Watershed Restoration Plan

for

The Ninemile Creek TMDL Planning Area

February 2013

Prepared by: Nick Littman and Rob Roberts, Trout Unlimited

Table of Contents

Introduction **3**

Watershed Characterization **4**

Historical Uses **5**

Causes and Sources of Pollution **5**

Mining and Resource Extraction 6

Transportation Infrastructure 6

Agricultural Practices 7

Load Reductions **8**

Management Measures **14**

Mine Reclamation 14

Road Decommissioning and Restoration 18

Culvert Removal/Replacement 19

Modification of Agricultural Practices 21

Education Component **23**

Implementation Schedule **24**

Interim Milestones **25**

Criteria/Evaluation Procedures **26**

Environmental Outcomes 26

Organizational Performance 26

Monitoring **27**

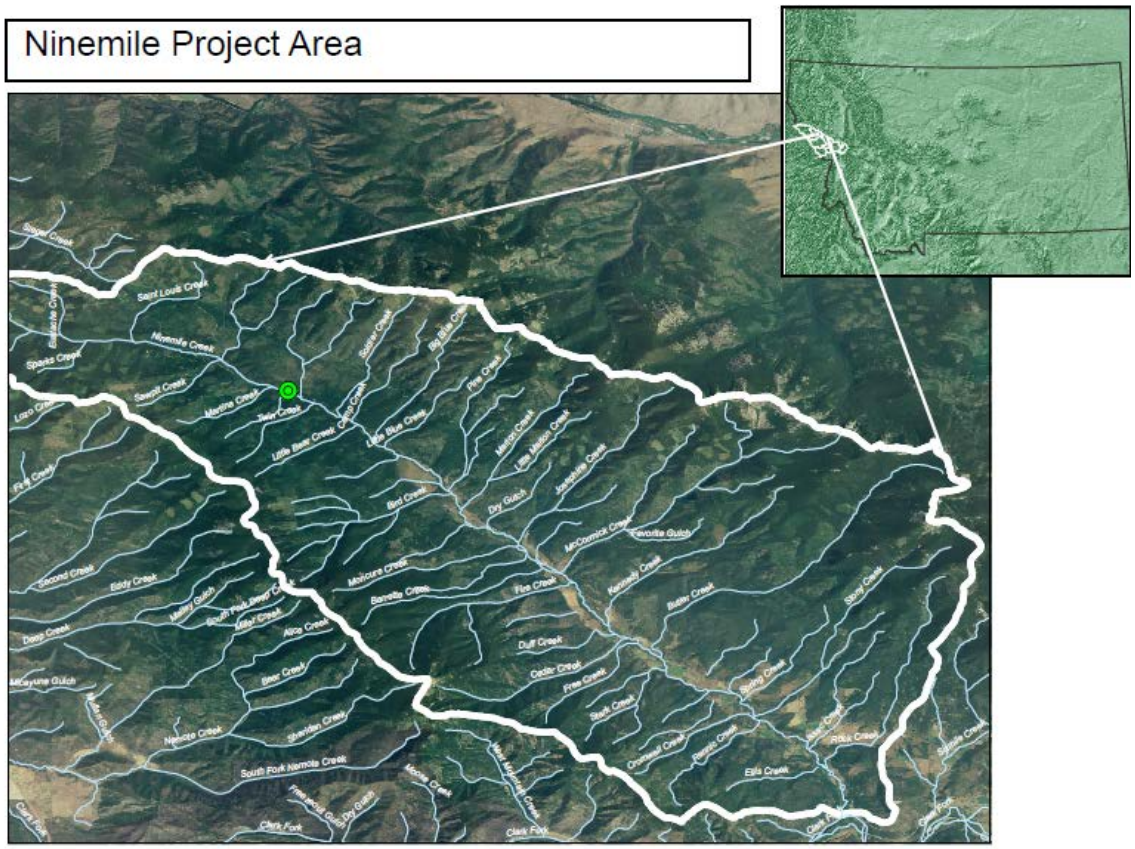
Subwatershed Summaries **34**

References **48**

Appendices **50**

Introduction

Ninemile Creek is located in the Middle Clark Fork River watershed approximately 20 miles west of Missoula, Montana. The closest town is Huson, Montana in Missoula County. Higher elevations are predominantly forested and managed by the Lolo National Forest's Ninemile Ranger District, while much of the lower valley is in private ownership and has been cleared for agricultural uses.



In 2002, nine waterbodies within the Ninemile TMDL Planning Area were indicated as impaired under MDEQ's 303(d) list, including: Ninemile Creek, Stony Creek, Kennedy Creek, upper McCormick Creek, lower McCormick Creek, Little McCormick Creek, Josephine Creek, Big Blue Creek, and Cedar Creek . All waterbodies within the Ninemile watershed are classified as B-1 and carry associated beneficial uses. B-1 waterbodies are "to be maintained suitable for drinking, culinary and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply." The primary beneficial use not being adequately met in Ninemile Creek is the growth and propagation of salmonid fishes and associated aquatic life.

A Water Quality Restoration Plan and TMDL were completed in January of 2005. Since then, the Ninemile Creek watershed has been a focal point of cooperative restoration efforts by local, state and federal government, as well as private watershed groups and individuals. These efforts have yielded significant progress towards diminishing load reduction targets. Several mine reclamation projects on tributaries to Ninemile Creek have been successfully completed, yielding a reduced sediment load, enhanced fish passage, and healthy, unimpaired stream channels. The Lolo National Forest has also

implemented numerous road decommissioning and culvert removal/replacement projects, contributing significantly to sediment reductions throughout the watershed. In addition to the TMDL, the *Post Burn Environmental Impact Statement of 2002* and the *Frenchtown Face Ecosystem Restoration Project Environmental Impact Statement* have informed Lolo National Forest's load reduction priorities and are referenced throughout this document (the *Post Burn EIS* is currently tied up in litigation and cannot be implemented. This may resolve in the next few years).

Partners are interested in continuing the implementation of projects within the Ninemile Creek watershed until all impairments are resolved and Ninemile Creek and its tributaries can be removed from the 303(d) list. It is recognized that cooperation is an important element in the implementation of projects in the watershed, due to the voluntary nature of non-point source pollution cleanup. Thus to effectively accomplish this goal, Trout Unlimited has partnered with other local stakeholders to compile a Watershed Restoration Plan for the Ninemile Creek watershed.

The purpose of this plan is threefold: 1) to assess the progress completed in the Ninemile Watershed up to the present and to set attainable goals and targets for the future, 2) to identify necessary funding and potential funding sources, and 3) to develop a timeline for implementation, completion and monitoring of projects within the Ninemile Creek watershed. This plan is written to meet all the necessary requirements for a WRP as outlined by USEPA and MDEQ. While this WRP can serve as a comprehensive guide to restoration and monitoring in Ninemile Creek in the near term, it is understood that continued implementation and evaluation of projects will guide future planning efforts and that adaptive management will be an important component of the planning process.

Watershed Characterization

The Ninemile TMDL Planning Area (NTPA) covers 186 square miles (119,040 acres), beginning in the upper reaches of the Ninemile and Reservation Divides of the Lolo National Forest and moving downstream to the confluence of Ninemile Creek with the Clark Fork River. Average annual precipitation at the Ninemile Ranger Station is approximately 15.7 inches, which is at an elevation of approximately 3,170 feet AMSL. Average annual precipitation higher in the drainage is approximately 27 inches, depending upon the elevation. The Ninemile Creek drainage has high-flow conditions during spring snow melt from late April to July. Tributaries on the north side of the drainage generally have higher discharge, shorter duration runoff conditions from April to June, while tributaries on the south side of the drainage generally have lower discharge, longer duration runoff conditions from May to July. Vegetative cover within the Ninemile Creek drainage is dominated by mixed mesic forest, with lesser amounts of Douglas Fir and Lodgepole Pine. Smaller areas of mixed mesic shrubs, Ponderosa Pine, and mixed sub-alpine forest are also present. Riparian areas were historically Drummond Willow/Bluejoint Reedgrass and Red Osier Dogwood habitat types.

Land ownership within the watershed is primarily divided between Lolo National Forest (82%) and private land (15%). The valley bottom is almost entirely privately owned. However, nearly all the higher elevation land stretching up to the Reservation Divide is managed by the Lolo National Forest. Small parcels of land were also historically managed by private timber companies. The landscape is dominated by Evergreen Forest (93% of Land Use in TMDL Planning Cover). Crop and Pasture land (3.5% of Land Cover) comprises a large portion of the land use along the valley floor flanking Ninemile Creek. The Ninemile Fault is the dominant structural feature in this area. Gradual sloping forest land below the Ninemile fault and steeper ground immediately above the Ninemile Fault were extensively logged from the 1960's until the early 1980's. Past logging practices can contribute to watershed instability and accelerated erosion (Post Burn EIS).

Historical Uses

There is a long history of surface mining on Ninemile Creek and its tributaries. The Ninemile Mining District is generally considered to extend up Ninemile Creek for approximately 16 miles, starting at Kennedy Creek and extending upstream to the headwaters of Eustache and St Louis Creek. Records indicate that a placer gold boom occurred on Ninemile Creek between 1874 and 1877. The district contains numerous recorded and unrecorded sites associated with historic mining in the drainage, dating from 1874 through the 1960s. These include two historic mining camps, Old Town and Martina, the 20th century logging and mining community of Stark; the Ninemile and San Martina mill sites; the Kennedy Creek dredge site; and numerous cabins, outbuildings, adits, flumes, ditches, reservoir and dam sites, mine dumps and an extensive network of tailing piles throughout the drainage. Shortly after gold claims were first made on upper Ninemile Creek in the autumn of 1874, hundreds of claims were staked on the upper tributaries of Ninemile Creek. By June 1875 300-400 men were reported at the Ninemile Diggings. The largest town named Montreal and later dubbed Old Town boasted a hotel, four saloons, one store, two butcher shops, two blacksmiths, one baker and two Chinese washhouses. Dragline dredging became prominent in the early 1940s. In 1941, the Weaver Dredging Company and the Beaver Dredging Company treated 506,187 cubic yards of gravel. Dragline dredging on Ninemile Creek and tributaries continued after World War II.

In 2000, the Upper Ninemile Complex Fire raced through the higher elevations of the watershed. A Post Burn EIS was conducted by the Forest Service to assess the potential impacts on the watershed. Approximately 20% of the 20,034 acres within the perimeter of the fire was deemed to have burned at a moderate to high severity. This severity of burn poses the highest potential impact to water temperature, runoff, and channel stability. The Post Burn EIS indicated that past timber management, natural disturbance, and the 2000 fires have impacted 25% of the entire upper Ninemile watershed. To quantify the disturbance, an Equivalent Clearcut Area (ECA) was calculated in drainages burned by the 2000 fires. Beecher, Big Blue, Burnt Fork, Camp, Little Blue, Martina, Nugget, Sawpit, Soldier and St. Louis were determined to have a high likelihood of change in their hydrologic regimes. The 2000 fires were the main contributors to high ECA values. However, recent harvests were a significant contributor on Martina and Nugget Creeks.

Agriculture was historically an important land use in the Ninemile Creek watershed, although its prevalence has waned in recent years. Approximately 7,758 acres (6.5%) of the watershed is under irrigation. The majority of these irrigated lands are located in the lower elevations of Ninemile Creek. Irrigation withdrawals have contributed to dewatering on Stony Creek. Land clearing, grazing practices and channel modification especially along Ninemile Creek and Cedar Creek contributes to stream bank erosion and a significant increase in total sediment loading. Agriculture, like logging and mining, are no longer significant components of the local economy in the Ninemile Creek valley.

I. Causes and Sources of Pollution

The 2005 *Water Quality Restoration plan and Total Maximum Daily Loads for the Ninemile Planning Area* listed water quality in the watershed as impaired, with causes of impairments including flow alterations, habitat alterations, sedimentation/siltation, and metals (copper, lead, zinc, and mercury). The most significant probable sources for these impacts to water quality stem from erosion and sediment loading and can be linked to mining and other resource extraction, transportation infrastructure, and agricultural practices. The fires of 2000 and historical timber harvests contributed appreciable quantities of sediment to Ninemile Creek. However, those inputs of sediment were expected to decline to 3 tons per year and 0 tons per year, respectively by 2015.

A. Mining and Resource Extraction

Historical mining has created one of the primary sources of pollution in the Ninemile Creek watershed. Abandoned placer mines are responsible for numerous detrimental impacts on waterbodies throughout the watershed including: dewatering, flow alteration from mining-induced changes to channel geometry and substrate, channel and floodplain confinement, habitat alteration, fish passage barriers, and sediment loading due to significant bank erosion. Large scale dredge operations from the early 1900s worked much of the valley bottom in Upper Ninemile Creek and have resulted in multiple thread stream channels, abandoned dredge ponds, and large piles of overburden 15-20 feet high that dominate stream corridor. Small scale mining operations in the mid to late 1900s have also contributed large quantities of sediment and significantly compromised fish passage and hydrologic connectivity of waterbodies throughout the Ninemile drainage. Placer mining has in numerous cases had "an inordinate influence on stream condition and function" according to the Lolo National Forest (Post Burn EIS). Creeks with significant effects from placer mining include: Ninemile, Kennedy, Josephine, Eustache, McCormick, Beecher, St. Louis, Mattie V, Sawpit, Marion and Twin. There are currently numerous mining claims in the Ninemile watershed (BLM Land and Mineral Records) However, very few of these mines are being actively worked.

Four hard rock mines are considered Priority Mine Reclamation Sites by MDEQ. Three of these are located in the Kennedy Creek watershed. The fourth highest priority is the Joe Wallit Mine on St. Louis Creek. This site was reclaimed in 2011 by the Lolo National Forest, Trout Unlimited and Missoula County. The Lost Cabin Mine and Nugget Mine are currently ranked #57 and #75, respectively, by the Montana Department of Environmental Quality's Mine Waste Cleanup Bureau on the Montana Priority Site List. The impacts of mining at the Lost Cabin and Nugget mine sites cover an area roughly 15-20 acres and include 3,850 cubic yards of waste rock with high levels of arsenic and lead. Abandoned waste rock dumps are being actively eroded by Kennedy Creek, and contaminated sediments are being carried downstream. Total arsenic and lead were detected at concentrations above their associated screening levels (70 and 1,100 milligrams per kilogram [mg/kg], respectively) in the majority of waste rock samples collected from the Lost Cabin mine. Lead was detected in four of the nine waste rock samples collected from the Nugget mine at concentrations that exceed the screening level (1,100 mg/kg). Arsenic was detected in three samples at concentrations above the screening level (70mg/kg) from the Nugget mine. Furthermore, a draining adit on the Nugget mine site has elevated levels of copper, lead and zinc. Copper, lead, and zinc have been detected in surface water samples from the mining complex at concentrations above screening levels since the first sampling event was conducted in1993.

B. Transportation Infrastructure

Forest roads are a major source of sediment in the watershed, contributing more than 40% of background sediment in all watersheds listed on the 303(d) list except for Big Blue Creek. Roads fragment habitat and contribute to fine sediment recruitment. The Post Burn EIS has found road density in the Middle Clark Fork drainage to be a key indicator of fisheries health and condition. Watersheds with a high road density frequently see their fisheries disproportionally impacted and notice a significant increase in the percentage of surface fines in their streams. The majority of watersheds within the Ninemile drainage have road densities of over 2 miles road/square mile (Post Burn EIS). Road encroachment, in which roads pass within 100 feet of the channel, exceeds 20% of all roads in the McCormick and Kennedy drainages. Numerous roads within the drainage have road treads, cut slope, and/or fill slopes that exceed 200ft and are identified in the TMDL as restoration priorities. Additionally, there are many jammer roads - used for timber harvest in the 1960s - located on lands managed by the Lolo National Forest. These jammer roads are especially damaging where they cross streams and have

either an undersized culvert or no culvert in place. In addition to roads, there are numerous culverts in the Ninemile watershed that are fish passage barriers and are slated to be removed or replaced by Lolo National Forest.

Roads managed by Missoula County also influence several tributaries and mainstem Ninemile Creek in the lower portion of the valley. There are several riprapped banks on the county road where Ninemile Creek is beginning to undercut the road surface. The county road has also led to fragmentation of habitat where undersized culverts were used for stream crossings. Several of these crossing have been replaced by bridges, such as the crossings at Pine Creek and Josephine Creek, while culverts on McCormick Creek, Stony Creek and other tributaries may need further investigation.

C. Agricultural Practices

Agricultural practices and the legacy impacts of historic land management contribute sediment due to high intensity grazing on streambanks and floodplains, bank modification and the removal of stream-side vegetation. Much of the agricultural inputs of sediment occur in the lower, private reaches of the Ninemile watershed where grazing and residential are the primary land uses. There are approximately 15 agricultural diversions for private irrigation use in the Ninemile drainage. Water withdrawals mainly occur during the late summer and early fall during periods of low water in the valley. This corresponds with the spawning migration timing for resident and potentially migratory populations of Bull Trout. Irrigation withdrawals can seasonally dewater tributaries in the Ninemile watershed and create seasonally passage and temperature barriers that impede upstream fish migration. Additionally, many of the ditches associated with the irrigation diversions are not screened and thus have potentially a high risk of fish entrainment.

Elevated water temperatures in the mid and lower reaches of Ninemile Creek have been observed over the last decade. A formal thermal impairment was not declared for Ninemile Creek during the TMDL assessment. However, DEQ did deploy temperature loggers over several years and observed that temperature thresholds for cold water fisheries were exceeded for long periods of time.

Montana DEQ has 3 informal standards for the interpretation of temperature data and cold-water fishery use support. Critical temperatures for native salmonids are 9 C for spawning, 12 C for rearing and 15 C for migration. Because native salmonids typically spawn in fall and spring when temperatures are not elevated, the rearing and migration temperatures are the critical levels evaluated. Temperatures at the Ninemile USGS gage site close to the mouth of Ninemile Creek were observed to exceed 15 degrees C for 87 days and 10 degrees C for 120 days in 2003. Little McCormick Creek was also observed to have elevated stream temperatures for extended periods.

The difficulty in declaring a thermal impairment in the Ninemile watershed was assigning sources to this cause. A number of factors could be contributing to elevated temperatures in the lower reaches of Ninemile Creek. The channel in the lower reaches is broad and shallow compared to the Upper Ninemile narrow, confined reaches. This allows the water surface to be exposed to more solar heating. For over 20 miles the channel is largely exposed with minimal overhanging vegetation to shade the water. Low flow velocities (partially due to irrigation withdrawals) and the lack of shading could combine to significantly elevate temperatures.

In the Ninemile TMDL, DEQ recommended conducting a thorough thermal analysis to identify the sources of temperature elevation. This study would address the following questions:

1. What is the expected thermal regime of the Ninemile watershed streams?

2. What are appropriate reference streams for comparison to the Ninemile watershed streams
3. What are the current sources that may be attributing to a thermal problem in the Ninemile watershed?

Numerous agencies have collected temperature data over the last decade and longer to provide temperature trends and thoroughly assess this potential impairment. This issue warrants further investigation.

II. Load Reductions

The *Water Quality Restoration Plan and Total Maximum Daily Loads for the Ninemile Planning Area* has load reduction allocations for sediment for all of the listed waterbodies in the Ninemile Creek watershed except for Upper McCormick and Big Blue Creek. Kennedy Creek has an allocated reduction in metals concentrations and carries with it a mandate to reduce concentrations below state standards. Elevated stream temperatures are also a concern in mainstem Ninemile Creek and McCormick Creek.

Sediment load reduction in the Ninemile Creek watershed has been identified as a high priority for project partners. Management measures to accomplish these load reductions are outlined in the following section and are largely focused in the near term on mine reclamation and repairing or removing road infrastructure. Mine reclamation has been shown to have a significant impact on sediment loading to tributaries of Ninemile Creek and the mainstem of Ninemile Creek. For example, following the successful completion of a mine reclamation project on St. Louis Creek in 2010-2011, post project monitoring showed a sediment load reduction of 100% at 99 tons per year.

Furthermore, numerous agencies and partners have worked to fully assess the elevated temperatures in Ninemile Creek (Appendix C). Temperature data has been collected along the length of Ninemile Creek and in many of its tributaries to more accurately define potential sources. Ninemile Creek temperatures rise dramatically as the creek flows through the Upper Ninemile Creek mining area and again when it flows into private, agricultural land (Appendix D). The rise in temperature could be attributed to a lack of riparian vegetation, large dredge ponds, sediment inputs or other sources. DEQ recommended in the *Ninemile TMDL* to conduct a study that identifies shade loss in the Ninemile watershed assess where restoration efforts could be focused. Numerous historical and current aerial photographs have been collected and site visits have been made to the mined reaches of Ninemile Creek. Many of these reaches have had significant shade loss from historical mining activities (*Ninemile Creek Housum Placer Restoration Project Vegetation Data Summary Report*). TU and Lolo NF will incorporate these temperature concerns into the planning process and implementation of placer mine reclamation projects on Ninemile Creek. Further shade loss and stream temperature evaluations are needed in the lower, private reaches of Ninemile creek with private landowner support and a variety of partners.

The TMDL process helped to identify many of the probable causes and sources of impairment in the Ninemile watershed. However, to fully address the impairments on Ninemile Creek, the loads must be addressed on many non-listed waterbodies flowing into Ninemile. The first table below includes listed waterbodies in the Ninemile Creek watershed and their respective causes, sources, load allocations and reductions. The second table lists the non-listed waterbodies which have been determined by TU and partners to have significant impairments along with their probable causes and sources, a load reduction and their current status. Sediment load reduction targets are derived from the Ninemile TMDL.

Impairments on TMDL-listed Waterbodies						
Waterbody	**Beneficial Uses Partially Supported or Not Supported**	**Probable Causes**	**Probable Sources**	**Load Reduction**	**Load Allocation**	**Status**
Cedar	Partially Supporting: Aquatic Life, Cold Water Fishery, Industrial, Primary Contact Recreation	Sedimentation/ Siltation, Low Flow Alterations, Alteration in stream-side or littoral vegetative covers	Agriculture, Forest Roads, Flow Alterations from Water Diversions, Natural Sources	Agriculture: 90% reduction of **79 tons/yr** Roads: 34.4% reduction of **5.3 tons/yr**	Agriculture: 9 tons/yr Roads: 10 tons/yr	Bar One Ranch Revegetation
Josephine	Not Supporting: Aquatic Life, Cold Water Fishery	Sedimentation/ Siltation, Low Flow Alterations, Alteration in stream-side or littoral vegetative covers	Forest Roads, Placer Mining, Impacts from Hydrostructure Flow Regulation/ modification	Mining: 100% reduction of **699 tons/yr**. Roads: 39% reduction of **8 tons/yr**	Mining: 0 tons/yr Roads: 12.4 tons/yr	Preliminary Design Completed Culvert Replacement on County road by FWP
Kennedy	Partially Supporting: Agricultural, Aquatic Life, Cold Water Fishery, Dr inking Water, Industrial, Recreation	Sedimentation/ Siltation, Low Flow Alterations, Alteration in stream-side or littoral vegetative covers, Copper, Lead, Mercury, Zinc	Mine Tailings, Placer Mining, Subsurface (Hardrock) Mining Irrigated Crop Production	Mining: 100% reduction of **719 tons/yr**. Roads: 81% reduction of **31.8 tons/yr.**	Mining: 0 tons/yr Roads: 7.5 tons/yr	Site Investigation and Engineering Evaluation Completed

Little McCormick	Not Supporting: Aquatic Life, Cold Water Fishery	Sedimentation/ Siltation, Low flow alterations, physical substrate habitat alterations, fish-passage barrier	Placer Mining	Mining: 100% Reduction of **1,840 tons/yr.** Roads: 63% Reduction of **105 tons/yr**	Mining: 0 tons/yr Roads: 62 tons/yr	Restoration work completed on Phase I and II of Little McCormick Culvert Replacements on main county road by FWP
Lower McCormick	Partially Supporting: Aquatic Life, Cold Water Fishery	Alteration in stream-side or littoral vegetative covers	Placer Mining			
Upper McCormick	Fully Supporting all Beneficial Uses	N/A	N/A			
Stony	Partially Supporting: Aquatic Life, Cold Water Fishery	Sedimentation/ Siltation, Phosphorus (Total)	Agriculture, Irrigated Crop Production	Roads: 76% Reduction of **22.6 tons/yr**	Roads: 7.1 tons/yr	2 culverts removed, roads decommissioned in Upper Stony Creek
Ninemile	Partially Supporting: Aquatic Life, Cold Water Fishery	Sedimentation/ Siltation, Low Flow Alterations	Streambank Modification/ destabilization, Flow Alterations from Water Diversions	Agriculture: 75% reduction of **4,651 tons/yr** Harvest: 100% reduction of **26.6 tons/yr** Fire: 99% reduction of **370 tons/yr** Mining: 100% reduction of **2,037 tons/yr**	Agriculture: 1,150 tons/yr Mining: 0 tons/yr Harvest: 0 tons/yr Fire: 3 tons/yr	Clark Fork Coalition Water Leases on Ninemile Creek and tributaries Riparian Fencing and channel work by FWP
Upper Ninemile	Partially Supporting: Aquatic Life, Cold Water Fishery	Sedimentation/ Siltation, Low Flow Alterations	Impacts from Abandoned Mine Lands, Streambank Modification/	Mining: 100% reduction Reach 1:**92.2 tons/yr** Reach 2: **352 tons/yr**	*Mining: 0 tons/year	Preliminary Design Document Completed

			destabilization	Reach 3: **129 tons/yr** Reach 4: **1,175 tons/yr** Reach 5: **351 tons/yr** Reach 6: **57.6 tons/yr** Reach 7: **778 tons/yr**		
Big Blue	Fully Supporting all Beneficial Uses	N/A	N/A	N/A	N/A	No Action

*One TMDL was completed for McCormick Creek because all 303(d) listed streams are within the same watershed

*Information taken from *Ninemile Creek-Housum Placer Restoration Project: Phase I Geomorphic Data Summary Report* prepared by River Design Group and WestWater Consultants

Probable Impairments on Non-listed Waterbodies					
Water body	**Lead Organization(s)**	**Probable Causes**	**Probable Sources**	**Load Reduction**	**Status**
Eustache	LNF, TU	Sediment/Siltation	Placer mining, forest	Mining: 100% reduction Percentage of fine surface sediment in riffles < 6mm: **≤14.8%**	Stream Restoration Completed Forest service roads decommissioned in Eustache watershed
St. Louis	LNF, TU, Missoula County	Sediment/Siltation, metals	Hard Rock mining, Forest roads	Mining: 100% reduction of **99 tons/yr**. Percentage of fine surface sediment in riffles < 6mm: **≤ 21.0%**	Mine Reclamation Completed 3 culverts removed along East Fork of St. Louis Creek Forest service roads decommissioned in St. Louis creek watershed
Mattie V	LNF, TU, Missoula County	Sediment/Siltation, Flow Alteration	Placer mining, Flow Regulation/ modification Forest roads	Mining: 100% reduction Percentage of fine surface sediment in riffles < 6mm: **≤ 14.8%**	Stream Restoration Completed 3 culverts removed Forest service roads decommissioned in Mattie V creek watershed
Sawpit	LNF, TU, Missoula County	Sediment/siltation	Placer mining, forest roads	Mining: 100% reduction Percentage of fine surface sediment in riffles < 6mm: **≤14.8%**	Preliminary Design Document Completed Culvert Removed Forest service roads decommissioned on upper and lower reaches of Sawpit Creek watershed
Twin	LNF, TU,	Sediment/siltation	Placer mining,	Mining: 100%	Preliminary Design Document Completed, Implementation in

	Missoula County		Flow Regulation/ modification, Forest Service Roads	reduction Percentage of fine surface sediment in riffles < 6mm: **≤ 14.8%**	2012 2 culverts removed Forest service roads decommissioned in Twin creek watershed
Martina	LNF, TU	Sediment/siltation	Placer mining	Mining: 100% reduction Percentage of fine surface sediment in riffles < 6mm: **≤ 14.8%**	Planning

III. Management Measures

Extensive management measures will need to be implemented to achieve the load reductions outlined in the TMDL and other watershed assessments. The Ninemile Creek TMDL listed multiple proposed restoration activities to address the primary source of pollution, sediment, in the watershed. These restoration activities include:

- Upgrade forest roads to meet Montana Forestry BMPs.
- Reclaim forest roads that are surplus to the needs of forest managers.
- Implement Montana's Forestry BMPs on all timber harvest operations.
- Continue post fire restoration and sediment mitigation efforts.
- Encourage riparian restoration and implementation of agricultural BMPs.
- Manage noxious weeds.
- Promote non-structural erosion control.
- Upgrade undersized culverts over time to better accommodate large floods and reduce the risk of culvert failure.
- Correct priority fish passage barriers that are significantly affecting the connectivity of native fish habitats.
- Continue riparian management and monitoring in areas impacted by livestock use.
- Encourage flood plain development setback.
- Pursue funding for restoration of historic mining impacts.
- Coordinate with the local watershed group to implement TMDL recommendations on private land and to bring local residents and land owners into the TMDL and watershed restoration process.

There are three general categories of management measures that have been implemented and will continue to be implemented in the Ninemile Creek watershed: Mine reclamation, road decommissioning, and culvert removal/replacement. Projects in all of these categories address the primary cause of impairment in the Ninemile watershed: sedimentation/siltation. Mine reclamation projects can also address metals impairment. These types of projects involve multiple partners and have been successfully implemented throughout the last decade. These projects have occurred primarily on Lolo National Forest land in the upper reaches of Ninemile Creek, as well as on major tributaries.

Furthermore, to fully address sedimentation issues, grazing and agricultural inputs in the lower, private reaches of Ninemile Creek should be addressed. This will require the cooperation of private landowners, and an increase of organizational capacity among project partners for project development and planning. There is the potential for landowners to pursue cost-share funding from the Missoula Conservation District or NRCS to pursue grazing modifications and bank stabilization projects. General reaches of Ninemile Creek that would benefit from this work were identified by Land and Water Consulting and recommendations were made by reach and summarized below. Examples of these management measures that will need to be implemented to reduce loads in the Ninemile watershed are outlined below. Brief descriptions of measures that have already been implemented and their load reduction success are also delineated.

A. Mine Reclamation

Successful mine reclamation projects have been implemented on Eustache, St. Louis, Mattie V and Little McCormick Creeks. All of these projects significantly reduced the sediment loading to these tributaries.

Mine Reclamation work at the Joe Waylett Copper Mine on St. Louis Creek also addressed a metals reduction after high concentrations on copper were found on the site.

Mine Reclamation projects that are currently in the planning phase and have been ranked as critical projects to achieve load reductions include: Kennedy, Upper Ninemile, Josephine, Twin, Sawpit, and Martina Creeks. With a strong design and thorough implementation, mine reclamation projects can drastically decrease in-channel erosion and sediment loading, allow the stream to utilize the floodplain and thus reduce large, flood-related sediment inputs, improve recruitment of vegetation, help to stabilize streambanks, improve fish passage through confined or dewatered reaches of stream channel, and reduce metals concentrations in these creeks which can adversely affect fisheries and human health. Mine reclamation projects have been successfully implemented through a partnership between Trout Unlimited, Missoula County and Lolo National Forest. Successful projects include:

1. St. Louis Creek

The Joe Waylett Mine was a hard rock copper mine worked up until 1981. Prior to reclamation, mine waste material was actively eroding into the creek. The East Fork of St. Louis Creek and the northern bank of St. Louis Creek were confined by large piles of mining tailings. The stream did not have any woody debris or typical stream channel features and in the last 200 yards had very little shading from direct sunlight. In Area D where higher grade, shear zone material was stockpiled, there were high quantities of copper. It was determined that copper and zinc could become mobile under the right condition and would be toxic to aquatic species. There was an estimated 30,000 cubic yards of waste rock at the site. High copper concentration contributed to a lack of surface vegetation on some of the waste rock.

In 2010 Trout Unlimited partnered with Lolo National Forest and Missoula County on reclamation work at the site. Waste rock was removed and transported to an on-site repository. Approximately 2,000 feet of streambank was restored and re-vegetated and 500 feet of stream channel was completely re-constructed. A culvert on the East Fork of St. Louis Creek was removed to reconnect fish passage for west slope cutthroat. In the fall of 2011, the site was re-vegetated with native conifers and spread with grass seed. The access road was removed and native riparian plants and a soil lift with willow cuttings were planted on the new streambanks.

2. Mattie V Creek

Problems on Mattie V Creek included barriers to fish passage, limited habitat complexity, a loss of connection between the active channel and the floodplain and undesirable pond features that reduced the connectivity between Mattie V and the mainstem of the Ninemile and favored non-native brook trout. The creek flowed through multiple dredge ponds, was confined to a man-made ditch for several hundred feet and had subsurface flows. Without a functional connection to Ninemile Creek, native fish were barred from upstream migration for nearly 80 years. Telesto Solutions Inc. and the University of Montana partnered to develop a conceptual stream channel design to restore stream channel function to Mattie V. The design created a more direct flow path and resulted in a step-pool channel morphology with average slopes of 8-10%.

With funding from Missoula County, MT DNRC, MT Fish Wildlife and Parks, LNF and private landowners , an engineered design was drafted in 2008. In the summer of 2010, reclamation was implemented. 12,000 cubic yards of mine waste was removed and re-contoured and 400 feet of new stream channel was constructed. The streambanks were augmented with coir logs and soil lifts and revegetation with native grasses and tree planting was finished in 2011.

3. Little McCormick Creek

The Little McCormick Creek watershed was intensively placer mined for gold during the last century. Most recently a local miner conducted a large-scale operation on the Glory Hole claim from 1978 to 1997. After removing the claim, the US Forest Service was left with 250 feet of diverted stream channel, one mile of mining spoil piles and a 15-20 foot high undercut bank that spans approximately sixty feet. Additionally, the base level of the valley bottom had been lowered by 12 feet, thus removing a functional floodplain from the Creek and leading to dewatering during most of the year.

Between 2008 and 2010, TU worked with Lolo National Forest, Sierra Club and other partners to restore more than 2,500 feet of stream channel on Little McCormick Creek. Project objectives were to 1) create a more properly scaled channel that can transport discharge and bedload more efficiently 2) provide a more natural array of instream habitat including more and higher quality pools and added large wood debris 3) reduce the amount of fine sediment that is recruited annually from over-steep hillslopes, and; 4) improve fish migration through restored surface water connectivity.

4. Eustache Creek

Eustache Creek is an important tributary to Ninemile Creek . It is one of the most important production areas for westslope cutthroat and one of the only places where bull trout has been documented. Prior to restoration, 10-15 foot high dredge piles impeded the function of the floodplain, dredge ponds disrupted natural stream flow and significant fish passage barriers existed.

The Westslope Chapter of TU, Lolo National Forest and the Ninemile Watershed Group partnered on a restoration strategy to be implemented on Eustache Creek. In 2006 with funding from the National Forest Foundation, Montana Future Fisheries program, Trout Unlimited and Lolo National Forest, restoration work was begun. Mining spoil piles were pulled away from the creek bottom and re-contoured against the hillside. A quarter mile of floodplain and stream channel was re-constructed to provide bank stability and create habitat for native fish. Over 6,000 native hardwoods were collected and planted. Native conifers, shrubs and grasses from locally collected seed were replanted along the project length after construction to improve bank shading and reduce erosion potential. Groundwater retention stills were installed to raise the groundwater table and re-water a previously dry reach of the creek.

Trout Unlimited continues to work with partners on multiple mine reclamation projects on mainstem Ninemile Creek and tributaries. Priority projects include:

- Twin Creek – Removal and regrading of historical dredge tailings and reconstruction of the stream channel to reconnect Twin Creek to Ninemile Creek.

- Sawpit - Removal and regrading of historical dredge tailings and reconstruction of the stream channel to reconnect Sawpit Creek to Ninemile Creek.

- Kennedy – Reclamation of priority mine sites, including the Lost Cabin and Nugget Mines, through removal of mine tailings and containment of a draining mine adit. Project activities will also include reconstruction of portions of the stream channel.

- Housum Placer – Reconstruction of approximately 3 miles of mainstem Upper Ninemile Creek, including removal and regarding of historic dredge tailings, significant revegetation activities and off channel wetland creation.

- Josephine Creek – Reconstruction of approximately 1 mile of stream channel, including removal and regarding of historic dredge tailings.

B. Road Decommissioning and Restoration

To date 88 miles of road have been decommissioned in the Ninemile watershed by Lolo National Forest (Appendix A). The closing of these roads has significantly reduced sediment loads in sections of Ninemile Creek and its tributaries. However, within the Ninemile watershed, 453 miles of National Forest roads and 126 miles of non-Forest Service roads remain open and many actively contribute sediment to the watershed's creeks. The TMDL document prioritizes sediment mitigation at road crossings over streams which can be large contributors of sediment. Road sources which have contributing road treads, cut slopes and/or fill slopes that exceed 200 ft are identified as restoration priorities. Some of these road crossings have been addressed in the Forest Service's decommissioning of road and replacement/removal of culverts. However, additional identified crossing can be addressed in the future to reduce the load allocation from road sources.

The Post Burn EIS also identifies roads with an inordinate effect on fisheries conditions including a significant increase in the percentage of surface fines. Roads that have an inordinate sediment contribution include those on Eustache Creek (FS Rd #97- 5.80 miles existing), portions of St. Louis Creek, and Upper Ninemile Creek (FS Road #412 -2.86 miles existing). In June of 2012, 1.36 miles of road on St. Louis Creek leading to the reclaimed Joe Waylett Copper Mine (FS Road #18193) was decommissioned by Lolo National Forest and Trout Unlimited.

Lolo National Forest remains focused on closing roads no longer necessary for forest maintenance. A priority list of road sources where sediment mitigation would substantially reduce sediment load in the Ninemile watershed has been developed below. This list is prioritized based on the location of the road source (sub-watershed that we have already worked on are priorities), the load reduction from sediment mitigation and if there are associated culverts identified by the forest service for replacement or removal. The road number/crossing is listed for each road source in addition to the numbered location given to each TMDL identified road source(this is not based on priority only on location).

Road Restoration Priority List				
Priority	Road number/crossing	Tributary Watershed	Road Source Length (ft.) and Total Sediment Load (tons/year)	Rationale/Comments
1	4256 #85 TMDL list	Mattie V		Last culvert removal in entire sub-watershed
2	5490 #317 TMDL list	Stony Creek	2950 ft., 19.951 tons	2 culverts removed below here
3	34005 #238 TMDL list	Kennedy Creek	5280 ft., 24.245 tons	In headwaters of Kennedy Creek

				above reclamation project, significant sediment source
4	412 #25 TMDL list	St. Louis Creek	1320 ft. , 12.198 tons	Culvert is barrier at some flows here
5	5520 #83 TMDL list	Sawpit	2120 ft, 7.340 tons	Priority culvert removal in headwaters significant sediment source
6	5520, #188 TMDL list	Bird Creek	5300 ft. 20.302 ft.	Culvert needs to be replaced here
7	5498, #26 TMDL list	East Fork Beecher	1380 ft., 10.158 tons	In Post-burn area. Culvert needs to be replaced here
8	5498, #23 TMDL list	West Fork Beecher	440 ft., 6.341 tons	In post-burn area. Culvert needs to be replaced here
9	5498 #61 and 62 TMDL list	Soldier Creek	1100 ft. 14.004 tons	In post-burn area along same road as East Fork and West Fork Beecher
10	97? #4 TMDL List	Eustache	1430 ft., 25.699 tons	Restoration work completed here already
11	5503 #124 TMDL list	Little Blue Creek	1350 ft., 15.986 tons	Significant sediment source
12	#354 TMDL list	Rock Creek	1980 ft. 21.246 tons	2 culverts need to be replaced here Possible decommission?

C. Culvert Removal/Replacement

Lolo National Forest has committed extensive resources to assessing fish passage and habitat connectivity associated with road culverts in the Ninemile watershed. Scott Spaulding, fisheries biologist for Lolo National Forest has updated the TMDL Priority Culvert Assessment and provided a synopsis of culvert barriers in the Ninemile watershed. The passage below is part of that synopsis and was included in the TMDL:

"The Ninemile watershed, and associated sub-watersheds, is an important Westslope cutthroat production area for the Middle Clark Fork. Ninemile also has the potential to produce bull trout in the upper watershed and in some portions of downstream subwatersheds where good quality habitat, connectivity, and thermal regimes exist.

Mainstem Ninemile has unimpeded physical connectivity to the Clark Fork except for possible thermal barriers (temperature data to be presented) and dewatering that may exist in mid to late summer both

on the mainstem and the lower end of tributary streams. Tributary streams to Ninemile Creek are highly dissected by roads that often create complete, or at least selective (certain life stages or certain times of the year based on flow conditions), fish passage impediments at culvert crossings (Appendix B). These passage impediments often prevent individuals from carrying out daily and seasonal migration that is important to their production, reproduction and persistence. Within Ninemile subwatersheds there are typically multiple fish passage impediments in tributary streams with one barrier often situated near the mouth, generally associated with non-Forest roads and ownerships, and more at various locales up the tributary on Forest managed land (Figure 1, see Marion and Stony creeks as examples). This fragmentation of watersheds, and its direct effect on fish passage has substantial implications for native cold-water fish beneficial use support within the Ninemile Watershed.

The Clean Water Act under which TMDLs are prescribed also calls for forest road crossings to be designed, constructed, and maintained such that they do not …"disrupt the migration or other movement of those species of aquatic life inhabiting the water body (40 CFR 232.3 (c)(6)(vii))". Although improving fish passage and habitat connectivity alone cannot assure that beneficial uses such as native cold water fisheries will improve (vis-a-vis the Clean Water Act), habitat connectivity can be a critical component, and one that needs strong consideration within the context of watershed and their beneficial use impairments. Often a fish passage remedy (removing a crossing, upsizing and pipe, or installing a bridge) serves to reduce the risk of channel and habitat impairment from confinement and fine sediment generation at these locations, thus providing multiple benefits."

Through the TMDL process it was determined that nearly 50 culverts pose fish passage problems for fish. A table was created by Scott Spaulding as part of the TMDL's Priority Culvert Assessment that lists the 26 most important fish passage problems where the maximum benefit from a culvert removal or replacement would be realized (Appendix B). The criteria accounts for the fish population composition, watershed production potential and the amount of habitat gained through a culvert remedy. The highest priority projects are those where native fish production is moderate to strong and a solution could help to reconnect the entire tributary watershed to the mainstem of Ninemile. Examples of high priority projects are removals or replacements on Cedar and Moncure Creeks where the culverts are close to the mouth of the tributary, thus cutting off the majority of the creek from fish passage. Lolo NF has produced a map which outlines the fish passage capabilities of many of the culverts present in the Ninemile watershed. This map will be used to determine which tributaries have barriers that could potentially be removed.

Lolo National Forest, FWP and Missoula County have all contributed to removing or replacing culverts in the Ninemile watershed. Successful projects include the removal of 2 culverts and the replacement of another on Stony Creek in 2009 and 2011. These projects have helped to reconnect the Stony Creek watershed to the mainstem Ninemile and have allowed fish to move into quality upstream habitat. The replacement of a culvert on Little McCormick Creek has drastically improved fish passage into the recently reclaimed mine site. Culvert removals have also occurred on Mattie V Creek, Twin Creek, and Sawpit Creek by Lolo NF. See Appendix B for a complete list of culvert priorities and those that have been addressed.

Priority culvert removal and replacement is ongoing in the Ninemile Watershed and will be principally carried out by Lolo NF. In addition to following the Priority Culvert Assessment, ten culverts have been prioritized in this Ninemile WRP based on if restoration work has been or will be completed within that subwatershed, if there are significant improvements to fish passage, and if road source reductions are already prioritized within that sub-watershed.

Culvert Removal/Replacement Priority List					
Priority	Road number/ crossing	Tributary watershed	Removal or Replacement	Tons of fill at risk of delivery to stream if complete failure	Rationale/Comments
1	4256	Mattie V	Removal		Last culvert removal in entire watershed
2	18079	Stony	Removal	146	2 culverts already removed and one replaced in watershed, would open up entire watershed to fish
3	5498	St. Louis	Replace	852	Would help complete mine reclamation project by opening up stream above it
4	5520	Sawpit	Removal		One culvert already removed here, would complement mine reclamation work and road decommissioning work here
5	5498,	West Fork Beecher	Replace	5,856	In cooperation with road work, in post-burn area
6	5498	East Fork Beecher	Replace	511	In cooperation with road work, in post burn area
7	890	Josephine	Replace/remove	519	Would complement mine reclamation to be completed here, excellent habitat upstream
8	5520	Bird	Replace	8,115	Road project here, potential major sediment source
9	5520, 16225	Moncure	Replace, remove	178	Replacing the upper culvert and removing the bottom culvert would open up an entire unroaded watershed to fish
10	5515	Cedar	Replace	315	Unique sub-watershed would help reduce sediment loading to this TMDL listed stream

D. Modification of Agricultural Practices

In addition to mining, agriculture has been identified as one of the primary contributors of bank instability in the Ninemile watershed. Much of this bank instability exists on the mainstem of Ninemile Creek in the lower reaches of the creek where it flows through private land.

In 2001, Land and Water Consulting was contracted by the Missoula Conservation District and Ninemile Creek Watershed Group to conduct a reach by reach assessment of the mainstem of the Ninemile watershed which aimed to provide a foundation on which to address water quality and fisheries limitations in the Ninemile watershed. The assessment divided Ninemile Creek into five reaches. Four

out of the five reaches were determined to have significant sources of sediment from bank erosion. Calculations in the TMDL process found a load of 6,201 tons/year of sediment from agricultural sources in Reaches 3, 4 and 5. These reaches are entirely on private land, thus reductions in sediment loading will be voluntary. By implementing BMPs, vegetating the streambanks and fencing off the streambanks from cattle, much of the sediment load can be reduced. Missoula Conservation District and NRCS have cost-share programs that can help to fund bank stabilization projects. Additionally, Trout Unlimited is committed to working with landowners to improve their streambanks and reduce the sediment load to the mainstem of Ninemile Creek.

Landowners have already begun to address bank erosion in the Ninemile watershed. Since 2005, 64 permits have been approved by the Missoula Conservation District for streambank modifications under the 310 permitting process(Appendix E). Many of these approvals have stipulated an improvement in bank stabilization. Additionally, since 2003, the Conservation District has funded over $17,000 of streambank restoration through their cost-share program (Appendix F).

The major observations and recommendations from Land and Water's report are summarized below:

Reach	Location	Sediment Load from Bank Erosion	Condition	Recommendations
1	Headwaters to Beecher Creek	Not Assessed	**Headwaters Reach**-Good Condition	Replace culverts that are fish barriers, plan future logging operations to minimize impacts to water quality and fish habitat
2	Beecher Creek to Moncure Creek	2,039 tons/year from Mining	**Mined Reach**-Severely degraded, little or no LWD present in sections, confined and channelized	Open up the floodplain. This is an expensive option and should be assessed by subreach
3	Moncure Creek to Lower Road 5520 Bridge	507 tons/year from Agriculture	**Alder Reach**-where within narrow riparian corridor there is high quality habitat, while flowing through pasture land, outside banks are eroding	Implement grazing management that balances forage and wee control requirements w/ streambank stability. Where land owners are interested in reducing active erosion, slope back stream banks to 2:1, add topsoil, grass seed, erosion fabric and plant shrubs. LWD could also be added to this reach. It is not recommended to install rigid stabilization such as riprap as this can lead to active erosion in other locations
4	Lower Road 5520 Bridge	1,347 tons/year from Agriculture	**Cottonwood Reach**-Overall good fish	Add LWD into channel. Install without any rock or permanent

	to Upper West Side Bridge		habitat and water quality in this reach Reach 4b is unstable with banks lacking complexity due to past riparian logging. Reach 4c has the appearance of being straightened in the past and is downcut now and trying to build a new floodplain Reach 4f is Piney Meadows subdivision where many of the houses are at risk of bank erosion/flooding. Some banks have riprap and others are actively eroding into the creek	structure holding it in place. Improve riparian vegetation in areas of bank erosion. Help landowners seek matching funds for fencing projects and off-stream water facilities.
5	Upper West Side Bridge to Mouth	4,347 tons/year from Agriculture	**Lake Missoula Reach** This reach has as large sediment inputs from streambanks and terraces adjacent to the creek. Reach 5a has high eroding silt terraces, Reach 5b is generally wide and shallow with degraded riparian habitat and Reach 5c is lacking in riparian vegetation and has numerous eroding banks	Reduce source of high turbidity (needs additional investigation) Modify grazing management, encourage riparian vegetation

IV. Education Component

This Watershed Restoration Plan is the result of nearly 10 years of collaboration on restoration work in the Ninemile Creek watershed. Starting in 2004, Trout Unlimited, the Lolo National Forest, the Ninemile Watershed Group, and Missoula County began a campaign to cleanup abandoned mine sites in the Ninemile watershed. The group developed a comprehensive report that included the history of mining at each mining area and characterized impacts to public safety, water quality and fish and wildlife habitat on more than a dozen tributaries and the mainstem Ninemile Creek. Using this information and supporting documents like the Ninemile TMDL, Forest Service inventories, and regional fish and wildlife conservation plans, the group prioritized projects and began raising funds for project design and implementation. To prepare this document, the following organizations were contacted for input:

- Lolo National Forest
- Montana Fish, Wildlife and Parks
- Ninemile Watershed Group
- Missoula Conservation District
- Missoula County Rural Initiatives
- Missoula County Department of Public Works
- Clark Fork Coalition

Furthermore, since community residents and students will serve as volunteers for revegetation and monitoring, the community will also be intimately involved with the projects during and after their completion. Local stakeholders have contributed thousands of volunteer hours to restoration projects in the Ninemile Creek area in the last several years. Student from the University of Montana have also worked on several restoration projects as part of their class practicums. Volunteers have been and will continue to be involved in a similar manner, so this project has a significant public education and outreach component as well. Trout Unlimited is also planning on holding a public tour and developing a newsletter for the Ninemile Creek area in 2013.

V & VI. Implementation Schedule

Waterbody	Task(s)	Schedule/ Prioritizations	Lead Organization(s)	Technical Resources Necessary/ Other Partners	Anticipated Cost
Upper Ninemile Creek	Mine Reclamation	2014-2019	TU, LNF, MSO CTY	Engineering/ Hydrology Consulting	$3,000,000
Twin Creek	Mine Reclamation	2012	TU, LNF, MSO CTY	Engineering/ Hydrology Consulting	$150,000
Josephine Creek	Mine Reclamation	2013	TU, LNF, MSO CTY	Engineering/ Hydrology Consulting	$175,000
Kennedy Creek	Mine Reclamation	2014	TU, LNF, MSO CTY	Engineering/ Hydrology Consulting	$500,000
Sawpit Creek	Mine Reclamation	2014	TU, LNF, MSO CTY	Engineering/ Hydrology Consulting	$150,000
Martina Creek	Mine Reclamation	2016	TU, LNF	Engineering/ Hydrology Consulting	$150,000
Ninemile Watershed	Road Decommissioning	Addressing priority roads as identified in the TMDL, Post Burn EIS and Frenchtown Face	LNF	Assessment by LNF hydrologist and engineer	$300,000
Ninemile Watershed	Culvert Removal/Replacement	Implementing LNF's culvert prioritization Replacement of undersized culverts on County Road	LNF, MSO CTY	Assessment by LNF or MSO CTY hydrologist and engineer	$400,000
Ninemile Watershed	Implementation of BMPs by private landowners	2013-2020	TU, Clark Fork Coalition, Montana FWP	Missoula Conservation District, NRCS	$300,000
Ninemile Watershed	Shade loss study Identification of temperature sources in lower Ninemile Creek	2013-2020	TU, LNF, Clark Fork Coalition, Montana FWP,	Aerial photo Analysis, Hydrology Consulting	$25,000

VII. Interim milestones

Mine Reclamation

- Four of Six mine reclamation projects are anticipated to be completed by the end of 2014. These projects will be on Twin Creek, Josephine Creek, Kennedy Creek, and Sawpit Creek. It is expected that post-restoration the percentage of fine surface sediment in riffles < 6mm will be ≤14.8%. These creeks are all tributaries of Ninemile creek and will significantly decrease sediment load to the creek and restore fish passage to the tributaries.
- Reclamation of Kennedy Creek and Josephine Creek mine sites will yield a load reduction in sedimentation/siltation from mining of 1418 tons/yr. This will be quantified by performing a Bank Erosion Hazard Index (BEHI) assessment.
- Reclamation work on Twin Creek and Sawpit Creek will yield a 100% load reduction in sedimentation/siltation from mining. It is expected that the percentage of fine surface sediment in riffles < 6mm will be ≤14.8% after reclamation. The success of this reduction will be assessed with a suite of monitoring including Wolman Pebble Counts (decrease in % of fine sediment) and fish population monitoring.
- Phase 1 of the Upper Ninemile Creek mine reclamation project will be completed by 2015

Road Decommissioning

- Road decommissioning by Lolo National Forest will proceed as funding from the Post Burn EIS, Frenchtown Face and other sources becomes available. The priority road restoration list in the management measures section of this WRP will be used to prioritize sediment mitigation projects within the Ninemile watershed. It is anticipated that 3-5 projects from this list will be implemented by 2015

Culvert Replacement/Removal

- Implementation of Lolo National Forest's Priority Culvert List is expected as funding from the Post Burn EIS, Frenchtown Face and other sources becomes available. The priority culvert replacement and removal list in the management measures section of this WRP will be used to prioritize culvert removal and replacement projects. It is anticipated that 3-5 projects from this list will be implemented by 2015

Implementation of BMPs

- Working with the Missoula Conservation District and NRCS cost-share programs it is anticipated that a minimum of 2 cost-share projects will be implemented each year for the next 3 years in the Ninemile watershed

Shade Loss Study

- Numerous partners including TU, LNF, CFC, and MT FWP will work to examine aerial photographs and make site visits in the next 3 years to begin characterizing the sources of thermal barriers on Ninemile Creek

VIII. Criteria/Evaluation Process

To determine the effectiveness of this Ninemile Watershed Restoration Plan in meeting its goals and the necessity of updating this document, criterion were developed along several parameters to evaluate the long term impacts of the WRP.

A. Environmental Outcomes

For all restoration projects on TMDL-listed streams which this WRP will implement, it is expected that TMDL Load Reductions for Sedimentation/Siltation as a result of mining will be fully achieved. A failure to meet these load reductions will result in a re-evaluation of reclamation and restoration procedures. On non-listed streams where this WRP will be implemented, it is expected that the percentage of fine surface sediment in riffles < 6mm will be ≤14.8%. This load reduction target and the additional suite of monitoring targets will thoroughly evaluate each waterbody and determine if a 100% reduction in Sedimentation/Siltation due to mining will be achieved and a fully functioning stream channel will be restored.

To determine the reduction of potential sediment inputs from roads at stream crossings, Lolo National Forest uses the FroSAM model, a modified version of what is frequently referred to as the "Washington Method" (Washington Forest Practices Manual, 1997). For each stream crossing and/or near stream road segment, the contributing length of road (including cut and fill slopes), the tread width, base erosion rate, gravel factor, percent cover and percent delivery are determined. In the Ninemile watershed, a base erosion rate of 30 tons/acre/year has been used for analysis. If decommissioning of roads does not yield significant sediment reductions, decommissioning procedures will be examined.

The removal/replacement of culverts and their effect on sediment load will be assessed using a FroSAM model by Lolo National Forest. The fish passage capabilities of removed or replaced culverts will also be examined. If fish passage issues exist or there are large inputs of sediment at these sites, culvert removal/replacement procedures will be examined.

B. Organizational performance

- Partnership/Leveraging

Trout Unlimited will continue to work with a variety of partners to achieve restoration goals in the Ninemile watershed. Organizations will work cooperatively and differing opinions will be addressed through discussion and compromise. If the vast majority of restoration work is being completed by one or two organizations without partnership, the Ninemile WRP should be re-examined to ensure adherence to partnership principles.

Partnering with private landowners is critical to fully addressing impairments in the Ninemile watershed, especially along the private reaches of lower Ninemile Creek. Efforts will be made to inform landowners and work with them to improve the stream in a manner that is non-confrontational and mutually beneficial. All organizations involved with this WRP will work to establish good relations with landowners and work cooperatively to achieve load reductions on private reaches within the Ninemile watershed.

- Social Indicators/Sustainability

It is our hope that through the complete implementation of this WRP, the impaired streams in the Ninemile watershed can ultimately be removed from the 303(d) list. It is recognized that this could

involve additional implementation of projects not delineated in this WRP. However, if residents of the Ninemile valley and organizations working in the valley can once again view their watershed as "unimpaired" and "clean" then the measures implemented in this WRP will be deemed a success on a social scale. Our hope is also that individuals within the Ninemile watershed will become more closely involved in their watershed and will work to maintain and preserve all the restoration work that has been completed.

IX. Monitoring

Trout Unlimited and Lolo National Forest have undertaken a comprehensive suite of monitoring in the Ninemile watershed to track the health and stability of modified waterbodies following Mine Reclamation projects. Different criteria will be monitored for with different frequencies depending upon the target load reductions and goals for each waterbody. To quantify reductions in sediment load, a BEHI assessment can provide a numeric indicator of the tons of sediment delivered to the watershed and its relative reduction. However, other indicators such as pebble counts, macroinvertebrate indices and fish populations can also show an accurate assessment of sediment reductions in the watershed. Combining these indicators with monitoring for fish habitat, riparian vegetation and temperature can deliver a complete picture of the recovery of an impaired waterbody.

The methods for monitoring in the Ninemile watershed were derived from the SAP's written for Eustache Creek and St. Louis Creek as well as the Ninemile TMDL and the more recent *2011 Bitterroot Temperature and Tributary Sediment Total Maximum Daily Loads* and *Framework Water Quality Improvement Plan* and the *2010 Lower Clark Fork Tributaries Sediment TMDLs and Framework for Water Quality Restoration* All monitoring procedures, relevancy and frequencies are summarized below:

Indicator	Frequency	Timeframe	Term
Fish Populations	Annual	Summer	3-5 years
Wolman Pebble Counts	Annual	Summer	3-5 years
Riffle Grid Toss	Annual	Summer	3-5 years
Bank Erosion	Annual	Summer	3-5 years
Temperature	Annual	Summer and Fall	3-5 years
Macroinvertebrates	1st, 3rd, and 5th years after reclamation	Summer	3-5 years
Instream Habitat	3 of 5 years after reclamation	Summer	3-5 years
Channel Form and Stability	3 of 5 years after reclamation	Summer	3-5 years

Vegetation	1st, 2nd, 3rd, 5th, and 10th years after reclamation.	Summer	5-10 years

The sediment targets developed for each monitoring parameter are listed in the table below. Both a Ninemile TMDL target and a regional target are given for each monitoring parameter. The regional target is from the Middle Rockies ecoregion which the Ninemile watershed is representative of. These regional targets are pulled from the recent *Bitterroot TMDL.* In cases where a Ninemile TMDL target is not given, is not specific enough, or is outdated, the regional target may be used as a reference.

Sediment Targets			
Monitoring Parameter	Target Description	Ninemile TMDL target	Regional Target
Wolman Pebble Count	Percentage of fine surface sediment in riffles **< 6mm** (reach average via pebble count method)	A3 Channels: **Mean**=14.8 **Range**=6.5-23.1 B3 Channels: **Mean**=10.0 **Range**=2-18 B4 Channels: **Mean=**21.0 **Range**=6-36 C3 Channels: **Mean**=12.0 **Range**=6-18 C4 Channels: **Mean**=22.0 **Range**=12-32	**Middle Rockies**: ≤ 14
Wolman Pebble Count	Percentage of fine surface sediment in riffles **< 2mm** (reach average via pebble count method)		**Middle Rockies:** ≤ 10
Riffle Grid Toss	Percentage of fine surface sediment **<6mm** in riffles and pool tails (reach average via grid toss method)		**Middle Rockies**: ≤ 6
Instream Habitat	Residual pool depth (reach average)		**< 20' bankfull width**: > 0.8 (ft) **20'-35' bankfull width**: ≥ 1.1 (ft) **> 35' bankfull width**: ≥ 1.3 (ft)
Instream Habitat	Pools/mile	**10' wetted width**: 96 **20'wetted width**: 56 **25' wetted width:** 47 **50' wetted width:** 26	**< 20' bankfull width**: ≥ 84 **20'-35' bankfull width**: ≥ 49 **> 35' bankfull width**: ≥ 26
Instream Habitat	LWD/mile	>156 pieces/mile	**< 20' bankfull width**: ≥ 573 **20'-35' bankfull width**: ≥ 380 **> 35' bankfull width:** ≥ 195

Channel Form and Stability	Bankfull width/depth ratio (median of channel x-sec measurements)	**B channels:** < 22 **C channels:** < 33	**Bankfull width ≤ 35':** ≤ 16 **Bankfull width > 35'** ≤ 29
Channel Form and Stability	Entrenchment ratio (median of channel x-sec measurements)		**B channel type**: > 1.5 **C channel type**: > 2.5 **E channel type**: > 2
BEHI	Retreat Rate from Rosgen 2001 (ft/yr) – used for A and B channels	**Low:** .045 **Moderate:** .17 **High: .**46 **Severe: .**82	
Macroinvertebrates	Macroinvertebrate bioassessment impairment thresholds	>14 clinger taxa **Mountain MMI**: >75	**O/E:** > 0.80 **Mountain MMI:** > 63 **Valley MMI:** > 48

A. Fish Populations

Fish populations will be measured by TU and Lolo NF using an electroshocking backpack on 2-3 sites along the creek. Captured fish will be classified by species, measured to the nearest 0.10 inch and weighed to the nearest 0.01 pound. Fish population estimates will be made using the three pass depletion methodology. The fish will be released after they have been measured and identified, though FWP may preserve some samples for archive purposes. The fish sampling will be conducted to document the types of fish that are living in the creek and their relative abundance. All fish sampling will be conducted in coordination with MTFWP since the use of electrofishing equipment and seining requires a permit.

B. Wolman Pebble Counts

Surface sediment is an important indicator of salmonid spawning and incubation habitat quality . Excess surface fine substrate may have detrimental impacts on aquatic habitat by cementing spawning gravels, thus reducing their accessibility, preventing flushing of toxins in egg beds, reducing oxygen and nutrient delivery to eggs and embryos, and impairing emergence of fry (Meehan 1991). Weaver and Fraley (1991) observed a significant inverse relationship between the percentage of material less than 6.35 mm and the emergence success of westslope cutthroat trout and bull trout. Studies have shown that increased substrate fine materials less than 2 mm can adversely affect embryo development success by limiting the amount of oxygen needed for development (Meehan 1991). As well, the TMDL for the Flathead Headwaters cites recent work completed in the Boise National Forest in Idaho, which showed a strong correlation between the health of macroinvertebrate communities and percent surface fines defined as all particles less than two millimeters. (*Appendix B-Lower Clark Fork Tributaries TMDL Planning Area Sediment Monitoring Report*)

Wolman pebble counts will be used to determine the percent surface fines <6mm and <2mm. The Wolman pebble count method (1954) provides a survey of the particle distribution of the entire channel width, allowing assesors to calculate a percentage of the surface substrate (as frequency of occurrence) composed of fine sediment.

Previous assessments in western Montana specify a wide range of target values for fine sediment less than 6 mm in diameter. Values vary by stream type and specific sampling method. For this WRP a guideline threshold value for fine sediment <6 mm in riffles is set at 14.8 for B4 streams and 21.0 for A3 streams based on the Ninemile TMDL targets and targets from the Middle Rockies Ecoregion.

Surface fine sediment is difficult to measure with a great degree of precision using the Wolman pebble count method. To be conservative, any of the study reaches displaying greater than 15% fine sediment <2 mm diameter in riffles may indicate an impact to fisheries or aquatic life. *(Appendix B-Lower Clark Fork Tributaries TMDL Planning Area Sediment Monitoring Report.)*

C. Riffle Grid Toss

The wire grid toss is a standard procedure frequently used in aquatic habitat assessment. This method provides a more precise (repeatable) measurement of surface fine sediment than the broader survey approach of the Wolman pebble count. This measurement does not cover the entire channel width, as in the Wolman pebble count, but rather provides a more thorough measurement of surface fines in a subsample of the cross-section.

Previous assessments in western Montana specify a wide range of target values for fine sediment less than 6 mm in diameter. Values vary by stream type and specific sampling method. For this assessment a guideline threshold value for fine sediment <6 mm in riffles is 20%, which represents an average value of the guideline values used in previous studies. (*Appendix B-Lower Clark Fork Tributaries TMDL Planning Area Sediment Monitoring Report*)

D. Bank Erosion

Bank erosion is a natural process in streams and can contribute a significant natural load of sediment. Bank instability in the Ninemile TMDL appears to result primarily from two sources: agriculture and mining. Due to the size of the Ninemile watershed and the large number of listed stream miles, a coarse filter approach is used to estimate the sediment load from anthropogenic stream bank instability and to attribute this load to human-caused sediment sources.

In the main stem of Ninemile Creek and its listed tributaries, Bank Erosion Hazard Index (BEHI) assessments are conducted on a sample of reaches to assess the potential for bank erosion, and results from sampled reaches are extrapolated to the remainder of the listed streams. The BEHI assessments are based on a slightly modified version of the Rosgen (1996) method to characterize stream bank conditions into numerical indices of bank erosion potential. BEHI is an effective means of numerically characterizing a sediment load reduction.

The modified BEHI methodology evaluates a stream bank's inherent susceptibility to erosion as a function of six factors, including:

1. The ratio of stream bank height to bankfull stage.
2. The ratio of riparian vegetation rooting depth to stream bank height.
3. The degree of rooting density.
4. The composition of stream bank materials.
5. Stream bank angle (i.e., slope).
6. Bank surface protection afforded by debris and vegetation.

To determine a yearly sediment load from eroding stream banks in each BEHI category within the sampled reaches, bank retreat rates developed by Rosgen 2001 are utilized (Table 4-1). The rate of erosion is then multiplied by the area of eroding bank (in square feet) to obtain a volume of sediment per year, and then multiplied by the sediment density (i.e., average bulk density of 1.3 grams per cubic centimeter from (USDA, 1998) to obtain a mass of sediment.

Bank Retreat Rates Used for Banks of Varying Severity of Erosion.

Bank Erosion Hazard Condition	Retreat Rate from Rosgen 2001 (ft/yr) – used for A and B channels	Retreat Rate from Rosgen 2001 (ft/yr) – used for C channels
Low	0.045	0.09
Moderate	0.17	0.34
High	0.46	0.7
Severe	0.82	1.2

To derive a total sediment load from eroding stream banks for each of the listed streams in the Ninemile watershed results of the BEHI analysis are extrapolated from the sampled reaches to the remainder of the channel length. In the reaches where bank instability is determined to be a significant source of sediment, it is assumed that BEHI results are typical of eroding banks throughout the stream, and the BEHI results are extrapolated on a proportional basis. So, for example, if 1 mile of a stream was inventoried during the BEHI analysis and determined to produce 2 tons of sediment/year, and stream bank instability was determined to be a significant sediment source in 5 miles of the stream, then the estimated sediment load from stream bank instability would be 10 tons/year (5 miles x 2 tons/mile).

E. Temperature

Continuous temperature data loggers have been deployed at numerous locations along Ninemile Creek and its tributaries by many different agencies (Appendix C) Some temperature data loggers have been deployed annually while others have been deployed periodically. However, from these loggers an appreciable quantity of baseline data has been collected and can be utilized for comparison.

Temperature data loggers will continue to be deployed to monitor temperature trends especially in the Lower reaches of Ninemile Creek where temperatures are elevated for extended periods of time. Deployment will follow DEQ SOP WQPBWQM-006, available at the following weblink: http://www.deq.mt.gov/wqinfo/QAProgram/SOP% 20WQPBWQM-006.pdf. A "Continuous Data Logger Field Form" will be completed at each site during installation and removal. A set of these forms will be supplied to staff completing the installation with the supplied data loggers. Temperature data loggers will be deployed sometime between June 1st and June 15th as flood flows decline. Removal will occur within the last 2 weeks in September or the first week of October. Data will be offloaded and results will be delivered to DEQ to support STORET load by TU by December 31st of each year.

F. Macroinvertebrates

Macroinvertebrate samples provide several metrics that can be used to indicate the overall water quality of a waterbody. These indicators include: the Mountain index of Biological Integrity (IBI), several individual biological metrics, and the relative stressor tolerance of dominant benthic and macroinvertebrate taxa. Of these metrics, the number of clinger taxa provides the strongest indication of sediment impairment. These taxa are sensitive to fine sediments that fill interstitial spaces. A

minimum of 14 clinger taxa are expected in unimpaired streams and that is the target for streams in the Ninemile watershed.

The O/E model compares the taxa that are expected at a site under a variety of environmental conditions with the actual taxa that were found when the site was sampled; it is expressed as a ratio of the observed/expected taxa (O/E value). The O/E threshold value for all Montana streams is any O/E value < 0.8. Therefore, an O/E score of > 0.80 is a sediment target on Ninemile waterbodies. (*Bitterroot Temperature and Tributary Sediment Total Maximum Daily Loads* and *Framework Water Quality Improvement Plan*)

Macroinvertebrate samples will be collected using a Surber Sampler once at four sampling sites during the summer to avoid sampling when the sites may dry up. This is the same method used at many nearby drainages in the Ninemile and Devils Creek – the reference site with several years of historical data – and is therefore being used so that the project team can compare similar data sets to determine project effectiveness. Any macroinvertebrates that are collected in the field will be collected in accordance with the SOP for Collection, Sorting, and Taxonomic Identification of Benthic Macroinvertebrates, which can be viewed at the following link: http://www.deq.state.mt.us/wqinfo/monitoring/SOP/pdf/12-1-3.pdf .

Caton sub-sampling devices (Caton 1991), divided into 30 grids, are used to facilitate sorting and randomly obtaining representative organisms. Staff members will hand-deliver the macroinvertebrates in person to the lab.

G. Instream Habitat

Monitoring efforts will follow USFS R1/R4 (Northern/Intermountain Regions) fish and fish habitat standard inventory procedures to quantify amount and quality of pool habitat, amount and quality of large woody debris (LWD), width:depth ratios, both before and after stream channel restoration activities (Overton, et al. 2007). These habitat indicators are critical components of quality salmonid habitat.

Large Woody Debris (LWD) plays a significant role in the creation of pools and is a primary influence on stream function, including sediment and organic material transport, channel form, bar formation and stabilization, and flow dynamics (Bilby and Ward, 1989). Pool frequency is a critical measure of the availability of rearing and refugia habitat for salmonids. Residual pool depth, defined as the difference between pool maximum depth and crest depth, is a discharge-independent measure of pool depth and an indicator of the quality of pool habitat. Deep pools are important resting and hiding habitat for fish, and provide refugia during temperature extremes and high flow periods. Pool residual depth is also an indirect measurement of sediment inputs to listed streams. An increase in sediment loading would be expected to cause pools to fill, thus decreasing residual pool depth over time. Used together these indicators can inform on the recovery and availability of fish habitat in impaired waterbodies.

In an effort to contribute to larger regional data sets, and to collect data that are more easily comparable within the Ninemile system, a transition was made beginning in 2007 to PACFISH/INFISH Biological Opinion (PIBO) protocols (PIBO 2007).

H. Channel Form and Stability

Changes in both the width/depth ratio and entrenchment ratio can be used to indicate change in the relative balance between the sediment load and the transport capacity of the stream channel. As the width/depth ratio increases, streams become wider and shallower, suggesting an excess coarse

sediment load (MacDonald, et al., 1991). As sediment accumulates, the depth of the stream channel decreases, which is compensated for by an increase in channel width as the stream attempts to regain a balance between sediment load and transport capacity (*Bitterroot Temperature and Tributary Sediment Total Maximum Daily Loads* and *Framework Water Quality Improvement Plan*).

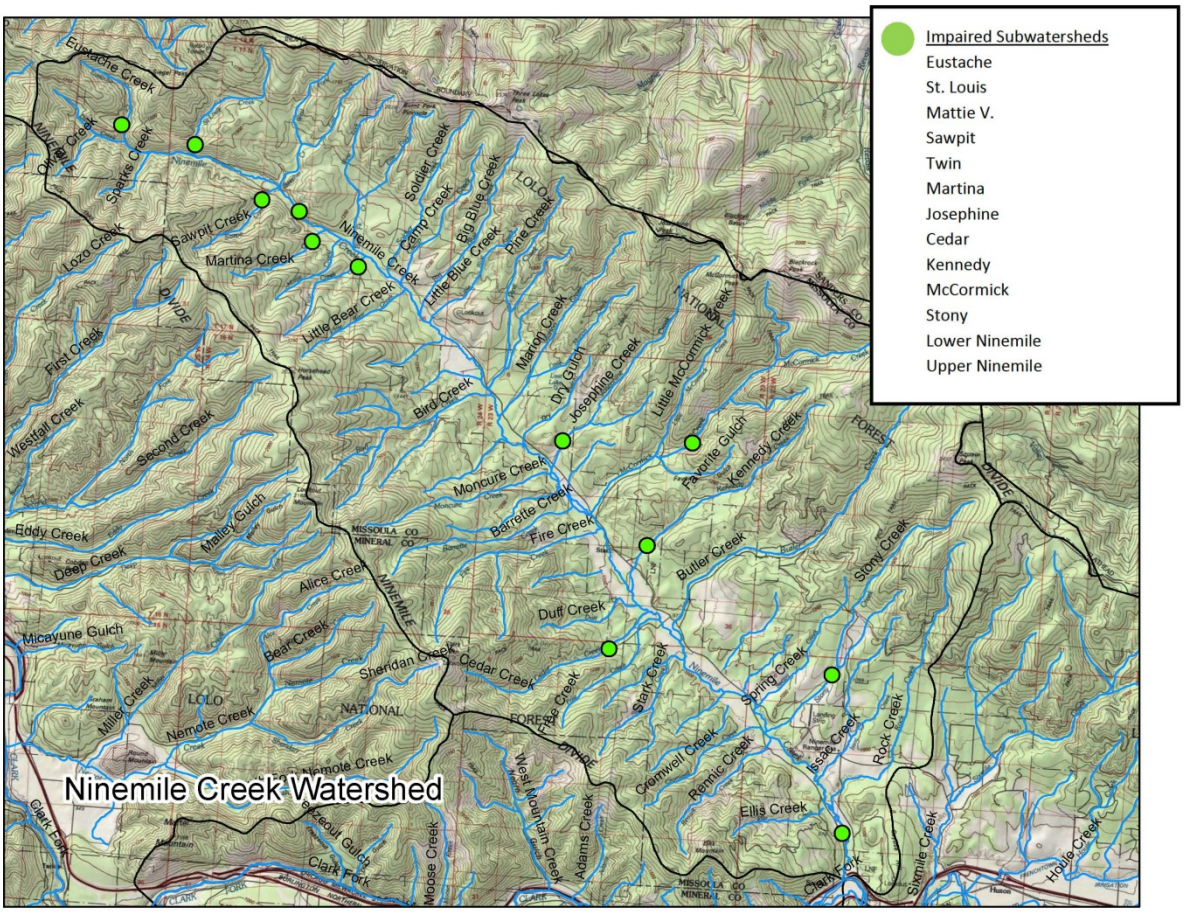
Stream entrenchment ratio is equal to the floodprone width divided by the bankfull width (Rosgen 1996). Entrenchment ratio is used to help determine if a stream shows departure from its natural stream type. It is an indicator of stream incision, and therefore indicates how easily a stream can access its floodplain. Streams are often incised due to detrimental land management or may be naturally incised due to landscape characteristics. A stream that is overly entrenched generally is more prone to streambank erosion due to greater energy exerted on the banks during flood events. Greater scouring energy in incised channels results in higher sediment loads derived from eroding banks. If the stream is not actively degrading (down-cutting), the sources of human caused incision may be historical in nature and may not currently be present, although sediment loading may continue to occur. The entrenchment ratio is an important measure of channel condition as it relates to sediment loading and habitat condition, due to the long-lasting impacts of incision and the large potential for sediment loading in incised channels. (*Appendix B-Lower Clark Fork Tributaries TMDL Planning Area Sediment Monitoring Report)*

I. Vegetation

The presence of riparian vegetation along streambanks is critical to a reduction in bank erosion and sedimentation. Vegetation is essential to stabilizing streambanks and preventing large sediment inputs from runoff events. Vegetation survival and density will be monitored using both photopoints and transect surveys. Digital photographs will be taken of the vegetation in the riparian zone within the project section.

X. Subwatershed Summaries

To accomplish the overall goals of this Ninemile Watershed Restoration Plan and to meet TMDL targets, many restoration projects throughout the watershed must be completed. Each of these projects will contribute to the health of the entire watershed. However, in undertaking these projects in each subwatershed, we want to ensure that all the impairments within the subwatershed are completely addressed before moving on to the next project. The pages below briefly delineate the problems, load reductions, management measures, status, timeline and needed resources for each impaired waterbody in the Ninemile watershed. TMDL-listed waterbodies are reported first followed by non-listed waterbodies.



Cedar Creek

Problem:
TMDL-listed as partially supporting aquatic life, cold water fishery, industrial, and primary contact recreation beneficial uses. Probable causes listed as sedimentation/ siltation, low flow alterations, and alterations in stream-side or littoral vegetative covers. Probable sources listed as agriculture, forest roads, flow alterations from water diversions, natural sources.

Load Reductions(from TMDL):
Sediment from Agriculture: 90% reduction of **79 tons/yr**
Sediment from Roads: 34.4% reduction of **5.3 tons/yr**

Management Measures :
Implementation of agricultural BMPs, modified grazing plans and bank stabilization practices by private landowners will significantly decrease the sediment loading to Cedar Creek from agriculture. Landowners are encouraged to work with the Missoula Conservation District and NRCS cost-share programs as well as other partners working in the Ninemile valley to implement these practices. The Bar One Ranch will be monitored by the Missoula Conservation District until EPA measures are successfully implemented. Decommissioning of roads and removal or replacement of culverts in the Cedar Creek watershed will occur as Lolo National Forest funding becomes available.

Status:
Since illegal ponds were discovered on Al Barone's Bar One Ranch property, extensive EPA mandated restoration has been undertaken on Cedar Creek. In 2007, filling of the ponds was completed which included a re-constructing of the Cedar Creek channel, removal of culverts, and maximization of wetland area. In 2008, 22,500 woody and 30,000 herbaceous plants were planted. In 2009, 17.72 acres of wetlands were observed to be performing well, exceeding expectations. In 2010, seeding within the first 20 feet of the stream was observed to be washed out and 400 additional shrubs were planted. In 2011, additional acreage was replanted.

Timeline:
Bar One Ranch revegetation is expected to be completed by 2015. Implementation of agricultural BMPs and decommissioning of forest roads to adequately meet sediment load reductions will occur over the next ten years.

Resources Needed:
Post Burn EIS and Frenchtown Face funding for decommissioning of roads. MCD and NRCS cost-share funding for bank stabilization projects. Cooperation with private landowners.

Josephine Creek

Problem:
TMDL-listed as not supporting Aquatic Life and Cold Water Fishery beneficial uses. Probable causes listed as Sedimentation/ Siltation, Low Flow Alterations, and Alterations in stream-side or littoral vegetative cover. Probable sources listed as Forest Roads, Placer Mining, Impacts from Hydrostructure, and Flow Regulation/ modification.

Load Reductions (from TMDL):
Sediment from Mining: 100% reduction of **699 tons/yr**.
Sediment from Roads: 39% reduction of **8 tons/yr**

Management Measures:
Planned reconstruction of approximately 1 mile of stream channel, including removal and regrading of historic dredge tailings will eliminate the current sediment loading from mining into Josephine Creek. Decommissioning of roads and removal or replacement of culverts in the Josephine Creek watershed will occur as Lolo National Forest funding becomes available. Roads will likely be decommissioned by Lolo National Forest and Trout Unlimited as part of the mine reclamation project.

Status:
A preliminary design has been completed for the mine reclamation project. Missoula County and Montana FWP recently replaced an undersized 18-inch culvert with a 19 foot bridge on the county road.

Timeline:
Mine reclamation is expected to occur in 2013 and 2014. Decommissioning of forest roads to adequately meet sediment load reductions will occur as funding becomes available.

Resources Needed:
Engineering/ Hydrology consulting. Cooperation with LNF and Missoula County on mine reclamation projects.

Kennedy Creek

Problems:
TMDL-listed as partially supporting agricultural, aquatic life, cold water fishery, drinking water, industrial, and recreation beneficial uses. Probable causes listed as sedimentation/ siltation, low flow alterations, alteration in stream-side or littoral vegetative covers, copper, lead, mercury, zinc. Probable sources listed as mine tailings, placer mining, subsurface (hardrock) mining, and irrigated crop production.

Load Reductions:
Sediment from Mining: 100% reduction of **719 tons/yr**
Sediment from Roads: 81% reduction of **31.8 tons/yr.**

Management Measures:
Reclamation of priority mine sites, including the Lost Cabin and Nugget Mines, through removal of mine tailings and containment of a draining mine adit. Project activities will also include reconstruction of portions of the stream channel. Implementation of reclamation measures is expected to fully address sediment inputs from mining. Decommissioning of roads and removal or replacement of culverts in the Kennedy Creek watershed will occur as Lolo National Forest funding becomes available. Roads will likely be decommissioned by Lolo National Forest and Trout Unlimited as part of the mine reclamation project.

Status:
A site investigation and engineering evaluation has been completed for the mine reclamation project.

Timeline:
Mine reclamation is expected to occur in 2014. Decommissioning of forest roads to adequately meet sediment load reductions will occur as funding becomes available.

Resources Needed:
Engineering/ Hydrology consulting. Cooperation with LNF and Missoula County on mine reclamation projects.

McCormick Creek

Problem:
McCormick Creek is TMDL-listed as not supporting aquatic life and cold water fishery beneficial uses. Lower McCormick creek is TMDL-listed as partially supporting aquatic life and cold water fishery. The probable causes of impairment on Little McCormick are sedimentation/siltation, low flow alterations, physical substrate habitat alterations and fish-passage barriers. The probable source for this impairment is placer mining. The probable causes of impairment on Lower McCormick Creek are alteration in stream-side or littoral vegetative covers. The probable sources for this impairment is placer mining.

Load Reductions:
Sediment from Mining: 100% reduction of **1,840 tons/yr.**
Sediment from Roads: 63% reduction of **105 tons/yr**

Management Measures:
The Little McCormick Creek watershed was intensively placer mined for gold during the last century. Most recently a local miner conducted a large-scale operation on the Glory Hole claim from 1978 to 1997. Between 2008 and 2010, TU worked with Lolo National Forest, Sierra Club and other partners to restore more than 2,500 feet of stream channel on Little McCormick Creek. Project objectives were to 1) create a more properly scaled channel that can transport discharge and bedload more efficiently 2) provide a more natural array of instream habitat including more and higher quality pools and added large wood debris 3) reduce the amount of fine sediment that is recruited annually from over-steepened hillslopes, and; 4) improve fish migration through restored surface water connectivity. These objectives have been successfully implemented on Little McCormick Creek leading to a substantial reduction of sediment load from mining sources to McCormick Creek. Decommissioning of roads and removal or replacement of culverts in the McCormick Creek watershed will occur as Lolo National Forest funding becomes available and roads are no longer needed for restoration access.

Status:
Restoration work has been completed on the Phase I and II mine reclamation project on Little McCormick Creek. Monitoring is being conducted to track improvement in the watershed. Culvert replacements have been completed on the main county road by FWP.

Timeline:
Monitoring on Phase I and II mine reclamation projects will be continued over the next 3-10 years depending upon the parameter being measured. Decommissioning of forest roads to adequately meet sediment load reductions will occur as funding becomes available.

Resources Needed:
LNF and TU staff to continue monitoring and tracking progress on Little McCormick Creek

Stony Creek

Problems:
TMDL-listed as partially supporting aquatic life and cold water fishery. Listed probable causes are sedimentation/siltation and phosphorus (total). Listed probable sources are agriculture and irrigated crop production.

Load Reductions:
Sediment from Roads: 76% reduction of **22.6 tons/yr**

Management Measures:
Decommissioning of roads and removal or replacement of culverts in the Stony Creek watershed will occur as Lolo National Forest funding becomes available. The culvert on the main county road should be investigated.

Status:
2 culverts have been removed and Forest Service roads were decommissioned in Upper Stony Creek.

Timeline:
Decommissioning of forest roads to adequately meet sediment load reductions will occur as funding becomes available.

Resources Needed:
Post Burn EIS and Frenchtown Face funding for decommissioning of roads.

Lower Ninemile Creek

Problem:
TMDL-listed as partially supporting aquatic life and cold water fishery (Ninemile Creek split for WRP). Listed probable causes are sedimentation/siltation and low flow alterations. Listed probable sources are streambank modification/ destabilization and flow alterations from water diversions.

Load Reductions:
Sediment from Agriculture: 75% reduction of **4,651 tons/yr**
Sediment from Timber Harvest: 100% reduction of **26.6 tons/yr**
Sediment from Fire: 99% reduction of **370 tons/yr**

Management Measures:
Implementation of agricultural BMPs including, riparian fencing, modified grazing management, planting of riparian vegetation and bank stabilization practices by private landowners will significantly decrease the sediment loading from agriculture to lower Ninemile Creek. Landowners are encouraged to work with the Missoula Conservation District and NRCS cost-share programs as well as other partners working in the Ninemile valley to implement these practices. With landowner support, FWP and TU could pursue Large Woody Debris projects which would enhance stream complexity and further stabilize eroding banks. Clark Fork Coalition and other partners will continue to pursue water leases with landowners to ensure adequate, cold flow during the irrigation season. It is predicted that sediment loads from Timber Harvest and Fire will decline naturally to 0 and 3 tons respectively by 2015. To further assess the sources of a potential thermal impairment in lower Ninemile Creek, a thorough shade loss study is proposed.

Status:
Clark Fork Coalition has secured several water leases on the mainstem of Ninemile Creek and its tributaries. The details and expiration of these leases are listed below:
High Mountain Meadow Ranch- 9.93 cfs, expires Dec. 2017
Scheer - .2 cfs, expires May 2014
Little Beaver Creek Ranch- 5.16 cfs, expires Nov. 2012
Fire Creek Ranch (on Fire Creek)- 1.75 cfs, expires Dec. 2016

Riparian fencing has been implemented by FWP on Lower Ninemile Creek pastures. Channel work including the addition of LWD and vegetation has been completed on reaches of Ninemile Creek by FWP. Since 2005, 64 permits have been approved by the Missoula Conservation District for streambank modifications (Appendix E). Many of these approvals have stipulated an improvement in bank stabilization. Additionally, since 2003, the Conservation District has funded over $17,000 of streambank restoration through their cost-share program (Appendix F).

Timeline:
It is anticipated that a minimum of 2 cost-share projects will be implemented each year that address bank stabilization. Implementation of agricultural BMPs will occur as landowners are willing and funding is available. A shade loss study will occur between 2013-2020 as funding becomes available.

Resources Needed:
Aerial photo analysis and hydrology consulting for the shade loss study. Landowner participation for the implementation of BMPs.

Upper Ninemile Creek

Problems:
TMDL-listed as partially supporting aquatic life and cold water fishery (Ninemile Creek split for WRP). Listed probable causes are sedimentation/siltation and low flow alterations. Listed probable sources are impacts from abandoned mine lands, streambank modification/ destabilization

Load Reductions:
Sediment from Mining:
Reach 1:92.2 tons/yr
Reach 2: 352 tons/yr
Reach 3: 129 tons/yr
Reach 4: 1,175 tons/yr
Reach 5: 351 tons/yr
Reach 6: 57.6 tons/yr
Reach 7: 778 tons/yr

Management Measures:
Reconstruction of approximately 3 miles of mainstem Upper Ninemile Creek, including removal and regrading of historic dredge tailings, significant revegetation activities and off channel wetland creation will address the majority of the sediment loading from mining to Upper Ninemile Creek.

Status:
A preliminary design document has been completed for the Upper Ninemile Creek Mine Reclamation Project.

Timeline:
Phase 1 of the Upper Ninemile Creek Mine Reclamation Project is expected to begin in 2014.

Resources Needed:
Engineering/ Hydrology consulting will be needed for the design. Significant funding from diverse sources and landowner/partner cooperation will be needed to fully implement this project.

Eustache Creek

Problems:
Eustache is not a TMDL-listed creek. Probable causes of impairment are sedimentation/siltation and probable sources of impairments are placer mining and forest service roads.

Load Reductions:
Sediment from Mining: 100% reduction

Management Measures:
Long-term monitoring efforts will continue to track re-vegetation efforts and current sediment loading to the creek.

Status:
The Eustache Creek mine reclamation project was completed in 2006. Mining spoil piles were pulled away from the creek bottom and re-contoured against the hillside. A quarter mile of floodplain and stream channel were re-constructed to provide bank stability and create habitat for native fish. Over 6,000 native hardwoods were collected and planted. Native conifers, shrubs and grasses from locally collected seed were replanted along the project length after construction to improve bank shading and reduce erosion potential. Groundwater retention stills were installed to raise the groundwater table and re-water a previously dry reach of the creek. Additionally, several miles of LNF roads have been decommissioned contributing to a decrease in delivery of sediment load to the watershed

Timeline:
Monitoring will continue through 2016.

Resources Needed:
TU and LNF staff time to continue monitoring efforts.

St. Louis Creek

Problems:
St. Louis Creek is not a TMDL-listed creek. Probable causes of impairment are sedimentation/siltation and probable sources of impairments are hard rock mining and forest service roads.

Load Reductions:
Sediment from Mining: 100% reduction

Management Measures:
Long-term monitoring efforts will continue to track re-vegetation efforts, current sediment loading and metals concentrations in the creek.

Status:
The Joe Waylett Mine was a hard rock copper mine worked up until 1981. Prior to reclamation, mine waste material was actively eroding into the creek. The East Fork of St. Louis Creek and the northern bank of St. Louis Creek were confined by large piles of mining tailings. The stream did not have any woody debris or typical stream channel features and in the last 200 yards had very little shading from direct sunlight. In Area D where higher grade, shear zone material was stockpiled, there were high quantities of copper.

In 2010 Trout Unlimited partnered with Lolo National Forest and Missoula County on reclamation work at the site. Waste rock was removed and transported to an on-site repository. Approximately 2,000 feet of streambank was restored and re-vegetated and 500 feet of stream channel was completely re-constructed. A culvert on the East Fork of St. Louis Creek was removed to reconnect fish passage for west slope cutthroat. In the fall of 2011, the site was re-vegetated with native conifers and spread with grass seed. The access road was removed and native riparian plants and a soil lift with willow cuttings were planted on the new streambanks.
In addition to mine reclamation, two culverts have been removed along the East Fork of St. Louis Creek and several forest service roads have been decommissioned in the watershed contributing to a sediment load reduction.

Timeline:
Monitoring will continue through 2020.

Resources Needed:
TU and LNF staff time to continue monitoring efforts.

Mattie V Creek

Problems:
Mattie V Creek is not a TMDL-listed creek. Probable causes of impairment are sedimentation/siltation and flow alterations and probable sources of impairment are placer mining, flow regulation/modification and forest service roads.

Load Reductions:
Sediment from Mining: 100% reduction

Management Measures:
Long-term monitoring efforts will continue to track re-vegetation efforts, current sediment loading and metals concentrations in the creek.

Status:
Prior to restoration efforts, Mattie V creek flowed through multiple dredge ponds, was confined to a man-made ditch for several hundred feet and had subsurface flows. Without a functional connection to Ninemile Creek, native fish were barred from upstream migration for nearly 80 years. With funding from Missoula County, MT DNRC, MT Fish Wildlife and Parks, LNF and private landowners , an engineered design was drafted in 2008. In the summer of 2010, reclamation was implemented. 12,000 cubic yards of mine waste was removed and re-contoured and 500 feet of new stream channel was constructed. The streambanks were augmented with coir logs and soil lifts and revegetation with native grasses and tree planting was finished in 2011.

Timeline:
Monitoring will continue through 2020.

Resources Needed:
TU and LNF staff time to continue monitoring efforts.

Sawpit Creek

Problems:
Sawpit Creek is not a TMDL-listed creek. Probable causes of impairment are sedimentation/siltation and probable sources of impairment are placer mining and forest service roads.

Load Reductions:
Sediment from Mining: 100% reduction

Management Measures:
The Sawpit Creek mine reclamation project will involve removal and regrading of historical dredge tailings and reconstruction of the stream channel to reconnect Sawpit Creek to Ninemile Creek.

Status:
A preliminary design document has been completed for mine reclamation in the Sawpit watershed. Several forest service roads have been decommissioned on the upper and lower reaches of the watershed and a culvert has been removed further reducing sediment loading to the creek.

Timeline:
Sawpit Creek mine reclamation is expected to begin in 2014.

Resources Needed:
Engineering/ Hydrology consulting will be needed for the design.

Twin Creek

Problems:
Twin Creek is not a TMDL-listed creek. Probable causes of impairment are sedimentation/siltation and probable sources of impairment are placer mining, flow regulation/modification and forest service roads.

Load Reductions:
Sediment from Mining: 100% reduction

Management Measures:
Long-term monitoring efforts will continue to track re-vegetation efforts, current sediment loading and metals concentrations in the creek.

Status:
The Twin Creek mine reclamation project was completed in 2012 and involved removal and regrading of historical dredge tailings and reconstruction of the stream channel to reconnect Twin Creek to Ninemile Creek. Overrall, 15,000 cubic yards of historic mining waste were removed and 700 feet of streamchannel was reconstructed. The streambanks were augmented with coir logs and soil lifts and revegetation with native grasses and tree planting will continue in 2013. Funding was provided by the Montana Department of Natural Resources, Montana Fish Wildlife and Parks, and Lolo National Forest.

Timeline:
Revegetation and site maintenance will continue in 2013 and monitoring will continue through 2020.

Resources Needed:

Martina Creek

Problems:
Martina Creek is not a TMDL-listed creek. Probable causes of impairment are sedimentation/siltation and probable sources of impairment are placer mining.

Load Reductions:
Sediment from Mining: 100% reduction

Management Measures:
The Martina Creek mine reclamation project will involve removal and regrading of historical dredge tailings and reconstruction of the stream channel to reconnect Martina Creek to Ninemile Creek

Status:
This project is currently in the planning phase and a design document has not been developed.

Timeline:
Martina Creek mine reclamation project is expected to start in 2016.

Resources Needed:
Engineering/ Hydrology consulting will be needed for the design.

References

Geum Environmental Consulting, Inc. 2012 Ninemile Creek-Housum Placer Restoration Project Vegetation Data Summary Report Prepared for Trout Unlimited.

Land and Water Consulting, Inc. 2001. Ninemile Creek, Geomorphic Analysis and Aquatic Habitat Assessment. Prepared for the Missoula Conservation District and Ninemile Watershed Group.

Lolo National Forest Roads in the Ninemile Drainage. Maps.

Lolo National Forest. 2008. Site Investigation Report Frances Copper Mine (Joe Waylett)

Lolo National Forest and Trout Unlimited. 2008. Sampling and Analysis Plan for Project Monitoring on Eustache Creek

Lolo National Forest and Trout Unlimited. 2007. Sampling and Analysis Plan for Project Monitoring on St. Louis Creek. 319 Contract #: 207044

Miller, Mark. 2010. Watershed Restoration Plan for Lower Clark Fork TMDL Planning Area. Prepared by Lower Clark Fork Watershed Group.

Missoula Conservation District. Ninemile 310 permits, cost-share projects, Bar-One Ranch files. MCD records

Montana Department of Environmental Quality (MDEQ). 2011. Appendix B-Lower Clark Fork Tributaries TMDL Planning Area Sediment Monitoring Report

Montana Department of Environmental Quality (MDEQ). 2011. Bitterroot Temperature and Tributary Sediment Total Maximum Daily Loads and Framework Water Quality Improvement Plan

Montana Department of Environmental Quality (MDEQ). 2005. Water Quality Restoration Plan and Total Maximum Daily Loads for the Ninemile Planning Area.

Montana Fish Wildlife and Parks. 2010. Westslope Cutthroat Trout Genetic Sampling Middle Clark Fork River Tributaries

River Design Group Inc. and Montana Department of Environmental Quality. 2010. Appendix B - Lower Clark Fork Tributaries Tmdl Planning Area Sediment Monitoring Report

River Design Group, Inc. and Westwater Consultants, Inc. 2012. Ninemile Creek-Housum Placer Restoration Project: Phase 1 Geomorphic Data Summary Report. Prepared for Trout Unlimited.

Spaulding, Scott. 2012. Ninemile TMDL Fish Passage Assessment and Recommendations for Forest-Managed Lands.

Sun River Watershed Group. 2012. Sun River Watershed Restoration Plan.

Telesto Solutions and The University of Montana Department of Geosciences. 2009. Mattie V Creek Conceptual Channel Design Report. Prepared for Trout Unlimited.

Trout Unlimited. 2011 Future Fisheries Improvement Program Grant Application: Twin Creek.

Trout Unlimited. 2006. Summary of Environmental and Mining Data for Selected Tributaries of the Ninemile Watershed.

United States Forest Service. 2005. Frenchtown Face Ecosystem Restoration Project Environmental Impact Statement.

United States Forest Service. 2002. Lolo National Forest Post Burn Final Environmental Impact Statement.

Appendices

Appendix A

Ninemile Creek Drainage

Roads in the Ninemile Drainage

Forest Service Roads
Number of Roads 550
Number of Miles 453.3

Non Forest Service Roads
Number of Roads 217
Number of Miles 125.8

Decommissioned Roads
Number of Roads 139
Number of Miles 88.03

170102040301

170102040302

170102040303

170102040304

170102040305

Legend

- Ninemile Ranger Station
- FS Roads
- Non FS Roads
- Decomm Roads
- Clark Fork
- perennial streams
- Township Range
- Sections
- Ninemile Drainage Hucs
- Lolo National Forest
- Plum Creek
- Private
- State of Montana
- Water

Fish Passage Data

- Bridge
- Passable at all flows
- Natural Channel Simulation
- Stream Simulation
- Removed
- Undetermined
- Too little information to determine
- Barrier at some flows
- Barrier at all flows
- No Fish

0 2.5 5 10 Miles

T 16 N

T 15 N

R 26 W R 25 W R 24 W R 23 W R 22 W

Created by E. Karuzas March 2012

Ninemile Creek - Butler Creek
170102040304

170102040303

170102040302

170102040304

170102040305

Bird Creek
Moncure Creek
Barrette Creek
Fire Creek
Duff Creek
Cedar Creek
Free Creek
Remote Creek
McCormick Creek
Ninemile Creek
Favorite Gulch
Kennedy Creek
Butler Creek
Spring Creek
Stony Creek
Rock Creek
Quirk Creek
Cromwell Creek
Ninemile Ranger Station

T 16 N
T 15 N

R 24 W
R 23 W
R 22 W

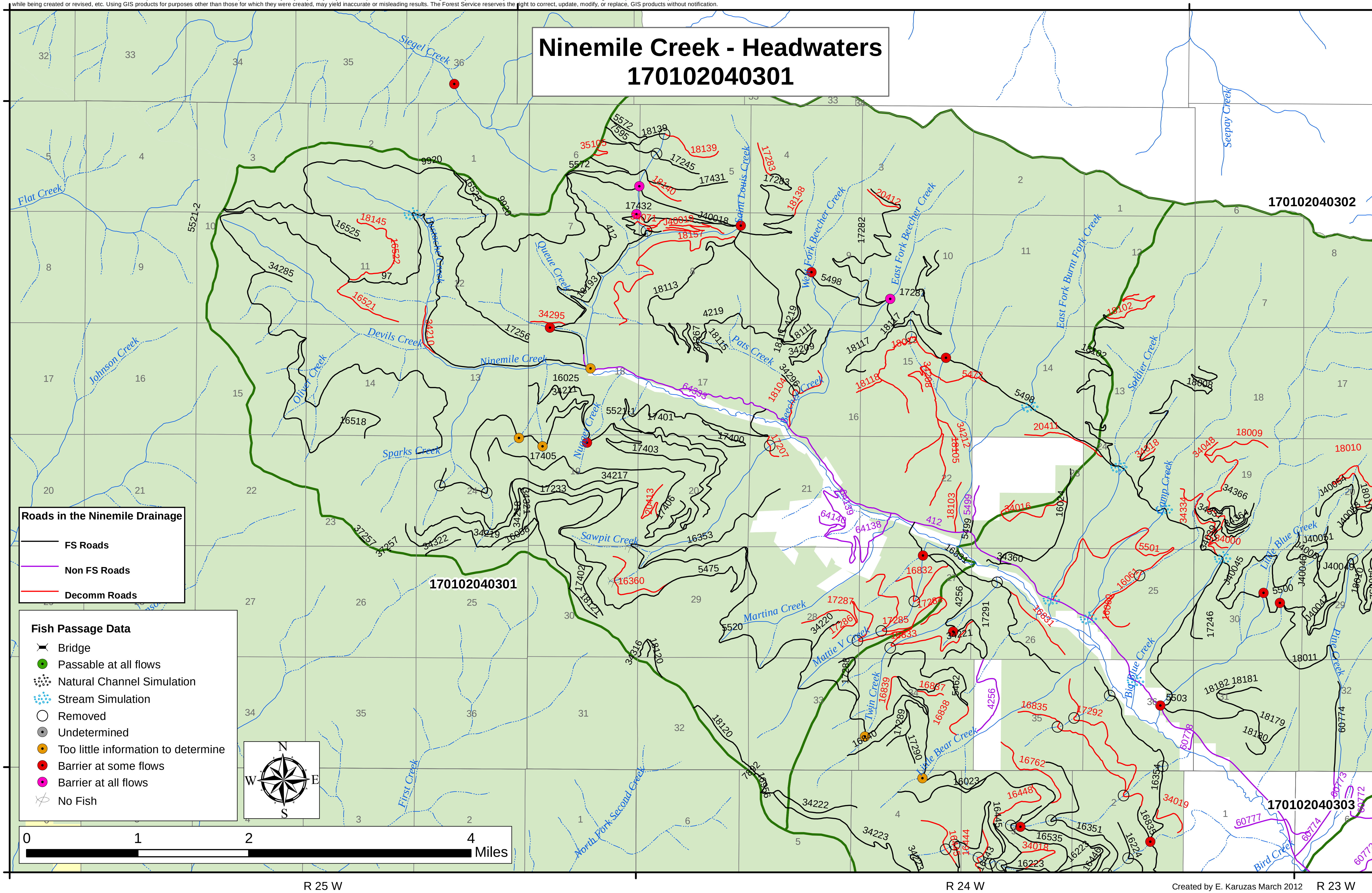
Roads in the Ninemile Drainage
- FS Roads
- Non FS Roads
- Decomm Roads

Fish Passage Data
- Bridge
- Passable at all flows
- Natural Channel Simulation
- Stream Simulation
- Removed
- Undetermined
- Too little information to determine
- Barrier at some flows
- Barrier at all flows
- No Fish

0 1 2 4 Miles

Created by E. Karuzas March 2012

The Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc. Using GIS products for purposes other than those for which they were created, may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify, or replace, GIS products without notification.



Created by E. Karuzas March 2012

Ninemile Creek - Little Bear Creek
170102040302

170102040301

170102040303

170102040304

T 17 N

T 16 N

R 25 W

R 24 W

R 23 W

N

W E

S

Roads in the Ninemile Drainage

- FS Roads
- Non FS Roads
- Decomm Roads

Fish Passage Data

- Bridge
- Passable at all flows
- Natural Channel Simulation
- Stream Simulation
- Removed
- Undetermined
- Too little information to determine
- Barrier at some flows
- Barrier at all flows
- No Fish

0 1 2 4 Miles

Created by E. Karuzas March 2012

Ninemile Creek - McCormick Creek
170102040303

170102040303

T 17 N

T 16 N

R 24 W

R 23 W

Roads in the Ninemile Drainage

- FS Roads
- Non FS Roads
- Decomm Roads

Fish Passage Data

- Bridge
- Passable at all flows
- Natural Channel Simulation
- Stream Simulation
- Removed
- Undetermined
- Too little information to determine
- Barrier at some flows
- Barrier at all flows
- No Fish

0 1 2 4 Miles

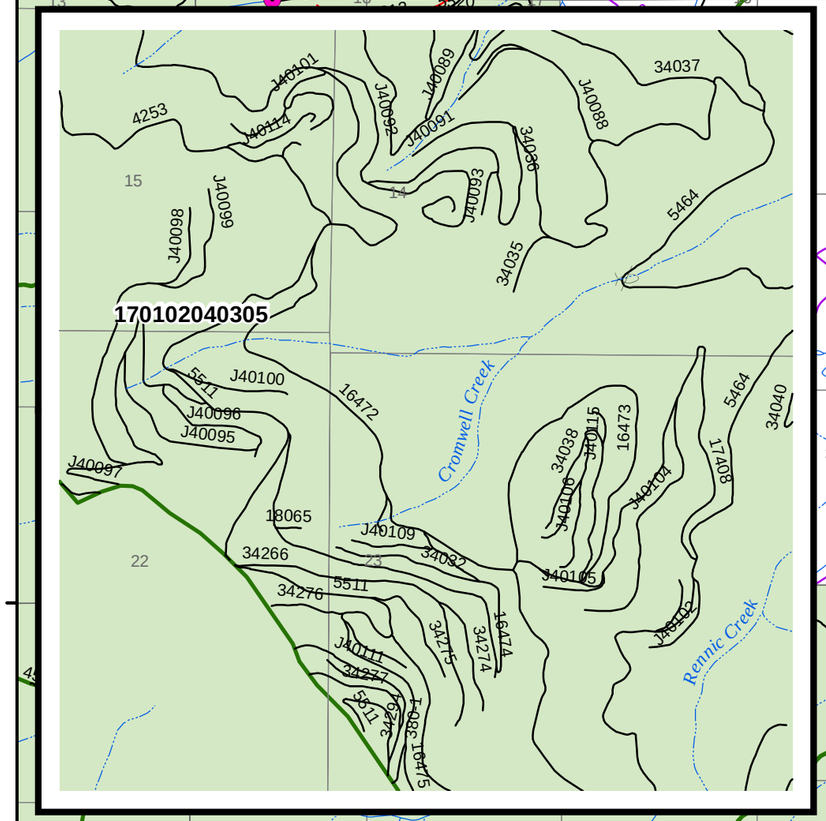
N W E S

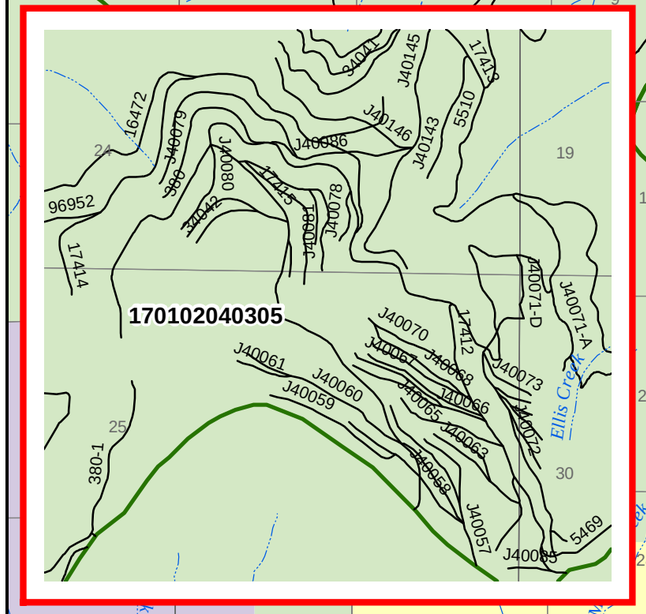
170102040303

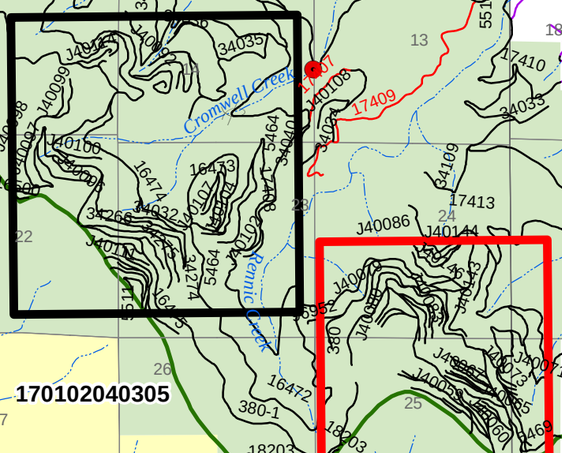
170102040304

Created by E. Karuzas March 2012

Ninemile Creek - Stony Creek
170102040305







Roads in the Ninemile Drainage

- FS Roads
- Non FS Roads
- Decomm Roads

Fish Passage Data

- Bridge
- Passable at all flows
- Natural Channel Simulation
- Stream Simulation
- Removed
- Undetermined
- Too little information to determine
- Barrier at some flows
- Barrier at all flows
- No Fish

0 1 2 4 Miles

Ninemile Ranger Station

T 16 N

T 15 N

R 24 W

R 23 W

R 22 W

Created by E. Karuzas March 2012

Appendix B

Table 1. Top 26 Fish passage barriers and proposed treatment for remedy, Ninemile watershed.

Treat-ment Priority	Road Number and (Crossing Location)	Tributary Watershed	Potential Treatment (remove or replace)	Associated Forest Project (Post Burn= PB, Frenchtown Face= FTF, Independent= I)	Miles of Habitat Upstream (to likely non-fish bearing water or the next passage impediment)	Tons of fill at risk of delivery to stream if complete failure	Rationale/Comments	Status
1	5520 (T16N R23W sec 19 NENW)	Moncure	replace	I	1.63	126	One of the few watersheds with little road influence, solution would open up entire unroaded watershed to fish. Moderate numbers of cutthroat only populations above and below.	
2	16225 (T16N R23W sec 17 SWSW)	Moncure	remove	I	0.53	52	Downstream of 5520 barrier. This culvert could likely be pulled and crossing restored, on old harvest spur. This coupled with above would make Moncure completely connected from Ninemile to headwater.	
3	5498 (T176N R24W sec 8 NENE)	St. Louis	replace	PB	1.08	852	Important native fishery in upper Ninemile. Evidence of migratory fish, this would open up stream to fish passage above mine altered segments downstream. Very good water temperatures.	
4	5498	West Fork	replace	PB	0.85	5,856	Important native fishery in	

Treat-ment Priority	Road Number and (Crossing Location)	Tributary Watershed	Potential Treatment (remove or replace)	Associated Forest Project (Post Burn= PB, Frenchtown Face= FTF, Independent= I)	Miles of Habitat Upstream (to likely non-fish bearing water or the next passage impediment)	Tons of fill at risk of delivery to stream if complete failure	Rationale/Comments	Status
	(T17N R24W sec 10 NESW)	Beecher					upper Ninemile. Very good water temperatures. Would open up entire watershed to fish when coupled with number 5 below.	
5	5498 (T17N R24W sec 9 SWNE)	East Fork Beecher	replace	PB	0.71	511	Important native fishery in upper Ninemile. Very good water temperatures. Would open up entire watershed to fish when coupled with number 4 above.	
6	5498 (T17N R24W sec 15 SWNE)	West Fork Burnt Fork	replace	PB	0.88	504	Burnt Fork below this point very disturbed from timber harvest, this opens upper end to native fish, lower end of stream heavily dominated by brook trout.	
7	5498 (T16N R23W sec 5 NENE)	Little Marion Creek	Replace/remove	I	1.6	398	Important native fishery in mid Ninemile. Fish Wildlife and Park with plans to improve passage at mouth near Ninemile.	

Treat-ment Priority	Road Number and (Crossing Location)	Tributary Watershed	Potential Treatment (remove or replace)	Associated Forest Project (Post Burn= PB, Frenchtown Face= FTF, Independent= I)	Miles of Habitat Upstream (to likely non-fish bearing water or the next passage impediment)	Tons of fill at risk of delivery to stream if complete failure	Rationale/Comments	Status
8	5515 (T15N R23W sec 4 SENE)	Cedar	replace	I	2.02	315	Moderate numbers of WCT, and good habitat and valley bottom that is unique (broader bottom with mixed hardwoods) to Ninemile tributaries.	
9	456 (T16N R22W sec 33 NWNW)	Stony	replace	FTF	3.64	211	Important native fishery in lower Ninemile. Reconnects lower with good quality habitat in upper watershed.	Replaced 2011
10	34030 (T15N R22W sec 5 NESW)	Stony	remove	FTF	0.75	50	Important native fishery in lower Ninemile. Would open up entire watershed to fish when coupled with other passage fixes in watershed.	Removed in 2009
11	18079 (T15N R22W sec 5 NENE)	Stony	remove	FTF	1.14	146	Important native fishery in lower Ninemile. Would open up entire watershed to fish when coupled with other passage fixes in watershed.	
12	5489	Stony	replace	FTF	0.14	66	Important native fishery in	Removed in

Treat-ment Priority	Road Number and (Crossing Location)	Tributary Watershed	Potential Treatment (remove or replace)	Associated Forest Project (Post Burn= PB, Frenchtown Face= FTF, Independent= I)	Miles of Habitat Upstream (to likely non-fish bearing water or the next passage impediment)	Tons of fill at risk of delivery to stream if complete failure	Rationale/Comments	Status
	(T15N R25W sec 5 NENE)						lower Ninemile. Would open up entire watershed to fish when coupled with other passage fixes in watershed.	2009
13	5520 (T16N R24W sec 11 NESE)	Bird	replace	PB	3.08	8,115	Opens up most of upper Bird, which has moderate habitat quality. Some brook trout present above current pipe. Some genetic samples collected in 2002.	
14	34297 (T17N R24W sec 21 NWNW)	Sawpit	remove	PB	1.55	387	Opens up most of Sawpit, a smaller watershed in upper Ninemile which has moderate habitat quality. Some brook trout present above current pipe.	Removed
15	890 (T17N R23W sec 35 SWSW)	Josephine	replace/remove	I	2.53	519	Excellent habitat upstream of crossing. Site a source of considerable slumping and sediment contribution to stream.	
16	60772 (T16N	Marion	remove	I	0.36	128	Important native fishery in mid Ninemile. Fish Wildlife and	

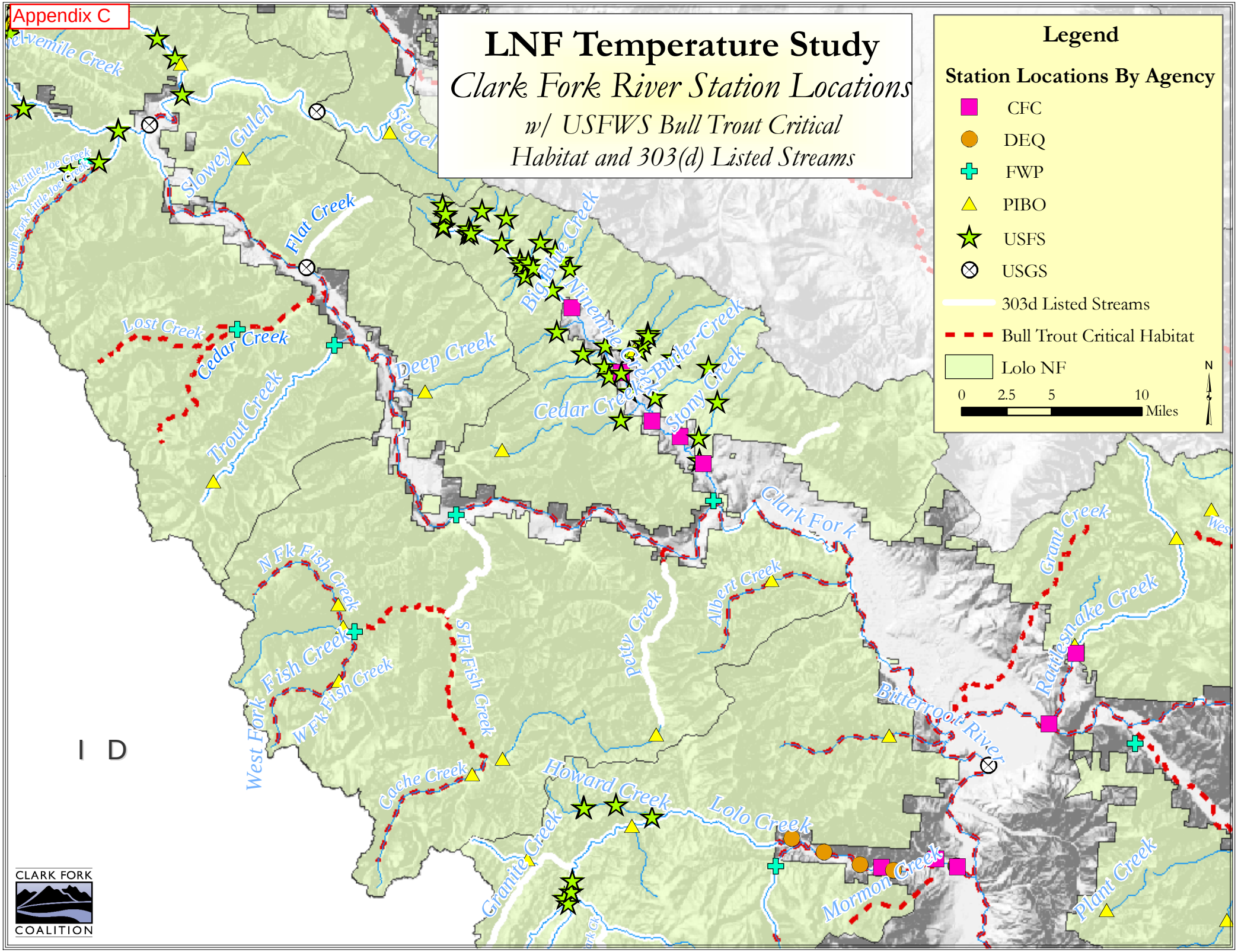
Treat-ment Priority	Road Number and (Crossing Location)	Tributary Watershed	Potential Treatment (remove or replace)	Associated Forest Project (Post Burn= PB, Frenchtown Face= FTF, Independent= I)	Miles of Habitat Upstream (to likely non-fish bearing water or the next passage impediment)	Tons of fill at risk of delivery to stream if complete failure	Rationale/Comments	Status
	R23W sec 5 SWNW)						Park with plans to improve passage at mouth near Ninemile. Benefits would be limited unless upstream pipes on private road addressed.	
17	17294 (T16N R22W sec 34 NWSE)	Rock	remove	FTF	1.23	99	Native fishery in lower Ninemile. Benefits would be lessened unless downstream pipes on non-Forest roads addressed.	
18	476 (T16N R22W sec 26 NWSW)	Rock	replace	FTF	0.52	40	Native fishery in lower Ninemile. Benefits would be lessened unless downstream pipes on non-Forest roads addressed.	
19	17209 (T16N R22W sec 27 NENE)	Rock	remove	FTF	0.49	167	Native fishery in lower Ninemile. Benefits would be lessened unless downstream pipes on non-Forest roads addressed.	Removed in 2009
20	16833 (T17N R24W sec	Twin	remove	PB	1.13	478	Smaller watershed with lower road effects, some native fish benefits.	Removed in 2005

Treat-ment Priority	Road Number and (Crossing Location)	Tributary Watershed	Potential Treatment (remove or replace)	Associated Forest Project (Post Burn= PB, Frenchtown Face= FTF, Independent= I)	Miles of Habitat Upstream (to likely non-fish bearing water or the next passage impediment)	Tons of fill at risk of delivery to stream if complete failure	Rationale/Comments	Status
	27 SESW)							
21	17285 (T17N R24W sec 27 NESW)	Mattie V	replace	PB	0.23	2,310	Smaller watershed, high road density, and moderate mine impact, moderate native fish potential.	Removed in 2005
22	16833 (T17N R24W sec 28 SESE)	Mattie V	remove	PB	0.64	1,520	Smaller watershed, high road density, and moderate mine impact, moderate native fish potential.	Removed in 2005
23	14256 (T17N R24W sec 27 NWNE)	Mattie V	remove	PB	0.63	36	Smaller watershed, high road density, and moderate mine impact, moderate native fish potential.	Big Priority
24	16832 (T17N R24W sec 27 SENW)	Mattie V	remove	PB	0.42	135	Smaller watershed, high road density, and moderate mine impact, moderate native fish potential.	Removed in 2005
25	5520 (T16N R24W sec 271 NESE)	East Fork Bird	replace	PB	0.28	5,148	Modest potential for native fish benefit.	
26	16831	Twin	remove	PB	1.02	627	Smaller watershed with lower	Removed in

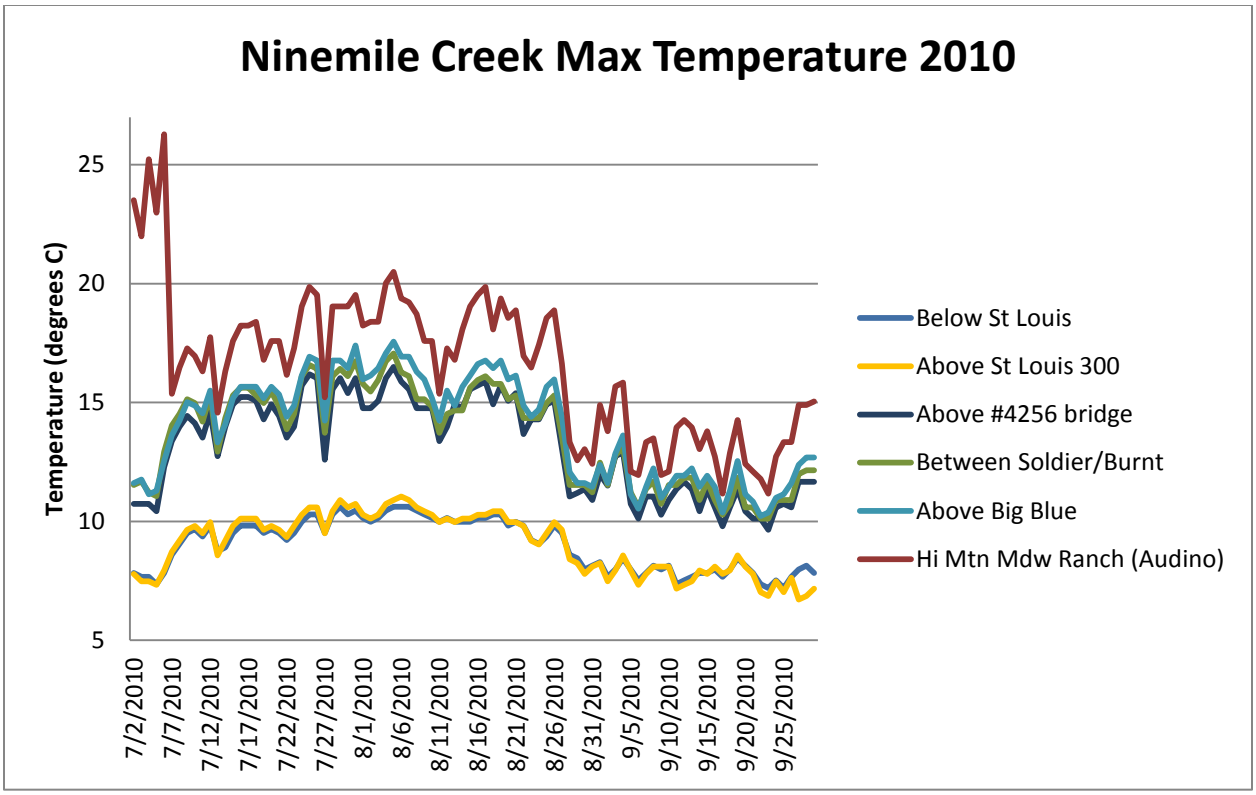
Treat-ment Priority	Road Number and (Crossing Location)	Tributary Watershed	Potential Treatment (remove or replace)	Associated Forest Project (Post Burn= PB, Frenchtown Face= FTF, Independent= I)	Miles of Habitat Upstream (to likely non-fish bearing water or the next passage impediment)	Tons of fill at risk of delivery to stream if complete failure	Rationale/Comments	Status
	(T17N R24W sec 26 SENW)						road effects, some native fish benefits.	2005

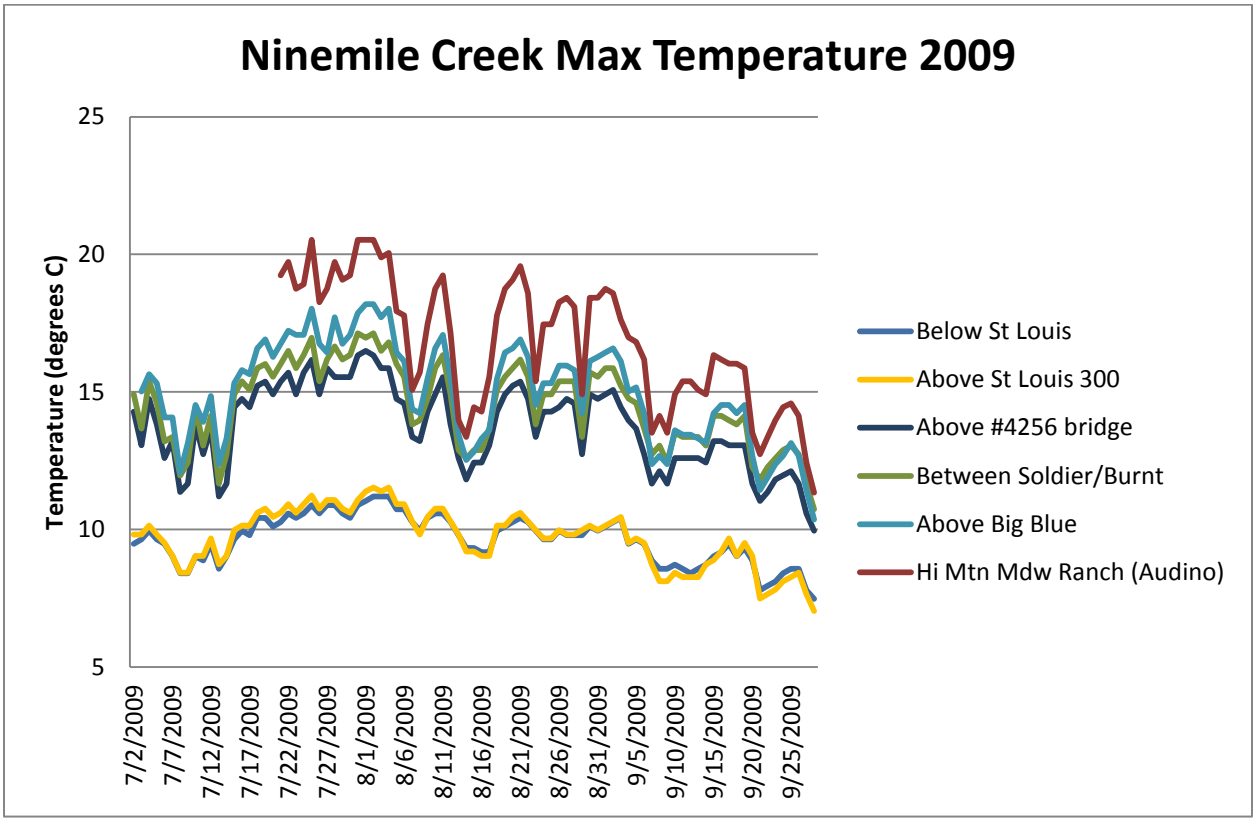
Additionally, a culvert was removed on road 17207 in the Sawpit Creek watershed in 2005. In 2010, a culvert was replaced on Little McCormick Creek on road 4213.

Appendix C


LNF Temperature Study
Clark Fork River Station Locations
w/ USFWS Bull Trout Critical Habitat and 303(d) Listed Streams
Legend
Station Locations By Agency
CFC
DEQ
FWP
PIBO
USFS
USGS
303d Listed Streams
Bull Trout Critical Habitat
Lolo NF
0 2.5 5 10
Miles
N
Siegel Creek
Slowey Gulch
Flat Creek
Big Blue Creek
Ninemile Creek
Butler Creek
Stony Creek
Cedar Creek
Lost Creek
Deep Creek
Trout Creek
Clark Fork
N Fk Fish Creek
W Fk Fish Creek
West Fork Fish Creek
S Fk Fish Creek
Petty Creek
Albert Creek
Grant Creek
Rattlesnake Creek
Bitterroot River
Cache Creek
Howard Creek
Lolo Creek
Granite Creek
Mormon Creek
Plant Creek
I D
CLARK FORK COALITION

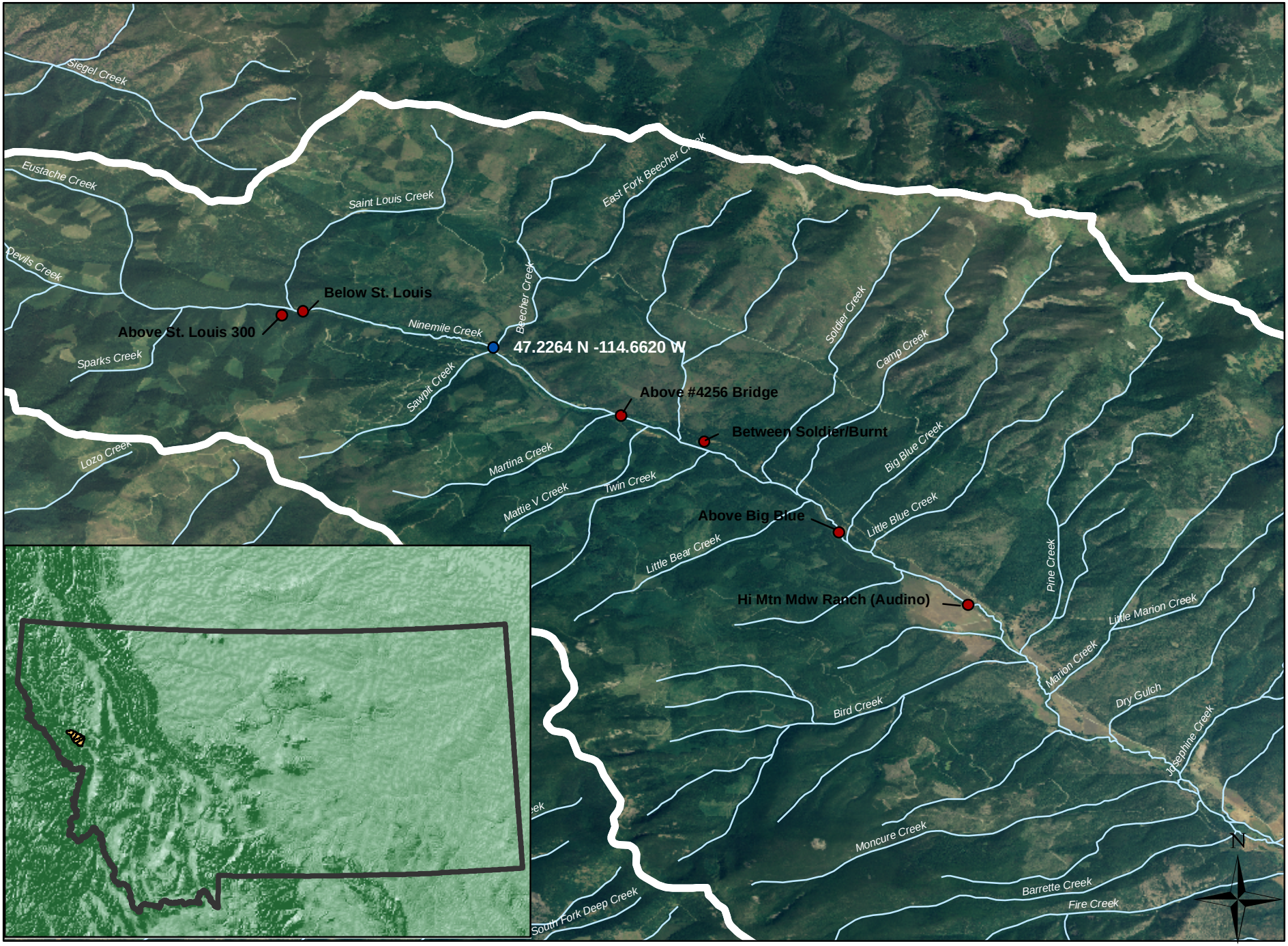
Appendix D


Ninemile Creek Max Temperature 2010
Temperature (degrees C)
25
20
15
10
5
7/2/2010
7/7/2010
7/12/2010
7/17/2010
7/22/2010
7/27/2010
8/1/2010
8/6/2010
8/11/2010
8/16/2010
8/21/2010
8/26/2010
8/31/2010
9/5/2010
9/10/2010
9/15/2010
9/20/2010
9/25/2010
Below St Louis
Above St Louis 300
Above #4256 bridge
Between Soldier/Burnt
Above Big Blue
Hi Mtn Mdw Ranch (Audino)


Ninemile Creek Max Temperature 2009
Temperature (degrees C)
25
20
15
10
5
7/2/2009
7/7/2009
7/12/2009
7/17/2009
7/22/2009
7/27/2009
8/1/2009
8/6/2009
8/11/2009
8/16/2009
8/21/2009
8/26/2009
8/31/2009
9/5/2009
9/10/2009
9/15/2009
9/20/2009
9/25/2009
Below St Louis
Above St Louis 300
Above #4256 bridge
Between Soldier/Burnt
Above Big Blue
Hi Mtn Mdw Ranch (Audino)

Appendix D

Ninemile Temperature Gauge Locations



Appendix F

Application #	Applicant	Location	Practices	Funded	Completed
CS-11-03	Krage/Guthrie	NINEMILE VALLEY		$358.50	Yes
CS-25-04	David Petrig	NINEMILE VALLEY		$746.25	Yes
CS-07-05	David Petrig	NINEMILE VALLEY		$832.50	Yes
CS-02-06	Joan Cook	NINEMILE VALLEY		$375.00	Yes
CS-21-08	JOHN VALENSI	NINEMILE VALLEY	SWD	$1,125.00	Yes
CS-10-09	MICHAEL & JAN S(	NINEMILE VALLEY	F	$2,250.00	Yes
CS-06-10	JOHN VALENSI	NINEMILE VALLEY	SWD	$1,522.50	Yes
CS-23-10	MARC VON DER R(	NINEMILE VALLEY	W	$2,500.00	Yes
CS-24-10	G. VON DER RUHR	NINEMILE VALLEY	W,SD	$2,500.00	Yes
CS-12-11	CAROLYN DEMIN	NINEMILE VALLEY	BS,E,P,S	$1,500.00	Extended One Year
CS-05-11	MIKE & JAN SOUS/	NINEMILE VALLEY	F	$338.00	Yes
CS-33-11	JOHN VALENSI	NINEMILE VALLEY	F,P,SWD	$2,989.00	Yes
				$17,036.75	

Appendix E

	Permit#	Year	Applicant	Creek	Type	Approval?	Notes
MS	4	2005	HULL, JEFF	NINEMILE CREEK	BANK STABILIZATION	APPROVE WITH MODIFICATIONS	EXPIRED - NOT DONE
MS	1	2005	COLE, TIM	NINEMILE CREEK	BANK STABILIZATION	DENIED FOR LACK OF PLAN	N/A
MS	30	2005	DAVIS, JIM	BUTLER CREEK	BRIDGE	APPROVED WITH MOD.	DONE FINAL 08/03/06
MS	22	2005	DAVIS, JIM	BUTLER CREEK	BRIDGE	DENIED	N/A NO FOLLOW-UP NEEDED
MS	13	2005	AMON, RICK	NINEMILE CREEK	BRIDGE	APPROVE WITH MODIFICATIONS	PROPERTY SOLD SEE MS-37-06
MS	45	2005	HANSON, PAUL	BUTLER CREEK	CULVERT REPLACEMENT	APPROVED WITH MOD.	DONE FINAL 10/03/06
CM	20	2005	BARONE, AL	NINEMILE CREEK	EQUIPMENT IN CREEK	NONVIOLATION	N/A
MS	44	2005	FLEMING, EDWARD	NINEMILE CREEK	FORD FOR FENCING	APPROVED WITH MOD.	DONE FINAL 5/10/06
APO	1	2005	SMITH, STAN	LITTLE MCCORMICK CREEK	MINING	EXPIRES 3/14/2010	N/A
CM	1	2005	MCINTOSCH, JAMES	NINEMILE CREEK	MUD IN CREEK AT FORD	NONVIOLATION	N/A SEE MS-61-04
MS	50	2005	USFS/NAT'L FS MUSEUM	BUTLER CREEK	TRENCHING FOR UTILITY	NOT A PROJECT	NO FOLLOW-UP NEEDED
MS	27	2005	MT-DOT/QWEST	BUTLER CREEK	UTILITY	NONPROJECT	N/A NO FOLLOW-UP NEEDED
CM	24	2005	BARONE, AL	CEDAR/NINEMILE CREEK	VEGETATION REMOVAL	VIOLATION	PENDING - EPA & MSLA CO. ATTNY
MS	37	2006	PARKER, ANDREW	NINEMILE CREEK	BRIDGE	APPROVED	Re: MS-13-05 AMON EXP 7/10/08
MS	51	2006	AMON, RICK & LAURA	KENNEDY CREEK	BRIDGE & ROCK DIVERS.	APPROVE WITH MODIFICATIONS	10/16/2007
MS	3	2006	WELCH/USFS	NINEMILE/ST. LOUIS CREEK	MINING DREDGE	DENIED	SUBMIT NEW PLAN
CM	10	2006	FLEMING, EDWARD	NINEMILE CREEK	POND DEVELOPMENT	NONVIOLATION	FOLLOW-UP 5/01/06
MS	34	2006	BARONE, AL	NINEMILE CREEK	RESTORATION PER EPA	APPROVED WITH MOD	PHASE II - PER EPA - 5 YEAR RECOVERY
MS	13	2006	BARONE, AL	NINEMILE CREEK	RESTORATION/BANK STAB.	APPROVE ACCORDING TO DEQ/EPA	PENDING
MS	31	2006	NW ENERGY/GRUTSCH	BUTLER CREEK	UTILITY	NOT A PROJECT	N/A NO FOLLOW-UP NEEDED
MS	27	2006	AUDINO, TONY	NINEMILE CREEK	WATER PUMPING SITE	APPROVED WITH MOD	EXP 6/12/07
APO	3	2007	ORIET, GEOFF	NINEMILE CREEK	ATV CROSSING	APPROVED FOR 2 YEARS	2007 DONE Expires 10/2009
MS	13	2007	MATA, JOSEPH	NINEMILE CREEK	BANK STABILIZATION	APPROVED WITH MODIFICATIONS	DONE NEEDS INSPECTION
MS	4	2007	MATA, JOSEPH	NINEMILE CREEK	BANK STABILIZATION	WITHDRAWN	N/A
CM	17	2007	BARKER, JUDY	JOSEPHINE CREEK	EQUIPMENT IN CREEK	DISMISSED	N/A
MS	38	2007	HAYFORD, STEVE	NINEMILE CREEK	EXISTING FORD STAB.	APPROVE FOR 10 YEAR APO	SEE APO-02-07
APO	2	2007	HAYFORD, STEVE	NINEMILE CREEK	FORD	APPROVED FOR 10 YEAR APO	EXPIRATION 9/10/2017

CM	20	2007	BARONE, AL	NINEMILE	FORDING CREEK	DISMISSED	N/A NO FOLLOW-UP NEEDED
MS	26	2007	DERSHAM, JANICE	NINEMILE CREEK	IRRIGATION DIVERSION	APPROVED WITH MODIFICATIONS	Done
CM	14	2007	VACCA, TIMOTHY	ST. LOUIS CREEK	MINING ACTIVITIES	DISMISSED	REAPPLY AFTER USFS POO
MS	16	2007	USFS/VACCA	ST. LOUIS CREEK	RECREATIONAL MINING	DENIED	REAPPLY AFTER USFS POOR
MS	41	2007	BARONE, AL	NINEMILE CREEK	RESTORATION		
CM	26	2007	DERSHAM, JANICE	NINEMILE CREEK TRIB	VEGETATION REMOVAL	NONVIOLATION	N/A RESEED DISTURBED AREA
MS	37	2008	BRUGH, BOB	NINEMILE CREEK	BANK STABILIZATION	APPROVE WITH MODIFICATIONS	RE: EM-03-08
MS	49	2008	BRUGH, BOB	NINEMILE CREEK	BANK STABILIZATION	APPROVE WITH MODIFICATIONS	RE: EM-03-08 & MS-37-08
MS	25	2008	MURRAY, DAVID	NINEMILE CREEK	BANK STABILZATION	APPROVE WITH MODIFICATION	8/11/2009
EM	3	2008	BRUGH, BOB	NINEMILE CREEK	BRIDGE & BANK WASH OUT	APPROVED AS EMERGENCY	SEE MS-37-08 & MS-49-08
MS	38	2008	MURRAY, DAVID	NINEMILE CREEK	BRIDGE ABUTMENTS	TABLED	
MS	33	2008	PARKER, ANDREW	NINEMILE CREEK	BRIDGE INSTALLATION	APPROVED	9/8/2009
MS	23	2008	MT SNOWBOWL	BUTLER CREEK TRIB	CULVERT EXTENSIONS	APPROVE WITH MODIFICATIONS	
MS	31	2008	DERSHAM, JAN	NINEMILE CREEK	DIVERSION	APPROVE WITH MOD & NRCS	
MS	11	2008	THISTED, RALPH & BETTY	JOSEPHINE CREEK	IRRIGATION DIVERSION	APPROVE WITH MODIFICATIONS	6/9/2009
MS	15	2008	McDOWELL, ROSE	NINEMILE CREEK	IRRIGATION PUMP SITE	APPROVE WITH MODIFICATIONS	MAY WANT TO APPLY FOR APO
APO	6	2008	TRACEY, TOM	ST. LOUIS CREEK	MINING OPERATION	DENIED	SEE MS-39-08
MS	39	2008	TRACEY, TOM	ST. LOUIS CREEK	PUMPING FOR MINING	APPROVE WITH MODIFICATIONS	APO DENIED
MS	21	2008	LEWIS-SLOAN, PAULA	BUTLER CREEK	SITE RESTORATION	APPROVE WITH MODIFICATIONS	Re: CM-09-08 DONE FINAL 11/10/08
CM	9	2008	LEWIS-SLOAN, PAULA	BUTLER CREEK	VEGETATION REMOVAL	VIOLATION SEE MS-21-08	STAY BACK 10' EACH SIDE OF CREEK
MS	45	2009	SOUSA, MICHAEL	NINEMILE CREEK	BANK STABILIZATION	APPROVED WITH MODIFICATIONS	
MS	32	2009	ORIET, GEOFF	NINEMILE CREEK	DEAD TREE REMOVAL	DENIED	N/A
EM	2	2009	ORIET, GEOFF	NINEMILE CREEK	DEBRIS JAM	APPROVED AS EMERGENCY	DONE - FIXED
MS	12	2009	SMITH, STAN	LITTLE MCCORMICK CREEK	MINING	APPROVED WITH MODIFICATIONS	EXTENSION TO 7/13/2011
MS	15	2009	SMITH, STAN/FORTNER	MCCORMICK CREEK	MINING	APPROVED WITH MODIFICATIONS	EXTENSION TO 7/13/2011
CM	20	2009	TROUT UNLIMITED	McCORMICK CREEK, LITTLE	VEG REMOVAL	SPA-124	SPA-124
MS	14	2010	BRUGH, BOB	NINEMILE CREEK	BRIDGE REPAIR	APPROVED WITH MOD	Expires 4/12/11
MS	10	2010	BRUGH, BOB	NINEMILE CREEK	BRIDGE REPAIR	DENIED	RE-APPLY

MS	40	2010	VERLEY, KEN	BUTLER CREEK	STREAMBANK RESTORATION	APPROVED-CONDITIONS	Re: CM-15-10 SLOAN-Done 9/22/10
CM	15	2010	SLOAN/VERELY	BUTLER CREEK	VEG REMOVAL & BANK WORK	SUBMIT 310 APP	DONE MS-40-10
MS	25	2011	DEMIN, CAROLYN	NINEMILE CREEK	BANK STABILIZATION	APPROVE WITH MODIFICATION	EXPIRES 9/12/12
MS	22	2011	SOUSA, MICHAEL	NINEMILE CREEK	BANK STABILIZATION	APPROVE WITH MODIFICATION	DONE INSPECTED 10/11
MS	28	2011	SOUSA, MICHAEL	BUTLER CREEK	BRIDGE INSTALLATION	APPROVE WITH MODIFICATION	EXPIRES 10/10/12
EM	4	2011	BRUGH, BOB	NINEMILE CREEK	BRIDGE WASH-OUT	APPROVED EMERGENCY ACTION	DONE-FINAL 6/29/11
CM	9	2011	VERLEY, KEN	BUTLER CREEK	CULVERT	VIOLATION	SUBMIT 310 APP
MS	34	2011	VERLEY, KEN	BUTLER CREEK	CULVERT REPLACEMENT	APPROVED WITH MODIFICATIONS	EXPIRES 11/14/12
MS	1	2011	MEC/LANGAUNET	KENNEDY CREEK	UTILITY	APPROVE	

Appendix G

WESTSLOPE CUTTHROAT TROUT GENETIC SAMPLING
MIDDLE CLARK FORK RIVER TRIBUTARIES

Table 1. Results of *Onchorynchus g*enetic testing in Clark Fork River tributaries in 1999-2010 using DNA and allozyme analyses. Percent WCT denotes the contribution of westslope cutthroat trout alleles as a percentage of the entire sample.

Stream	Lab Sample #	No. Sites	n	Upstream Boundary	Downstream Boundary	Power[#] (%)	% WCT	Hyb. Species	Comments
NINEMILE CR									
Beecher Cr - lower (Ninemile Cr trib)	3853	1	8	T17N R24W S9 (forks confluence)	T17N R24W S16 (near mouth)	-	>95	RBT	
Beecher Cr - WF (Ninemile C trib)	3854	1	7	T17N R24W S4 (headwaters)	T17N R24W S9 (foothills Rd)	84	**100**	-	
Beecher Cr - EF (Ninemile C trib)	3855	1	9	T17N R24W S3 (headwaters)	T17N R24W S10 (foothills Rd)	90	**100**	-	
Big Blue C- lower (Ninemile Cr. trib)	3848-3849	2	23	T17N R23W S30 (Foothills Rd)	T17N R24W S36 (near mouth)	-	>95	RBT	>99% WCT @ Foothills Rd
Burnt Fk Cr -WF (Ninemile C trib)	3860	1	7	T17N R24W S10 (headwaters)	T17N R24W S15 (foothills Rd)	84	**100**	-	
Burnt Fk Cr- EF (Ninemile C trib)	3861	1	8	T17N R24W S11 (headwaters)	T17N R24W S14 (foothills Rd)	88	**100**	-	
Burnt Fk Cr. - low (Ninemile Cr. trib)	3859	1	8	T17N R24W S15 (below Foothill Rd)	T17N R24W S22 (Ninemile Rd)	-	>95	RBT	
Butler Creek (Ninemile C trib)	3506	3	30	T16N R22W S9 (headwaters)	T16N R22W S20 (Just below dam)	>97	**100**	-	Above and below dam
Devil's Creek (Ninemile Cr trib)	3499	1	8	T17N R25W S10 (headwaters)	T17N R25W S13 (upper main stem)	-	96	RBT	
Eustache Creek (Ninemile Cr trib)	3500-3501	2	17	T17N R25W S2 (headwaters)	T17N R25W S13 (upper main stem)	-	>93	RBT	
Kennedy Creek – Upper (Ninemile)	3813-3814	2	22	T16N R22W S7 (headwaters)	T16N R23W S13 (upper main stem)	>99	**100**	-	
Lit. McCormick-Upper (Ninemile)	3824	1	14	T17N R23W S36 (headwaters)	T16N R23W S11 (check dam)	97	**100**	-	Above mining check dam
Little McCormick-lower (Ninemile)	3821-3823	3	24	T16N R23W S11 (check dam)	T16N R23W S15 (mouth)	-	96-99	RBT	

Martina Creek (Ninemile C trib)	4134	1	12	T17N R24W S28C	T17N R24W S28A (private boundry)	96	**100**	-	Upper samples needed
McCormick Creek (Ninemile Cr trib)	3825-3826	2	14	T16N R23W S1	T16N R23W S21 (near mouth)	-	>95	RBT	
Moncure Creek (Ninemile C trib)	4272	2	22	T16N R24W S23 (headwaters)	T16N R24W S19B (FS Rd 5520)	>99	**100**	-	USFS sites
Ninemile Creek (upper main stem)	3501	1	7	T17N R24W S18	T17N R24W S17	-	>95	RBT	Trouble extracting DNA -definitely hybridized
Rock Creek (Ninemile C trib)	3290	2	25	T16N R22W S34 (above culvert)	T15N R22W S16 (below culvert)	95	**100**	-	
U. St. Louis Cr. (Ninemile C trib)	3862	2	10	T17N R24W S5 (headwaters)	T17N R24W S8	93	**100**	-	
Sawpit Creek (Ninemile Cr trib)	4135	2	12	T17N R24W S20A	T17N R24W S21B (mouth)	-	>95	RBT	1 hyb + 11 WCT
Stony Creek (Ninemile C trib)	3293, 3276	2	26	T16N R22W S22 (headwaters)	T15N R22W S5 (near FS boundary)	97	**100**	-	