanders (1998).

Appendix B: Maps of proposed activities at 1:12,500 scale. All restoration work is on the Lolo National Forest.

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46.706082°, -114.537830°
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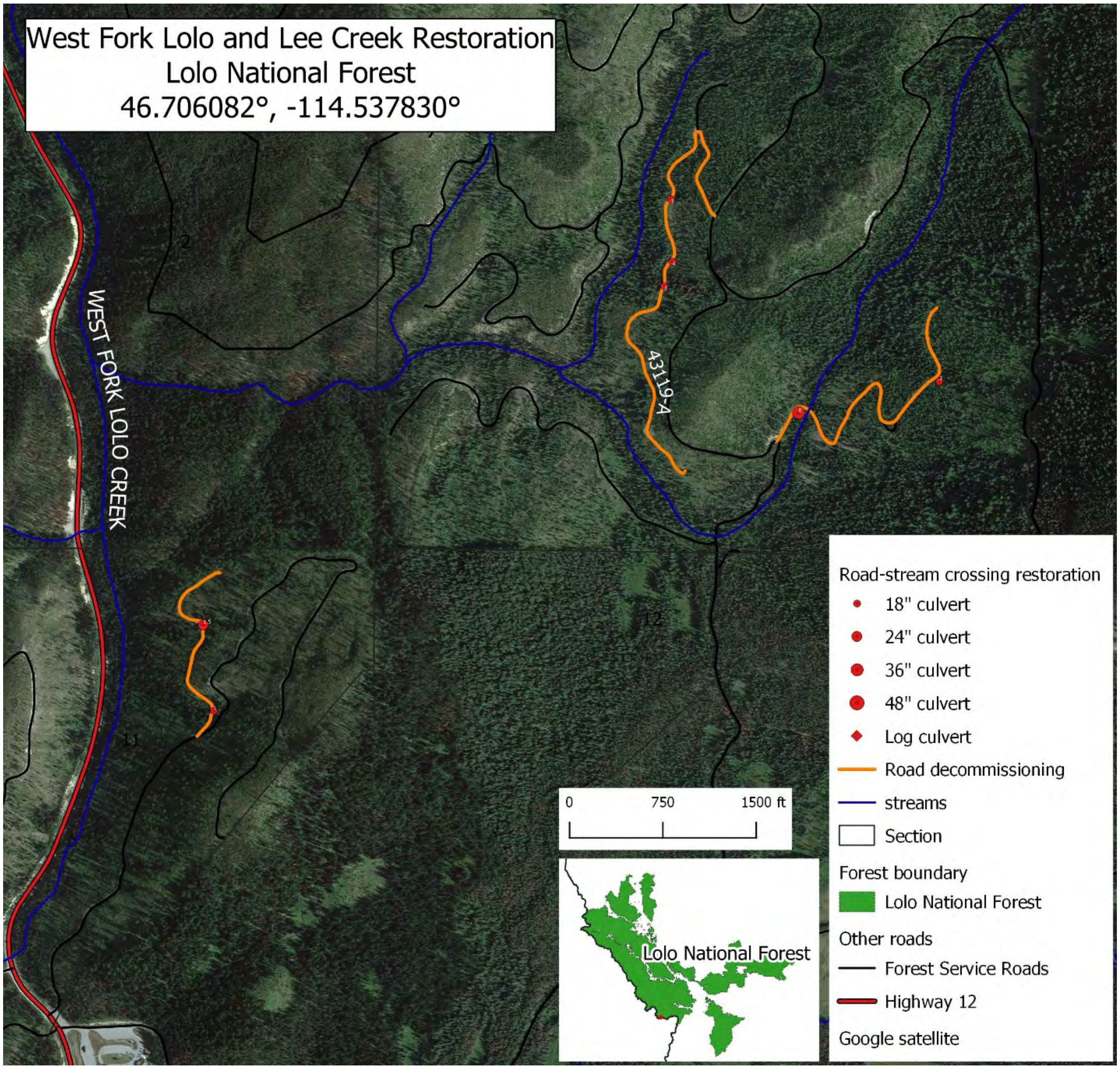
Lolo National Forest
Road-stream crossing restoration
18" culvert
24" culvert
36" culvert
48" culvert
Log culvert
Road decommissioning
streams
Section
Forest boundary
Lolo National Forest
Other roads
Forest Service Roads
Highway 12
Google satellite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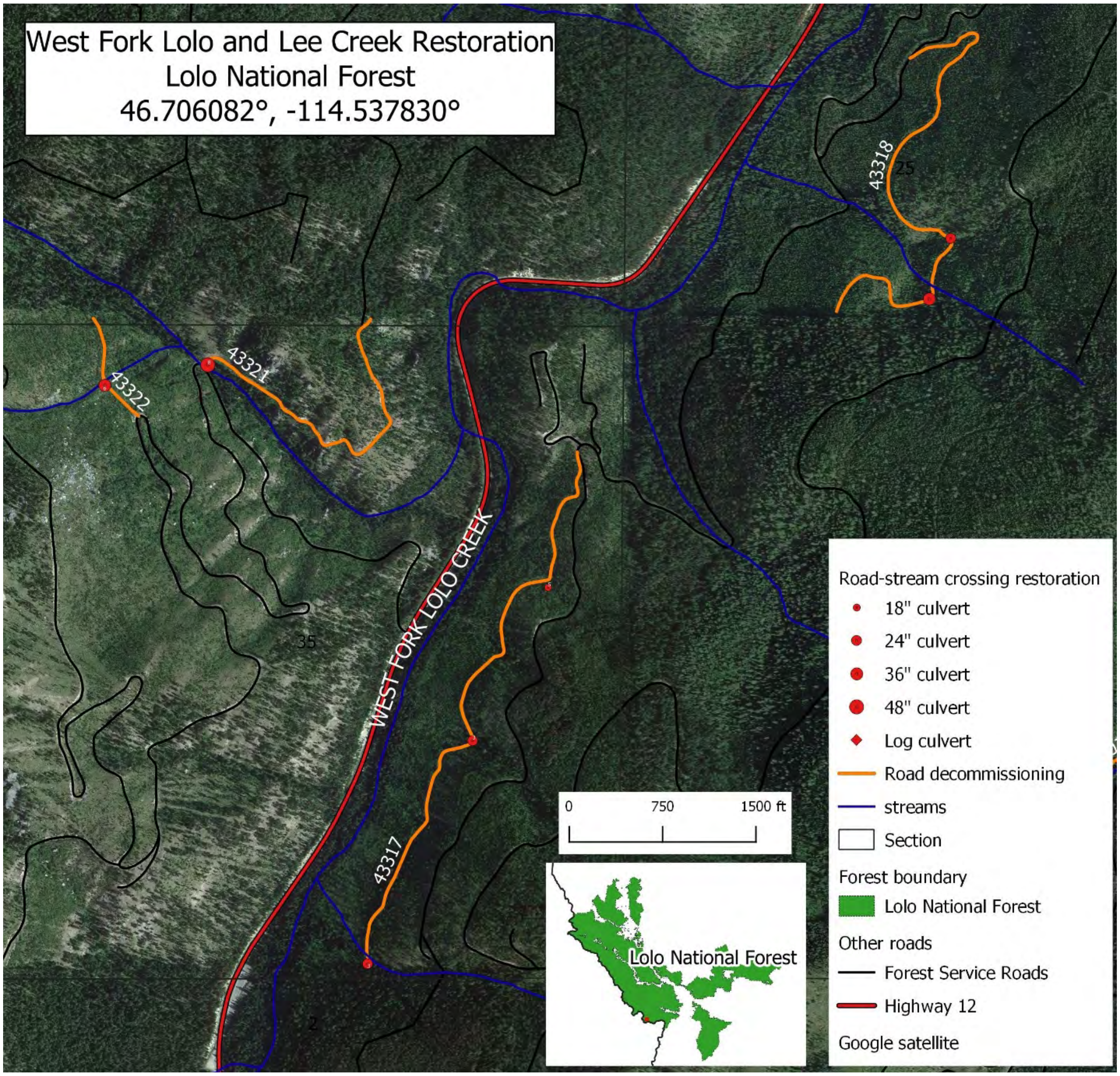
Lolo National Forest
Road-stream crossing restoration
18" culvert
24" culvert
36" culvert
48" culvert
Log culvert
Road decommissioning
streams
Section
Forest boundary
Lolo National Forest
Other roads
Forest Service Roads
Highway 12
Google satellite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Road-stream crossing restoration
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24" culvert
36" culvert
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Log culvert
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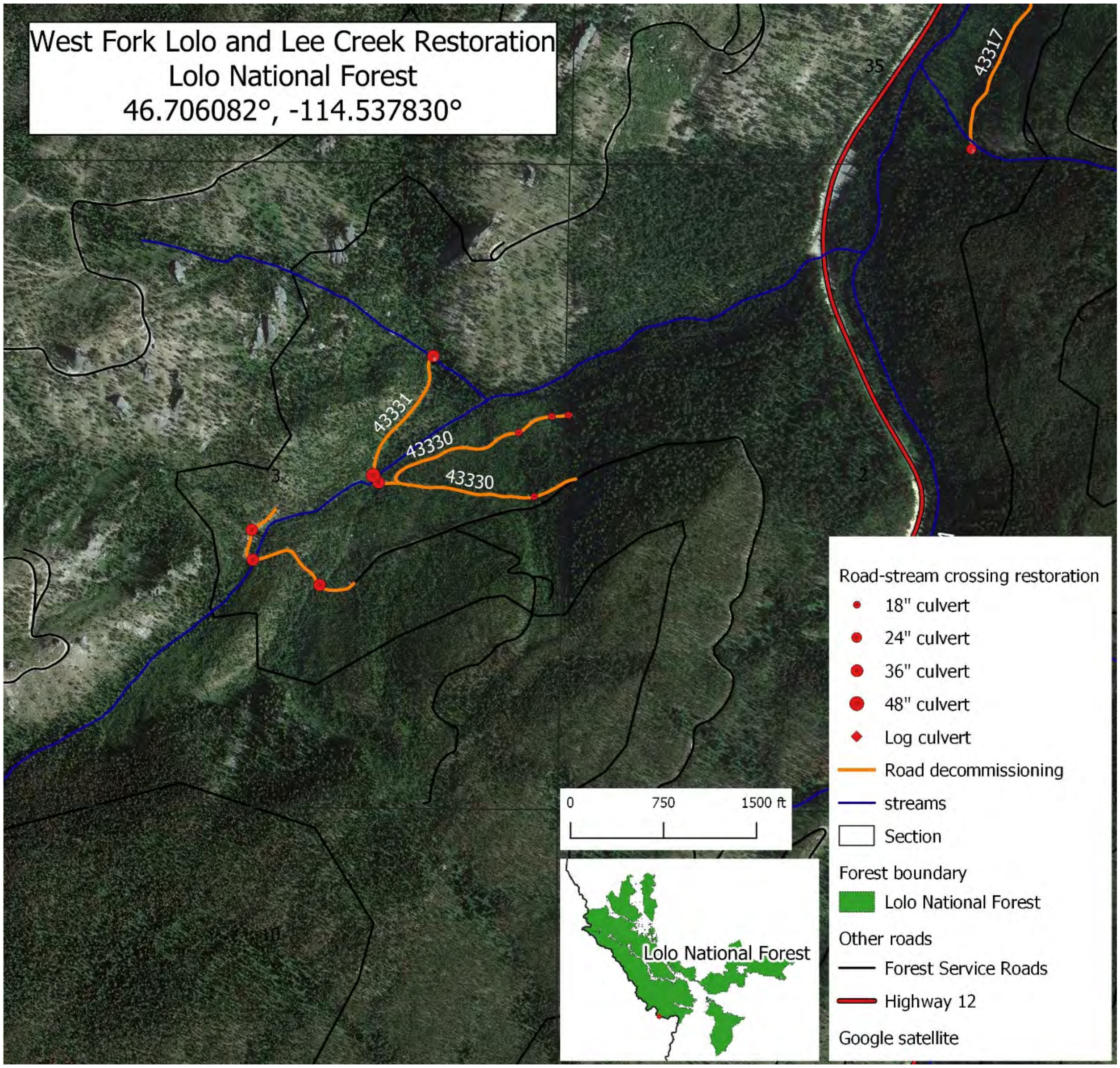
Other roads
Forest Service Roads
Highway 12
Google satellite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Road-stream crossing restoration
18" culvert
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Road decommissioning
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Forest boundary
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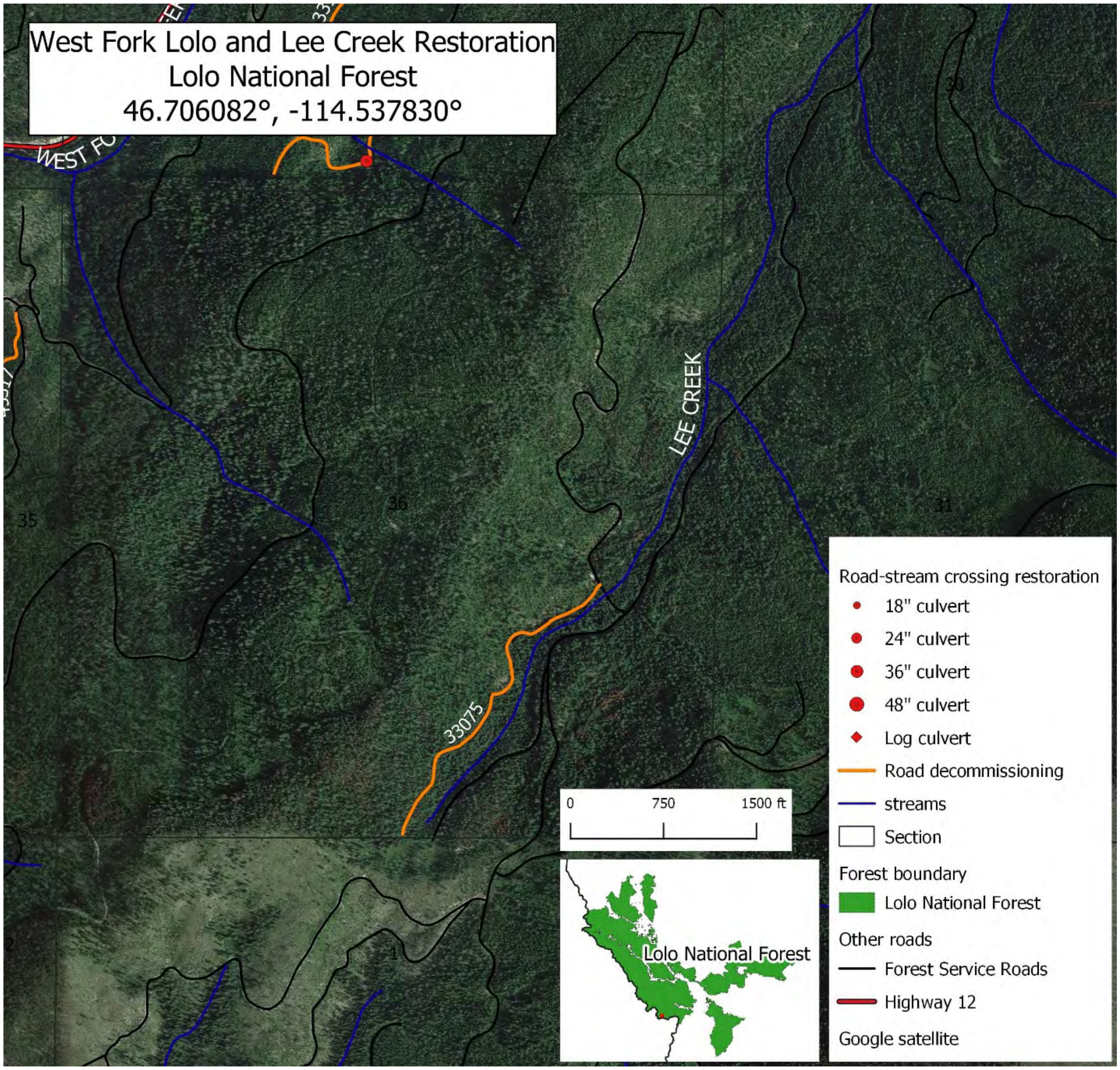
Other roads
Forest Service Roads
Highway 12
Google satellite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Road-stream crossing restoration
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Other roads
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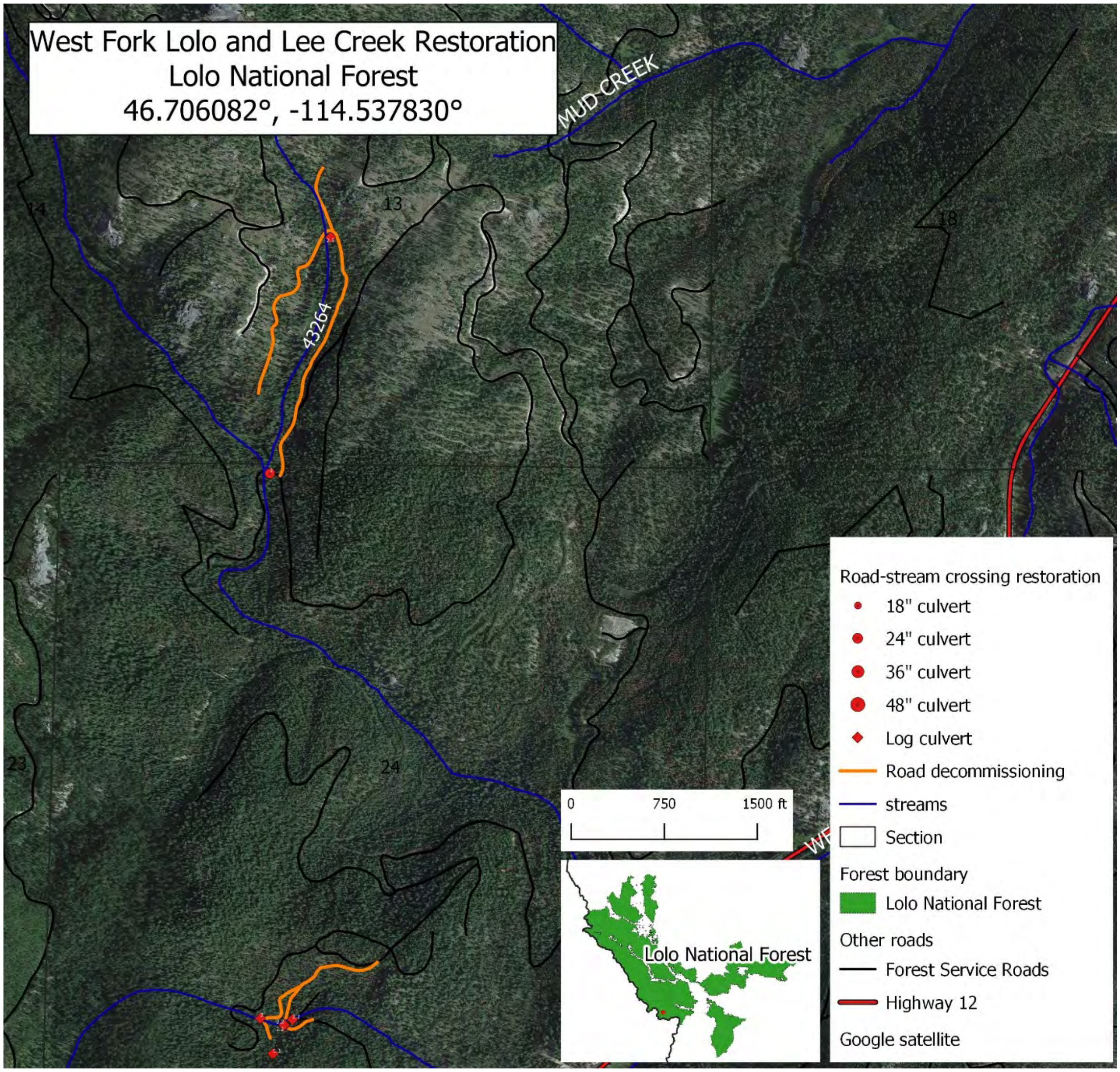
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Road-stream crossing restoration
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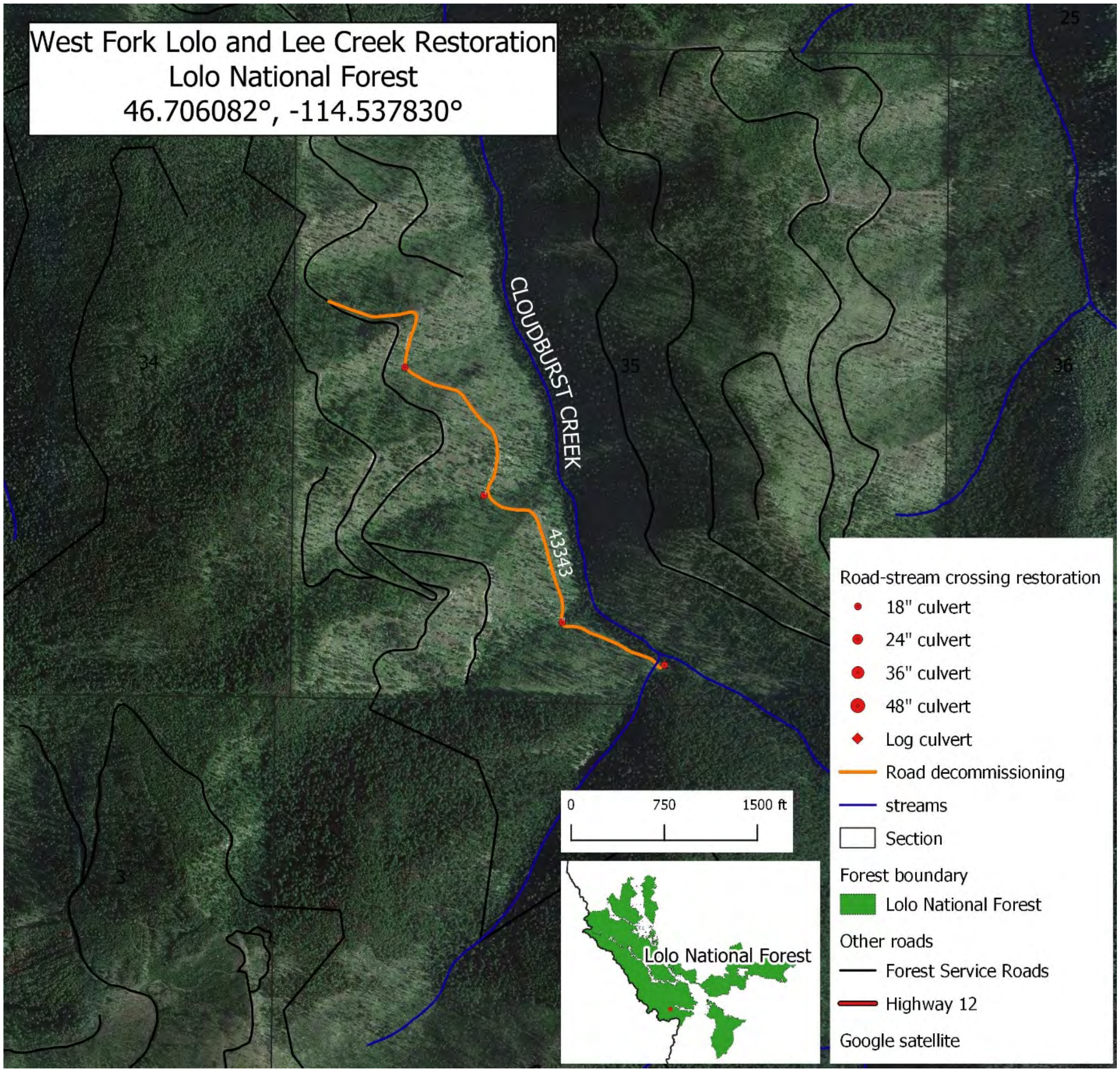
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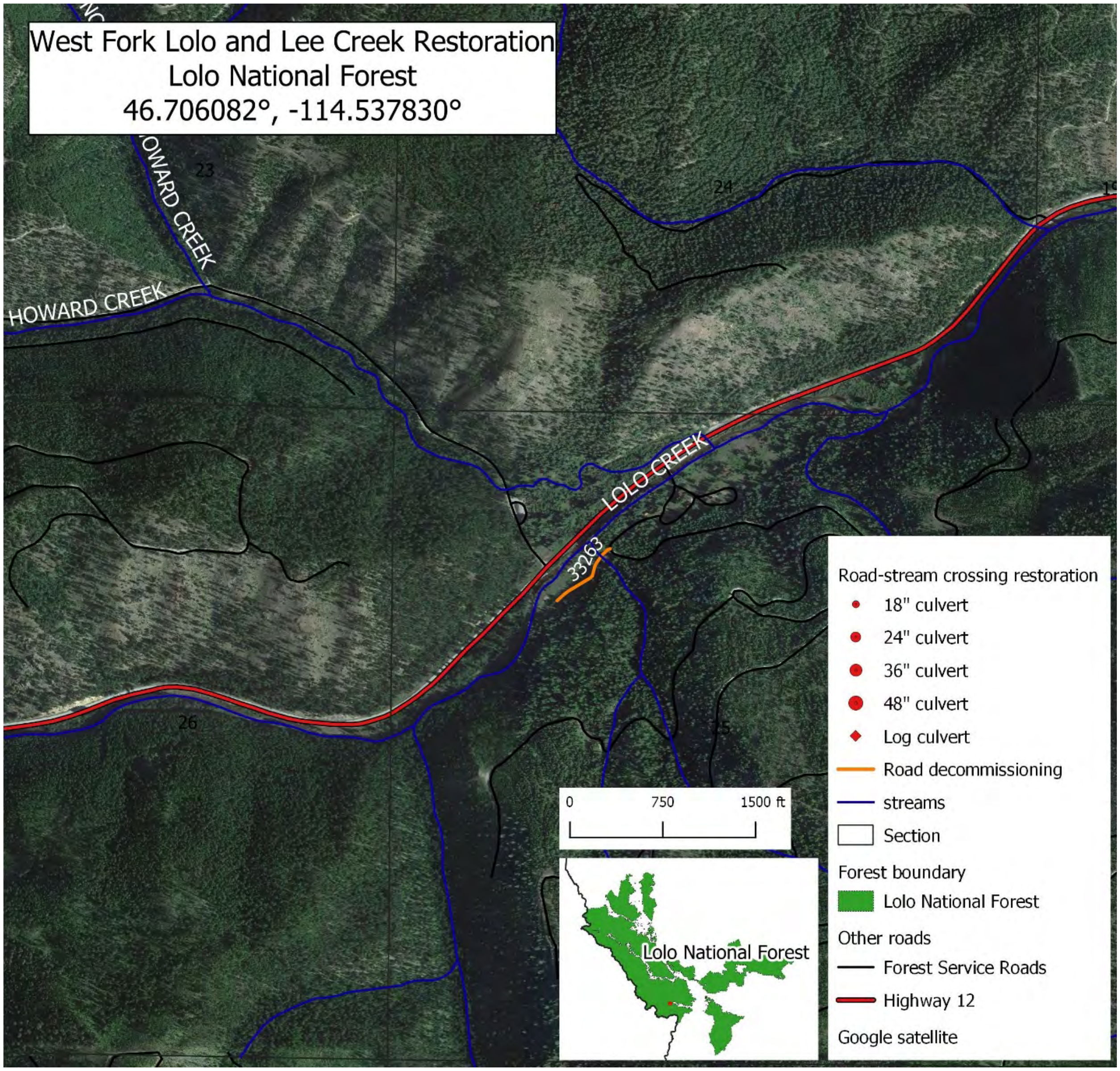
West Fork Lolo and Lee Creek Restoration
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Road-stream crossing restoration
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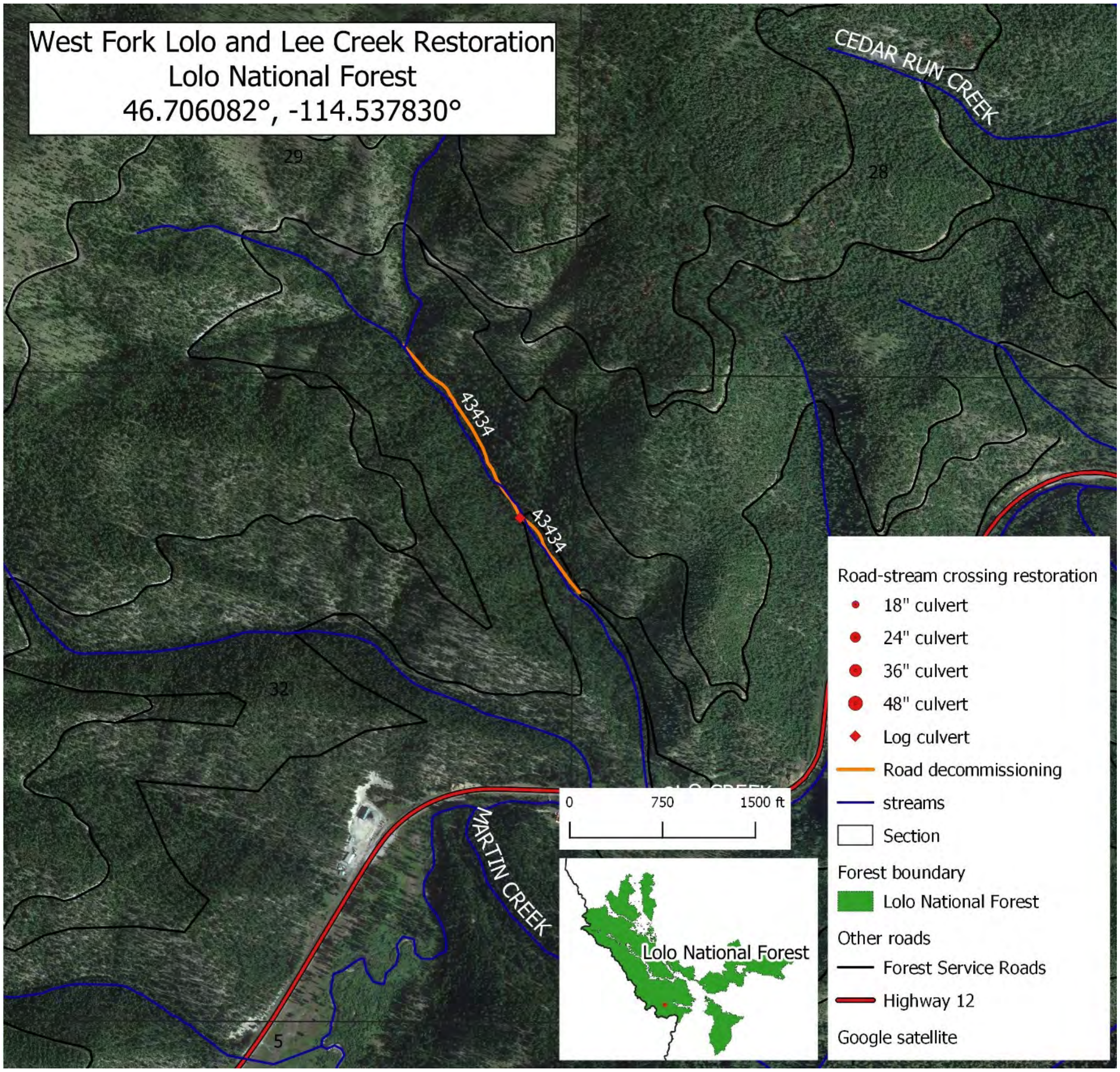
West Fork Lolo and Lee Creek Restoration
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Lolo National Forest
Road-stream crossing restoration
18" culvert
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