ATTACHMENT A - SEDIMENT AND HABITAT ASSESSMENT

Central Clark Fork Tributaries
TMDL Project Area:
Sediment and Habitat Assessment

Prepared by:

ATKINS
Water Resources Group
820 North Montana Avenue
Helena, MT 59601

July 2013

TABLE OF CONTENTS

List of Tables

List of Figures

ATTACHMENTS

1.0 INTRODUCTION

A detailed sediment and habitat assessment of streams in the Central Clark Fork Tributaries TMDL Project Area (Project Area) was conducted to facilitate development of sediment TMDLs. The Central Clark Fork Tributaries Project Area encompasses an area of approximately 2,175 square miles in Granite, Missoula and Mineral counties in western Montana. The Central Clark Fork Tributaries Project Area includes two TMDL Planning Areas (TPAs): the Middle Clark Fork Tributaries TPA and the Clark Fork – Drummond TPA. Within the Central Clark Fork Tributaries Project Area, there are ten water body segments listed on the 2012 303(d) List for sediment related impairments (**Table 1-1**). Flat Creek, Petty Creek, Trout Creek, and West Fork Petty Creek are listed as impaired due to sediment in the Middle Clark Fork Tributaries TPA, while Cramer Creek, Deep Creek, Grant Creek, Mulkey Creek, Tenmile Creek, and Rattler Gulch are listed as impaired due to sediment in the Clark Fork – Drummond TPA.

Table 1-1. Waterbody Segments Addressed during the Road Assessment

TPA	List ID	Waterbody Description
Clark Fork - Drummond	MT76E004_020	CRAMER CREEK, headwaters to mouth (Clark Fork River)
Clark Fork - Drummond	MT76E004_070	DEEP CREEK, headwaters to mouth (Bear Creek, which is a tributary to Clark Fork River near Bearmouth)
Clark Fork - Drummond	MT76E004_050	MULKEY CREEK, headwaters to mouth (Clark Fork River)
Clark Fork - Drummond	MT76E004_060	RATTLER GULCH, headwaters to mouth (Clark Fork River), T11N R13W S22
Clark Fork - Drummond	MT76E004_030	TENMILE CREEK, headwaters to mouth (Bear Creek-Clark Fork River)
Middle Clark Fork Tributaries	MT76M002_180	FLAT CREEK, headwaters to mouth (Clark Fork)
Middle Clark Fork Tributaries	MT76M002_130	GRANT CREEK, headwaters to mouth (Clark Fork River)
Middle Clark Fork Tributaries	MT76M002_090	PETTY CREEK, headwaters to mouth (Clark Fork River)
Middle Clark Fork Tributaries	MT76M002_050	TROUT CREEK, headwaters to mouth (Clark Fork River)
Middle Clark Fork Tributaries	MT76M002_100	WEST FORK PETTY CREEK, headwaters to mouth (Petty Creek)

The goal of this assessment is to collect data to evaluate the existing condition of sediment impaired streams and to estimate the relative existing sediment load from eroding streambanks and the sediment load reductions that will occur with the application of all appropriate riparian best management practices (BMPs). Sediment from eroding streambanks is commonly a major contributing sediment source to streams throughout western Montana. Estimated sediment loads from eroding streambanks will be used to assist Montana DEQ and EPA with development of sediment TMDLs, which are expressed as a percent reduction in annual loading. Estimated sediment loads should not be considered absolute loads, but instead are used to indicate the relative amount of loading from streambank erosion, as well as the percent reduction in loading that could be achieved via the improvement of riparian management practices. In addition to estimating sediment loads from eroding streambanks, stream channel morphology, in-stream habitat, and riparian vegetation assessments were also performed to further examine sediment dynamics within the streams of interest. The Central Clark Fork Tributaries Project Area sediment and habitat assessment included three main components, which are presented in the following sections: aerial assessment reach stratification, sediment and habitat assessment, and streambank erosion assessment.

2.0 Aerial Assessment Reach Stratification

Prior to field data collection, an aerial assessment of streams in the Central Clark Fork Tributaries Project Area was conducted in GIS to stratify streams into distinct reaches based on landscape and land-use factors following procedures described in the document *Watershed Stratification Methodology for TMDL Sediment and Habitat Investigations* (DEQ 2008). The reach stratification process involved dividing each stream segment into distinct reaches based on four landscape factors: ecoregion, valley gradient, Strahler stream order, and valley confinement resulting in a series of "reach types" specific to the streams within the Central Clark Fork Tributaries Project Area.

2.1 Methods

An aerial assessment of streams in the Central Clark Fork Tributaries Project Area was conducted using National Agricultural Imagery Program (NAIP) color imagery from 2009 in GIS along with other relevant data layers, including the National Hydrography Dataset (NHD) 1:100,000 stream layer and United States Geological Survey 1:24,000 Topographic Quadrangle Digital Raster Graphics. GIS data layers were used to stratify streams into distinct reaches based on landscape and land-use factors. The reach stratification methodology involves breaking a water body **stream segment** into **stream reaches** and **sub-reaches**. Each of the stream segments in the Central Clark Fork Tributaries Project Area was initially divided into distinct stream reaches based on four landscape factors: ecoregion, valley gradient, Strahler stream order, and valley confinement. Stream reaches classified by these four criteria were then further divided into sub-reaches based on the surrounding vegetation and land-use characteristics, including predominant vegetation type, riparian health, adjacent land-use, level of development, and potential anthropogenic influences on streambank erosion. This resulted in a series of stream reaches and sub-reaches delineated based on landscape and land-use factors which were compiled into an Aerial Assessment Database for the Central Clark Fork Tributaries Project Area.

2.1.1 Reach Types

The aerial assessment reach stratification process involved dividing each stream segment into distinct reaches based on four landscape factors: ecoregion, valley gradient, Strahler stream order, and valley confinement. Each individual combination of the four landscape factors is referred to as a **reach type** in this report based on the following definition:

Reach Type - *Unique combination of ecoregion, gradient, Strahler stream order and confinement*

Reach types were described using the following naming convention based on the reach type identifiers presented in **Table 2-1**:

Level III Ecoregion – Valley Gradient – Strahler Stream Order – Confinement

Table 2-1. Reach Type Identifiers

Landscape Factor	Stratification Category	Reach Type Identifier
Level III Ecoregion	Middle Rockies	MR
	Northern Rockies	NR
Valley Gradient	0-<2%	0
	2-<4%	2
	4-<10%	4
	>10%	10
Strahler Stream Order	first order	1
	second order	2
	third order	3
Confinement	unconfined	U
	confined	C

Thus, a stream reach identified as NR-0-3-U is a low gradient (0-<2%), 3rd order, unconfined stream in the Northern Rockies Level III ecoregion.

2.2 Results

A total of 109 reaches were delineated during the aerial assessment reach stratification process covering 97.7 miles of stream (**Table 2-2**). Based on the level III ecoregions, there were a total of 24 distinct reach types delineated in the Central Clark Fork Tributaries Project Area. The complete Aerial Assessment Database is provided in **Attachment A**.

Table 2-2. Aerial Assessment Stream Segments

Stream Segment	Number of Reaches	Number of Reaches and Sub-Reaches	Length (Miles)	Level III Ecoregion
Cramer Creek	8	11	12.0	Middle Rockies
Deep Creek	6	8	5.1	Middle Rockies
Flat Creek	9	10	8.0	Northern Rockies
Grant Creek	13	18	18.8	Middle Rockies
Mulkey Creek	9	11	6.0	Middle Rockies
Petty Creek	9	11	12.2	Northern Rockies
Rattler Gulch	9	13	8.1	Middle Rockies
Tenmile Creek	4	5	4.9	Middle Rockies
Trout Creek	12	17	15.0	Northern Rockies
West Fork Petty Creek	4	5	7.6	Northern Rockies
Total	**83**	**109**	**97.7**	

3.0 Sediment and Habitat Assessment

Substrate character and stream habitat conditions were evaluated by performing a stream channel assessment in the listed tributaries within the Central Clark Fork Tributaries Project Area. Longitudinal surveys including pebble counts, grid toss, cross sections, pool data collection, riparian greenline surveys, and eroding streambank measurements were performed at each of the selected monitoring sites during August of 2012 following methods presented in *Field Methodology for the Assessment of TMDL Sediment and Habitat Impairments* (DEQ 2011).

Field assessment reaches were selected in relatively low-gradient portions of the listed streams to facilitate the evaluation of sediment loading impacts. The monitoring locations were chosen to represent various reach characteristics, land-use categories, and human-caused influences, but their representativeness relative to other reaches of the same slope, order, confinement and ecoregion, as well as ease of access, were also considered. There was a preference toward sampling those reaches where human influences would most likely lead to impairment conditions, since it is a primary goal of sediment TMDL development to further characterize sediment impairment conditions. Thus, it is not a random sampling design intended to sample stream reaches representing all potential impairment and non-impairment conditions. Instead, it is a targeted sampling design that aims to assess a representative subset of reach types, while ensuring that reaches within each 303(d) listed waterbody with potential sediment impairment conditions are incorporated into the overall evaluation.

3.1 Methods

Sediment and habitat assessments were performed at 17 field monitoring sites, which were selected based on the aerial assessment in GIS and on-the-ground reconnaissance using the factors discussed above. Sediment and habitat data was collected along all stream segments cited in **Table 1-1** except for Deep Creek since no appropriate monitoring sites were identified in areas where access was obtained. Sediment and habitat data was collected within nine reach types, with the complete sediment and habitat assessment performed at 16 monitoring sites and only the streambank erosion portion of the assessment performed at one site (**Table 3-1**, **Figures 3-1** and **3-2**). Field monitoring sites were assessed progressing in an upstream direction and the length of the monitoring site was based on the bankfull channel width. A monitoring site length of 500 feet was used at three sites in which the bankfull width was less than 10 feet, a monitoring site length of 1,000 feet was used at nine sites in which the bankfull width was between 10 feet and 50 feet, and a monitoring site length of 1,500 feet was used at three sites in which the bankfull width exceeded 50 feet. Each monitoring site was divided into five equally sized study cells in which a series of sediment and habitat measurements were performed. Study cells were numbered 1 through 5 progressing in an upstream direction. The following sections provide brief descriptions of the various field methodologies employed during the sediment and habitat assessment. A more in-depth description of the methods is available in *Field Methodology for the Assessment of TMDL Sediment and Habitat Impairments* (DEQ 2011).

Table 3-1. Reach Types and Monitoring Sites

Level III Ecoregion	Reach Type	Number of Reaches	Number of Monitoring Sites	Monitoring Sites
Middle Rockies	MR-0-3-U	12	3	CRAM07-02, GRNT11-02, GRNT12-03
	MR-10-1-C	3		
	MR-10-1-U	3		
	MR-10-2-C	2		
	MR-2-1-U	2		
	MR-2-2-C	8	2	RATT04-01, TENM03-01
	MR-2-2-U	5		
	MR-2-3-U	5		
	MR-4-1-C	5	1	MULK03-01
	MR-4-1-U	5		
	MR-4-2-C	11	1	CRAM05-01
	MR-4-2-U	3	1	GRNT08-02
	MR-4-3-U	2		
Northern Rockies	NR-0-3-C	3		
	NR-0-3-U	18	4	PETT03-01, PETT07-01, PETT07-02*, TROU12-03
	NR-10-1-C	2		
	NR-10-1-U	1		
	NR-2-2-C	2	1	FLAT09-01
	NR-2-2-U	3		
	NR-2-3-C	2	1	TROU03-01
	NR-2-3-U	4		
	NR-4-1-C	2		
	NR-4-2-C	5	3	FLAT06-01, FLAT06-02, WFPY03-01
	NR-4-3-C	1		

*Streambank Erosion Only Assessment

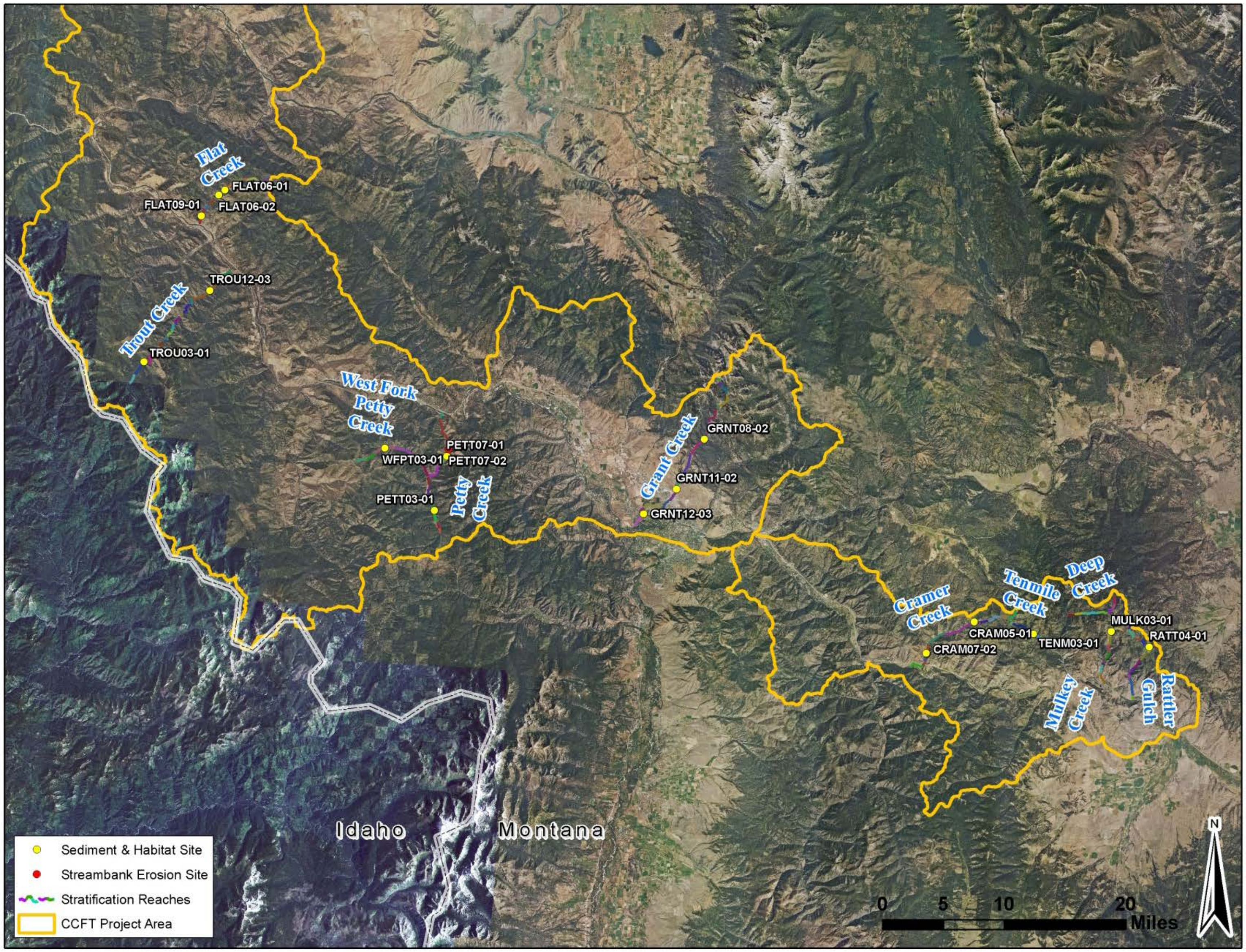


Figure 3-1. Aerial Assessment Reach Stratification

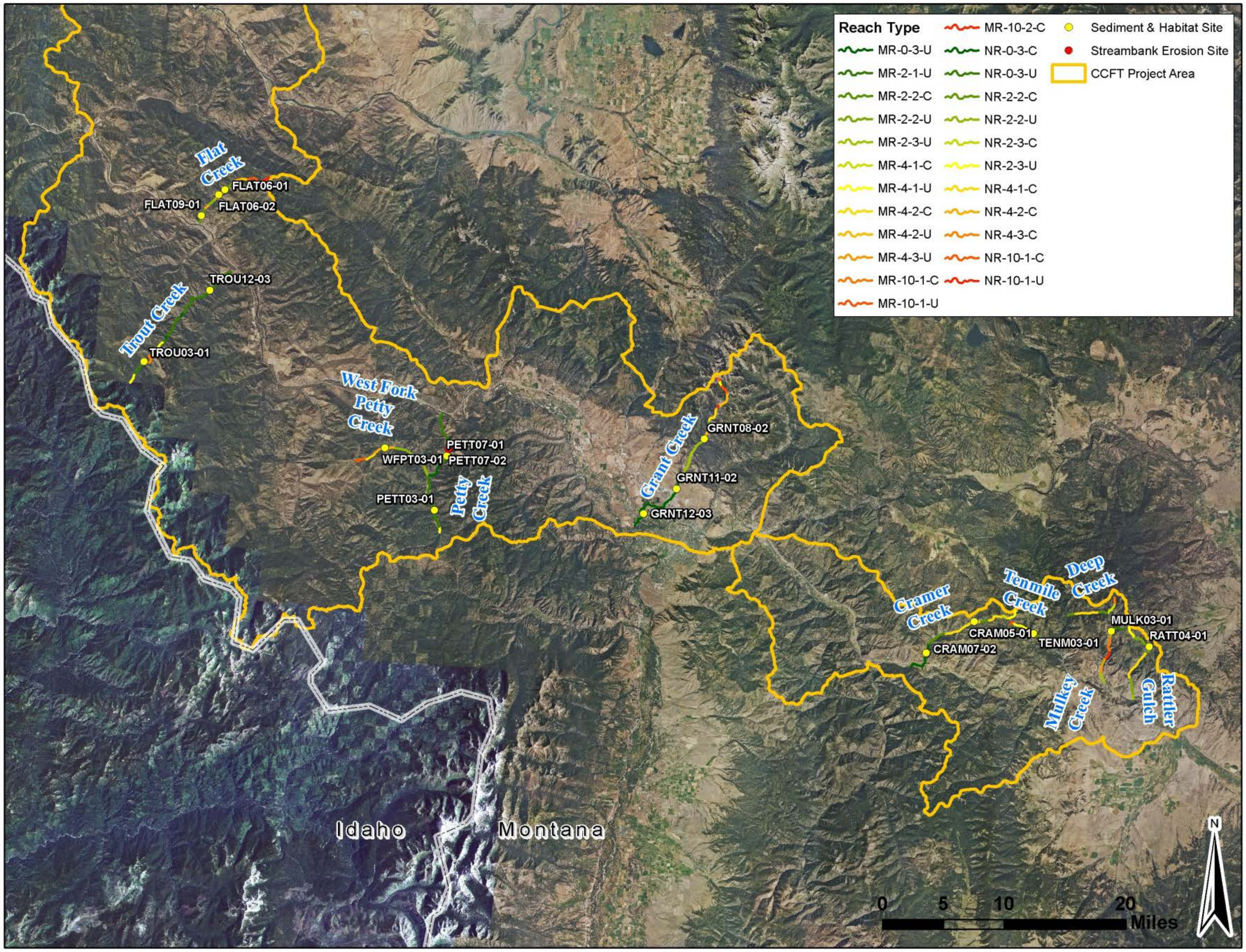


Figure 3-2. Aerial Assessment Reach Types

Field measurements conducted during the sediment and habitat assessment include channel form and stability measurements, fine sediment measurements, in-stream habitat measurements, and riparian health measurements, as summarized below:

Channel Form and Stability Measurements
- Field Determination of Bankfull
- Channel Cross-sections
- Floodprone Width Measurements
- Water Surface Slope

Fine Sediment Measurements
- Riffle Pebble Count
- Riffle Grid Toss
- Pool Tail-out Grid Toss
- Riffle Stability Index

In-stream Habitat Measurements
- Channel Bed Morphology
- Residual Pool Depth
- Pool Habitat Quality
- Woody Debris Quantification

Riparian Health Measurements
- Riparian Greenline Assessment

3.1.1 Channel Form and Stability Measurements

Channel form and stability measurements include the field determination of bankfull, channel cross-sections, floodprone width, and surface water slope.

3.1.1.1 Field Determination of Bankfull

The bankfull elevation was determined for each monitoring site. Bankfull is a concept used by hydrologists to define a regularly occurring channel-forming high flow. One of the first generally accepted definitions of bankfull was provided by Dunne and Leopold (1978):

> The bankfull stage corresponds to the discharge at which channel maintenance is the most effective, that is, the discharge at which moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing work that results in the average morphologic characteristics of channels.

Indicators that were used to estimate the bankfull elevation included scour lines, changes in vegetation types, tops of point bars, changes in slope, changes in particle size and distribution, staining of rocks, and inundation features. Multiple locations and bankfull indicators were examined at each site to determine the bankfull elevation, which was then applied during channel cross-section measurements.

3.1.1.2 Channel Cross-sections

Channel cross-section measurements were performed at the first riffle in each cell using a line level and a measuring rod. At each cross-section, depth measurements at bankfull were performed across the channel at regular intervals, which varied depending on channel width. These measurements allowed for the calculation of the cross sectional area, the average bankfull depth, and the [bankfull] width/depth ratio. The thalweg depth (i.e., maximum depth) was recorded at the deepest point of the channel independent of the regularly spaced intervals.

3.1.1.3 Floodprone Width Measurements

The floodprone elevation was determined by multiplying the maximum depth value by two (Rosgen 1996). The floodprone width was then measured by stringing a tape from the bankfull channel margin on both the right and left banks until the tape (pulled tight and "flat") touched the ground at the floodprone elevation. When dense vegetation or other features prevented a direct line of tape from being strung, the floodprone width was estimated by pacing or making a visual estimate. The floodprone width divided by the bankfull width of the channel is the entrenchment ratio, which is typically within a certain range by stream type and is an indicator of a stream's ability to access it floodplain.

3.1.1.4 Water Surface Slope

Water surface slope measurements were performed using a clinometer. This measurement was used to evaluate the slope assigned in GIS based on the aerial assessment. The field measured slope was used when evaluating the Rosgen stream type at each monitoring site.

3.1.2 Fine Sediment Measurements

Fine sediment measurements include the riffle pebble count, riffle grid toss, pool tail-out grid toss, and the riffle stability index. The pebble count and grid toss measurements were used to identify if excess fine sediment was accumulating in areas important for the reproduction and survival of aquatic life. The riffle stability index measures the dominant size of mobile particles in a riffle and is an indicator of excess sediment supply.

3.1.2.1 Riffle Pebble Count

One Wolman pebble count (Wolman 1954) was performed at the first riffle encountered in cells 1, 2, 3 and 5, providing a minimum of 400 particles measured within each assessment reach. Particle sizes were measured along their intermediate length axis (b-axis) and results were grouped into size categories. The pebble count was performed from bankfull to bankfull using the "heel to toe" method.

3.1.2.2 Riffle Grid Toss

The riffle grid toss was performed at the same location as the pebble count measurement. The riffle grid toss measures fine sediment accumulation on the surface of the streambed. Riffle grid tosses were performed prior to the pebble count to avoid disturbances to surface fine sediments.

3.1.2.3 Pool Tail-out Grid Toss

A measurement of the percent of fine sediment in pool tail-outs was taken using the grid toss method at each pool in which potential spawning gravels were identified. Three measurements were taken in each pool with appropriate sized spawning gravels using a 49-point grid. The spawning potential was recorded as “Yes” (Y) or “Questionable” (Q). No grid toss measurements were made when the substrate was observed to be too large to support spawning. Pool tail-out grid toss measurements were performed when the substrate was observed to be too fine to support spawning since the goal of this assessment is to quantify fine sediment accumulation in spawning areas.

3.1.2.4 Riffle Stability Index

In streams that had well-developed point bars, a Riffle Stability Index (RSI) evaluation was performed. For streams in which well-developed point bars were present, a total of three RSI measurements were conducted, which consisted of intermediate axis (b-axis) measurements of 15 particles determined to be among the largest size group of recently deposited particles that occur on over 10% of the point bar (Kappesser 2002). During post-field data processing, the riffle stability index was determined by calculating the geometric mean of the dominant bar particle size measurements and comparing the result to the cumulative particle distribution from the riffle pebble count in an adjacent or nearby riffle.

3.1.3 Instream Habitat Measurements

Instream habitat measurements include channel bed morphology, residual pool depth, pool habitat quality and woody debris quantification.

3.1.3.1 Channel Bed Morphology

The length of each monitoring site occupied by pools and riffles was recorded progressing in an upstream direction. The upstream and downstream stations of “dominant” riffle and pool features were recorded. Features were considered “dominant” when occupying over 50% of the bankfull channel width.

3.1.3.2 Residual Pool Depth

At each pool encountered, the maximum depth and the depth of the pool tail crest at its deepest point was measured. The difference between the maximum depth and the tail crest depth is considered the residual pool depth. It is basically a measure of the water depth that will remain in a pool if the channel is drained. No pool tail crest depth was recorded for dammed pools.

3.1.3.3 Pool Habitat Quality

Qualitative assessments of each pool feature were undertaken, including pool type (i.e., scour or dammed), size (i.e., small or large), formative feature (i.e., lateral scour, plunge, boulder, woody debris), and cover type (i.e., overhanging vegetation, depth, undercut, boulder, woody debris, none). The total number of pools was also quantified.

3.1.3.4 Woody Debris Quantification

The amount of large woody debris (LWD) within each monitoring site was recorded. Large pieces of woody debris located within the bankfull channel that were relatively stable so as to influence the channel form were counted as either single, aggregate or “willow bunch”. A single piece of large woody debris was counted when it was greater than 9 feet long or spanned two-thirds of the wetted stream width, and 4 inches in diameter at the small end (Overton et al. 1997). Two or more single pieces that are touching each other and collectively influencing channel morphology were considered an aggregate, and the number of pieces per aggregate was recorded. A “willow bunch” could be a dead or living willow, or other riparian shrub, that was in the channel and influencing channel morphology.

3.1.4 Riparian Health Measurements

Riparian health measurements include the riparian greenline assessment.

3.1.4.1 Riparian Greenline Assessment

An assessment of riparian vegetation cover was performed along both streambanks at each monitoring site. Vegetation types were recorded at 10 to 20-foot intervals, depending on the bankfull channel width. The riparian greenline assessment described the general vegetation community type of the groundcover, understory and overstory. The vegetation options on the field forms for groundcover were wetland, grasses/rose/snowberry, disturbed/bare ground, rock, and riprap; the options for understory and overstory were coniferous, deciduous, and mixed coniferous/deciduous. At 50-foot intervals, the riparian buffer width was estimated on either side of the channel. The riparian buffer width corresponds to the belt of vegetation buffering the stream from adjacent land uses.

3.2 RESULTS

In the Central Clark Fork Tributaries Project Area, sediment and habitat parameters were assessed at 16 monitoring sites. Out of the 24 reach types delineated on the sediment impaired stream segments in GIS, sediment and habitat assessments were performed in nine reach types, with a focus on low gradient reach types. A statistical analysis of the sediment and habitat data is presented by reach type and for individual monitoring sites in the following sections. The complete sediment and habitat dataset is presented in **Attachment B**.

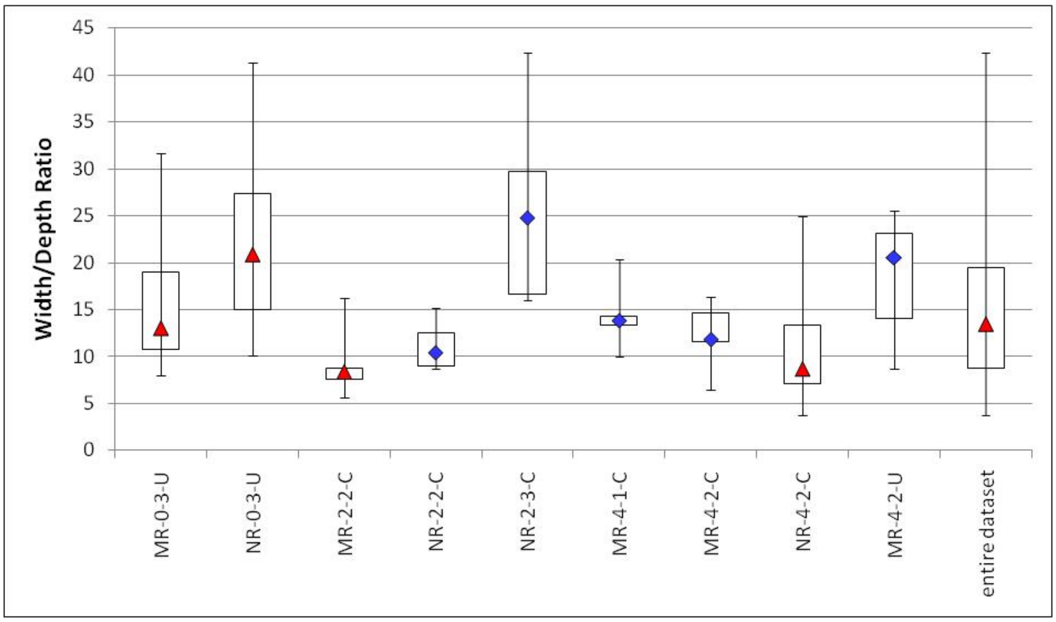
3.2.1 Reach Type Analysis

This section presents a statistical analysis of sediment and habitat base parameters for each of the reach types assessed in the Central Clark Fork Tributaries Project Area. Reach type discussions are based on median values, while summary statistics for the minimum, 25^{th} percentile, 75^{th} percentile, and maximum values are also provided since these may be more applicable for developing sediment TMDL criteria. Sediment and habitat base parameter analysis is provided by reach type for the following parameters:

- width/depth ratio
- entrenchment ratio
- riffle pebble count <2mm
- riffle pebble count <6mm
- riffle grid-toss <6mm
- pool tail-out grid toss <6mm
- residual pool depth
- pool frequency
- LWD frequency
- greenline understory shrub cover
- greenline bare ground

3.2.1.1 Width/Depth Ratio

The channel width/depth ratio is defined as the channel width at bankfull divided by the mean bankfull depth (Rosgen 1996). The channel width/depth ratio is one of several standard measurements used to classify stream channels, making it a useful variable for comparing conditions between reaches with the same stream type (Rosgen 1996). A comparison of observed and expected width/depth ratios is also an indicator of channel over-widening and aggradation, which are often linked to excess streambank erosion and/or sediment inputs from sources upstream of the study reach. Channels that are over-widened are often associated with excess sediment deposition and streambank erosion, contain shallower and warmer water, and provide fewer deepwater refugia for fish. Median width/depth ratios for assessed reach types ranged from 8.3 in MR-2-2-C to 24.8 in NR-2-3-C (**Figure 3-3** and **Table 3-2**).



Blue diamonds denote reach types with one monitoring site; red triangles denote more than one monitoring site.
Figure 3-3. Width/Depth Ratio

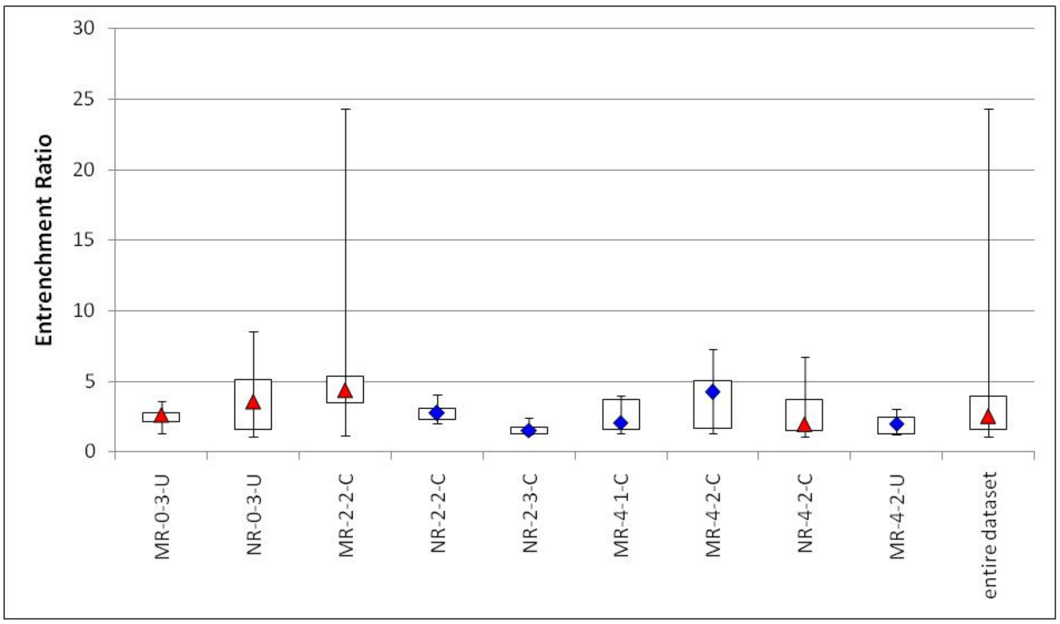
Table 3-2. Width/Depth Ratio

Statistical Parameter	Reach Type									
	MR-0-3-U	NR-0-3-U	MR-2-2-C	NR-2-2-C	NR-2-3-C	MR-4-1-C	MR-4-2-C	NR-4-2-C	MR-4-2-U	Entire Dataset
# of Monitoring Sites	3	3	2	*1*	*1*	*1*	*1*	3	*1*	16
Sample Size	14	13	9	*5*	*5*	*5*	*5*	14	*5*	75
Minimum	8.0	10.1	5.6	*8.7*	*16.0*	*10.0*	*6.5*	3.7	*8.7*	3.7
25th Percentile	10.7	15.1	7.6	*9.0*	*16.6*	*13.3*	*11.6*	7.1	*14.0*	8.8
Median	13.0	20.8	8.3	*10.4*	*24.8*	*13.9*	*11.8*	8.7	*20.5*	13.4
75th Percentile	19.0	27.4	8.7	*12.5*	*29.7*	*14.3*	*14.6*	13.4	*23.1*	19.5
Maximum	31.7	41.4	16.2	*15.1*	*42.4*	*20.4*	*16.4*	25.0	*25.5*	42.4
Monitoring Sites	CRAM07-02, GRNT 11-03, GRNT12-03	PETT03-01, PETT07-01, TROU12-03	RATT04-01, TENM03-01	FLAT09-01	TROU03-01	MULK03-01	CRAM05-01	FLAT06-01, FLAT06-02, WFPY03-01	GRNT08-02	

Note: See Table 2-1 for reach type descriptions.

3.2.1.2 Entrenchment Ratio

A stream's entrenchment ratio is equal to the floodprone width divided by the bankfull width (Rosgen 1996). The entrenchment ratio is used to help determine if a stream shows departure from its natural stream type and is an indicator of stream incision that describes how easily a stream can access its floodplain. Streams can become incised due to detrimental land management activities or may be naturally incised due to landscape characteristics. A stream that is entrenched is more prone to streambank erosion due to greater energy exerted on the streambanks during flood events, which results in higher sediment loads. The entrenchment ratio is an important measure of channel conditions since it relates to sediment loading and habitat condition. Rosgen (1996) defines an entrenched channel as having a ratio less than 1.4, a moderately entrenched channel having a ratio between 1.4 and 2.2, and a slightly entrenched channel as having a ratio greater than 2.2. Therefore, as the entrenchment ratio increases, floodplain access increases. The median entrenchment ratio for assessed reach types ranged from 1.6 in NR-2-3-C to 4.4 in MR-2-2-C (**Figure 3-4** and **Table 3-3**).



Blue diamonds denote reach types with one monitoring site; red triangles denote more than one monitoring site.

Figure 3-4. Entrenchment Ratio

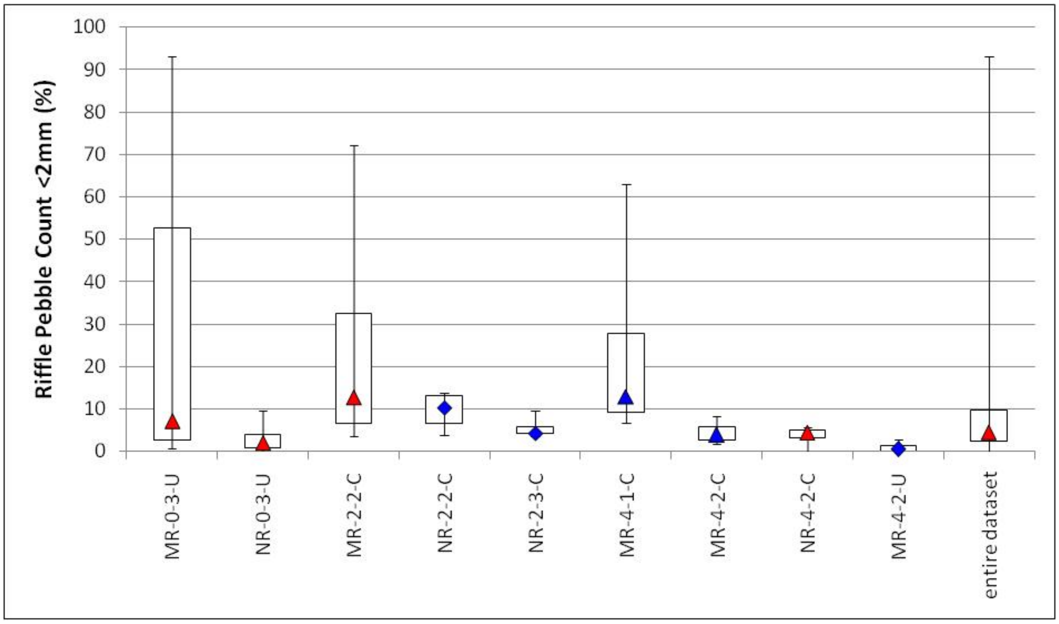
Table 3-3. Entrenchment Ratio

Statistical Parameter	Reach Type									
	MR-0-3-U	NR-0-3-U	MR-2-2-C	NR-2-2-C	NR-2-3-C	MR-4-1-C	MR-4-2-C	NR-4-2-C	MR-4-2-U	Entire Dataset
# of Monitoring Sites	3	3	2	*1*	*1*	*1*	*1*	3	*1*	16
Sample Size	14	13	9	*5*	*5*	*5*	*5*	14	*5*	75
Minimum	1.3	1.1	1.2	*2.1*	*1.3*	*1.3*	*1.3*	1.1	*1.2*	1.1
25th Percentile	2.1	1.6	3.5	*2.3*	*1.3*	*1.6*	*1.7*	1.5	*1.3*	1.6
Median	2.6	3.6	4.4	*2.7*	*1.6*	*2.1*	*4.2*	2.0	*2.0*	2.5
75th Percentile	2.7	5.2	5.4	*3.1*	*1.8*	*3.8*	*5.0*	3.7	*2.4*	4.0
Maximum	3.6	8.6	24.3	*4.0*	*2.4*	*4.0*	*7.3*	6.7	*3.0*	24.3
Monitoring Sites	CRAM07-02, GRNT 11-03, GRNT12-03	PETT03-01, PETT07-01, TROU12-03	RATT04-01, TENM03-01	FLAT09-01	TROU03-01	MULK03-01	CRAM05-01	FLAT06-01, FLAT06-02, WFPY03-01	GRNT08-02	

Note: See Table 2-1 for reach type descriptions.

3.2.1.3 Riffle Pebble Count <2mm

Percent surface fine sediment measures the amount of siltation occurring in a river system. Surface fine sediment measured using the Wolman (1954) pebble count method is one indicator of aquatic habitat condition and higher values can signify excessive sediment loading. The Wolman pebble count provides a survey of the particle distribution of the entire channel width, allowing investigators to calculate a percentage of the surface substrate (as frequency of occurrence) composed of fine sediment. Median values for the percent of fine sediment <2mm based on riffle pebble counts ranged from 0% in MR-4-2-U to 13% in MR-2-2-C and MR-4-1-C (**Figure 3-5** and **Table 3-4**).



Blue diamonds denote reach types with one monitoring site; red triangles denote more than one monitoring site.

Figure 3-5. Riffle Pebble Count <2mm

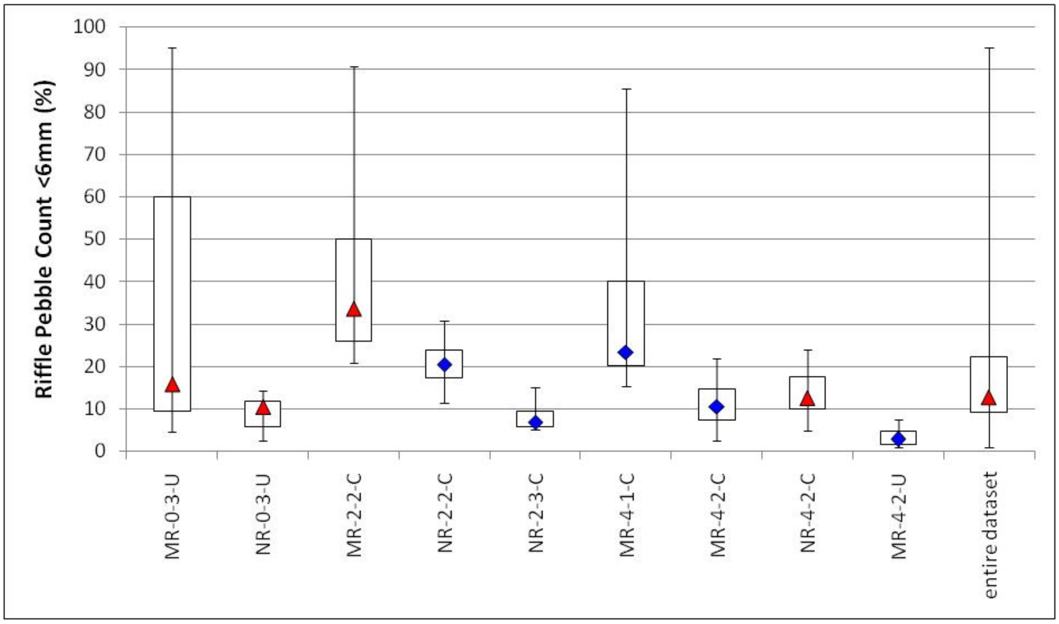
Table 3-4. Riffle Pebble Count <2mm

Statistical Parameter	Reach Type									
	MR-0-3-U	NR-0-3-U	MR-2-2-C	NR-2-2-C	NR-2-3-C	MR-4-1-C	MR-4-2-C	NR-4-2-C	MR-4-2-U	Entire Dataset
# of Monitoring Sites	3	3	2	*1*	*1*	*1*	*1*	3	*1*	16
Sample Size	12	12	8	*4*	*4*	*4*	*4*	12	*4*	64
Minimum	1	0	4	*4*	*4*	*7*	*2*	0	*0*	0
25th Percentile	3	1	7	*7*	*4*	*9*	*3*	3	*0*	2
Median	7	2	13	*10*	*4*	*13*	*4*	4	*0*	4
75th Percentile	53	4	33	*13*	*6*	*28*	*6*	5	*1*	10
Maximum	93	10	72	*14*	*10*	*63*	*8*	6	*3*	93
Monitoring Sites	CRAM07-02, GRNT 11-03, GRNT12-03	PETT03-01, PETT07-01, TROU12-03	RATT04-01, TENM03-01	FLAT09-01	TROU03-01	MULK03-01	CRAM05-01	FLAT06-01, FLAT06-02, WFPY03-01	GRNT08-02	

Note: See Table 2-1 for reach type descriptions.

3.2.1.4 Riffle Pebble Count <6mm

As with surface fine sediment <2mm, an accumulation of surface fine sediment <6mm may indicate excess sedimentation. Median values for the percent of fine sediment <6mm based on pebble counts conducted in riffles ranged from 3% in MR-4-2-Uto 34% in MR-2-2-C (**Figure 3-6** and **Table 3-5**). The percent of fine sediment <6mm followed the same general trend as the percent of fine sediment <2mm.



Blue diamonds denote reach types with one monitoring site; red triangles denote more than one monitoring site.

Figure 3-6. Riffle Pebble Count <6mm

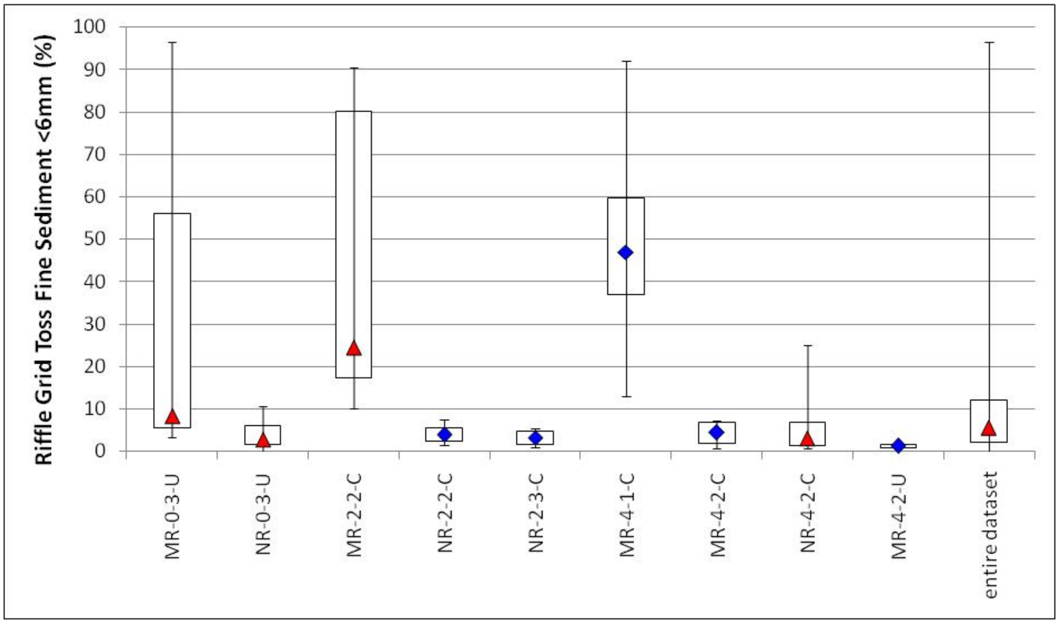
Table 3-5. Riffle Pebble Count <6mm

Statistical Parameter	Reach Type									
	MR-0-3-U	NR-0-3-U	MR-2-2-C	NR-2-2-C	NR-2-3-C	MR-4-1-C	MR-4-2-C	NR-4-2-C	MR-4-2-U	Entire Dataset
# of Monitoring Sites	3	3	2	*1*	*1*	*1*	*1*	3	*1*	16
Sample Size	12	12	8	*4*	*4*	*4*	*4*	12	*4*	64
Minimum	5	3	21	*11*	*5*	*15*	*3*	5	*1*	1
25th Percentile	9	6	26	*17*	*6*	*20*	*7*	10	*2*	9
Median	16	10	34	*20*	*7*	*23*	*11*	13	*3*	13
75th Percentile	60	12	50	*24*	*10*	*40*	*15*	18	*5*	22
Maximum	95	14	91	*31*	*15*	*85*	*22*	24	*8*	95
Monitoring Sites	CRAM07-02, GRNT 11-03, GRNT12-03	PETT03-01, PETT07-01, TROU12-03	RATT04-01, TENM03-01	FLAT09-01	TROU03-01	MULK03-01	CRAM05-01	FLAT06-01, FLAT06-02, WFPY03-01	GRNT08-02	

Note: See Table 2-1 for reach type descriptions.

3.2.1.5 Riffle Grid Toss <6mm

The riffle grid toss is a standard procedure frequently used in aquatic habitat assessments that provides complimentary information to the Wolman pebble count. Median values for riffle grid toss fine sediment <6mm in the Central Clark Fork Tributaries Project Area range from 1% in MR-4-2-U to 47% in MR-4-1-C (**Figure 3-7** and **Table 3-6**).



Blue diamonds denote reach types with one monitoring site; red triangles denote more than one monitoring site.

Figure 3-7. Riffle Grid Toss Fine Sediment <6mm

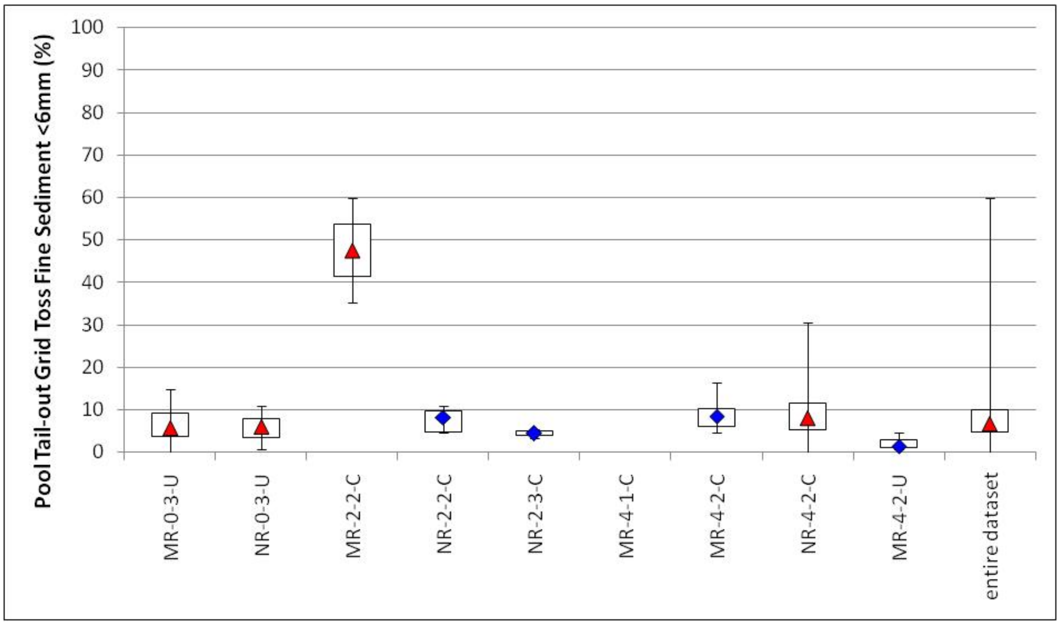
Table 3-6. Riffle Grid Toss Fine Sediment <6mm

Statistical Parameter	Reach Type									
	MR-0-3-U	**NR-0-3-U**	**MR-2-2-C**	**NR-2-2-C**	**NR-2-3-C**	**MR-4-1-C**	**MR-4-2-C**	**NR-4-2-C**	**MR-4-2-U**	**Entire Dataset**
# of Monitoring Sites	3	3	2	*1*	*1*	*1*	*1*	3	*1*	16
Sample Size	12	12	8	*4*	*4*	*4*	*4*	12	*4*	64
Minimum	3	0	10	*1*	*1*	*13*	*1*	1	*1*	0
25th Percentile	5	2	17	*2*	*2*	*37*	*2*	1	*1*	2
Median	8	3	24	*4*	*3*	*47*	*4*	3	*1*	6
75th Percentile	56	6	80	*6*	*5*	*60*	*7*	7	*2*	12
Maximum	97	11	90	*7*	*6*	*92*	*7*	25	*2*	97
Monitoring Sites	CRAM07-02, GRNT 11-03, GRNT12-03	PETT03-01, PETT07-01, TROU12-03	RATT04-01, TENM03-01	FLAT09-01	TROU03-01	MULK03-01	CRAM05-01	FLAT06-01, FLAT06-02, WFPY03-01	GRNT08-02	

Note: See Table 2-1 for reach type descriptions.

3.2.1.6 Pool Tail-out Grid Toss <6mm

Grid toss measurements in pool tail-outs provide a measure of fine sediment accumulation in potential fish spawning sites, which may have detrimental impacts on aquatic habitat by cementing spawning gravels, 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 6.35mm and the emergence success of westslope cutthroat trout and bull trout, both of which are present in the Central Clark Fork Tributaries Project Area. Median values for pool tail-out grid toss fine sediment <6mm range from 1% in MR-4-2-U to 48% in MR-2-2-C (**Figure 3-8** and **Table 3-7**).



Blue diamonds denote reach types with one monitoring site; red triangles denote more than one monitoring site.
Figure 3-8. Pool Tail-out Grid Toss <6mm

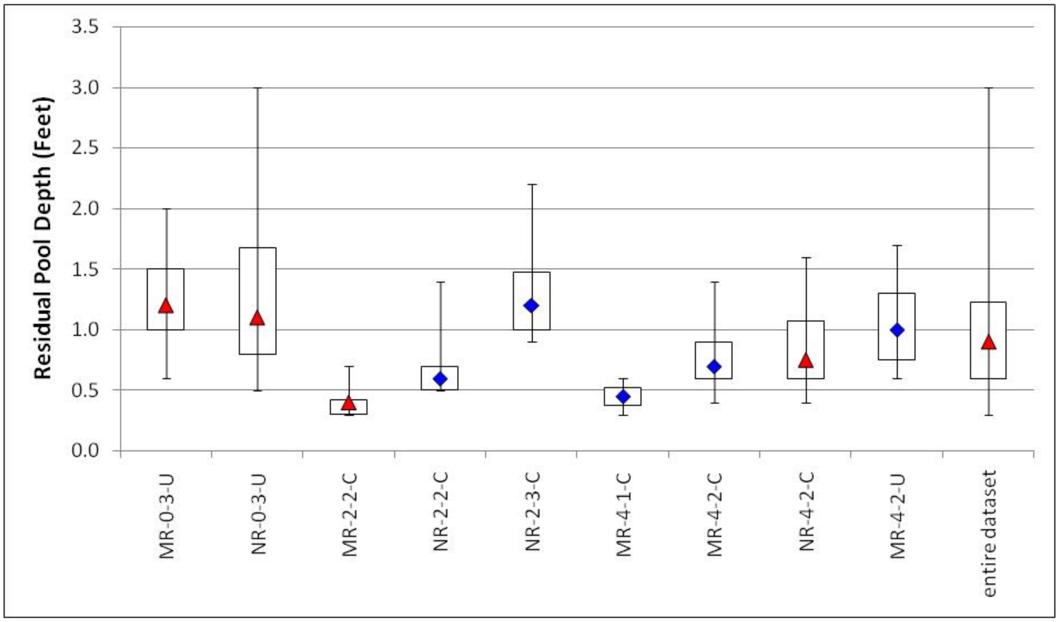
Table 3-7. Pool Tail-out Grid Toss <6mm

Statistical Parameter	Reach Type									
	MR-0-3-U	NR-0-3-U	MR-2-2-C	NR-2-2-C	NR-2-3-C	MR-4-1-C	MR-4-2-C	NR-4-2-C	MR-4-2-U	Entire Dataset
# of Monitoring Sites	3	3	2	*1*	*1*	*1*	*1*	3	*1*	16
Sample Size	18	11	2	*8*	*2*	*0*	*6*	32	*3*	82
Minimum	0	1	35	*5*	*3*	*N/A*	*5*	0	*1*	0
25th Percentile	4	3	41	*5*	*4*	*N/A*	*6*	5	*1*	5
Median	6	6	48	*8*	*4*	*N/A*	*9*	8	*1*	7
75th Percentile	9	8	54	*10*	*5*	*N/A*	*10*	12	*3*	10
Maximum	15	11	60	*11*	*5*	*N/A*	*16*	31	*5*	60
Monitoring Sites	CRAM07-02, GRNT 11-03, GRNT12-03	PETT03-01, PETT07-01, TROU12-03	RATT04-01, TENM03-01	FLAT09-01	TROU03-01	MULK03-01	CRAM05-01	FLAT06-01, FLAT06-02, WFPY03-01	GRNT08-02	

Note: See Table 2-1 for reach type descriptions.

3.2.1.7 Residual Pool Depth

Residual pool depth, defined as the difference between the maximum depth and the tail 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. Residual pool depth is also an indirect measurement of sediment inputs to streams since an increase in sediment loading can cause pools to fill, thus decreasing residual pool depth over time. Median residual pool depths ranged from 0.4 feet in MR-2-2-C to 1.2 feet in MR-0-3-U and NR-2-3-C (**Figure 3-9** and **Table 3-8**). This analysis indicates that the deepest pools are found in 3rd order streams and that residual pool depth tends to increase as stream order increases in the Central Clark Fork Tributaries Project Area.



Blue diamonds denote reach types with one monitoring site; red triangles denote more than one monitoring site.

Figure 3-9. Residual Pool Depth

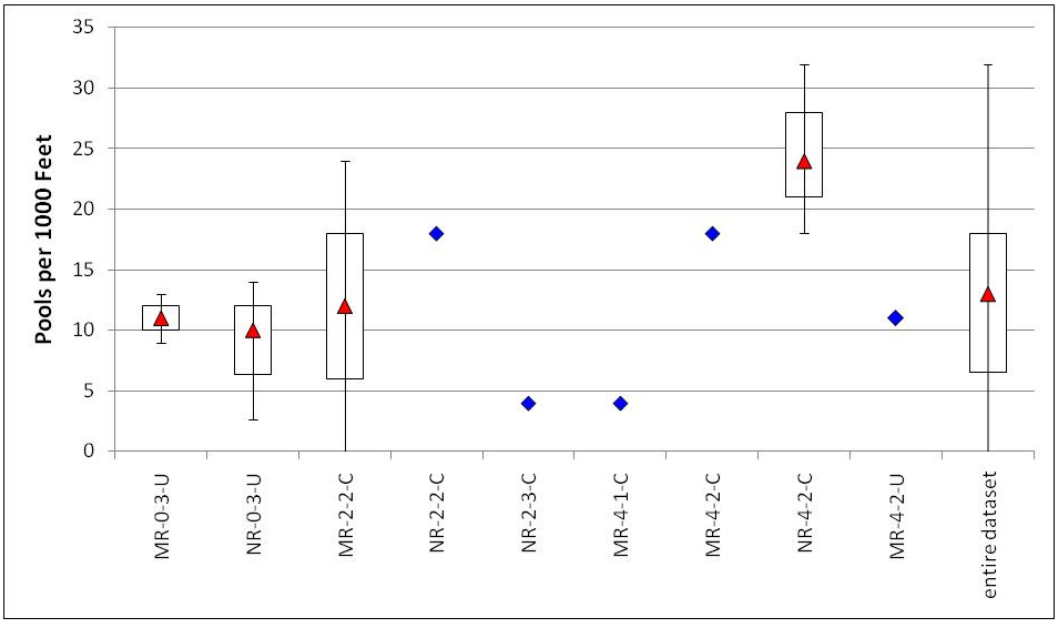
Table 3-8. Residual Pool Depth

Statistical Parameter	Reach Type									
	MR-0-3-U	NR-0-3-U	MR-2-2-C	NR-2-2-C	NR-2-3-C	MR-4-1-C	MR-4-2-C	NR-4-2-C	MR-4-2-U	Entire Dataset
# of Monitoring Sites	3	3	2	*1*	*1*	*1*	*1*	3	*1*	16
Sample Size	21	28	12	*9*	*6*	*2*	*9*	32	*11*	130
Minimum	0.6	0.5	0.3	*0.5*	*0.9*	*0.3*	*0.4*	0.4	*0.6*	0.3
25th Percentile	1.0	0.8	0.3	*0.5*	*1.0*	*0.4*	*0.6*	0.6	*0.8*	0.6
Median	1.2	1.1	0.4	*0.6*	*1.2*	*0.5*	*0.7*	0.8	*1.0*	0.9
75th Percentile	1.5	1.7	0.4	*0.7*	*1.5*	*0.5*	*0.9*	1.1	*1.3*	1.2
Maximum	2.0	3.0	0.7	*1.4*	*2.2*	*0.6*	*1.4*	1.6	*1.7*	3.0
Monitoring Sites	CRAM07-02, GRNT 11-03, GRNT12-03	PETT03-01, PETT07-01, TROU12-03	RATT04-01, TENM03-01	FLAT09-01	TROU03-01	MULK03-01	CRAM05-01	FLAT06-01, FLAT06-02, WFPY03-01	GRNT08-02	

Note: See Table 2-1 for reach type descriptions.

3.2.1.8 Pool Frequency

Pool frequency is a measure of the availability of pools to provide rearing habitat, cover, and refugia for salmonids. Pool frequency is related to channel complexity, availability of stable obstacles, and sediment supply. Excessive erosion and sediment deposition can reduce pool frequency by filling in smaller pools. Pool frequency can also be adversely affected by riparian habitat degradation resulting in a reduced supply of large woody debris or scouring from stable root masses in streambanks. Excluding reach types with only one monitoring site, the median value for the number of pools per 1,000 feet ranged from 10 (NR-0-3-U) to 24 (NR-4-2-C) (**Figure 3-10** and **Table 3-9**).



Blue diamonds denote reach types with one monitoring site; red triangles denote more than one monitoring site.

Figure 3-10. Pools per 1000 Feet

Table 3-9. Pools per 1000 feet

Statistical Parameter	Reach Type									
	MR-0-3-U	NR-0-3-U	MR-2-2-C	NR-2-2-C	NR-2-3-C	MR-4-1-C	MR-4-2-C	NR-4-2-C	MR-4-2-U	Entire Dataset
# of Monitoring Sites	3	3	2	*1*	*1*	*1*	*1*	3	*1*	16
Sample Size	2	3	2	*1*	*1*	*1*	*1*	3	*1*	15
Minimum	9	3	0	*18*	*4*	*4*	*18*	18	*11*	0
25th Percentile	10	6	6	*18*	*4*	*4*	*18*	21	*11*	7
Median	11	10	12	*18*	*4*	*4*	*18*	24	*11*	13
75th Percentile	12	12	18	*18*	*4*	*4*	*18*	28	*11*	18
Maximum	13	14	24	*18*	*4*	*4*	*18*	32	*11*	32
Monitoring Sites	CRAM07-02, GRNT 11-03, GRNT12-03	PETT03-01, PETT07-01, TROU12-03	RATT04-01, TENM03-01	FLAT09-01	TROU03-01	MULK03-01	CRAM05-01	FLAT06-01, FLAT06-02, WFPY03-01	GRNT08-02	

Note: See Table 2-1 for reach type descriptions. Reach types with only one monitoring site denoted in blue italics.

Pool frequency data is also provided as pools per mile in **Table 3-10** for future TMDL applications.

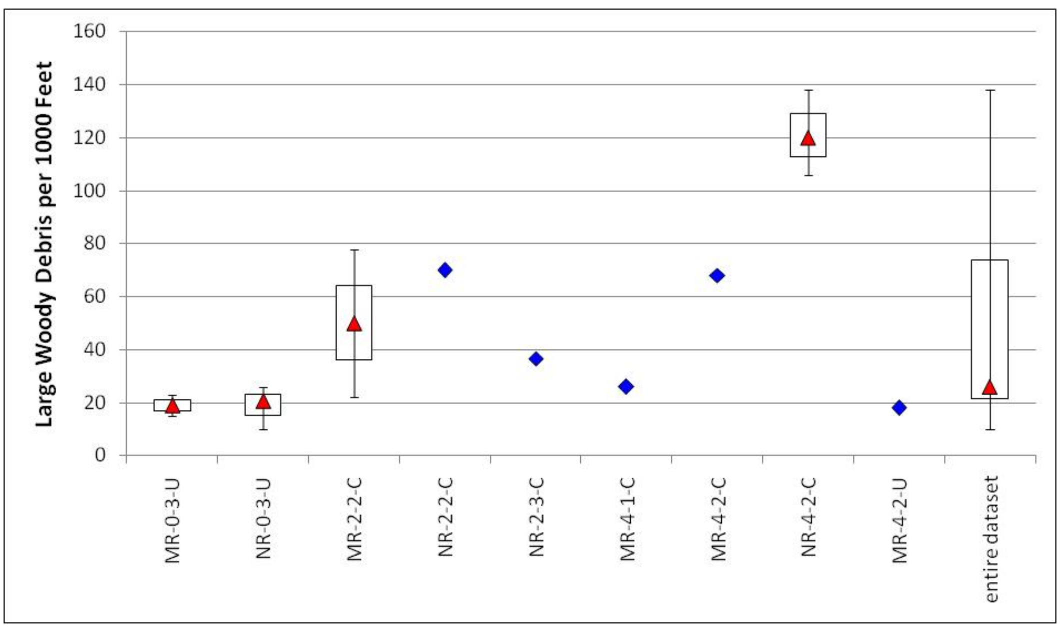
Table 3-10. Pools per Mile

Statistical Parameter	Reach Type									
	MR-0-3-U	NR-0-3-U	MR-2-2-C	NR-2-2-C	NR-2-3-C	MR-4-1-C	MR-4-2-C	NR-4-2-C	MR-4-2-U	Entire Dataset
Minimum	48	14	0	*95*	*21*	*21*	*95*	95	*58*	0
25th Percentile	53	33	32	*95*	*21*	*21*	*95*	111	*58*	34
Median	58	53	63	*95*	*21*	*21*	*95*	127	*58*	69
75th Percentile	63	63	95	*95*	*21*	*21*	*95*	148	*58*	95
Maximum	69	74	127	*95*	*21*	*21*	*95*	169	*58*	169

Note: See Table 2-1 for reach type descriptions. Reach types with only one monitoring site denoted in blue italics.

3.2.1.9 Large Woody Debris Frequency

Large woody debris (LWD) is a critical component of high-quality salmonid habitat, providing habitat complexity, quality pool habitat, cover, and long-term nutrient inputs. LWD also constitutes 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). LWD frequency can be measured and compared to reference reaches or literature values to determine if more or less LWD is present than would be expected under optimal conditions. Excluding reach types with only one monitoring site, the median value for the amount of large woody debris (LWD) per 1,000 feet ranged from 19 in MR-0-3-U to 120 in NR-4-2-C (**Figure 3-11** and **Table 3-11**). Note that “willow bunches” assigned in the field were tallied as large woody debris. Thus, this analysis makes no distinction as to the size of the woody material.



Blue diamonds denote reach types with one monitoring site; red triangles denote more than one monitoring site.

Figure 3-11. Large Woody Debris per 1000 Feet

Table 3-11. Large Woody Debris per 1000 Feet

Statistical Parameter	Reach Type									
	MR-0-3-U	NR-0-3-U	MR-2-2-C	NR-2-2-C	NR-2-3-C	MR-4-1-C	MR-4-2-C	NR-4-2-C	MR-4-2-U	Entire Dataset
# of Monitoring Sites	3	3	2	*1*	*1*	*1*	*1*	3	*1*	16
Sample Size	2	3	2	*1*	*1*	*1*	*1*	3	*1*	15
Minimum	15	10	22	*70*	*37*	*26*	*68*	106	*18*	10
25th Percentile	17	15	36	*70*	*37*	*26*	*68*	113	*18*	21
Median	19	21	50	*70*	*37*	*26*	*68*	120	*18*	26
75th Percentile	21	23	64	*70*	*37*	*26*	*68*	129	*18*	74
Maximum	23	26	78	*70*	*37*	*26*	*68*	138	*18*	138
Monitoring Sites	CRAM07-02, GRNT 11-03, GRNT12-03	PETT03-01, PETT07-01, TROU12-03	RATT04-01, TENM03-01	FLAT09-01	TROU03-01	MULK03-01	CRAM05-01	FLAT06-01, FLAT06-02, WFPY03-01	GRNT08-02	

Note: See Table 1-1 for reach type descriptions. Reach types with only one monitoring site denoted in blue italics.

Data is also provided as large woody debris per mile in **Table 3-12** for future TMDL applications.

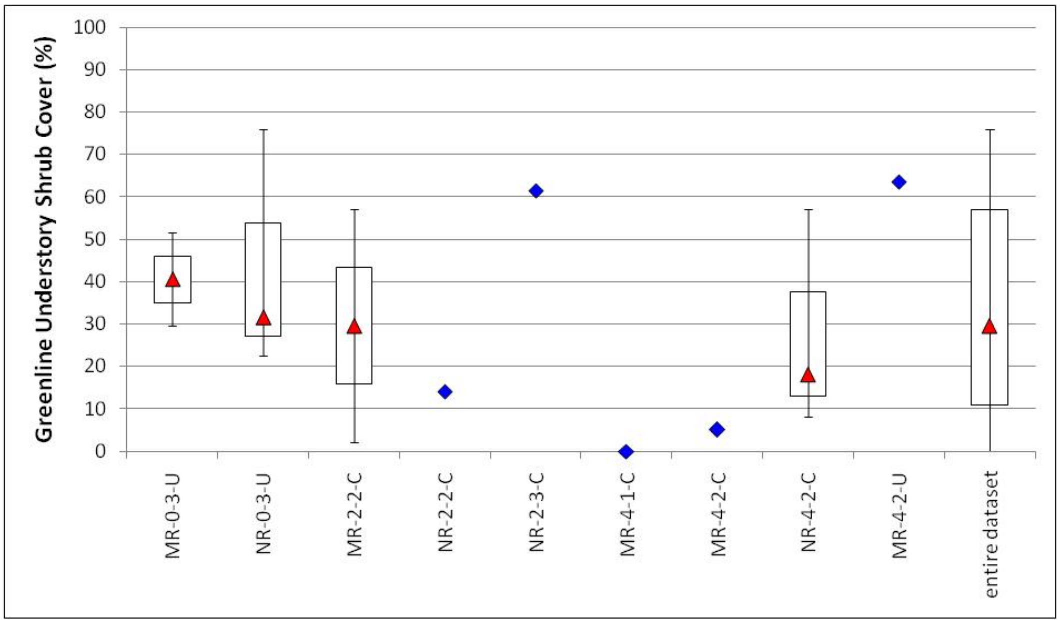
Table 3-12. Large Woody Debris per Mile

Statistical Parameter	Reach Type									
	MR-0-3-U	NR-0-3-U	MR-2-2-C	NR-2-2-C	NR-2-3-C	MR-4-1-C	MR-4-2-C	NR-4-2-C	MR-4-2-U	Entire Dataset
Minimum	79	53	116	*370*	*194*	*137*	*359*	560	*95*	53
25th Percentile	90	81	190	*370*	*194*	*137*	*359*	597	*95*	113
Median	100	109	264	*370*	*194*	*137*	*359*	634	*95*	137
75th Percentile	111	123	338	*370*	*194*	*137*	*359*	681	*95*	391
Maximum	121	137	412	*370*	*194*	*137*	*359*	729	*95*	729

Note: See Table 2-1 for reach type descriptions. Reach types with only one monitoring site denoted in blue italics.

3.3.1.10 Greenline Understory Shrub Cover

Riparian shrub cover is an important influence on streambank stability. Removal of riparian shrub cover can dramatically increase streambank erosion and increase channel width/depth ratios. Shrubs stabilize streambanks by holding soil and armoring lower banks with their roots, and reduce scouring energy of water by slowing flows with their branches. Good riparian shrub cover is also important for fish habitat. Riparian shrubs provide shade, reducing solar inputs and increases in water temperature. The dense network of fibrous roots of riparian shrubs allows streambanks to remain intact while water scours the lowest portion of streambanks, creating important fish habitat in the form of overhanging banks and lateral scour pools. Excluding reach types with only one monitoring site, the median value for greenline understory shrub cover ranged from 18% in NR-4-2-C to 41% in MR-0-3-U (**Figure 3-12** and **Table 3-13**).



Blue diamonds denote reach types with one monitoring site; red triangles denote more than one monitoring site; and the green circle indicates the results of a qualitative visual estimate.

Figure 3-12. Greenline Understory Shrub Cover

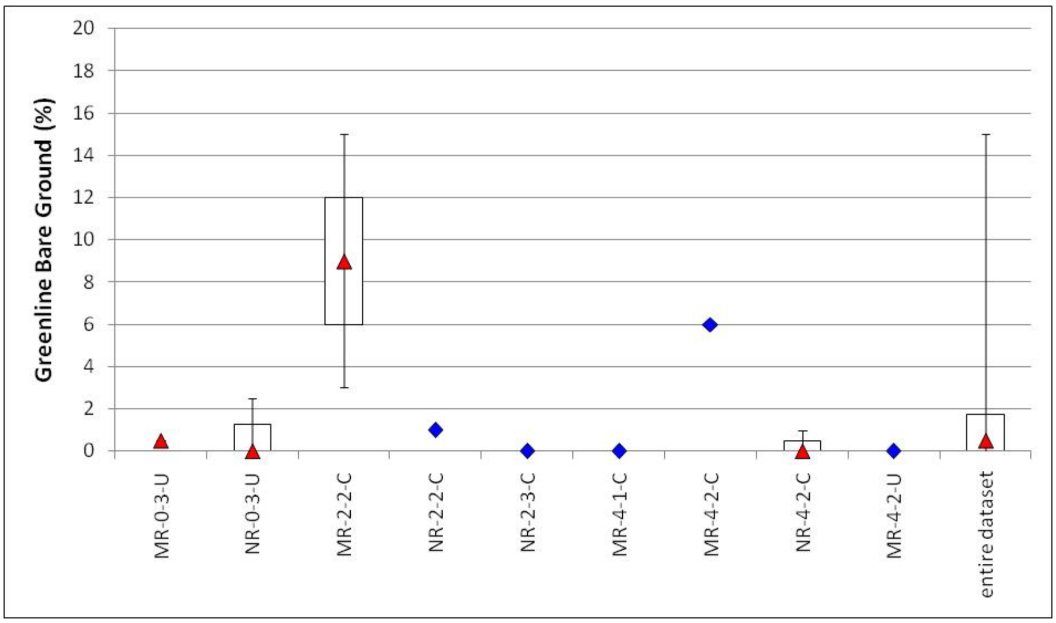
Table 3-13. Greenline Understory Shrub Cover

Statistical Parameter	Reach Type									
	MR-0-3-U	NR-0-3-U	MR-2-2-C	NR-2-2-C	NR-2-3-C	MR-4-1-C	MR-4-2-C	NR-4-2-C	MR-4-2-U	Entire Dataset
# of Monitoring Sites	3	3	2	*1*	*1*	*1*	*1*	3	*1*	16
Sample Size	2	3	2	*1*	*1*	*1*	*1*	3	*1*	15
Minimum	30	23	2	*14*	*62*	*0*	*5*	8	*64*	0
25th Percentile	35	27	16	*14*	*62*	*0*	*5*	13	*64*	11
Median	41	32	30	*14*	*62*	*0*	*5*	18	*64*	30
75th Percentile	46	54	43	*14*	*62*	*0*	*5*	38	*64*	57
Maximum	52	76	57	*14*	*62*	*0*	*5*	57	*64*	76
Monitoring Sites	CRAM07-02, GRNT 11-03, GRNT12-03	PETT03-01, PETT07-01, TROU12-03	RATT04-01, TENM03-01	FLAT09-01	TROU03-01	MULK03-01	CRAM05-01	FLAT06-01, FLAT06-02, WFPY03-01	GRNT08-02	

Note: See Table 2-1 for reach type descriptions. Reach types with only one monitoring site denoted in blue italics.

3.2.1.11 Greenline Bare Ground

Percent bare ground is an important indicator of erosion potential, as well as an indicator of land management influences on riparian habitat. Bare ground was noted in the greenline inventory where recent disturbance has resulted in exposed bare soil. Bare ground is often caused by trampling from livestock or wildlife, fallen trees, recent bank failure, new sediment deposits from overland or overbank flow, or severe disturbance in the riparian area, such as from past mining, road-building, or fire. Ground cover on streambanks is important to prevent sediment recruitment to stream channels since sediment can wash in from unprotected areas during snowmelt, storm runoff and flooding. Bare areas are also more susceptible to erosion from hoof shear. Excluding reach types with only one monitoring site, the median value for greenline bare ground ranged from 0% in NR-0-3-U and NR-4-2-C to 9% in MR-2-2-C (**Figure 3-13** and **Table 3-14**).



Blue diamonds denote reach types with one monitoring site; red triangles denote more than one monitoring site; and the green circle indicates the results of a qualitative visual estimate.

Figure 3-13. Greenline Bare Ground

Table 3-14. Greenline Bare Ground

Statistical Parameter	Reach Type									
	MR-0-3-U	NR-0-3-U	MR-2-2-C	NR-2-2-C	NR-2-3-C	MR-4-1-C	MR-4-2-C	NR-4-2-C	MR-4-2-U	Entire Dataset
# of Monitoring Sites	3	3	2	*1*	*1*	*1*	*1*	3	*1*	16
Sample Size	2	3	2	1	1	1	1	3	1	15
Minimum	1	0	3	*1*	*0*	*0*	*6*	0	*0*	0
25th Percentile	1	0	6	*1*	*0*	*0*	*6*	0	*0*	0
Median	1	0	9	*1*	*0*	*0*	*6*	0	*0*	1
75th Percentile	1	1	12	*1*	*0*	*0*	*6*	1	*0*	2
Maximum	1	3	15	*1*	*0*	*0*	*6*	1	*0*	15
Monitoring Sites	CRAM07-02, GRNT 11-03, GRNT12-03	PETT03-01, PETT07-01, TROU12-03	RATT04-01, TENM03-01	FLAT09-01	TROU03-01	MULK03-01	CRAM05-01	FLAT06-01, FLAT06-02, WFPY03-01	GRNT08-02	

Note: See Table 2-1 for reach type descriptions. Reach types with only one monitoring site denoted in blue italics.

3.2.2 Monitoring Site Analysis

Sediment and habitat data collected at each monitoring site was reviewed individually in the following sections. Monitoring site discussions are based on median values. Summary statistics for the minimum, 25th percentile, 75th percentile and maximum values are presented graphically, since these may be more applicable for developing sediment TMDL criteria.

3.2.2.1 Width/Depth Ratio

The highest median width/depth ratio was observed in TROU12-03, followed by TROU03-01 (**Figure 3-14**).

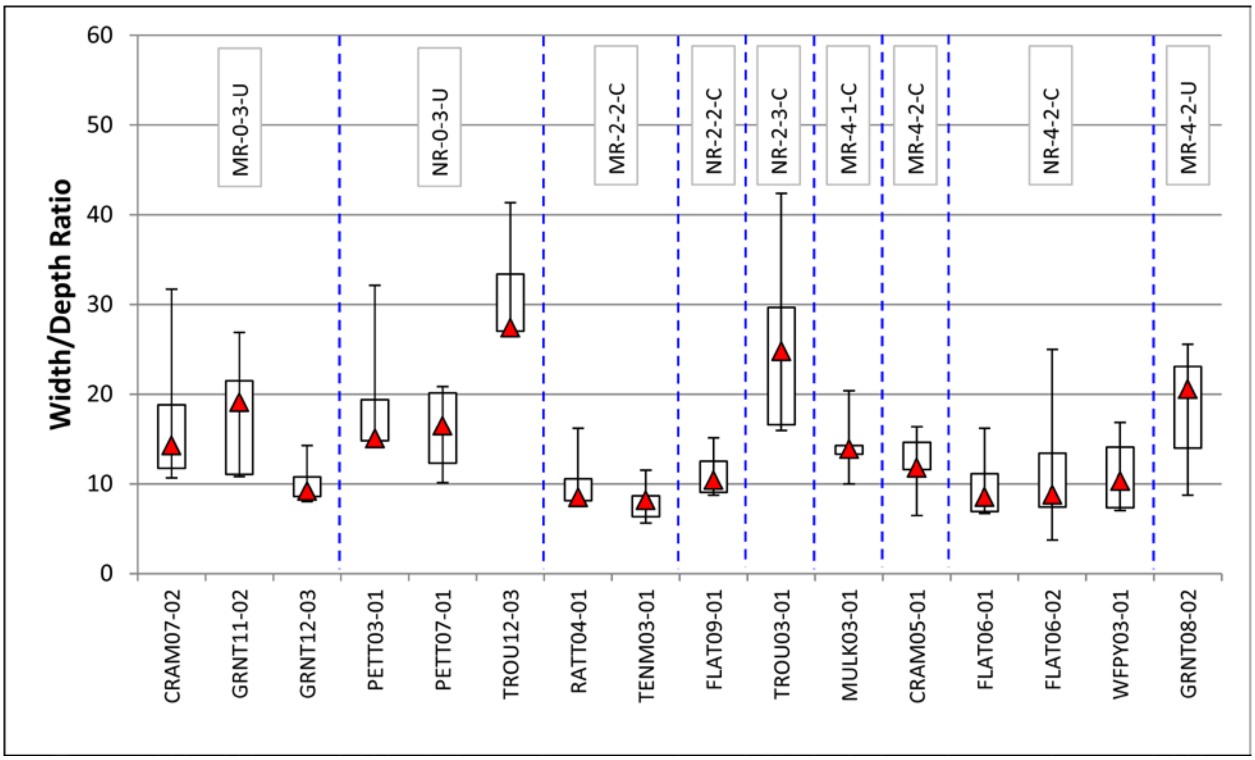


Figure 3-14. Width/Depth Ratio

3.2.2.2 Entrenchment Ratio

Entrenchment ratio data collected within the Central Clark Fork Tributaries Project Area indicates the following (**Figure 3-15**):

1. RATT04-01 on Rattler Gulch has the greatest amount of floodplain access out of the sites assessed.
2. Entrenched conditions (entrenchment ratio <1.4) were documented in FLAT06-01, likely as a result of historic road building and timber harvest.
3. Moderately entrenched conditions (entrenchment ratio 1.4-2.2) were naturally occurring in TROU12-03, TROU03-01, and GRNT08-02. Moderately entrenched conditions in FLAT06-02 and MULK03-01 arise from historic land use activities, including historic road construction.

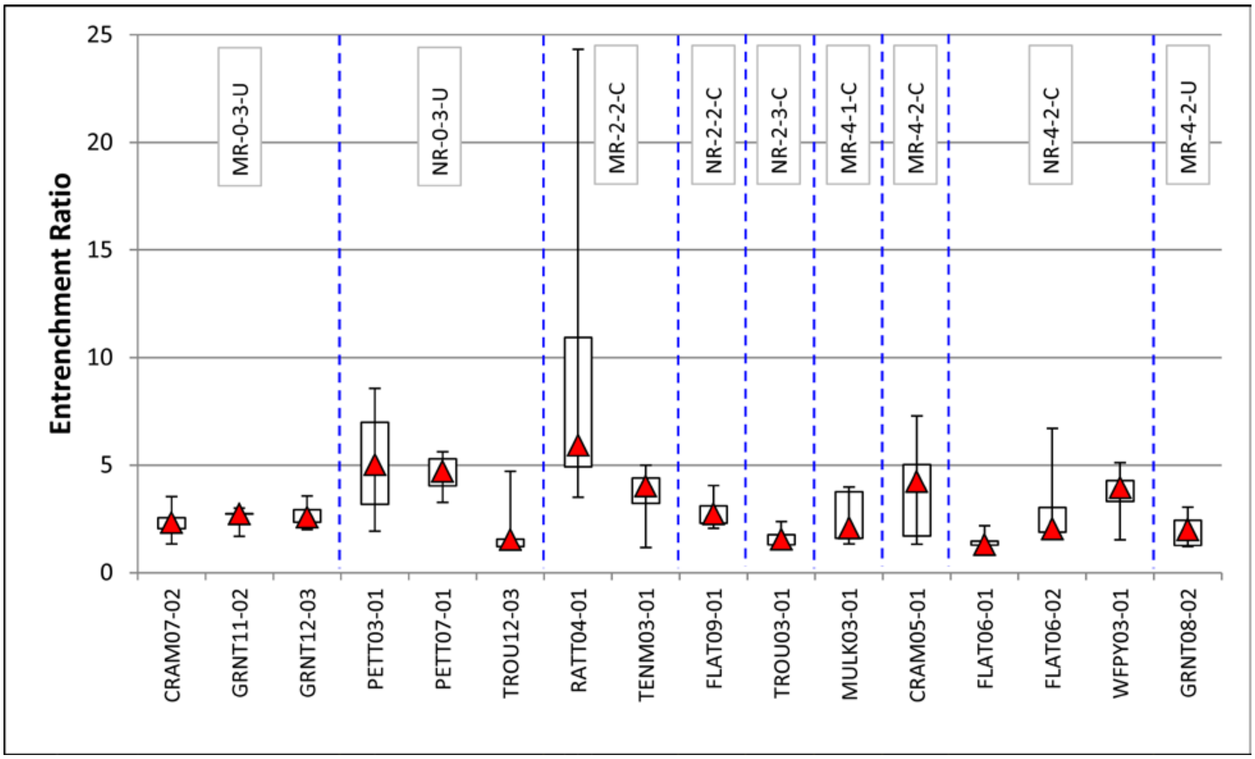


Figure 3-15. Entrenchment Ratio

3.2.2.3 Riffle Pebble Count <2mm

The median percent of fine sediment in riffles <2mm as measured by a pebble count was highest in GRNT12-03, followed by RATT04-01 (**Figure 3-16**).

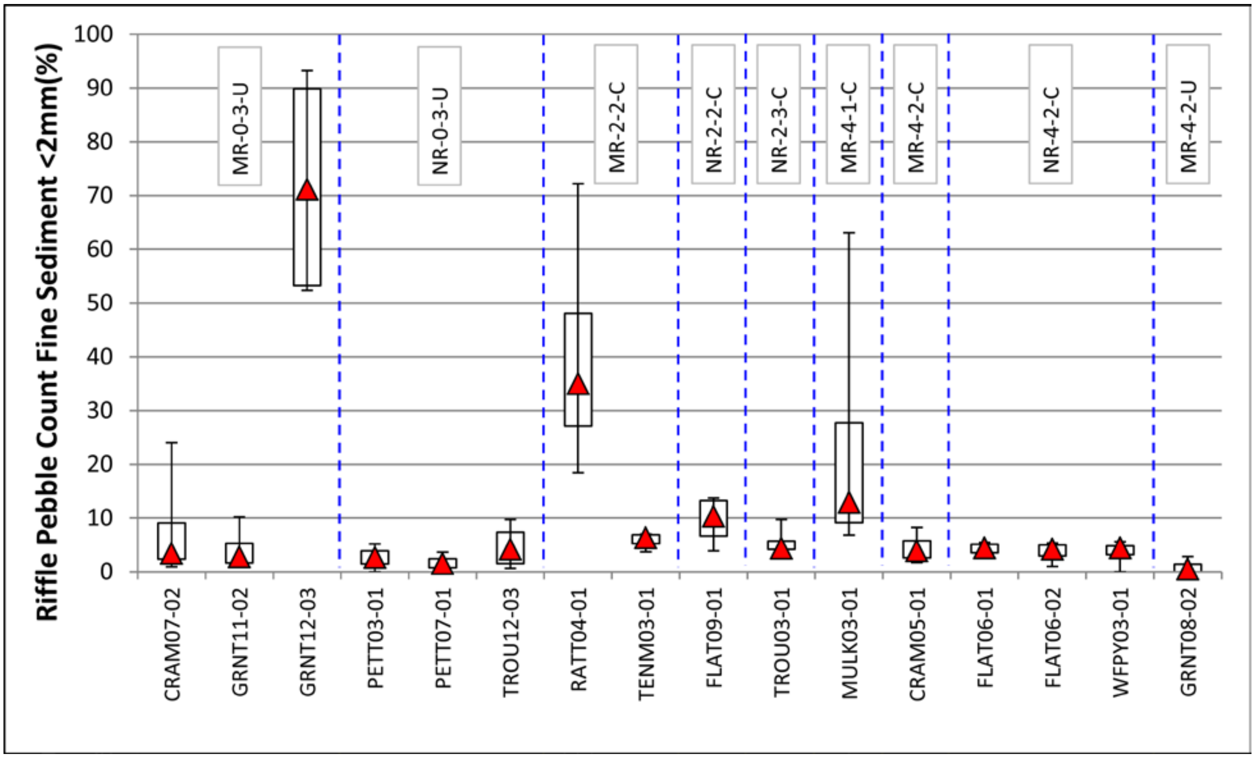


Figure 3-16. Riffle Pebble Count <2mm

3.2.2.4 Riffle Pebble Count <6mm

The percent of fine sediment in riffles <6mm as measured by a pebble count followed a similar trend as the percent of fine sediment <2mm, with the highest median values in GRNT12-03, followed by RATT04-01 (**Figure 3-17**).

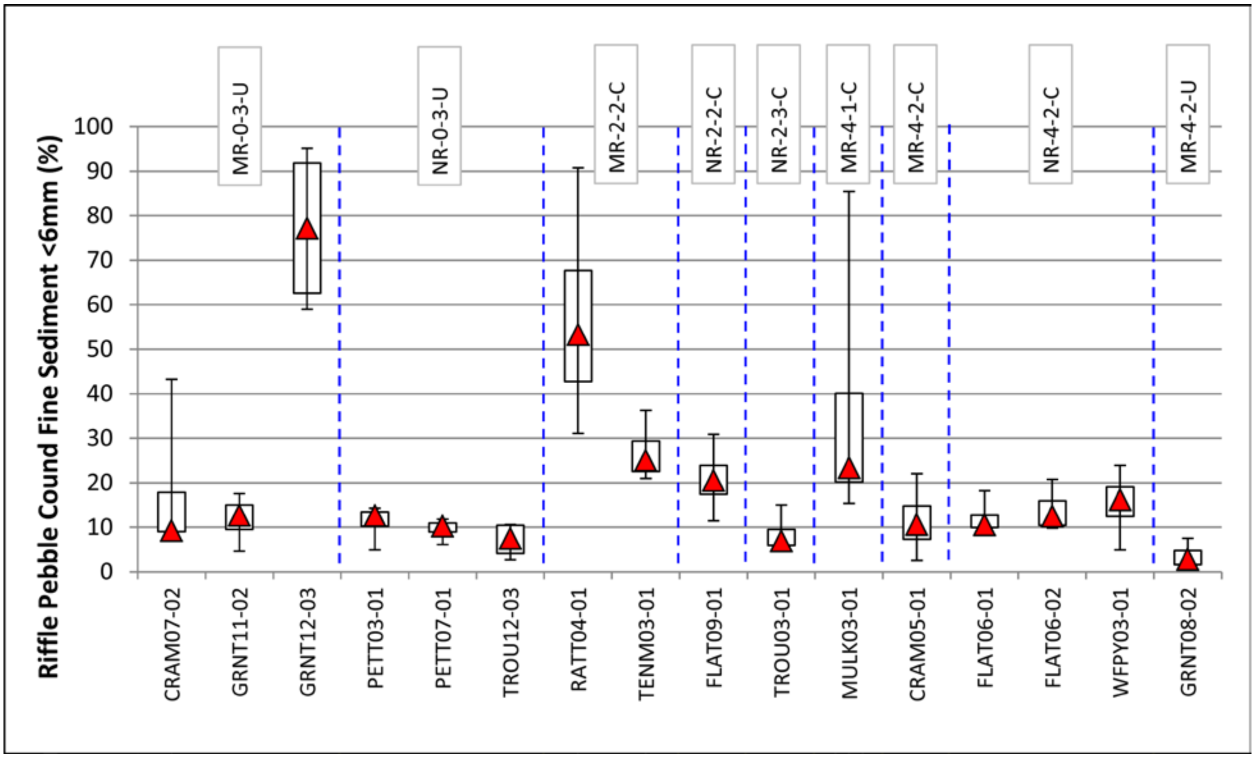


Figure 3-17. Riffle Pebble Count <6mm

3.2.2.5 Riffle Grid Toss <6mm

The median percent of fine sediment in riffles <6mm as measured by a grid toss was highest in GRNT12-03, followed by RATT04-01 and MULK03-01 (**Figure 3-18**).

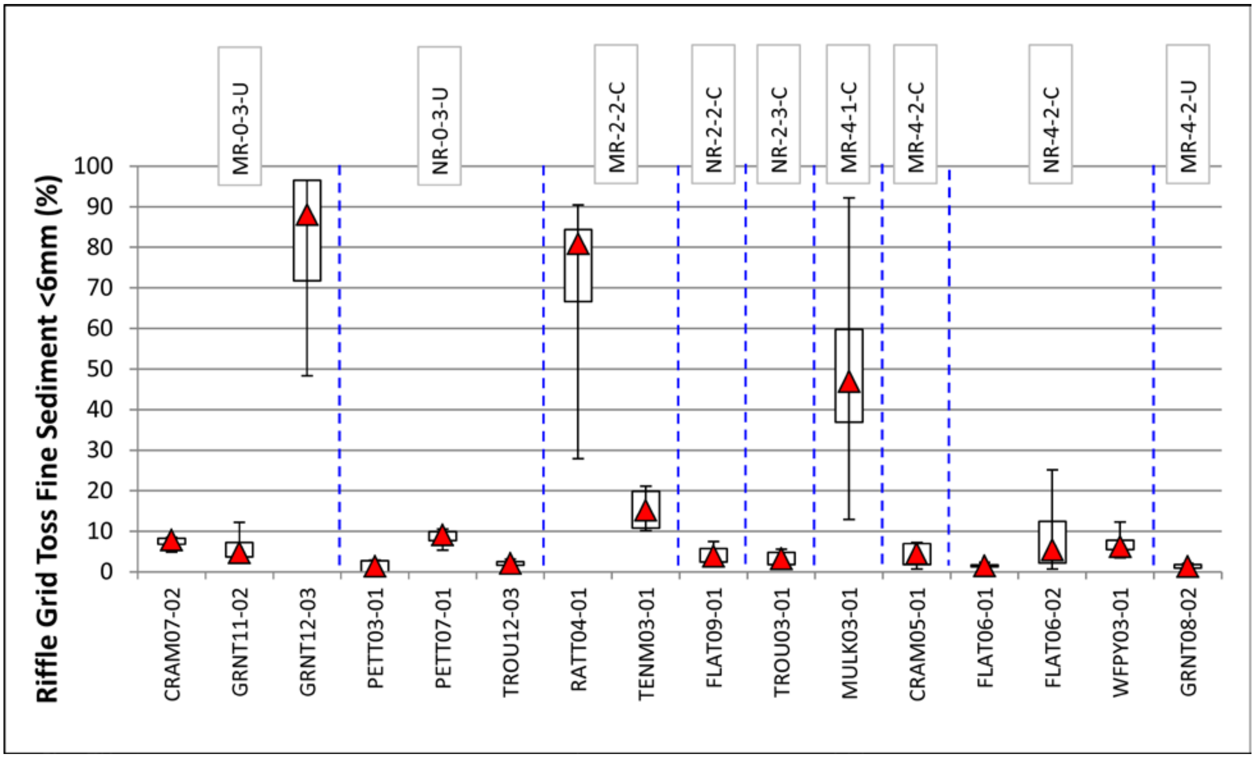


Figure 3-18. Riffle Grid Toss <6mm

3.2.2.6 Riffle Stability Index

The mobile percentile of particles on the riffle is termed "Riffle Stability Index" (RSI) and provides a useful estimate of the degree of increased sediment supply to riffles. The RSI addresses situations in which increases in gravel bedload from headwater activities is depositing material on riffles and filling in pools, and it reflects qualitative differences between reference and managed watersheds. Although the expected range varies some by stream type, RSI values above 70 generally indicate increased sediment supply to riffles (Kappesser 2002). In the Central Clark Fork Tributaries Project Area, RSI evaluations were performed in CRAM07-02, PETT03-01, TROU03-01, and TROU12-03 (**Table 3-15**).

Table 3-15. Riffle Stability Index Summary

Site	Mobile Particle Analysis		Pebble Count Analysis		RSI
	Cell	Geometric Mean	Cell	D50	
CRAM07-02	2	51	2	22	92
PETT03-01	1	96	1	30	87
PETT03-01	3	128	3	29	93
PETT03-01	4	103	4	43	96
TROU03-01	3	179	3	88	70
TROU12-03	1	214	1	60	90

3.2.2.7 Pool Tail-out Grid Toss <6mm

Fine sediment in pool tail-outs as measured by the grid toss followed a similar pattern as the riffle grid toss. The median percent of fine sediment in pool tail-outs as measured with the grid toss was highest in TENM03-01, followed by GRNT11-02 and FLAT06-02 (**Figure 3-19**).

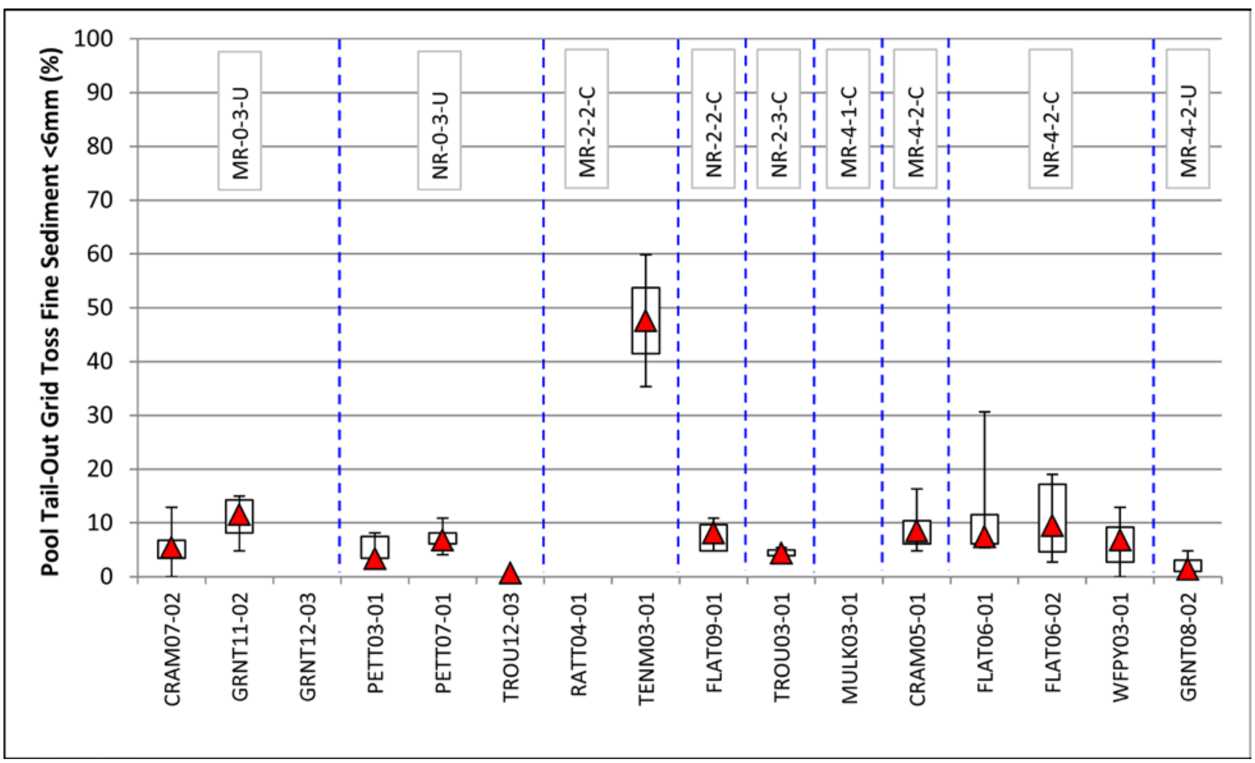


Figure 3-19. Pool Tail-out Grid Toss <6mm

3.2.2.8 Residual Pool Depth

The greatest median residual pool depth was measured in TROU12-03, followed by CRAM07-02, GRNT11-02, and TROU03-01 (**Figure 3-20**). The lowest residual pool depth was found in TENM03-01. In general, residual pool depths increase in the downstream direction within the assessed streams.

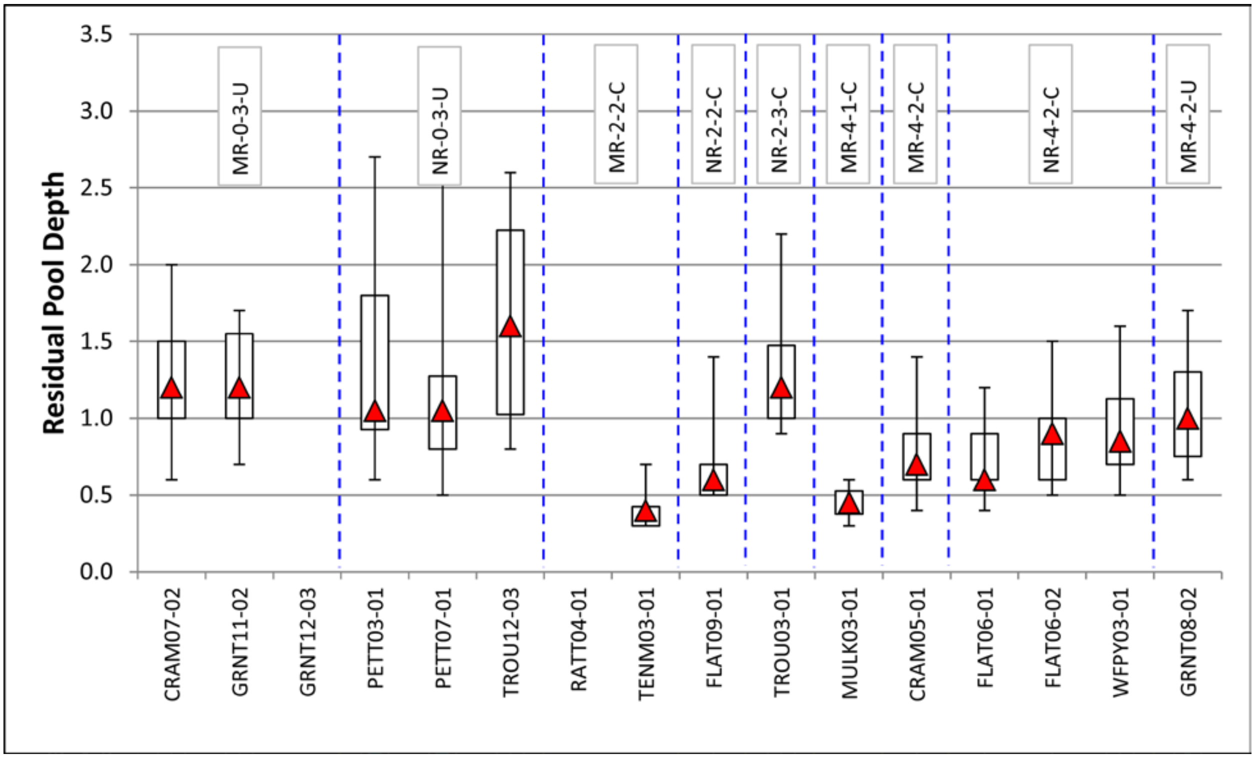


Figure 3-20. Residual Pool Depth

3.2.2.9 Pool Frequency

FLAT06-02 had the greatest number of pools per 1000 feet, followed by WFPY03-01 and TENM03-01 (**Figure 3-21**). Numerous small pools in all three of these monitoring sites were formed by interactions with woody debris inputs.

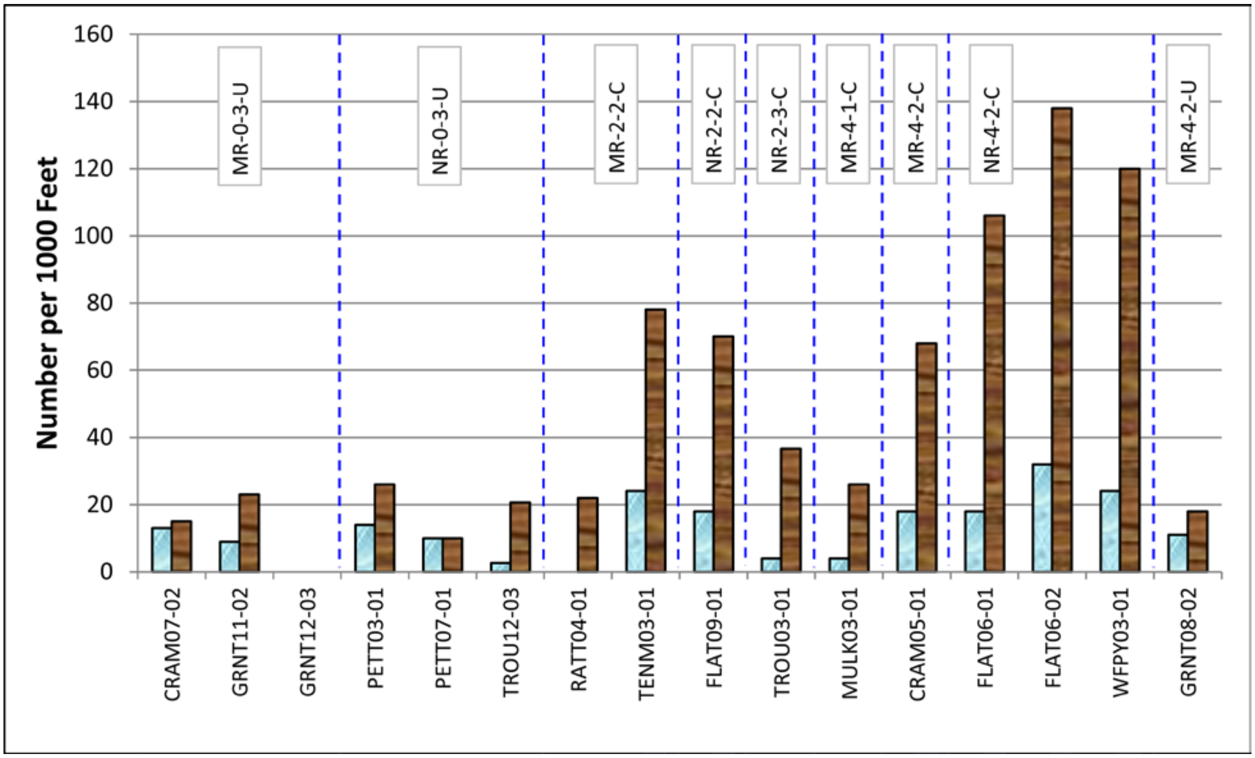


Figure 3-21. Pool and Large Woody Debris Frequency

3.2.2.10 Large Woody Debris Frequency

FLAT06-02 had the greatest amount of large woody debris per 1000 feet, followed by WFPY03-01, which was assessed for potential reference conditions (**Figure 3-21**). Large woody debris was found throughout the conifer lined reach in FLAT06-02, while course woody debris inputs from the shrub-lined streambanks comprised the majority of the large woody debris in WFPY03-01.

3.2.2.11 Greenline Understory Shrub Cover

Mean understory shrub cover exceeded 50% in GRNT11-02, TROUT12-03, TENM03-01, TROU03-01, WFPY03-01, and GRNT08-02 while mean shrub density was less than 50% in CRAM07-02, PETT03-01, PETT07-01, RATT04-01, FLAT09-01, MULK03-01, CRAM05-01, FLAT06-01, and FLAT06-02 (**Figure 3-22**). No greenline measurements were performed in GRNT12-03 since this monitoring site was located in a channelized reach where stream restoration, including the planting of willows, was recently completed.

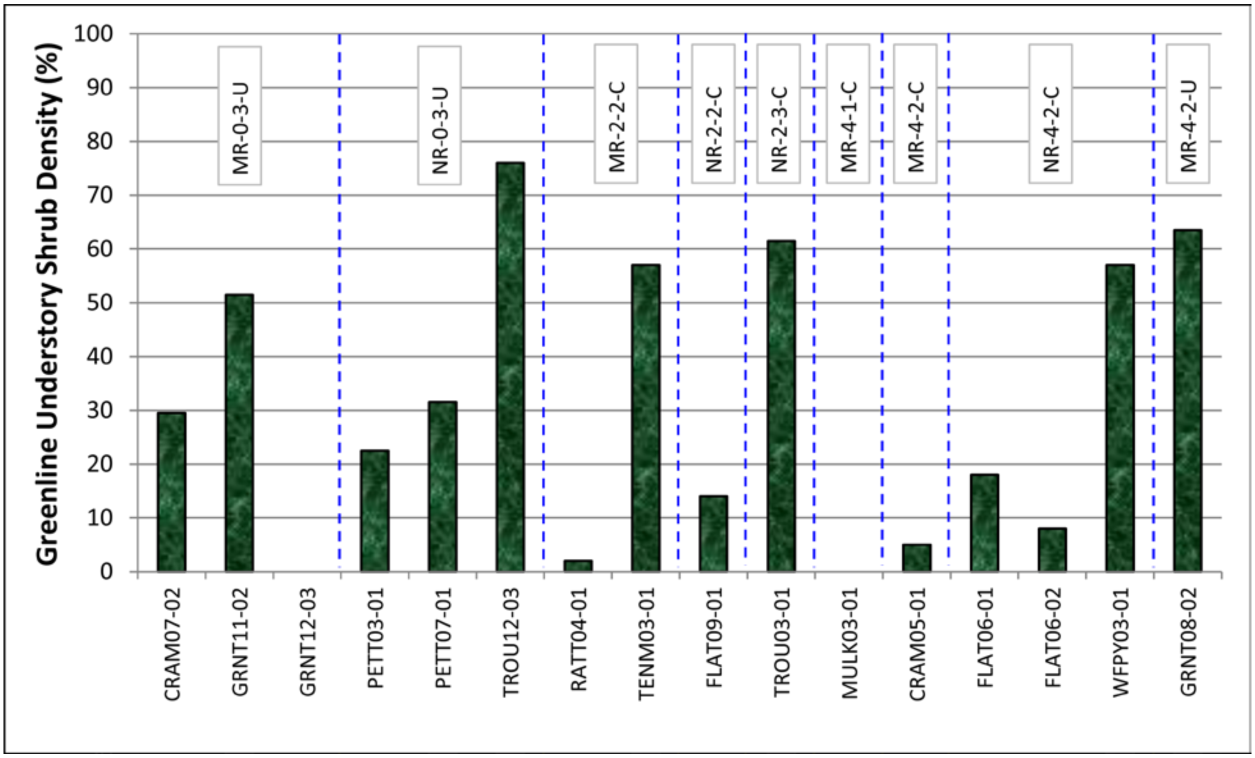


Figure 3-22. Greenline Understory Shrub Cover

3.2.2.12 Greenline Bare Ground

Mean bare ground values equaled or exceeded 5% in RATT04-01 and CRAM05-01, with all other monitoring sites remaining below 5% (**Figure 3-23**).

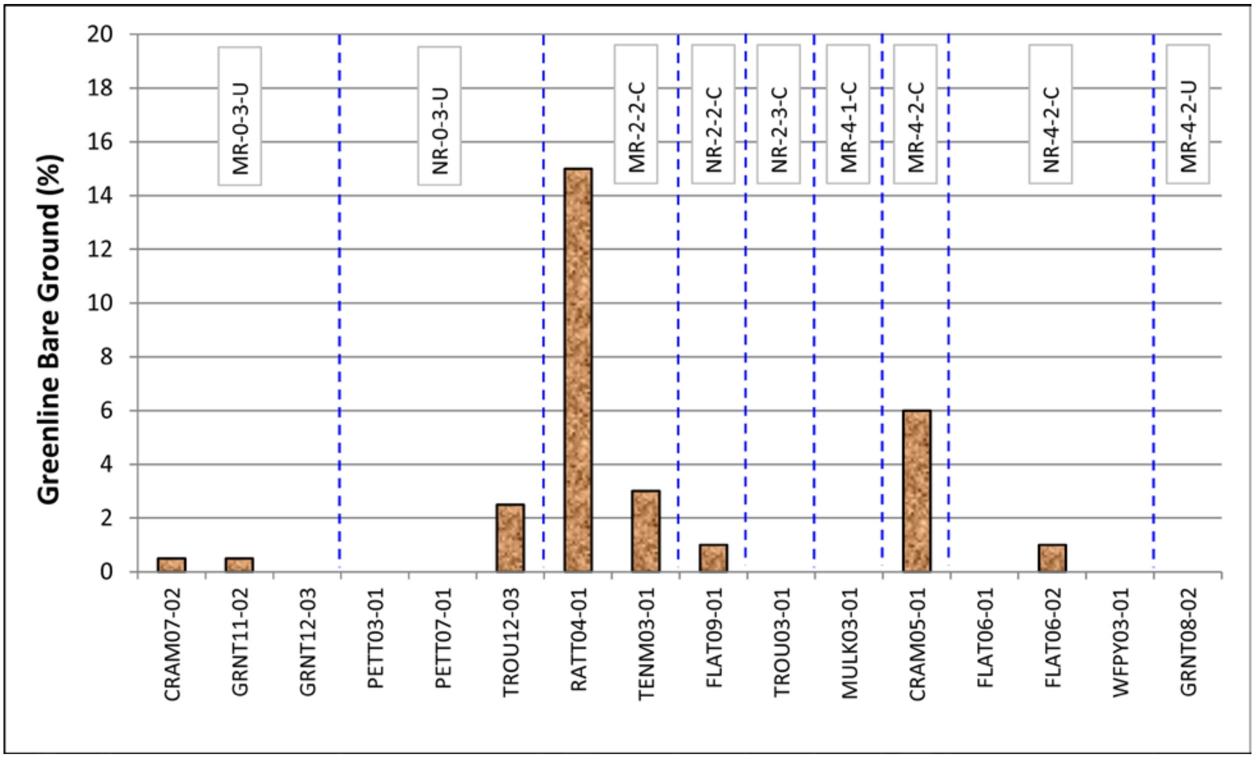


Figure 3-23. Greenline Bare Ground

3.2.3 Site Visit Notes

Following field data collection, field notes were recorded describing conditions observed in the field. Field notes were recorded for four categories and are summarized in the following sections:

- Description of human impacts and their severity
- Description of stream channel conditions
- Description of streambank erosion conditions
- Description of riparian vegetation conditions

3.2.3.1 Flat Creek – FLAT06-01

FLAT06-01 was located upstream of at least some of the historic mining in the Flat Creek watershed. Signs of historical logging were also observed on the hillslope and in the riparian zone, with large cedar stumps along the channel. An old abandoned road crosses the channel downstream of the monitoring site and runs parallel to the site along river left. Overall, the channel was slightly entrenched, with woody debris formed pools. Appropriate sized spawning gravels were observed. Isolated large eroding streambanks were observed. Riparian shrubs and young cedar trees lined the stream channel. The potential for this reach is a B4 stream type, with existing conditions ranging from B4 to F4. The restoration potential for this site is moderate and could involve stabilizing eroding streambanks.

3.2.3.2 Flat Creek – FLAT06-02

FLAT06-02 was located downstream of a large abandoned mine site and orange colored historic mining tailings lined the channel. Mining tailings were also used to construct the old road bed, which parallels the stream channel. Numerous can and bottles were observed in the streambanks, suggesting the site was once used as a garbage dump. An irrigation diversion structure was observed in the channel upstream of the monitoring site. In this reach, Flat Creek contained a riffle-pool channel with pools formed by woody debris. Some fine sediment was observed surrounding the woody debris. Appropriate sized spawning gravels were observed, along with a few small fish. Moss lined streambanks indicate very slow streambank retreat rates. Riparian vegetation included smaller cedars, alder and birch. The potential for this reach is a B4 stream type, with existing conditions ranging from B4 to E4b. The restoration potential for this site is moderate and would require removing the mine tailings from the streambanks and floodplain.

3.2.3.3 Flat Creek – FLAT09-01

FLAT09-01 is located upstream of the town of Superior. Logging has occurred along the monitoring site with young mixed conifers and shrubs along the channel. The main road is approximately 100 feet from the channel. Large tailings piles were observed along the channel margin, with signs of erosion during extreme high water events. Mine tailings are present consistently four feet above the channel suggesting historic aggradation. The monitoring site is located in a losing reach, either due to natural geology or past mining activities. The stream is comprised primarily of riffles with poorly developed pools at the outsides of meander bends. Small fish were observed. There was less fine sediment in the substrate than at the FLAT06-02 reach upstream. The potential for this reach is a C4 stream type, with existing conditions ranging from B4 to C4b to E4b. The restoration potential for this site is moderate and would require removing the mine tailings from the streambanks and floodplain.

3.2.3.4 Trout Creek – TROU03-01

TROU03-01 is located in the upper Trout Creek watershed upstream of the Verde-Windfall road crossing. Two historic road crossings have been removed within this monitoring site and the main road is within close proximity to the stream channel in places. Extensive logging has occurred throughout the surrounding watershed. Within the monitoring site, Trout Creek is a mountain stream with large boulders and boulder formed pools. Large substrate size limits the spawning potential. Large woody debris was commonly found along the channel margins. Wood was likely removed from the system historically for the transport of logs to the mill at the mouth of Trout Creek. Streambanks were stable due to the large substrate size. There was a band of alders along the channel margin and mixed conifers in the overstory. The potential for this reach is a B3 stream type, with existing conditions ranging from C3b to B3 to F3. The restoration potential for this reach is low as it is in an essentially natural condition, though large woody debris aggregates likely played a more significant role historically.

3.2.3.5 Trout Creek – TROU12-03

TROU12-03 is located in lower Trout Creek along the national forest campground. Extensive logging has occurred in the surrounding watershed. Wood was likely removed from the system historically for the transport of logs to the mill at the mouth of Trout Creek. Large substrate size limits the spawning potential. Streambanks were stable due to large substrate size. There was a band of shrubs along the channel margin and mixed conifers in the overstory. The potential for this reach is a B3c stream type, with existing conditions ranging from B4c to C3 to B3 to F3. The restoration potential for this reach is low as it is in an essentially natural condition, though large woody debris aggregates likely played a more significant role historically. Minor impacts due to recreational access from the campground were observed, but did not appear to be a significant problem at this time.

3.2.3.6 Tenmile Creek – TENM03-01

TENM03-01 is located parallel to a dirt road that connects the Tenmile Creek watershed to the Cramer Creek watershed. Transmission lines also parallel the channel, with the associated forest clearing. Historic logging has occurred throughout the watershed and signs of grazing were observed at the monitoring site. The stream channel was dominated by riffle habitat with infrequent shallow pools. A generally cobble substrate was finer in areas where dense vegetation obscured the channel and course woody debris inputs slowed the water. The streambanks on this small stream were subject to trampling by cattle. Road encroachment was also leading to streambank erosion. Extremely dense vegetation covered a portion of the monitoring site, while the majority of the site was comprised of a grass-lined channel with sparse shrubs and numerous weeds. The potential for this reach is an E4 stream type, with existing conditions ranging from E4 to F4. The restoration potential for this reach is moderate and could include grazing management and improved road best management practices.

3.2.3.7 Grant Creek – GRNT08-02

GRNT08-02 is located at the upper end of rural residential development along Grant Creek. Channel conditions represent a relatively natural mountain stream. Observed anthropogenic influences include an irrigation diversion at the upstream end of the reach and vegetation removal. However, dense riparian vegetation lines the majority of the monitoring site with conifers in the overstory. Pools formed behind boulders, while large woody debris was relatively sparse. The relatively large substrate limits the spawning potential within this monitoring site. Large substrate also limits the streambank erosion sediment load. The potential for this reach is a B3 stream type, with existing conditions ranging from B4 to F3 to C3b. The restoration potential for this reach is low as it is in an essentially natural condition.

3.2.3.8 Grant Creek – GRNT11-02

GRNT11-02 is located just upstream of the Interstate 90 crossing. This channelized urban stream flows through a natural area with walking trails along the west side of the channel and a road along the east side of the channel. The channel is somewhat entrenched with little floodplain access. Pools formed at the outsides of slight meander bends. The relatively large substrate limits the spawning potential within this monitoring site. Many of the streambanks are comprised of exposed cobbles. Large cottonwood trees line this reach with alder in the understory. The potential for this reach is a C4 stream type, with existing conditions ranging from B4c to E4 to C4 to C3. The restoration potential for this reach is low due to surrounding urban infrastructure and given that the reach is currently managed with an emphasis on its natural characteristics.

3.2.3.9 Grant Creek – GRNT12-03

GRNT12-03 is located in lower Grant Creek. The channel appears to have been converted to an irrigation ditch in this reach and attempts to restore some natural channel characteristics have been made, including narrowing the channel by adding a bankfull bench with willow plantings. However, the channel is still essentially a ditch lacking meanders, riffles, and pools. The streambed was comprised of fine sediment mixed with cobbles. Willow plantings and weeds comprised the riparian vegetation. The potential for this reach is a C4 stream type, though it is currently essentially a ditch with existing conditions ranging from C5 to B5c to E5. Additional restoration measures could emphasize re-creating a more natural riffle-pool sequence.

3.2.3.10 Rattler Gulch – RATT04-01

RATT04-01 is located in one of the flowing portions of Rattler Gulch, while the lower reaches are dry and lack a defined stream channel. The road has obliterated any signs of a stream channel in the narrow limestone canyon located on the way to the monitoring site. Active grazing was observed at this monitoring site, with extensive hoof shear along the banks of this small channel. The channel is riffle-dominated and lacked pools or spawning potential. Extensive fine sediment depositions were noted. The channel was lined by grass and lacked woody shrubs. The potential for this reach is an E4b stream type, with existing conditions ranging from E4b to E5b to C4b. The restoration potential for this reach is moderate and should emphasize a grazing management plan that would lead to improved riparian shrub density.

3.2.3.11 Mulkey Creek – MULK03-01

MULK03-01 is located in upper Mulkey Creek upstream of an obliterated road crossing. This small stream is flowing through a meadow in this reach, though the channel is dry in lower Mulkey Creek. The road along the stream has been revegetated. Some evidence of grazing was observed. The small riffle-dominated channel generally lacked pools. Small streambanks were lined with grass and sedge generally limiting sediment contribution. Numerous weeds were observed. The potential for this reach is and E4b stream type, with existing conditions ranging from B5 to F4b to B4 to C4b. The restoration potential for this reach is moderate and should emphasize a grazing management plan that will maintain the wet meadow characteristics along this reach which is currently in a state of recovery.

3.2.3.12 West Fork Petty Creek – WFPY03-01

WFPY03-01 is located just upstream of a bridge crossing that was removed in the summer of 2012. Historic logging was noted at the monitoring site, though the conifer forest is returning. Extensive logging has occurred throughout the watershed. A road parallels the stream channel. This monitoring site is lined by dense riparian shrubs. Aggradation was observed where course woody debris chokes the channel. The site generally lacked fine sediment accumulations. Pools are formed by course woody debris and spawning sized gravels were observed. The potential for this reach is a B4 stream type, with existing conditions ranging from E4b to C4b to B4. The restoration potential for this reach is low as it is currently in a state of recovery, though it will likely take many years for accumulated sediment deposits to flush through the system.

3.2.3.13 Petty Creek – PETT03-01

PETT03-01 is located downstream of the second road crossing of Petty Creek (when heading upstream). Road construction was occurring along Petty Creek during the summer of 2012. The site is located in an area with rural residential development, including a small walking bridge crossing the stream. The stream meanders through an open meadow with pools formed at the outsides of meander bends. Numerous fish were observed in the pools. Channel substrate was generally considered too large to support spawning expect in isolated pockets. Eroding streambanks were also associated with channel meanders. Streambanks were lined with grass and some alder, with sparse cottonwoods and conifers. Petty Creek was dry upstream of this site during temperature monitoring in October 2012, with inputs from Printers Creek and Johns Creek providing all of the streamflow to Petty Creek in this reach. The potential for this reach is a C4 stream type, with existing conditions ranging from C4 to B4c. The restoration potential for this reach is high and could include increased riparian shrub density.

3.2.3.14 Petty Creek – PETT07-01

PETT07-01 is located in a relatively narrow valley lower in the Petty Creek watershed. The road parallels this portion of the stream, but was not encroaching the channel at the monitoring site. This is a meandering channel with pools formed at the outsides of meander bends. Suitable sized spawning gravels were observed and the larger pools were formed by large woody debris. One large eroding streambank was observed where the stream was cutting into the toe of the hillslope. Erosion at this spot appears to be due largely to natural processes, though timber harvest throughout the watershed may have altered the hydrology for a period of time. Reed canarygrass lined the streambanks along the majority of this monitoring site, along with alders and other deciduous shrubs in the understory and cottonwoods and conifers in the overstory. The potential for this reach is a C4 stream type, with a C4b stream type as the existing conditions. The restoration potential for this reach is low as it is in a relatively natural condition within the monitoring site where the road is away from the channel. Outside of the monitoring site, road encroachment along this reach likely limits restoration potential, though sediment loads from eroding streambanks should be addressed.

3.2.3.15 Petty Creek – PETT07-02

A streambank erosion assessment was conducted along PETT07-02 to further characterize streambank erosion sediment loads in this reach of Petty Creek where the road periodically encroaches upon the stream channel. Extensive erosion was observed due to road encroachment along the river right streambank. Restoration measures in the form of two log vanes have been added to this reach, though they were added perpendicular to the flow and were leading to accelerated streambank erosion downstream of the log vanes. Riparian vegetation was similar to PETT07-01 upstream, with alders and other deciduous shrubs in the understory and cottonwoods and conifers in the overstory. The potential for this reach is a C3 stream type. Sediment loads from eroding streambanks caused by road encroachment should be addressed.

3.2.3.16 Cramer Creek – CRAM05-01

CRAM05-01 is located in a narrow valley in the upper Cramer Creek watershed. The road parallels the stream and encroaches the channel in places. This site was heavily grazed with pugging and hummocking of the streambanks and cattle trails crisscrossing the floodplain. Riparian vegetation consisted of grass with a few alders and a few conifers leading up the hillslope on the east side of the valley. The potential for this reach is an E4b stream type, with existing conditions ranging from C4b to E4b to B4 to F4. The restoration potential for this reach is moderate and should emphasize a grazing management plan that would lead to improved riparian shrub density.

3.2.3.17 Cramer Creek – CRAM07-02

CRAM07-02 is located lower in the Cramer Creek watershed, but upstream of the area of intensive irrigation withdrawals and agricultural use. The site was used for agricultural production historically and is currently being managed to improve riparian conditions. Grass lines the streambanks of this meadow stream with younger alders becoming more abundant. Pool formation and streambank erosion occur at meander bends. Pool tail-outs contained appropriate sized spawning gravels and provided excellent potential for spawning. However, fine sediment disturbed when walking up the stream channel remained suspended in slow water areas. The potential for this reach is a C4 stream type, with existing conditions ranging from B4c to C4 to E4 to F4. This reach is in a state of recovery and the restoration potential is high as it is currently being managed with an emphasis on its natural characteristics. Large eroding streambanks may require active restoration.

3.2.3.18 Deep Creek

No sediment and habitat assessment was performed on Deep Creek since no suitable sites were identified. There is a reservoir in the upper portion of Deep Creek out of which Deep Creek flows with a portion diverted into a pipe for apparent use in a mining operation. The channel quickly goes dry and loses definition in an area where active mining is occurring. Progressing downstream, flowing water was again observed downstream of the Gambler Creek confluence. In this reach, the channel resembled a small spring creek flowing through wetland vegetation. The stream then became channelized by the road and proceeded to go dry. Access to the flowing portion of Deep Creek was denied by the landowner. Progressing downstream, the channel remained encroached upon by the road and evidence of historic placer mining was observed, including a portion where a small rock wall had been constructed along both sides of the channel. As the valley opens up, there is no flowing water and no defined channel in an area where extensive mine related disturbance has occurred leading down to the confluence with Bear Creek.

4.0 STREAMBANK EROSION ASSESSMENT

4.1 METHODS

In the Central Clark Fork Tributaries Project Area, streambank erosion data was collected at 16 monitoring sites in which the complete sediment and habitat assessment was performed. An additional assessment of streambank erosion was conducted at one site to increase the representativeness of the assessment. At each of the 17 monitoring sites, eroding streambanks were assessed for erosion severity and categorized as either "actively/visually eroding" or "slowly eroding/vegetated/undercut". At each eroding streambank, **Bank Erosion Hazard Index (BEHI)** measurements were performed and the **Near Bank Stress (NBS)** was evaluated (Rosgen 1996, 2006). Bank erosion severity was rated from "very low" to "extreme" based on the BEHI score, which was determined based on the following six parameters: bank height, bankfull height, root depth, root density, bank angle, and surface protection. Near Bank Stress was also rated from "very low" to "extreme" depending on the shape of the channel at the toe of the bank and the force of the water (i.e. "stream power") along the bank. In addition, the source, or underlying cause, of streambank erosion was evaluated at each eroding streambank based on observed anthropogenic disturbances within the riparian corridor, as well as current and historic land-use practices observed within the surrounding landscape. The source of streambank instability was identified based on the following near-stream source categories: transportation, riparian grazing, cropland, mining, silviculture, irrigation, natural, and "historic or other". Naturally eroding streambanks were considered the result of "natural sources" while "historic or other" sources in the Central Clark Fork Tributaries Project Area include historic grazing in CRAM07-02, rural residential development in GRNT08-02 and PETT03-01, residential development in GRNT12-03, historic road construction in MULK03-01, recreation campsites in TROU12-03, and attempted restoration using log vanes in PETT07-02. If multiple sources were observed, then a percent was noted for each source.

For each eroding streambank, the average annual sediment load was estimated based on the streambank length, mean height, and annual retreat rate. The length and mean height were measured in the field, while the annual retreat rate was determined based on the relationship between the BEHI and NBS ratings. Annual retreat rates were estimated based on retreat rates developed using Colorado USDA Forest Service (1989) data for sedimentary and metamorphic geologies (Rosgen 2006) (**Table 4-1**). The annual sediment load in cubic feet was then calculated from the field data (annual retreat rate x mean bank height x bank length), converted into cubic yards, and finally converted into tons per year based on the bulk density of streambank material, which was assumed to average 1.3 tons/yard^3 as identified in *Watershed Assessment of River Stability and Sediment Supply* (WARSSS) (EPA 2006, Rosgen 2006). This process resulted in a sediment load for each eroding streambank expressed in tons per year.

Table 4-1. Annual Streambank Retreat Rates (Feet/Year), Colorado USDA Forest Service (adapted from Rosgen 2006)

BEHI	Near Bank Stress					
	very low	low	moderate	high	very high	extreme
very low	NA	NA	NA	NA	NA	NA
low	0.02	0.04	0.07	0.16	0.32	0.67
moderate	0.09	0.15	0.25	0.42	0.70	1.16
high - very high	0.17	0.25	0.38	0.58	0.87	1.32
extreme	0.16	0.42	1.07	2.75	7.03	17.97

4.1.1 Monitoring Site Sediment Loads

During field data collection, streambank erosion was assessed at a total of 17 monitoring sites in nine different reach types. For each monitoring site, the streambank erosion sediment load was normalized to 1000 feet. Streambank erosion data was then averaged for all sites for the purpose of analysis and extrapolation (**Table 4-2**).

Table 4-2. Reach Type Data Groupings

Reach Type	Number of Monitoring Sites	Monitoring Sites
MR-0-3-U	3	CRAM07-02, GRNT11-02, GRNT12-03
MR-2-2-C	2	RATT04-01, TENM03-01
MR-4-1-C	1	MULK03-01
MR-4-2-C	1	CRAM05-01
MR-4-2-U	1	GRNT08-02
NR-0-3-U	4	PETT03-01, PETT07-01, PETT07-02*, TROU12-03
NR-2-2-C	1	FLAT09-01
NR-2-3-C	1	TROU03-01
NR-4-2-C	3	FLAT06-01, FLAT06-02, WFPY03-01

*Streambank Erosion Only Assessment

4.1.2 Streambank Erosion Sediment Loads for Existing Conditions

Streambank erosion was estimated to be predominantly due to natural sources at seven of the 17 assessed monitoring sites, while streambank erosion was estimated to be predominately due to anthropogenic sources at 10 monitoring sites. Erosion from predominantly natural sources is defined as reaches where 75% or more of the causes of streambank erosion influence are attributed to natural sources, whereas anthropogenically influenced reaches attribute streambank erosion to human caused sources for greater than 25% of the reach. The average sediment load per year (24.82 tons/year/1000 feet) for the ten reaches with erosion predominantly influenced by human sources was then used to represent existing conditions for all reach types throughout the watershed that are predominately influenced by anthropogenic sources of erosion (**Table 4-3**).

Table 4-3. Sediment Loads by Reach Type for Existing Conditions

Field Assessed Reach Type Group	Number of Monitoring Sites	Average Sediment Load per 1000 Feet (Tons/Year)	Standard Error (Tons/Year)	Minimum (Tons)	Maximum (Tons)
MR-0-3-U, NR-0-3-U, MR-2-2-C, MR-4-1-C, MR-4-2-C, NR-4-2-C	10	24.82	3.35	7.03	39.25

4.1.3 Reducing Streambank Erosion Sediment Loads through Best Management Practices

The ability to reduce streambank erosion through the application of Best Management Practices (BMPs) was evaluated by comparing the existing conditions sediment load for monitoring sites with predominately human influenced erosion to the sediment load at the seven monitoring sites in which streambank erosion was due to predominately natural sources. The average sediment load per year (12.57 tons/year/1000 feet) for the seven reaches with erosion predominantly influenced by natural sources was used to represent potential bank erosion loading under best management practices for all reach types (**Table 4-4**).

Table 4-4. Sediment Loads by Reach Type with BMPs

Field Assessed Reach Type Group	Number of Monitoring Sites	Average Sediment Load per 1000 Feet with BMPs (Tons/Year)	Standard Error (Tons/Year)	Minimum (Tons)	Maximum (Tons)
NR-0-3-U, NR-2-2-C, NR-2-3-C, NR-4-2-C, MR-4-2-U	7	12.57	1.91	3.16	18.55

4.1.4 Streambank Erosion Sediment Load Extrapolation for Existing Conditions

Streambank erosion data collected at **monitoring sites** were extrapolated to the **stream reach**, **stream segment**, and **sub-watershed** scales based on similar reach type characteristics as identified in the Aerial Assessment Database. Sediment load calculations were performed for monitoring sites, stream reaches, stream segments, and sub-watersheds, which are distinguished as follows:

Monitoring Site - *A 500, 1000, or 1500 foot section of a stream reach where field monitoring was conducted*

Stream Reach -*Subdivision of the stream segment based on ecoregion, stream order, gradient and confinement as evaluated in GIS*

Stream Segment -*303(d) listed segment*

Sub-watershed -303(d) listed segment and tributary streams based on 1:100,000 NHD data layer

Streambank erosion sediment loads for the 303(d) listed stream segments were estimated based on the following criteria:

1. Monitoring site sediment loads were extrapolated directly to the stream reach in which the monitoring site was located and the percent contribution from different source categories was based on field observations.

2. Existing conditions data from the ten monitoring sites with erosion predominantly influenced by human sources was applied to all reach types in the Central Clark Fork Tributaries Project Area with predominately anthropogenic sources (>25%, based on the aerial assessment) (**Table 4-5**).

3. BMP condition sediment loads from the seven monitoring sites with erosion predominately influenced by natural sources were assigned to reaches with predominately natural sediment loads (>75%, based on the aerial assessment) (**Table 4-5**).

4. No streambank erosion sediment load was applied to 1st and 2nd order high gradient (>10%) reach types as these channels tend to be small and well armored and have a very low streambank erosion rate.

Table 4-5. Reach Type Groupings for Extrapolation

Field Assessed Reach Type Group	Un-Assessed Reach Types
MR-0-3-U, NR-0-3-U, MR-2-2-C, NR-2-2-C, NR-2-3-C, MR-4-1-C, MR-4-2-C, NR-4-2-C, MR-4-2-U	NR-0-3-C, MR-2-1-U, MR-2-2-U, NR-2-2-U, MR-2-3-U, NR-2-3-U, MR-4-1-U, NR-4-1-C, MR-4-3-U, NR-4-3-C

For 2nd and 3rd order streams that did not undergo the stratification process and field analysis, but are tributaries to TMDL streams, a simple sediment loading rate was developed to account for the additional streambank erosion sediment load that likely enters the TMDL stream. A value of 6.29 tons/year/1000 feet was applied to these un-assessed streams. This value is 50% of the average sediment load from the seven monitoring sites with a predominately natural sediment load, which averaged 12.57 tons/year/1000 feet. Because these un-assessed streams did not undergo stratification but undoubtedly contain a wide variety of conditions, the simplest approach of deriving the average for the population of reach types most likely to exist on those streams was used. Un-assessed 1st order tributary streams were presumed to contribute a load negligible enough to warrant exclusion from the estimate.

4.1.5 Streambank Erosion Sediment Load Extrapolation with Best Management Practices

Montana's narrative water quality standards that apply to sediment relate to the naturally occurring condition, which is typically associated with either reference conditions or those that occur if all reasonable land, soil, and water conservation practices are applied. Anthropogenic activities that remove streamside vegetation tend to de-stabilize streambanks and increase the amount streambank erosion. Through the implementation of riparian and streambank BMPs, streambanks can be stabilized and sediment loads can be reduced. The reduction in streambank erosion sediment loads due to anthropogenic sources achievable via the implementation of BMPs was approximated using the estimated streambank erosion rate for monitoring sites in which the sediment load was due to predominately natural sources as discussed in **Section 4.1.3**, along with the following criteria:

1. Because they are assumed to be achieving the naturally occurring condition, no sediment load reductions were applied to reaches with predominately natural sources of erosion (>75%, based

on the aerial assessment and observations at monitoring sites). In addition, no load reduction was applied to the natural portion of the sediment load in reaches with <75% natural sources.

2. Percent reductions for monitoring sites with predominately (>25%) anthropogenic sources were based on the difference between the existing conditions streambank erosion sediment load and the BMP sediment load as depicted in **Table 4-6**. Note: The existing streambank erosion sediment load in MULK03-01 was lower than BMP load so the existing sediment load was retained at this site.

3. BMP sediment loads discussed in **Section 4.1.3** were applied to un-assessed reaches on the 303(3) listed stream segments as shown in **Table 4-6**.

4. No reductions were applied to the un-assessed tributaries to the sediment listed streams (i.e., those not included in the aerial assessment database).

Table 4-6. Percent Reduction in Streambank Erosion Sediment Loads

Field Assessed Reach Type Group	Number of Monitoring Sites	Average Sediment Load per 1000 Feet (Tons/Year)	Average Sediment Load per 1000 Feet with BMPs (Tons/Year)	Percent Reduction
MR-0-3-U, NR-0-3-U, MR-2-2-C, NR-2-2-C, NR-2-3-C, MR-4-1-C, MR-4-2-C, NR-4-2-C, MR-4-2-U	17	24.82	12.57	49%

4.2 Results

4.2.1 Streambank Erosion Sediment Load Extrapolation

A total average annual sediment load of 336 tons/year was attributed to the 166 assessed eroding streambanks within the 17 monitoring sites. Average annual sediment loads for each monitoring site were normalized to a length of 1,000 feet for the purpose of comparison and extrapolation. Monitoring site sediment loads per 1,000 feet ranged from 3.16 tons/year in TROU03-01 on Trout Creek to 39.25 tons/year at CRAM05-01 on Cramer Creek (**Table 4-7**).

Table 4-7. Monitoring Site Estimated Average Annual Sediment Loads due to Streambank Erosion

Stream Segment	Reach ID	Reach Type	Monitoring Site Length (Feet)	Length of Eroding Bank (Feet)	Percent of Reach with Eroding Streambank	Reach Sediment Load (Tons/Year)	Total Sediment Load per 1000 Feet (Tons/Year)
Cramer Creek	CRAM05-01	MR-4-2-C	500	845	85%	19.62	39.25
	CRAM07-02	MR-0-3-U	1000	781	39%	35.94	35.94
Flat Creek	FLAT06-01	NR-4-2-C	500	394	39%	12.57	25.14
	FLAT06-02	NR-4-2-C	500	403	40%	4.80	9.60
	FLAT09-01	NR-2-2-C	500	227	23%	9.16	18.32
Grant Creek	GRNT08-02	MR-4-2-U	1000	452	23%	12.51	12.51
	GRNT11-02	MR-0-3-U	1000	491	25%	24.84	24.84
	GRNT12-03	MR-0-3-U	1000	562	28%	17.34	17.34
Mulkey Creek	MULK03-01	MR-4-1-C	500	525	53%	3.51	7.03
Petty Creek	PETT03-01	NR-0-3-U	1000	790	40%	28.89	28.89
	PETT07-01	NR-0-3-U	1000	665	33%	18.55	18.55
	PETT07-02	NR-0-3-U	1000	998	50%	36.82	36.82
Rattler Gulch	RATT04-01	MR-2-2-C	500	1000	100%	7.37	14.73
Tenmile Creek	TENM03-01	MR-2-2-C	500	738	74%	9.10	18.20
Trout Creek	TROU03-01	NR-2-3-C	1500	275	9%	4.73	3.16
	TROU12-03	NR-0-3-U	1500	451	15%	11.70	7.80
West Fork Petty Creek	WFPT03-01	NR-4-2-C	500	641	64%	9.04	18.08

Monitoring site sediment loads were extrapolated to each 303(d) listed stream segment as discussed in **Section 4.1.4**. Stream segment sediment loads were estimated for all 97.7 miles of stream included in the Aerial Assessment Database (**Attachment C**). A total annual sediment load of 10,846 tons/year was attributed to eroding streambanks at the stream segment scale (**Table 4-8**). In the Central Clark Fork Tributaries Project Area, streambank erosion sediment loads ranged from 454 tons/year in Mulkey Creek to 1,938 tons/year in Grant Creek (**Attachment C**). Cramer Creek has highest sediment load due to streambank erosion per mile of stream, followed by Petty Creek, while Flat Creek has the lowest streambank erosion sediment load per mile of stream. At the stream segment scale, this assessment indicates that transportation, timber harvest, and grazing are the greatest anthropogenic contributors of sediment loads due to streambank erosion in the Central Clark Fork Tributaries Project Area (**Figure 4-1**).

Average annual streambank erosion sediment loads at the sub-watershed scale were estimated for the assessed stream segments in the Central Clark Fork Tributaries Project Area based on the total length of stream within each sub-watershed. These sub-watershed sediment loads were estimated from the sum of the average annual streambank erosion sediment loads at the stream segment scale combined with an estimate of streambank erosion sediment loads from un-assessed streams. A total of 97.7 miles of stream were included in the Aerial Assessment Database and there are a total of 328.9 miles of stream in the assessed sub-watersheds based on a modified version of the 1:100,000 NHD Plus stream layer in which ditches were removed (**Table 4-8**). First order tributaries were then removed from the dataset, resulting in 131.2 miles of stream. For the purposes of estimating an annual average sub-watershed streambank erosion sediment load, streambank erosion sediment inputs from un-assessed 2nd and 3rd order tributary streams was assumed to be 6.29 tons/year/1000 feet as discussed in **Section 4.1.4**. A total sediment load of 11,958 tons per year is estimated at the sub-watershed scale for the Central Clark Fork Tributaries Project Area (**Table 4-8**).

Table 4-8. Sub-watershed Streambank Erosion Sediment Loads

Stream Segment	Stream Length (Miles)	Stream Segment Sediment Load (Tons/Year)	Sub-watershed Stream Length Excluding 1st Order Tributaries (Miles)	Un-assessed Stream Length Excluding 1st Order Tributaries (Miles)	Sediment Load Applied to Un-assessed Stream Length (33.18 Tons/Year/Mile)	Sub-watershed Sediment Load (Tons/Year)	Total Load per Mile (Tons/Year)
Cramer Creek	11.98	1847.8	12.62	0.6	21.23	1869.05	148.1
Deep Creek	5.09	606.1	5.57	0.5	15.84	621.99	111.7
Flat Creek	8.02	517.7	8.02	0.0	0.00	517.68	64.5
Grant Creek	18.78	1938.2	18.78	0.0	0.00	1938.18	103.2
Mulkey Creek	5.99	454.2	7.75	1.8	58.42	512.62	66.1
Petty Creek (excluding West Fork Petty Creek)	12.20	1667.8	28.66	16.5	546.04	2213.83	77.2
Rattler Gulch	8.08	1036.1	8.80	0.7	23.88	1060.00	120.5
Tenmile Creek	4.92	557.8	5.68	0.8	25.08	582.88	102.6
Trout Creek	14.99	1417.5	27.70	12.7	421.70	1839.17	66.4
West Fork Petty Creek	7.64	802.9	7.64	0.0	0.00	802.95	105.0
TOTAL	**97.7**	**10,846**	**131.2**	**33.5**	**1,112**	**11,958**	**91.1**

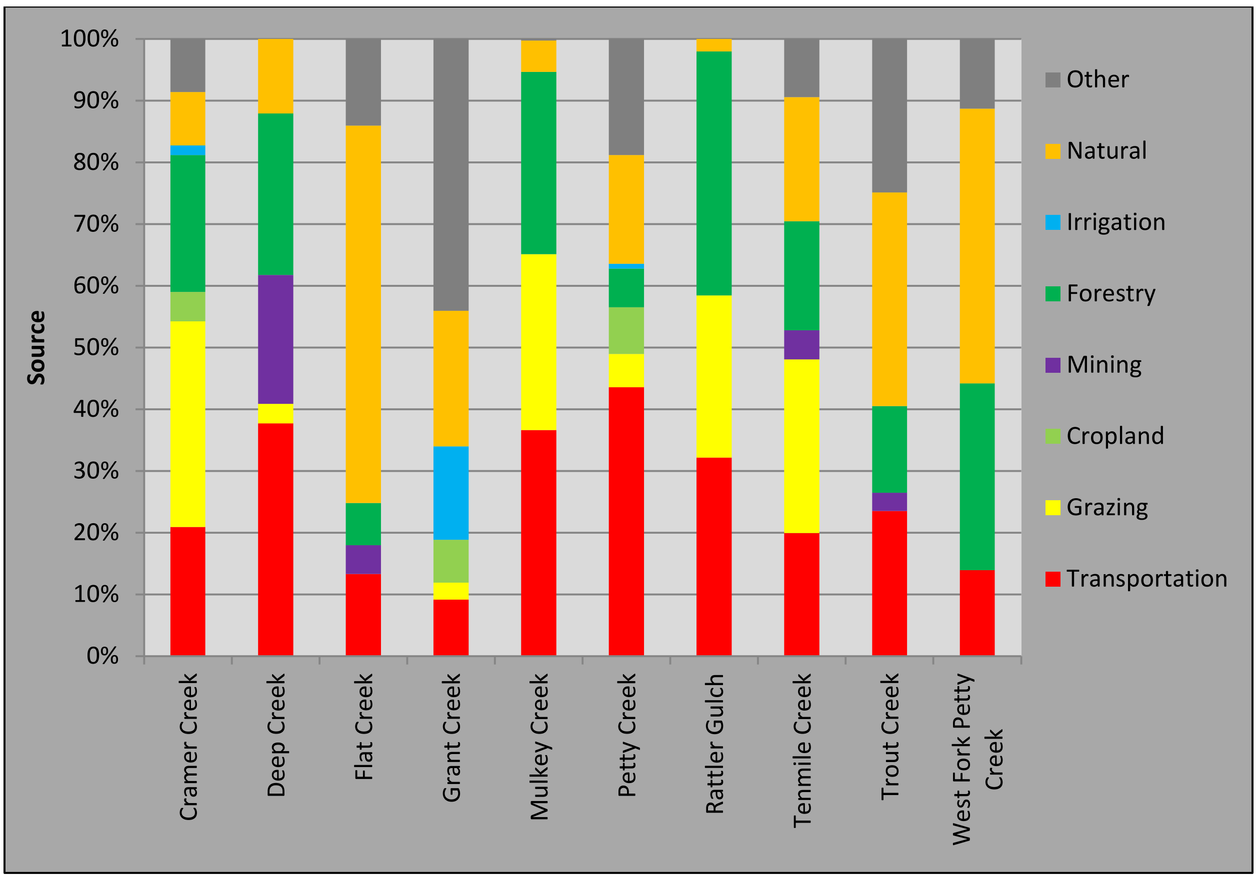


Figure 4-1. Stream Segment and Sub-watershed Streambank Erosion Sources

4.2.1.1 Streambank Composition

The percent of eroding streambank within each particle size category was evaluated for each monitoring site based on the sediment load from each eroding streambank relative to the total sediment load for the monitoring site. Then, the loads per particle size category from the monitoring sites within each impaired stream segment were summed to provide the streambank particle size breakdown for each stream segment (**Table 4-9**). Thus, it is assumed that streambank composition assessed at the field monitoring sites is representative of the overall stream segment. This analysis will help guide implementation activities geared toward reducing sediment loads for specific particle size categories. In the Central Clark Fork Tributaries Project Area, sand/silt generally comprised the greatest portion of the streambank sediment load, comprising greater than 50% of the sediment load in all of the assessed streams except for Cramer Creek and Petty Creek.

Table 4-9. Stream Segment Streambank Composition

Stream Segment	Coarse Gravel >6mm (Percent)	Fine Gravel <6mm & >2mm (Percent)	Sand/Silt <2mm (Percent)
Cramer Creek	43%	34%	24%
Flat Creek	22%	13%	65%
Grant Creek	40%	3%	57%
Mulkey Creek	0%	0%	100%
Petty Creek	36%	16%	48%
Rattler Gulch	0%	0%	100%
Tenmile Creek	0%	0%	100%
Trout Creek	23%	10%	67%
West Fork Petty Creek	16%	16%	68%

4.2.2 Streambank Erosion Sediment Load Reductions

Streambank erosion sediment load reductions for each sediment 303(d) listed sub-watershed in the Central Clark Fork Tributaries Project Area are provided in **Table 4-10**. Potential reductions in anthropogenic loading as a result of the application of BMPs range from 16% in Flat Creek to 52% in Cramer Creek. The loading reductions listed in **Table 4-10** were calculated based on the erosion rates of streambanks predominately influenced by natural sources on the 303(d) listed water body segments, but additional reductions may also be possible from the tributaries to the listed water bodies.

Table 4-10. Sub-watershed Sediment Load Reductions with BMPs

Stream Segment	Existing Sediment Load (Tons/Year)			Reduced Sediment Load through BMPs (Tons/Year)			Potential Reduction in Total Sediment Load (Total Existing-Total Reduced) (Tons/Year)	Percent Reduction in Total Sediment Load
	Total Sub-watershed (Tons/Year)	Anthropogenic Sub-watershed Load (Tons/Year)	Natural Sub-watershed Load (Tons/Year)	Total Sub-watershed (Tons/Year)	Anthropogenic Sub-watershed Load (Tons/Year)	Natural Sub-watershed Load (Tons/Year)		
Cramer Creek	1,869.0	1707.3	161.8	905.6	743.8	161.8	963.4	52%
Deep Creek	622.0	546.9	75.1	358.9	283.8	75.1	263.0	42%
Flat Creek	517.7	201.4	316.3	435.2	118.8	316.3	82.5	16%
Grant Creek	1,938.2	1512.2	425.9	1224.5	798.5	425.9	713.7	37%
Mulkey Creek	512.6	486.4	26.2	305.6	279.5	26.2	207.0	40%
Petty Creek (excluding West Fork Petty Creek)	2,213.8	1824.2	389.7	1503.6	1113.9	389.7	710.2	32%
Rattler Gulch	1,060.0	1038.2	21.8	570.7	548.9	21.8	489.3	46%
Tenmile Creek	582.9	465.5	117.4	381.9	264.5	117.4	201.0	34%
Trout Creek	1,839.2	1201.9	637.2	1415.0	777.8	637.2	424.2	23%
West Fork Petty Creek	802.9	445.8	357.1	599.8	242.6	357.1	203.2	25%
TOTAL	**11,958**	**9,430**	**2,529**	**7,701**	**5,172**	**2,529**	**4,258**	**36%**

5.0 Assumptions and Uncertainty

The Central Clark Fork Tributaries sediment and habitat assessment assumes reaches with similar reach type characteristics will have similar physical attributes and sediment loads due to streambank erosion. Since only a portion of the streams within the Central Clark Fork Tributaries Project Area were assessed in the field, a degree of uncertainty is unavoidable when extrapolating data from assessed reaches to un-assessed reaches. Although the accuracy of the GIS data may influence the length of each reach type, the largest potential sources of inaccuracy within the project are the small sample size per reach type, the near-stream land uses identified based on aerial images, and the retreat rates used for the extrapolation process. These are minimized by careful selection of representative monitoring sites and only using the near-stream land uses for informational purposes within the TMDL document. Since sediment source modeling may under-estimate or over-estimate sediment inputs due to selection of sediment monitoring sites and the extrapolation methods used, model results should not be taken as an absolutely accurate account of sediment production within each sub-watershed. Instead, the streambank erosion assessment model results should be considered an instrument for estimating existing streambank erosion sediment loads and making general comparisons of streambank erosion sediment loads from various sources.

6.0 Summary

The 2012 sediment and habitat assessment in the Central Clark Fork Tributaries Project Area provides a comprehensive analysis of existing sediment conditions within impaired stream segments and estimated streambank erosion sediment loads for use in TMDL development. A total of 109 reaches were delineated during the aerial assessment reach stratification process covering 97.9 miles of stream. Based on the level III ecoregion, there were a total of 24 distinct reach types and sediment and habitat parameters were assessed at 17 monitoring sites. Statistical analysis of the sediment and habitat data from the 17 monitoring sites will aid in developing sediment TMDL targets that are specific for the Central Clark Fork Tributaries Project Area, while streambank erosion data will be utilized in the sediment TMDL. Within the 17 monitoring sites, an average annual sediment load of 336 tons/year was attributed to the 166 assessed eroding streambanks and average annual sediment load of 10,846 tons/year was estimated for the listed stream segments. Out of the 328.9 miles of stream within the assessed sub-watersheds, a total sediment load of 11,958 tons per year was estimated at the sub-watershed scale. It is estimated that this sediment load can be reduced to 7,701 tons/year, which is a 36% reduction in sediment load from streambank erosion.

7.0 REFERENCES

Bilby, R. and J.W. Ward. 1989. Changes in characteristics and function of woody debris with increasing size of streams in western Washington. Transactions of the American Fisheries Society 118:368-378.

Dunne, T. and L.B. Leopold. 1978. Water in Environmental Planning. W.H. Freeman and Company, New York.

Dunnigan, Jim. Montana Fish, Wildlife, and Parks, Libby, Montana. Personal Communication, December 14, 2012.

Kappesser, G.B. 2002. A riffle stability index to evaluate sediment loading to streams. Journal of the American Water Resources Association 38(4): 1069-1081.

Meehan, W.R., ed. 1991. Influences of forest and rangeland management on salmonid fishes and their habitats. Special Publication 19. American Fisheries Society, Bethesda, MD. 751 p.

Montana Department of Environmental Quality (DEQ 2008). Watershed Stratification Methodology for TMDL Sediment and Habitat Investigations. Montana Department of Environmental Quality.

Montana Department of Environmental Quality (DEQ 2011). Field Methodology for the Assessment of TMDL Sediment and Habitat Impairments. Montana Department of Environmental Quality.

Overton, C. K., S. P. Wollrab, B. C Roberts, and M. A. Radko. 1997. R1/R4 (Northern/ Intermountain Regions) Fish and Fish Habitat Standard Inventory Procedures Handbook. General Technical Report INT-GTR-346. Ogden, UT: USDA Forest Service, Intermountain Research Station. 73 p.

Rosgen, D. 1996 Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Rosgen, D. 2006. *Watershed Assessment of River Stability and Sediment Supply* (WARSSS). Wildland Hydrology, Fort Collins, Colorado.

U.S. Environmental Protection Agency (EPA). 2006. *Watershed Assessment of River Stability and Sediment Supply* (WARSSS). Version 1.0. Available at: http://www.epa.gov/warsss/index.htm. Site accessed March 2008.

Weaver, T. and Fraley, J., 1991. Fisheries Habitat and Fish Populations, Flathead Basin Forest Practices Water Quality and Fisheries Cooperative Program - Final Report. Flathead Basin Commission,Kalispell, MT. pp. 53- 68.

Wolman, M.G., 1954. A method of sampling coarse river-bed material: Trans. Am. Geophys. Union, v. 35, p. 951-956

Attachment A

Aerial Assessment Database

Stream	Reach_ID	Reach_Type	Length_ft	Pri_Ecoreg	Sec_Ecoreg	Strm_Ord	Confine	Gradient	HB_Trigger	SB_Trigger	LB_Landuse	LB_Anthro	LB_RP_Veg	LB_RP_Hlth	LB_Comment	RB_Landuse	RB_Anthro	RB_RP_Veg	RB_RP_Hlth	RB_Comment	BE_TRANSP	BE_GRAZ	BE_CROP	BE_MINE	BE_FORST	BE_IRRIG	BE_NATR	BE_OTH_HIS	BE_TOT	RP_Hlth_Overall	RP_Hlth_Potential_Overall
Cramer Creek	CRAM 01-01	MR-4-1-U	6388	17al		1	U	4-10	Start		Forest	Yes	Grass	Fair	Grass under Pondos	Forest	Yes	Grass	Fair	Grass under Pondos	20	0	0	0	0	0	0	80	0	Fair	Good
Cramer Creek	CRAM 02-01	MR-4-1-C	2765	17al		1	C	4-10	Confinement		Harvest/Fire	Yes	Grass	Fair		Harvest/Fire	Yes	Grass	Fair		20	0	0	0	80	0	0	0	0	Mod-Fair	Good
Cramer Creek	CRAM 03-01	MR-4-2-C	7350	17al		2	C	4-10	Stream Order		Harvest/Fire	Yes	Grass	Fair	Logged	Harvest/Fire	Yes	Grass	Fair	Logged	20	0	0	0	80	0	0	0	0	Mod-Fair	Good
Cramer Creek	CRAM 04-01	MR-2-2-C	2951	17al		2	C	2-<4	Gradient		Harvest/Fire	Yes	Coniferous	Mod-good	Slight buffer	Harvest/Fire	Yes	Grass	Fair	Grass to road	10	0	0	0	70	0	20	0	0	Fair	Good
Cramer Creek	CRAM 05-01	MR-4-2-C	17662	17al		2	C	4-10	Gradient		Harvest/Fire	Yes	Woody Wetland	Mod-Good		Harvest/Fire	Yes	Emergent Wetland	Mod-Good		10	0	0	20	60	0	10	0	0	Fair	Good
Cramer Creek	CRAM 06-01	MR-2-2-C	8905	17x	17al	2	C	2-<4	Ecoregion, Gradient		Harvest/Fire	Yes	Woody Wetland	Mod-Good		Harvest/Fire	Yes	Woody Wetland	Mod-Good		20	0	0	0	60	0	20	0	0	Fair	Good
Cramer Creek	CRAM 07-01	MR-0-3-U	3991	17x	17al	3	U	<2	Strm Ordr, Grdient, Conf		Grassland/Herbaceous	Yes	Woody Wetland	Mod-Good		Grassland/Herbaceous	Yes	Woody Wetland	Good		0	30	0	0	10	10	40	10	0	Fair	Mod-Good
Cramer Creek	CRAM 07-02	MR-0-3-U	2066	17x	17al	3	U	<2	Strm Ordr, Grdient, Conf	LULC	Hay/Pasture	Yes	Woody Wetland	Fair		Hay/Pasture	Yes	Woody Wetland	Fair		0	80	0	0	0	20	0	0	0	Mod-Fair	Mod-Good
Cramer Creek	CRAM 07-03	MR-0-3-U	2011	17x	17al	3	U	<2	Strm Ordr, Grdient, Conf	LULC / Agriculture	Hay/Pasture	Yes	Grass	Poor		Grassland/Herbaceous	Yes	Woody Wetland	Poor		0	50	40	0	0	10	0	0	0	Poor	Fair
Cramer Creek	CRAM 08-01	MR-0-3-U	1866	17ak	17al, 17x	3	U	<2	Ecoregion		Hay/Pasture	Yes	Woody Wetland	Poor		Hay/Pasture	Yes	Grass	Poor		0	40	30	0	0	30	0	0	0	Poor	Fair
Cramer Creek	CRAM 08-02	MR-0-3-U	7299	17ak	17al, 17x	3	U	<2	Ecoregion	Transportation	Hay/Pasture	Yes	Grass	Poor		Transportation	Yes	Woody Wetland	Mod-Fair		50	20	30	0	0	0	0	0	0	Poor	Fair
Deep Creek	DEEP 01-01	MR-10-1-C	2467	17al		1	C	>10	Start		Forest	Yes	Coniferous	Good		Harvest/Fire	Yes	Coniferous	Mod-Good		10	0	0	0	50	0	40	0	0	Mod-Good	Mod-Good
Deep Creek	DEEP 02-01	MR-4-1-C	3194	17al		1	C	4-10	Gradient		Forest	Yes	Bare (?)	Poor (?)		Forest	Yes	Bare (?)	Poor (?)		0	0	0	0	0	0	0	0	0	Poor	Fair
Deep Creek	DEEP 02-02	MR-4-1-C	2413	17al		1	C	4-10	Gradient	Forest Harvest	Harvest/Fire	Yes	Grass	Poor	Clearcut	Harvest/Fire	Yes	Grass	Poor	Clearcut	20	0	0	0	80	0	0	0	0	Poor	Fair
Deep Creek	DEEP 03-01	MR-2-2-C	4560	17al		2	C	2-<4	Stream Order, Gradient		Forest	Yes	Woody Wetland	Mod-Good		Forest	Yes	Emergent Wetland	Fair	Road	50	0	0	0	30	0	20	0	0	Mod-Fair	Mod-Good
Deep Creek	DEEP 04-01	MR-4-2-C	4144	17x	17al	2	C	4-10	Ecoregion		Forest	Yes	Woody Wetland	Mod-Good		Forest	Yes	Coniferous	Good	Some scree slopes	40	0	0	0	40	0	20	0	0	Mod-Good	Mod-Good
Deep Creek	DEEP 05-01	MR-4-2-C	4026	17al	17al, 17x	2	C	4-10	Ecoregion		Forest	No	Woody Wetland	Mod-Good		Forest	Yes	Woody Wetland	Mod-Good	Road	60	0	0	0	10	0	30	0	0	Mod-Good	Mod-Good
Deep Creek	DEEP 05-02	MR-4-2-C	2575	17al	17al, 17x	2	C	4-10	Ecoregion	Riparian	Grassland/Herbaceous	Yes	Grass	Poor	log staging?	Grassland/Herbaceous	Yes	Grass	Poor		30	30	0	0	40	0	0	0	0	Poor	Fair
Deep Creek	DEEP 06-01	MR-2-2-C	3509	17al	17al, 17x	2	C	2-<4	Gradient		Grassland/Herbaceous	Yes	Bare	Poor		Grassland/Herbaceous	Yes	Bare	Poor		0	0	0	0	0	0	0	0	0	Poor	Fair
Flat Creek	FLAT 01-01	NR-10-1-U	3276	15a		1	U	>10	Start		Forest	No	Coniferous	Mod-Good		Harvest/Fire	No	Coniferous	Fair	Beetle kill / fire	0	0	0	0	0	0	50	50	0	Fair	Good
Flat Creek	FLAT 02-01	NR-10-1-C	9056	15a		1	C	>10	Confinement		Forest	No	Coniferous	Good		Forest	No	Coniferous	Good		0	0	0	0	0	0	100	0	0	Good	Good
Flat Creek	FLAT 03-01	NR-4-1-C	1386	15a		1	C	4-10	Gradient		Forest	No	Coniferous	Good		Forest	No	Coniferous	Good		0	0	0	0	0	0	100	0	0	Good	Good
Flat Creek	FLAT 04-01	NR-4-2-C	4964	15a		2	C	4-10	Stream Order		Forest	No	Coniferous	Good		Forest	No	Coniferous	Good		0	0	0	0	0	0	100	0	0	Good	Good
Flat Creek	FLAT 05-01	NR-2-2-C	3049	15a		2	C	2-<4	Gradient		Forest	No	Coniferous	Good		Forest	No	Coniferous	Good		0	0	0	0	0	0	100	0	0	Good	Good
Flat Creek	FLAT 06-01	NR-4-2-C	2507	15a		2	C	4-10	Gradient		Forest	Yes	Coniferous	Mod-Good	Clearing near btm rch	Forest	Yes	Coniferous	Mod-Good	Rd near btm of rch	10	0	0	0	0	0	0	90	0	Mod-Good	Mod-Good
Flat Creek	FLAT 06-02	NR-4-2-C	4430	15a		2	C	4-10	Gradient	Forest Harvest / Roads	Forest	Yes	Coniferous	Mod-Good		Transportation	Yes	Coniferous	Mod-Good		50	0	0	0	10	0	10	30	0	Mod-Good	Mod-Good
Flat Creek	FLAT 07-01	NR-2-2-U	4192	15a		2	U	2-<4	Gradient, Confinement		Rural Res	Yes	Coniferous	Mod-Good		Transportation	Yes	Coniferous	Mod-Good		20	0	0	0	0	0	10	70	0	Fair	Mod-Good
Flat Creek	FLAT 08-01	NR-4-2-C	2422	15a		2	C	4-10	Gradient		Forest	No	Coniferous	Mod-Good		Transportation	Yes	Coniferous	Fair		80	0	0	0	0	0	20	0	0	Mod-Good	Mod-Good
Flat Creek	FLAT 09-01	NR-2-2-C	7087	15a		2	C	2-<4	Gradient		Forest	No	Coniferous	Fair		Transportation	Yes	Coniferous	Fair		80	0	0	0	0	0	20	0	0	Mod-Good	Mod-Good
Grant Creek	GRNT 01-01	MR-10-1-U	1720	17x		1	U	>10	Start		Forest	No	Grass	Good		Forest	No	Coniferous	Good		0	0	0	0	0	0	100	0	0	Good	Good
Grant Creek	GRNT 02-01	MR-4-1-U	2908	17x		1	U	4-10	Gradient		Forest	No	Coniferous	Good		Forest	No	Coniferous	Good		0	0	0	0	0	0	100	0	0	Good	Good
Grant Creek	GRNT 03-01	MR-10-1-U	3884	17x		1	U	>10	Gradient		Forest	No	Coniferous	Good		Forest	No	Coniferous	Good		0	0	0	0	0	0	100	0	0	Good	Good
Grant Creek	GRNT 04-01	MR-4-2-U	7879	17x		2	U	4-10	Stream Order, Gradient		Forest	No	Coniferous	Good		Forest	No	Coniferous	Good		0	0	0	0	0	0	100	0	0	Good	Good
Grant Creek	GRNT 05-01	MR-10-2-C	910	17x		2	C	>10	Gradient, Confinement		Forest	No	Coniferous	Good		Forest	No	Coniferous	Good		0	0	0	0	0	0	100	0	0	Good	Good
Grant Creek	GRNT 06-01	MR-4-2-C	7826	17x		2	C	4-10	Gradient		Forest	No	Coniferous	Good		Forest	No	Coniferous	Good		0	0	0	0	0	0	100	0	0	Good	Good
Grant Creek	GRNT 07-01	MR-2-2-U	2731	17x		2	U	2-<4	Gradient, Confinement		Forest	Yes	Coniferous	Good	Patchy forest- old cut?	Forest	Yes	Coniferous	Good	Faint road	0	0	0	0	0	0	70	30	0	Good	Good
Grant Creek	GRNT 08-01	MR-4-2-U	3002	17x		2	U	4-10	Gradient		Forest	No	Coniferous	Good		Forest	Yes	Coniferous	Good		0	0	0	0	0	0	90	10	0	Good	Good
Grant Creek	GRNT 08-02	MR-4-2-U	3587	17x		2	U	4-10	Gradient	Rural Residential	Rural Res	Yes	Coniferous	Mod-Good		Rural Res	Yes	Coniferous	Mod-Good		10	0	0	0	0	0	0	90	0	Mod-Good	Mod-Good
Grant Creek	GRNT 09-01	MR-2-3-U	9622	17x		3	U	2-<4	Stream Order, Gradient		Rural Res	Yes	Coniferous	Mod-Good		Forest	Yes	Coniferous	Mod-Good	Rural res upper 1/3	0	0	0	0	0	0	10	90	0	Mod-Good	Mod-Good
Grant Creek	GRNT 10-01	MR-2-3-U	13402	17s	17x	3	U	2-<4	Ecoregion		Rural Res	Yes	Coniferous	Mod-Good		Rural Res	Yes	Coniferous	Mod-good		0	0	0	0	0	10	0	90	0	Fair	Mod-Good
Grant Creek	GRNT 11-01	MR-0-3-U	3371	17s	17x	3	U	<2	Gradient		Forest	Yes	Deciduous	Good		Forest	Yes	Deciduous	Good		0	0	0	0	0	0	50	50	0	Fair	Mod-Good
Grant Creek	GRNT 11-02	MR-0-3-U	3231	17s	17x	3	U	<2	Gradient	Residential	Forest	Yes	Deciduous	Mod-Good		Urban Res	Yes	Deciduous	Mod-Good		20	0	0	0	0	0	0	80	0	Fair	Mod-Good
Grant Creek	GRNT 11-03	MR-0-3-U	4795	17s	17x	3	U	<2	Gradient	Road	Industrial	Yes	Deciduous	Fair	N Reserve commercial	Industrial	yes	Decidious			50	0	0	0	0	0	0	50	0	Mod-Fair	Mod-Good
Grant Creek	GRNT 12-01	MR-0-3-U	4738	17s	17x	3	U	<2	Ditch												0	0	0	0	0	0	0	0	0	Poor	Fair
Grant Creek	GRNT 12-02	MR-0-3-U	11414	17s	17x	3	U	<2	Ditch	Agriculture											0	0	0	0	0	0	0	0	0	Poor	Fair
Grant Creek	GRNT 12-03	MR-0-3-U	6968	17s	17x	3	U	<2	Ditch	Residential	Urban Res	Yes	Grass	Poor	ditched	Urban Res	Yes	Grass	Poor	ditched	0	0	0	0	0	0	0	100	0	Poor	Fair
Grant Creek	GRNT 13-01	MR-0-3-U	7161	17s	17x	3	U	<2	End of ditching		Hay/Pasture	Yes	Grass	Poor		Hay/Pasture	Yes	Grass	Poor		0	30	30	0	0	10	0	30	0	Poor	Fair
Mulkey Creek	MULK 01-01	MR-2-1-U	400	17x		1	U	2-<4	Start		Harvest/Fire	Yes	Grass	Fair	Logged	Harvest/Fire	Yes	Grass	Fair	Logged	0	0	0	0	100	0	0	0	0	Mod-Fair	Good
Mulkey Creek	MULK 02-01	MR-2-1-U	4327	17al	17x	1	U	2-<4	Ecoregion		Harvest/Fire	Yes	Grass	Fair	Logged	Harvest/Fire	Yes	Grass	Fair	Logged	10	20	0	0	60	0	10	0	0	Mod-Fair	Good
Mulkey Creek	MULK 03-01	MR-4-1-C	1657	17al	17x	1	C	4-10	Gradient, Confinement		Forest	Yes	Grass	Poor	apparent grazing	Forest	Yes	Coniferous	Mod-Good		30	20	0	0	50	0	0	0	0	Fair	Good
Mulkey Creek	MULK 03-02	MR-4-1-C	1816	17al	17x	1	C	4-10	Gradient, Confinement	Forest Harvest	Forest	Yes	Grass	Fair	Logging	Harvest/Fire	Yes	Woody Wetland	Fair		10	30	0	0	60	0	0	0	0	Fair	Good
Mulkey Creek	MULK 04-01	MR-10-1-C	4428	17al	17x	1	C	>10	Gradient		Harvest/Fire	Yes	Woody Wetland	Fair	Logged	Harvest/Fire	Yes	Grass	Fair	Logged	0	30	0	0	70	0	0	0	0	Fair	Good
Mulkey Creek	MULK 04-02	MR-10-1-C	2675	17al	17x	1	C	>10	Gradient	Forest Harvest	Forest	Yes	Woody Wetland	Fair	Road	Forest	Yes	Woody Wetland	Mod-good		30	0	0	0	50	0	20	0	0	Mod-Good	Mod-Good
Mulkey Creek	MULK 05-01	MR-10-2-C	5034	17al	17x	2	C	>10	Stream Order		Forest	Yes	Woody Wetland	Mod-Good	Road	Forest	No	Woody Wetland	Good		40	0	0	0	0	0	60	0	0	Mod-Good	Mod-Good
Mulkey Creek	MULK 06-01	MR-4-3-U	1135	17al	17x	3	U	4-10	Strm Ordr, Grdient, Conf		Grassland/Herbaceous	No	Grass	Fair		Forest	Yes	Grass	Fair	Road	20	50	0	0	30	0	0	0	0	Mod-Fair	Mod-Good
Mulkey Creek	MULK 07-01	MR-2-3-U	1842	17al	17x	3	U	2-<4	Gradient		Forest	No	Grass	Fair		Grassland/Herbaceous	Yes	Grass	Fair	Road	20	50	0	0	30	0	0	0	0	Mod-Fair	Mod-Good
Mulkey Creek	MULK 08-01	MR-4-3-U	3292	17ak	17x, 17al	3	U	4-10	Ecoregion, Gradient		Grassland/Herbaceous	Yes	Grass	Poor		Grassland/Herbaceous	Yes	Grass	Poor		60	30	0	0	10	0	0	0	0	Poor	Fair
Mulkey Creek	MULK 09-01	MR-2-3-U	5018	17ak	17x, 17al	3	U	2-<4	Gradient		Grassland/Herbaceous	Yes	Bare	Poor	Road	Grassland/Herbaceous	No	Bare	Poor		70	20	0	0	0	0	10	0	0	Poor	Fair

Stream	Reach_ID	Reach_Type	Length_ft	Pri_Ecoreg	Sec_Ecoreg	Strm_Ord	Confine	Gradient	HB_Trigger	SB_Trigger	LB_Landuse	LB_Anthro	LB_RP_Veg	LB_RP_Hlth	LB_Comment	RB_Landuse	RB_Anthro	RB_RP_Veg	RB_RP_Hlth	RB_Comment	BE_TRANSP	BE_GRAZ	BE_CROP	BE_MINE	BE_FORST	BE_IRRIG	BE_NATR	BE_OTH_HIS	BE_TOT	RP_Hlth_Overall	RP_Hlth_Potential_Overall
Petty Creek	PETT 01-01	NR-2-3-U	2705	15a		3	U	2-<4	Start		Forest	Yes	Coniferous	Fair		Grassland/Herbaceous	Yes	Grass	Fair		0	40	0	0	0	10	50	0	0	Fair	Mod-Good
Petty Creek	PETT 02-01	NR-0-3-U	2284	15a		3	U	<2	Gradient		Hay/Pasture	Yes	Grass	Mod-Fair		Hay/Pasture	Yes	Grass	Mod-Fair		0	50	0	0	0	10	10	30	0	Mod-Fair	Mod-Good
Petty Creek	PETT 03-01	NR-0-3-U	6330	15a		3	U	<2	Tributary		Hay/Pasture	Yes	Grass	Fair		Hay/Pasture	Yes	Grass	Fair		10	60	0	0	0	20	10	0	0	Mod-Fair	Mod-Good
Petty Creek	PETT 04-01	NR-0-3-U	7046	15a		3	U	<2	Tributary		Grassland/Herbaceous	Yes	Grass	Mod-Good		Grassland/Herbaceous	Yes	Grass	Fair		10	20	0	0	0	0	10	60	0	Mod-Fair	Mod-Good
Petty Creek	PETT 04-02	NR-0-3-U	4923	15a		3	U	<2	Tributary	Agriculture	Hay/Pasture	Yes	Grass	Fair	hayfields	Transportation	Yes	Grass	Fair	Old Petty Creek Rd	40	0	50	0	0	0	0	10	0	Mod-Fair	Mod-Good
Petty Creek	PETT 05-01	NR-0-3-U	5762	15a		3	U	<2	Tributary		Hay/Pasture	Yes	Bare	Poor		Grassland/Herbaceous	Yes	Grass	Poor		20	0	20	0	0	0	0	60	0	Poor	Fair
Petty Creek	PETT 06-01	NR-0-3-C	9255	15a		3	C	<2	Tributary, Confinement		Forest	No	Woody Wetland	Good	Hillside	Transportation	Yes	Woody Wetland	Fair		70	0	0	0	0	0	30	0	0	Fair	Mod-Good
Petty Creek	PETT 07-01	NR-0-3-U	4155	15a		3	U	<2	Confinement		Forest	No	Coniferous	Fair	Some big eroding banks	Hay/Pasture	Yes	Woody Wetland	Mod-Good	Hay/graze upper 1/2	0	10	20	0	0	0	70	0	0	Mod-Good	Mod-Good
Petty Creek	PETT 07-02	NR-0-3-U	5739	15a		3	U	<2	Confinement	LULC	Forest	Yes	Coniferous	Good		Transportation	Yes	Coniferous	Fair		60	0	0	0	30	0	10	0	0	Mod-Good	Mod-Good
Petty Creek	PETT 08-01	NR-0-3-U	14070	15a		3	U	<2	Tributary		Forest	Yes	Coniferous	Fair		Transportation	Yes	Coniferous	Fair		60	0	0	0	30	0	10	0	0	Fair	Mod-Good
Petty Creek	PETT 09-01	NR-0-3-U	2163	15a		3	U	<2	Tributary		Urban Res	Yes	Woody Wetland	Fair		Urban Res	Yes	Woody Wetland	Mod-Good	fewer homes	50	0	0	0	0	0	0	50	0	Fair	Mod-Good
Rattler Gulch	RATT 01-01	MR-4-1-U	2146	17x		1	U	4-10	Start		Harvest/Fire	Yes	Grass	Fair	Logged	Harvest/Fire	Yes	Grass	Fair	Logged	20	0	0	0	80	0	0	0	0	Fair	Good
Rattler Gulch	RATT 02-01	MR-4-1-U	4569	17al	17x	1	U	4-10	Ecoregion		Harvest/Fire	Yes	Coniferous	Fair	Logged, thin buffer	Harvest/Fire	Yes	Coniferous	Fair	Logged, thin buffer	30	0	0	0	70	0	0	0	0	Fair	Good
Rattler Gulch	RATT 03-01	MR-2-2-U	2833	17al	17x	2	U	2-<4	Stream Order, Gradient		Harvest/Fire	Yes	Emergent Wetland	Fair	Logged, thin bufer	Harvest/Fire	Yes	Emergent Wetland	Fair	Logged, thin buffer	40	0	0	0	60	0	0	0	0	Fair	Good
Rattler Gulch	RATT 03-02	MR-2-2-U	3508	17al	17x	2	U	2-<4	Stream Order, Gradient	Riparian	Forest	Yes	Woody Wetland	Fair		Forest	Yes	Woody Wetland	Mod-Good		50	0	0	0	50	0	0	0	0	Mod-Good	Good
Rattler Gulch	RATT 04-01	MR-2-2-C	2261	17al	17x	2	C	2-<4	Confinement		Forest	Yes	Woody Wetland	Fair	Road	Forest	Yes	Coniferous	Mod-Good		70	0	0	0	30	0	0	0	0	Mod-Good	Good
Rattler Gulch	RATT 05-01	MR-2-2-U	2099	17al	17x	2	U	2-<4	Confinement		Grassland/Herbaceous	Yes	Grass	Poor		Forest	Yes	Grass	Poor		30	50	0	0	20	0	0	0	0	Mod-Fair	Mod-Good
Rattler Gulch	RATT 06-01	MR-2-2-C	1593	17al	17x	2	C	2-<4	Confinement		Harvest/Fire	Yes	Emergent Wetland	Fair	Logged, thin buffer	Forest	Yes	Emergent Wetland	Fair	Road	50	0	0	0	50	0	0	0	0	Fair	Mod-Good
Rattler Gulch	RATT 07-01	MR-4-2-C	3280	17al	17x	2	C	4-10	Gradient		Harvest/Fire	Yes	Woody Wetland	Fair	Logged, not much buffer	Forest	Yes	Woody Wetland	Fair	Road	50	0	0	0	50	0	0	0	0	Fair	Mod-Good
Rattler Gulch	RATT 07-02	MR-4-2-C	5999	17al	17x	2	C	4-10	Gradient	Forest Harvest	Harvest/Fire	Yes	Wood Wetland	Fair	Logged, not much buffer	Forest	Yes	Woody Wetland	Fair	Road	30	0	0	0	70	0	0	0	0	Fair	Mod-Good
Rattler Gulch	RATT 07-03	MR-4-2-C	3093	17al	17x	2	C	4-10	Gradient	LULC	Forest	Yes	Woody Wetland	Fair	Logged upper 20%	Forest	Yes	Woody Wetland	Fair	Road	70	0	0	0	30	0	0	0	0	Mod-Good	Mod-Good
Rattler Gulch	RATT 07-04	MR-4-2-C	1075	17al	17x	2	C	4-10	Gradient	LULC	Grassland/Herbaceous	Yes	Grass	Mod-Fair		Grassland/Herbaceous	Yes	Grass	Poor		40	60	0	0	0	0	0	0	0	Mod-Fair	Mod-Good
Rattler Gulch	RATT 08-01	MR-2-2-U	8571	17ak	17x, 17al	2	U	2-<4	Ecoregion, Gradient, Conf		Grassland/Herbaceous	Yes	Grass	Poor		Grassland/Herbaceous	Yes	Grass	Poor		10	80	0	0	0	0	10	0	0	Poor	Fair
Rattler Gulch	RATT 09-01	MR-2-3-U	1638	17ak	17x, 17al	3	U	2-<4	Stream Order		Hay/Pasture	Yes	Grass	Poor		Hay/Pasture	Yes	Grass	Poor		10	90	0	0	0	0	0	0	0	Poor	Fair
Tenmile Creek	TENM 01-01	MR-10-1-U	1439	17al		1	U	>10	Start		Harvest/Fire	Yes	Emergent Wetland	Fair		Forest	Yes	Emergent Wetland	Fair		0	0	0	0	100	0	0	0	0	Fair	Good
Tenmile Creek	TENM 02-01	MR-4-1-U	8487	17al		1	U	4-10	Gradient		Forest	Yes	Woody Wetland	Fair	partially harvested	Forest	Yes	Woody Wetland	Fair	Partially harvested	20	30	0	0	40	0	10	0	0	Fair	Good
Tenmile Creek	TENM 03-01	MR-2-2-C	7822	17al		2	C	2-<4	Strm Ordr, Grdient, Conf		Forest	Yes	Woody Wetland	Mod-Good	Logging upslope	Harvest/Fire	Yes	Woody Wetland	Mod-good	Logging, powerlines	10	0	0	0	80	0	10	0	0	Fair	Good
Tenmile Creek	TENM 03-02	MR-2-2-C	5294	17al		2	C	2-<4	Strm Ordr, Grdient, Conf	LULC	Grassland/Herbaceous	Yes	Woody Wetland	Fair		Grassland/Herbaceous	Yes	Woody Wetland	Fair		10	30	0	20	0	0	0	40	0	Fair	Good
Tenmile Creek	TENM 04-01	MR-4-2-C	2958	17al		2	C	4-10	Gradient		Forest	No	Woody Wetland	Good	Prob hist logging	Forest	yes	Woody Wetland	Good	Road alongside	30	0	0	0	0	0	70	0	0	Good	Good
Trout Creek	TROU 01-01	NR-2-3-U	4151	15p		3	U	2-<4	Start		Forest	No	Coniferous	Good		Forest	No	Coniferous	Good		10	0	0	0	0	0	90	0	0	Good	Good
Trout Creek	TROU 02-01	NR-0-3-U	6417	15p		3	U	<2	Gradient		Forest	No	Coniferous	Good		Forest	No	Coniferous	Good	Old logging evident	0	0	0	0	0	0	80	20	0	Good	Good
Trout Creek	TROU 03-01	NR-2-3-C	3041	15p		3	C	2-<4	Gradient, Confinement		Forest	No	Coniferous	Good	maybe grazed	Forest	No	Coniferous	Good		0	0	0	0	0	0	100	0	0	Good	Good
Trout Creek	TROU 04-01	NR-4-3-C	6743	15p		3	C	4-10	Gradient		Harvest/Fire	Yes	Coniferous	Fair	Logged	Harvest/Fire	Yes	Coniferous	Fair	Logged	10	0	0	0	70	0	20	0	0	Fair	Mod-Good
Trout Creek	TROU 05-01	NR-2-3-C	3252	15p		3	C	2-<4	Gradient		Harvest/Fire	Yes	Coniferous	Mod-Good	Logged upslope	Forest	Yes	Coniferous	Mod-Good		20	0	0	0	60	0	20	0	0	Mod-Good	Mod-Good
Trout Creek	TROU 06-01	NR-2-3-U	2166	15p		3	U	2-<4	Tributary, Confinement		Harvest/Fire	No	Coniferous	Fair	Some high eroding banks	Forest	No	Coniferous	Mod-Good		50	0	0	0	0	0	50	0	0	Mod-Good	Mod-Good
Trout Creek	TROU 06-02	NR-2-3-U	1631	15p		3	U	2-<4	Tributary, Confinement	Road	Transportation	Yes	Coniferous	Fair		Forest	No	Coniferous	Mod-Good		70	0	0	0	0	0	30	0	0	Fair	Mod-Good
Trout Creek	TROU 07-01	NR-0-3-U	1687	15p		3	U	<2	Tributary, Gradient		Mining	Yes	Coniferous	Fair	Quarry?	Forest	No	Coniferous	Mod-Good		0	0	0	100	0	0	0	0	0	Mod-Fair	Mod-Good
Trout Creek	TROU 08-01	NR-0-3-C	2808	15p		3	C	<2	Confinement		Transportation	Yes	Coniferous	Fair		Forest	Yes	Coniferous	Mod-Good		50	0	0	0	30	0	20	0	0	Fair	Mod-Good
Trout Creek	TROU 09-01	NR-0-3-U	3971	15p		3	U	<2	Tributary, Confinement		Rural Res	Yes	Woody Wetland	Mod-Good		Forest	No	Coniferous	Mod-Good		10	0	0	0	0	0	0	90	0	Fair	Mod-Good
Trout Creek	TROU 10-01	NR-0-3-U	2790	15a	15p	3	U	<2	Ecoregion		Forest	Yes	Coniferous	Mod-Good		Forest	No	Coniferous	Good		10	0	0	0	0	0	90	0	0	Mod-Good	Mod-Good
Trout Creek	TROU 10-02	NR-0-3-U	4965	15a	15p	3	U	<2	Ecoregion	Forest Harvest / Road	Forest	Yes	Woody Wetland	Mod-Good		Forest	No	Woody Wetland	Mod-Good		20	0	0	0	0	0	80	0	0	Mod-Good	Mod-Good
Trout Creek	TROU 11-01	NR-0-3-C	2517	15a	15p	3	C	<2	Confinement		Transportation	Yes	Woody Wetland	Fair		Forest	No	Coniferous	Mod-Good		70	0	0	0	0	0	30	0	0	Mod-Good	Mod-Good
Trout Creek	TROU 12-01	NR-0-3-U	5921	15a	15p	3	U	<2	Confinement		Forest	Yes	Woody Wetland	Good	Road impinges few times	Forest	No	Coniferous	Good		60	0	0	0	0	0	40	0	0	Fair	Mod-Good
Trout Creek	TROU 12-02	NR-0-3-U	2738	15a	15p	3	U	<2	Confinement	Forest Harvest / Road	Forest	No	Woody Wetland	Mod-good	bare banks & bars	Forest	No	Coniferous	Good		0	0	0	0	0	0	30	70	0	Mod-Good	Mod-Good
Trout Creek	TROU 12-03	NR-0-3-U	15083	15a	15p	3	U	<2	Confinement		Forest	Yes	Woody Wetland	Mod-Good	logged other side of rd	Forest	No	Coniferous	Good		30	0	0	0	30	0	0	40	0	Mod-Good	Mod-Good
Trout Creek	TROU 12-04	NR-0-3-U	9269	15a	15p	3	U	<2	Confinement	Industrial	Industrial	Yes	Grass	Mod-Fair	Lumber mill	Forest	No	Coniferous	Fair		20	0	0	0	0	0	0	80	0	Mod-Fair	Mod-Good
West Fork Petty Creek	WFPY 01-01	NR-10-1-C	5259	15a		1	C	>10	Start		Harvest/Fire	Yes	Grass	Mod-Fair	logged	Harvest/Fire	Yes	Grass	Mod-Fair	logged	0	0	0	0	100	0	0	0	0	Mod-Fair	Good
West Fork Petty Creek	WFPY 02-01	NR-4-1-C	4339	15a		1	C	4-10	Gradient		Harvest/Fire	Yes	Coniferous	Good	Logging upslope	Harvest/Fire	No	Coniferous	Good	Logged far upslope	0	0	0	0	60	0	40	0	0	Good	Good
West Fork Petty Creek	WFPY 03-01	NR-4-2-C	10129	15a		2	C	4-10	Stream Order		Transportation	Yes	Coniferous	Mod-Good		Harvest/Fire	Yes	Coniferous	Mod-Good		40	0	0	0	60	0	0	0	0	Mod-Good	Mod-Good
West Fork Petty Creek	WFPY 04-01	NR-2-2-U	8411	15a		2	U	2-<4	Gradient, Confinement		Forest	Yes	Coniferous	Mod-Good		Forest	Yes	Coniferous	Good		10	0	0	0	40	0	50	0	0	Mod-Good	Mod-Good
West Fork Petty Creek	WFPY 04-02	NR-2-2-U	12222	15a		2	U	2-<4	Gradient, Confinement	Rural Residential	Transportation	Yes	Coniferous	Mod-Good		Rural Res	Yes	Coniferous	Mod-Good		30	0	0	0	20	0	20	30	0	Fair	Mod-Good

Attachment B

Sediment and Habitat Database

Reach ID	Date	Cell	Reach Type	Existing Rosgen Stream Type	Potential Rosgen Stream Type	GIS Calculated Sinuosity	Field Slope (Percent)	Aerial Assessment Valley Gradient	Bankfull Channel Width	Cross-Sectional Area	Bankfull Mean Depth	Width / Depth Ratio	Maximum Depth	Floodprone Width	Entrenchment Ratio	Riffle Pebble Count D50	Riffle Pebble Count Percent <2mm	Riffle Pebble Count Percent <6mm	Riffle Grid Toss Percent <6mm	Riffle Stability Index	Number of Pools per 1000 Feet	Mean Residual Pool Depth	Number of Individual Pieces of LWD per 1000 Feet	Number of LWD Aggregates per 1000 Feet	Total Number of LWD per 1000 Feet	Percent Understory Shrub Cover	Percent Bare/Disturbed Ground	Percent Riprap	Percent Overstory Canopy Cover	Right Bank Mean Riparian Zone Width	Left Bank Mean Riparian Zone Width	Latitude	Longitude
CRAM05-01	8/29/12	1	MR-4-2-C	C4b	E4b	1.18	3.8	4-<10%	9.6	6.3	0.66	14.6	1.0	40.6	4.2	21	3	12	7		18	0.8	30	8	68	5	6	0	2	65	13	46.77935	-113.50331
CRAM05-01	8/29/12	2		E4b	E4b			4-<10%	7.7	5.1	0.66	11.6	1.1	38.7	5.0	15	8	22	7													46.77936	-113.50303
CRAM05-01	8/29/12	3		B4	E4b			4-<10%	8.5	6.1	0.72	11.8	1.0	14.5	1.7	34	5	9	2													46.77939	-113.50258
CRAM05-01	8/29/12	4		F4	E4b			4-<10%	9.0	5.0	0.55	16.4	1.0	12.0	1.3																	46.77945	-113.50228
CRAM05-01	8/29/12	5		E4b	E4b			4-<10%	7.0	7.6	1.08	6.5	1.8	51.0	7.3	25	2	3	1													46.77963	-113.50196
CRAM07-02	8/29/12	1	MR-0-3-U	B4c	C4	1.58	0.9	<2%	13.4	15.3	1.14	11.7	1.5	27.4	2.0	21	3	9	5		13	1.3	13	0	15	30	1	0	4	327	186	46.73933	-113.58402
CRAM07-02	8/29/12	2		C4	C4			<2%	13.0	11.8	0.91	14.3	1.1	46.0	3.5	22	1	9	8	92												46.73972	-113.58378
CRAM07-02	8/29/12	3		E4	C4			<2%	12.3	14.2	1.15	10.7	1.6	31.3	2.5	28	4	9	9													46.74013	-113.58377
CRAM07-02	8/29/12	4		F4	C4			<2%	26.5	22.2	0.84	31.7	1.6	35.5	1.3	8	24	43	7													46.74063	-113.58354
CRAM07-02	8/29/12	5		C4	C4			<2%	18.7	18.6	0.99	18.8	1.8	43.7	2.3																	46.74084	-113.58314
FLAT06-01	8/21/02	1	NR-4-2-C	B4	B4	1.16	2.1	4-<10%	9.8	8.6	0.88	11.1	1.3	21.3	2.2	24	3	10	2		18	0.7	90	2	106	18	0	0	11	13	13	47.24039	-114.85071
FLAT06-01	8/21/02	2		B4	B4			4-<10%	12.8	10.1	0.79	16.2	1.4	18.8	1.5	26	5	18	1													47.24048	-114.85052
FLAT06-01	8/21/02	3		F4	B4			4-<10%	10.0	11.7	1.17	8.5	1.4	13.0	1.3	30	4	9	1													47.24065	-114.84993
FLAT06-01	8/21/02	4		F4	B4			4-<10%	9.0	12.1	1.34	6.7	1.6	11.5	1.3																	47.24088	-114.84978
FLAT06-01	8/21/02	5		F4	B4			4-<10%	8.6	10.7	1.24	6.9	1.6	9.1	1.1	29	5	11	1													47.24110	-114.84947
FLAT06-02	8/21/12	1	NR-4-2-C	E4b	B4	1.08	3.9	4-<10%	10.0	11.4	1.14	8.8	1.5	67.0	6.7	23	4	11	3		32	0.9	104	6	138	8	1	0	12	4	5	47.23361	-114.86083
FLAT06-02	8/21/12	2		B4	B4			4-<10%	13.0	6.8	0.52	25.0	0.8	21.0	1.6	18	5	14	1													47.23389	-114.86044
FLAT06-02	8/21/12	3		B4	B4			4-<10%	8.6	10.0	1.16	7.4	1.6	17.6	2.0	28	5	10	8													47.23399	-114.86019
FLAT06-02	8/21/12	4		E4b	B4			4-<10%	6.4	10.9	1.71	3.7	2.3	19.4	3.0																	47.23420	-114.86008
FLAT06-02	8/21/12	5		B4	B4			4-<10%	12.5	11.6	0.93	13.4	1.6	23.5	1.9	24	1	21	25													47.23454	-114.85957
FLAT09-01	8/21/12	1	NR-2-2-C	B4	C4	1.28	2.0	2-<4%	9.4	9.8	1.04	9.0	1.5	19.4	2.1	28	14	22	1		18	0.7	30	6	70	14	1	0	3	5	5	47.20745	-114.88884
FLAT09-01	8/21/12	2		C4b	C4			2-<4%	10.4	8.6	0.83	12.5	1.3	32.4	3.1	17	13	31	3													47.20773	-114.88885
FLAT09-01	8/21/12	3		C4b	C4			2-<4%	11.5	8.7	0.76	15.1	1.4	31.5	2.7	18	4	19	7													47.20791	-114.88878
FLAT09-01	8/21/12	4		E4b	C4			2-<4%	10.0	9.6	0.96	10.4	1.4	23.0	2.3																	47.20806	-114.88874
FLAT09-01	8/21/12	5		E4b	C4			2-<4%	8.2	7.7	0.94	8.7	1.4	33.2	4.0	21	8	11	5													47.20835	-114.88849
GRNT08-02	8/24/12	1	MR-4-2-U	B4	B3	1.15	3.9	4-<10%	35.0	48.0	1.37	25.5	2.1	70.0	2.0	57	3	8	1		11	1.1	18	0	18	64	0	0	64	10	10	46.97975	-113.98872
GRNT08-02	8/24/12	2		F3	B3			4-<10%	30.0	43.8	1.46	20.5	2.1	38.2	1.3	82	0	2	2													46.98033	-113.98853
GRNT08-02	8/24/12	3		C3b	B3			4-<10%	30.0	39.0	1.30	23.1	2.3	73.0	2.4	100	1	4	1													46.98046	-113.98794
GRNT08-02	8/24/12	4		F3	B3			4-<10%	19.0	41.4	2.18	8.7	2.8	23.0	1.2	119	0	1	2													46.98082	-113.98786
GRNT08-02	8/24/12	5		C3b	B3			4-<10%	22.0	34.5	1.57	14.0	2.1	67.0	3.0																	46.98151	-113.98726
GRNT11-02	8/23/12	1	MR-0-3-U	B4c	C4	1.13	1.5	<2%	32.0	38.1	1.19	26.9	1.7	54.0	1.7	29	1	11	3		9	1.3	15	2	23	52	1	0	72	0	0	46.91821	-114.03217
GRNT11-02	8/23/12	2		E4	C4			<2%	17.5	27.7	1.58	11.1	2.5	52.5	3.0	34	10	18	4													46.91856	-114.03164
GRNT11-02	8/23/12	3		E4	C4			<2%	20.0	37.0	1.85	10.8	2.7	55.0	2.8	38	2	14	12													46.91920	-114.03151
GRNT11-02	8/23/12	4		C4	C4			<2%	26.0	35.4	1.36	19.1	1.9	71.0	2.7																	46.91963	-114.03157
GRNT11-02	8/23/12	5		C3	C4			<2%	26.0	31.5	1.21	21.5	1.9	71.0	2.7	78	4	5	6													46.92012	-114.03145

Reach ID	Date	Cell	Reach Type	Existing Rosgen Stream Type	Potential Rosgen Stream Type	GIS Calculated Sinuosity	Field Slope (Percent)	Aerial Assessment Valley Gradient	Bankfull Channel Width	Cross-Sectional Area	Bankfull Mean Depth	Width / Depth Ratio	Maximum Depth	Floodprone Width	Entrenchment Ratio	Riffle Pebble Count D50	Riffle Pebble Count Percent <2mm	Riffle Pebble Count Percent <6mm	Riffle Grid Toss Percent <6mm	Riffle Stability Index	Number of Pools per 1000 Feet	Mean Residual Pool Depth	Number of Individual Pieces of LWD per 1000 Feet	Number of LWD Aggregates per 1000 Feet	Total Number of LWD per 1000 Feet	Percent Understory Shrub Cover	Percent Bare/Disturbed Ground	Percent Riprap	Percent Overstory Canopy Cover	Right Bank Mean Riparian Zone Width	Left Bank Mean Riparian Zone Width	Latitude	Longitude
GRNT12-03	8/29/13	1	MR-0-3-U	C5	E4	1.10	0.7	<2%	16.0	17.9	1.12	14.3	1.5	57.0	3.6	<2	54	59	48													46.88658	-114.08660
GRNT12-03	8/29/13	2		B5c	E4			<2%	13.5	18.9	1.40	9.6	2.1	27.0	2.0	<2	89	91	97													46.88747	-114.08712
GRNT12-03	8/29/13	3		E5	E4			<2%	11.7	15.6	1.33	8.8	2.1	28.7	2.5	<2	93	95	97													46.88770	-114.08717
GRNT12-03	8/29/13	4		E5	E4			<2%	10.5	13.7	1.31	8.0	1.7	28.5	2.7																	46.88799	-114.08793
GRNT12-03	8/29/13	5						<2%								<2	52	64	80														
MULK03-01	8/27/12	1	MR-4-1-C	B5	E4b	1.04	5.6	4-<10%	9.0	5.7	0.63	14.3	1.2	14.5	1.6	<2	63	85	92		4	0.5	26	0	26	0	0	0	1	0	50	46.77600	-113.26528
MULK03-01	8/27/12	2		F4b	E4b			4-<10%	10.2	5.1	0.50	20.4	0.8	13.7	1.3	13	10	22	45													46.77638	-113.26549
MULK03-01	8/27/12	3		B4	E4b			4-<10%	6.0	3.6	0.60	10.0	1.2	12.5	2.1	14	7	15	13													46.77660	-113.26521
MULK03-01	8/27/12	4		C4b	E4b			4-<10%	7.4	4.0	0.53	13.9	1.1	29.4	4.0	8	16	25	49													46.77709	-113.26513
MULK03-01	8/27/12	5		C4b	E4b			4-<10%	8.0	4.8	0.60	13.3	1.4	30.0	3.8																	46.77712	-113.26492
PETT03-01	8/28/12	1	NR-0-3-U	C4	C4	1.35	1.5	<2%	21.0	29.3	1.40	15.1	1.9	136.0	6.5	30	5	14	0	87	14	1.4	12	2	26	23	0	0	18	100	100	46.87530	-114.44999
PETT03-01	8/28/12	2		C4	C4			<2%	18.5	24.2	1.31	14.1	1.8	158.5	8.6	27	0	13	3													46.87501	-114.45028
PETT03-01	8/28/12	3		B4c	C4			<2%	16.0	17.0	1.06	15.1	1.4	31.0	1.9	29	3	12	0	93												46.87459	-114.45068
PETT03-01	8/28/12	4		C4	C4			<2%	27.0	22.7	0.84	32.1	1.3	97.0	3.6	43	2	5	3	96												46.87405	-114.45077
PETT03-01	8/28/12	5			C4			<2%																									
PETT07-01	8/28/12	1	NR-0-3-U	C4b	C4	1.21	2.0	<2%	24.0	44.2	1.84	13.0	2.6	124.0	5.2	32	0	10	9		10	1.2	7	0	10	32	0	0	13	520	126	46.94093	-114.43449
PETT07-01	8/28/12	2		C4b	C4			<2%	27.0	35.0	1.30	20.8	2.3	152.0	5.6	40	1	11	11													46.94036	-114.43469
PETT07-01	8/28/12	3		C4b	C4			<2%	22.5	25.4	1.13	19.9	2.3	96.5	4.3	31	4	12	5													46.93972	-114.43515
PETT07-01	8/28/12	4		C4b	C4			<2%	15.0	22.2	1.48	10.1	1.9	49.0	3.3																	46.93945	-114.43548
PETT07-01	8/28/12	5			C4			<2%								54	2	6	10														
RATT04-01	8/27/12	1	MR-2-2-C	E4b	E4b	1.06	3.0	2-<4%	4.0	1.8	0.46	8.7	0.7	14.0	3.5	4	30	60	80		0	0.0	22	0	22	2	15	0	11	70	70	46.75972	-113.19796
RATT04-01	8/27/12	2		E5b	E4b			2-<4%	3.0	1.1	0.36	8.3	0.8	73.0	24.3	<2	72	91	90													46.76012	-113.19861
RATT04-01	8/27/12	3		E4b	E4b			2-<4%	2.5	0.8	0.33	7.6	0.6	13.5	5.4	7	40	47	82													46.76007	-113.19887
RATT04-01	8/27/12	4			E4b			2-<4%																									
RATT04-01	8/27/12	5		C4b	E4b			2-<4%	5.5	1.9	0.34	16.2	0.7	35.5	6.5	10	18	31	28													46.76075	-113.19877
TENM03-01	8/23/13	1	MR-2-2-C	E4	E4	1.17	1.9	2-<4%	5.0	3.1	0.61	8.2	0.9	25.0	5.0	9	4	27	21		24	0.4	42	4	78	57	3	0	2	10	10	46.76885	-113.40001
TENM03-01	8/23/13	2		F4	E4			2-<4%	6.0	3.1	0.52	11.5	0.9	7.0	1.2	14	7	21	11													46.76892	-113.40051
TENM03-01	8/23/13	3		E4	E4			2-<4%	4.3	2.9	0.68	6.3	0.9	17.3	4.0	9	7	36	19													46.76894	-113.40102
TENM03-01	8/23/13	4		E4	E4			2-<4%	4.5	2.3	0.52	8.7	1.0	14.5	3.2																	46.76894	-113.40118
TENM03-01	8/23/13	5		E4	E4			2-<4%	5.0	4.5	0.89	5.6	1.2	22.0	4.4	13	6	23	10													46.76902	-113.40139
TROU03-01	8/22/13	1	NR-2-3-C	C3b	B3	1.02	2.1	2-<4%	58.0	113.4	1.95	29.7	3.5	138.0	2.4	174	4	6	2		4	1.3	31	1	37	62	0	0	52	10	10	47.02906	-114.97109
TROU03-01	8/22/13	2		B3	B3			2-<4%	65.0	99.7	1.53	42.4	2.4	101.0	1.6	111	4	5	4													47.02845	-114.97208
TROU03-01	8/22/13	3		B3	B3			2-<4%	48.0	93.0	1.94	24.8	2.6	85.0	1.8	88	4	8	1	70												47.02824	-114.97296
TROU03-01	8/22/13	4		B3	B3			2-<4%	40.0	100.3	2.51	16.0	3.4	52.0	1.3																		
TROU03-01	8/22/13	5		F3	B3			2-<4%	37.0	82.3	2.23	16.6	2.4	46.5	1.3	90	10	15	6														

Reach ID	Date	Cell	Reach Type	Existing Rosgen Stream Type	Potential Rosgen Stream Type	GIS Calculated Sinuosity	Field Slope (Percent)	Aerial Assessment Valley Gradient	Bankfull Channel Width	Cross-Sectional Area	Bankfull Mean Depth	Width / Depth Ratio	Maximum Depth	Floodprone Width	Entrenchment Ratio	Riffle Pebble Count D50	Riffle Pebble Count Percent <2mm	Riffle Pebble Count Percent <6mm	Riffle Grid Toss Percent <6mm	Riffle Stability Index	Number of Pools per 1000 Feet	Mean Residual Pool Depth	Number of Individual Pieces of LWD per 1000 Feet	Number of LWD Aggregates per 1000 Feet	Total Number of LWD per 1000 Feet	Percent Understory Shrub Cover	Percent Bare/Disturbed Ground	Percent Riprap	Percent Overstory Canopy Cover	Right Bank Mean Riparian Zone Width	Left Bank Mean Riparian Zone Width	Latitude	Longitude
TROU12-03	8/22/12	1	NR-0-3-U	B4c	B3c	1.04	1.8	<2%	55.0	112.9	2.05	26.8	3.0	86.0	1.6	60	7	10	2	90	3	1.7	15	0	21	76	3	0	65	10	10	47.11897	-114.86566
TROU12-03	8/22/12	2		C3	B3c			<2%	70.0	118.5	1.69	41.4	2.5	330.0	4.7	77	10	11	2													47.11762	-114.86643
TROU12-03	8/22/12	3		F3	B3c			<2%	70.0	146.8	2.10	33.4	2.9	85.0	1.2	71	1	3	1													47.11696	-114.86733
TROU12-03	8/22/12	4		F3	B3c			<2%	58.0	122.7	2.12	27.4	3.4	63.0	1.1																	47.11655	-114.86772
TROU12-03	8/22/12	5		B3	B3c			<2%	55.0	111.8	2.03	27.1	2.9	85.0	1.5	80	2	5	3													47.11607	-114.86876
WFPY03-01	8/28/12	1	NR-4-2-C	E4b	B4	1.14	2.5	4-<10%	9.0	11.5	1.28	7.0	1.9	36.0	4.0	13	5	17	12		24	0.9	76	8	120	57	0	0	78	50	50	46.94557	-114.54260
WFPY03-01	8/28/12	2			B4			4-<10%																									
WFPY03-01	8/28/12	3		C4b	B4			4-<10%	12.0	10.9	0.91	13.2	1.3	47.0	3.9	20	4	24	6													46.94564	-114.54352
WFPY03-01	8/28/12	4		B4	B4			4-<10%	13.2	10.3	0.78	16.9	1.5	20.2	1.5	14	6	15	6													46.94575	-114.54370
WFPY03-01	8/28/12	5		E4b	B4			4-<10%	8.5	9.7	1.14	7.5	1.6	43.5	5.1	35	0	5	3													46.94556	-114.54415

Reach ID	Reach Type	Pool	Residual Depth (Feet)	Pool Tail-out % Fines
CRAM05-01	MR-4-2-C	1	1.4	16
CRAM05-01	MR-4-2-C	2	0.8	
CRAM05-01	MR-4-2-C	3	0.9	8
CRAM05-01	MR-4-2-C	4	0.6	11
CRAM05-01	MR-4-2-C	5	0.7	5
CRAM05-01	MR-4-2-C	6	0.6	9
CRAM05-01	MR-4-2-C	7	1.3	
CRAM05-01	MR-4-2-C	8	0.7	5
CRAM05-01	MR-4-2-C	9	0.4	
CRAM07-02	MR-0-3-U	1	2.0	13
CRAM07-02	MR-0-3-U	2	1.9	0
CRAM07-02	MR-0-3-U	3	1.2	6
CRAM07-02	MR-0-3-U	4	1.1	1
CRAM07-02	MR-0-3-U	5	0.9	7
CRAM07-02	MR-0-3-U	6	1.6	5
CRAM07-02	MR-0-3-U	7	1.5	7
CRAM07-02	MR-0-3-U	8	0.6	3
CRAM07-02	MR-0-3-U	9	0.8	3
CRAM07-02	MR-0-3-U	10	1.2	5
CRAM07-02	MR-0-3-U	11	1.5	1
CRAM07-02	MR-0-3-U	12	1.0	10
CRAM07-02	MR-0-3-U	13	1.4	5
FLAT06-01	NR-4-2-C	1	0.6	6
FLAT06-01	NR-4-2-C	2	0.6	6
FLAT06-01	NR-4-2-C	3	0.6	12
FLAT06-01	NR-4-2-C	4	1.2	7
FLAT06-01	NR-4-2-C	5	0.9	12
FLAT06-01	NR-4-2-C	6	0.5	10
FLAT06-01	NR-4-2-C	7	0.4	7
FLAT06-01	NR-4-2-C	8	0.8	5
FLAT06-01	NR-4-2-C	9	1.1	31
FLAT06-02	NR-4-2-C	1	1.1	9
FLAT06-02	NR-4-2-C	2		
FLAT06-02	NR-4-2-C	3	0.9	17
FLAT06-02	NR-4-2-C	4		
FLAT06-02	NR-4-2-C	5	1.0	19
FLAT06-02	NR-4-2-C	6	0.6	18
FLAT06-02	NR-4-2-C	7	1.0	10
FLAT06-02	NR-4-2-C	8	0.5	10
FLAT06-02	NR-4-2-C	9	0.5	5
FLAT06-02	NR-4-2-C	10	1.3	3
FLAT06-02	NR-4-2-C	11	0.9	18
FLAT06-02	NR-4-2-C	12	0.7	4
FLAT06-02	NR-4-2-C	13	1.5	3
FLAT06-02	NR-4-2-C	14	0.6	10
FLAT06-02	NR-4-2-C	15	0.7	
FLAT06-02	NR-4-2-C	16		
FLAT09-01	NR-2-2-C	1	0.5	10
FLAT09-01	NR-2-2-C	2	1.2	9
FLAT09-01	NR-2-2-C	3	1.4	7
FLAT09-01	NR-2-2-C	4	0.5	5
FLAT09-01	NR-2-2-C	5	0.5	5
FLAT09-01	NR-2-2-C	6	0.7	
FLAT09-01	NR-2-2-C	7	0.6	11
FLAT09-01	NR-2-2-C	8	0.7	10
FLAT09-01	NR-2-2-C	9	0.6	5

Reach ID	Reach Type	Pool	Residual Depth (Feet)	Pool Tail-out % Fines
GRNT08-02	MR-4-2-U	1	1.2	
GRNT08-02	MR-4-2-U	2	1.7	1
GRNT08-02	MR-4-2-U	3	0.6	1
GRNT08-02	MR-4-2-U	4	1.4	
GRNT08-02	MR-4-2-U	5	0.8	
GRNT08-02	MR-4-2-U	6	1.2	
GRNT08-02	MR-4-2-U	7	0.7	
GRNT08-02	MR-4-2-U	8	1.5	
GRNT08-02	MR-4-2-U	9	0.7	5
GRNT08-02	MR-4-2-U	10	0.8	
GRNT08-02	MR-4-2-U	11	1.0	
GRNT11-02	MR-0-3-U	1	1.0	8
GRNT11-02	MR-0-3-U	2	1.0	
GRNT11-02	MR-0-3-U	3	1.4	15
GRNT11-02	MR-0-3-U	4	0.7	12
GRNT11-02	MR-0-3-U	5	1.7	5
GRNT11-02	MR-0-3-U	6	1.5	
GRNT11-02	MR-0-3-U	7	1.0	
GRNT11-02	MR-0-3-U	8	1.7	14
GRNT12-03	MR-0-3-U	1	0.0	
MULK03-01	MR-4-1-C	1	0.6	
MULK03-01	MR-4-1-C	2	0.3	
PETT03-01	NR-0-3-U	1	1.0	
PETT03-01	NR-0-3-U	2	1.2	
PETT03-01	NR-0-3-U	3	1.0	3
PETT03-01	NR-0-3-U	4	2.2	3
PETT03-01	NR-0-3-U	5	2.7	
PETT03-01	NR-0-3-U	6	1.0	
PETT03-01	NR-0-3-U	7	2.7	
PETT03-01	NR-0-3-U	8	0.9	8
PETT03-01	NR-0-3-U	9	0.8	3
PETT03-01	NR-0-3-U	10	0.6	
PETT03-01	NR-0-3-U	11	1.5	
PETT03-01	NR-0-3-U	12	1.9	7
PETT03-01	NR-0-3-U	13	1.1	
PETT03-01	NR-0-3-U	14	0.8	
PETT07-01	NR-0-3-U	1	1.1	11
PETT07-01	NR-0-3-U	2	3.0	4
PETT07-01	NR-0-3-U	3	1.2	8
PETT07-01	NR-0-3-U	4	1.0	
PETT07-01	NR-0-3-U	5	0.8	
PETT07-01	NR-0-3-U	6	1.3	
PETT07-01	NR-0-3-U	7	0.8	7
PETT07-01	NR-0-3-U	8	0.8	
PETT07-01	NR-0-3-U	9	1.6	6
PETT07-01	NR-0-3-U	10	0.5	
RATT04-01	MR-2-2-C	1	0.0	

Reach ID	Reach Type	Pool	Residual Depth (Feet)	Pool Tail-out % Fines
TENM03-01	MR-2-2-C	1	0.3	35
TENM03-01	MR-2-2-C	2	0.3	60
TENM03-01	MR-2-2-C	3	0.3	
TENM03-01	MR-2-2-C	4	0.7	
TENM03-01	MR-2-2-C	5	0.4	
TENM03-01	MR-2-2-C	6	0.3	
TENM03-01	MR-2-2-C	7	0.4	
TENM03-01	MR-2-2-C	8	0.4	
TENM03-01	MR-2-2-C	9	0.4	
TENM03-01	MR-2-2-C	10	0.3	
TENM03-01	MR-2-2-C	11	0.5	
TENM03-01	MR-2-2-C	12	0.5	
TROU03-01	NR-2-3-C	1	1.4	5
TROU03-01	NR-2-3-C	2	0.9	
TROU03-01	NR-2-3-C	3	1.5	
TROU03-01	NR-2-3-C	4	1.0	
TROU03-01	NR-2-3-C	5	2.2	3
TROU03-01	NR-2-3-C	6	1.0	
TROU12-03	NR-0-3-U	1	2.6	1
TROU12-03	NR-0-3-U	2	1.1	
TROU12-03	NR-0-3-U	3	2.1	
TROU12-03	NR-0-3-U	4	0.8	
WFPY03-01	NR-4-2-C	1	1.0	12
WFPY03-01	NR-4-2-C	2	1.6	0
WFPY03-01	NR-4-2-C	3	1.1	1
WFPY03-01	NR-4-2-C	4	1.2	7
WFPY03-01	NR-4-2-C	5	0.6	7
WFPY03-01	NR-4-2-C	6	0.7	13
WFPY03-01	NR-4-2-C	7	0.7	10
WFPY03-01	NR-4-2-C	8	0.7	
WFPY03-01	NR-4-2-C	9	1.0	1
WFPY03-01	NR-4-2-C	10	0.7	9
WFPY03-01	NR-4-2-C	11	1.3	5
WFPY03-01	NR-4-2-C	12	0.5	7

Attachment C

Streambank Erosion Sediment Loads

Stream Segment	Reach ID	Reach Type	Sediment Load per 1000 Feet (Tons/Year)	Length (Feet)	Reach Sediment Load (Tons/Year)	Transportation (Percent)	Grazing (Percent)	Cropland (Percent)	Mining (Percent)	Silviculture (Percent)	Irrigation (Percent)	Natural (Percent)	Other (Percent)	Transportation (Tons/Year)	Grazing (Tons/Year)	Cropland (Tons/Year)	Mining (Tons/Year)	Silviculture (Tons/Year)	Irrigation (Tons/Year)	Natural (Tons/Year)	Other (Tons/Year)
Bristow Creek	BRST 01-01	NR-4-2-C	2.81	6699	18.8	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	18.8	0.0
Bristow Creek	BRST 02-01	NR-4-2-U	2.81	1184	3.3	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0
Bristow Creek	BRST 03-01	NR-4-3-U	2.81	9942	27.9	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	27.9	0.0
Bristow Creek	BRST 04-01	NR-2-3-U	6.32	1980	12.5	0	0	0	0	70	0	30	0	0.0	0.0	0.0	0.0	8.8	0.0	3.8	0.0
Bristow Creek	**BRST 04-02**	**NR-2-3-U**	**5.82**	**5050**	**29.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**100.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**29.4**	**0.0**
Bristow Creek	BRST 04-03	NR-2-3-U	6.32	4924	31.1	0	0	0	0	80	0	20	0	0.0	0.0	0.0	0.0	24.9	0.0	6.2	0.0
Bristow Creek	**BRST 04-04**	**NR-2-3-U**	**2.34**	**1661**	**3.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**100.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3.9**	**0.0**
Bristow Creek	BRST 05-01	NR-4-3-U	2.81	2344	6.6	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	0.0
Bristow Creek			**TOTAL**	**33783**	**133.6**								**TOTAL**	**0.0**	**0.0**	**0.0**	**0.0**	**33.7**	**0.0**	**99.9**	**0.0**
Bristow Creek													**PERCENT**	**0.00**	**0.00**	**0.00**	**0.00**	**0.25**	**0.00**	**0.75**	**0.00**
Lake Creek	LAKE 01-01	NR-0-3-U	22.00	8145	179.2	20	0	0	0	0	0	60	20	35.8	0.0	0.0	0.0	0.0	0.0	107.5	35.8
Lake Creek	**LAKE 02-01**	**NR-0-4-U**	**5.48**	**18056**	**98.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**76.2**	**23.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**75.4**	**23.5**
Lake Creek	LAKE 02-02	NR-0-4-U	22.00	13006	286.1	0	0	0	0	0	0	50	50	0.0	0.0	0.0	0.0	0.0	0.0	143.1	143.1
Lake Creek	LAKE 03-01	NR-0-4-U	9.42	4515	42.5	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	42.5	0.0
Lake Creek	LAKE 03-02	NR-0-4-U	22.00	17510	385.2	20	0	0	0	0	0	20	60	77.0	0.0	0.0	0.0	0.0	0.0	77.0	231.1
Lake Creek	**LAKE 03-03**	**NR-0-4-U**	**22.14**	**11402**	**252.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**82.6**	**17.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**208.6**	**43.8**
Lake Creek	LAKE 04-01	NR-0-4-U	22.00	11526	253.6	10	0	0	0	20	0	20	50	25.4	0.0	0.0	0.0	50.7	0.0	50.7	126.8
Lake Creek	LAKE 05-01	NR-0-4-U	22.00	3186	70.1	50	0	0	50	0	0	0	0	35.0	0.0	0.0	35.0	0.0	0.0	0.0	0.0
Lake Creek	LAKE 06-01	NR-2-4-C	6.32	941	5.9	0	0	0	0	0	100	0	0	0.0	0.0	0.0	0.0	0.0	5.9	0.0	0.0
Lake Creek	LAKE 07-01	NR-2-4-U	6.32	2981	18.8	50	0	0	0	0	0	0	50	9.4	0.0	0.0	0.0	0.0	0.0	0.0	9.4
Lake Creek	LAKE 08-01	NR-0-4-U	22.00	1501	33.0	70	0	0	0	0	0	0	30	23.1	0.0	0.0	0.0	0.0	0.0	0.0	9.9
Lake Creek			**TOTAL**	**92768**	**1625.9**								**TOTAL**	**205.8**	**0.0**	**0.0**	**35.0**	**50.7**	**5.9**	**704.9**	**623.5**
Lake Creek													**PERCENT**	**0.13**	**0.00**	**0.00**	**0.02**	**0.03**	**0.00**	**0.43**	**0.38**
Libby Creek	LIBY 01-01	NR-2-2-U	6.32	5374	34.0	80	0	0	0	0	0	20	0	27.2	0.0	0.0	0.0	0.0	0.0	6.8	0.0
Libby Creek	LIBY 02-01	NR-0-3-U	22.00	3489	76.7	0	0	0	0	0	0	0	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	76.7
Libby Creek	LIBY 02-02	NR-0-3-U	9.42	2065	19.5	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	19.5	0.0
Libby Creek	LIBY 03-01	NR-2-3-U	6.32	6032	38.1	30	0	0	30	0	0	10	30	11.4	0.0	0.0	11.4	0.0	0.0	3.8	11.4
Libby Creek	LIBY 03-02	NR-2-3-U	6.32	8130	51.4	20	0	0	0	20	0	0	60	10.3	0.0	0.0	0.0	10.3	0.0	0.0	30.8
Libby Creek	LIBY 04-01	NR-0-3-U	22.00	2358	51.9	0	0	0	0	0	0	0	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51.9
Libby Creek	LIBY 05-01	NR-0-3-C	22.00	3106	68.3	0	0	0	0	0	0	0	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.3
Libby Creek	LIBY 05-02	NR-0-3-C	22.00	5732	126.1	0	0	0	0	0	0	0	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	126.1
Libby Creek	LIBY 06-01	NR-0-3-U	22.00	1260	27.7	0	0	0	0	0	0	0	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.7
Libby Creek	LIBY 06-02	NR-0-3-U	22.00	7353	161.8	0	0	0	0	40	0	0	60	0.0	0.0	0.0	0.0	64.7	0.0	0.0	97.1
Libby Creek	LIBY 07-01	NR-0-3-C	22.00	1931	42.5	0	0	0	0	50	0	0	50	0.0	0.0	0.0	0.0	21.2	0.0	0.0	21.2
Libby Creek	LIBY 07-02	NR-0-3-C	22.00	4449	97.9	10	0	0	0	70	0	0	20	9.8	0.0	0.0	0.0	68.5	0.0	0.0	19.6
Libby Creek	LIBY 08-01	NR-0-3-U	22.00	4528	99.6	20	0	0	0	80	0	0	0	19.9	0.0	0.0	0.0	79.7	0.0	0.0	0.0
Libby Creek	LIBY 08-02	NR-0-3-U	22.00	5162	113.6	30	0	0	0	0	0	0	70	34.1	0.0	0.0	0.0	0.0	0.0	0.0	79.5
Libby Creek	LIBY 09-01	NR-0-4-U	22.00	6475	142.5	0	0	0	0	40	0	0	60	0.0	0.0	0.0	0.0	57.0	0.0	0.0	85.5
Libby Creek	LIBY 09-02	NR-0-4-U	22.00	6077	133.7	0	10	0	0	0	0	0	90	0.0	13.4	0.0	0.0	0.0	0.0	0.0	120.3
Libby Creek	**LIBY 09-03**	**NR-0-4-U**	**25.03**	**14582**	**365.0**	**4.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**48.9**	**46.6**	**16.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**178.3**	**170.2**
Libby Creek	LIBY 09-04	NR-0-4-U	22.00	6708	147.6	10	0	0	0	20	0	0	70	14.8	0.0	0.0	0.0	29.5	0.0	0.0	103.3
Libby Creek	**LIBY 09-05**	**NR-0-4-U**	**34.73**	**22803**	**791.9**	**19.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**37.2**	**43.7**	**151.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**294.5**	**346.2**
Libby Creek	LIBY 09-06	NR-0-4-U	22.00	7814	171.9	10	10	0	0	0	0	0	80	17.2	17.2	0.0	0.0	0.0	0.0	0.0	137.5
Libby Creek	LIBY 10-01	NR-0-5-U	22.00	12029	264.6	20	0	0	0	0	0	0	80	52.9	0.0	0.0	0.0	0.0	0.0	0.0	211.7
Libby Creek			**TOTAL**	**137458**	**3026.2**								**TOTAL**	**365.2**	**30.6**	**0.0**	**11.4**	**330.9**	**0.0**	**502.9**	**1785.1**
Libby Creek													**PERCENT**	**0.12**	**0.01**	**0.00**	**0.00**	**0.11**	**0.00**	**0.17**	**0.59**
Quartz Creek	QRTZ 01-01	NR-2-1-U	2.81	2412	6.8	10	0	0	0	0	0	90	0	0.7	0.0	0.0	0.0	0.0	0.0	6.1	0.0
Quartz Creek	QRTZ 02-01	NR-2-1-C	6.32	2226	14.1	30	0	0	0	0	0	70	0	4.2	0.0	0.0	0.0	0.0	0.0	9.8	0.0
Quartz Creek	**QRTZ 03-01**	**NR-2-2-C**	**5.64**	**10466**	**59.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**100.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**59.0**	**0.0**
Quartz Creek	QRTZ 04-01	NR-4-2-U	2.81	3758	10.6	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	10.6	0.0
Quartz Creek	QRTZ 05-01	NR-2-2-U	2.81	15428	43.4	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	43.4	0.0
Quartz Creek	QRTZ 06-01	NR-4-2-U	2.81	1180	3.3	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0
Quartz Creek	QRTZ 07-01	NR-4-2-C	2.81	5031	14.1	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	14.1	0.0
Quartz Creek	QRTZ 08-01	NR-2-3-C	6.32	925	5.8	0	0	0	0	50	0	50	0	0.0	0.0	0.0	0.0	2.9	0.0	2.9	0.0
Quartz Creek	QRTZ 09-01	NR-2-3-U	2.81	11271	31.7	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	31.7	0.0
Quartz Creek	QRTZ 09-02	NR-2-3-U	6.32	3666	23.2	20	0	0	0	0	0	0	80	4.6	0.0	0.0	0.0	0.0	0.0	0.0	18.5
Quartz Creek	**QRTZ 10-01**	**NR-0-3-U**	**12.67**	**3042**	**38.5**	**16.3**	**0.0**	**0.0**	**0.0**	**65.2**	**0.0**	**18.5**	**0.0**	**6.3**	**0.0**	**0.0**	**0.0**	**25.1**	**0.0**	**7.1**	**0.0**
Quartz Creek			**TOTAL**	**59403**	**250.5**								**TOTAL**	**15.8**	**0.0**	**0.0**	**0.0**	**28.1**	**0.0**	**188.0**	**18.5**
Quartz Creek													**PERCENT**	**0.06**	**0.00**	**0.00**	**0.00**	**0.11**	**0.00**	**0.75**	**0.07**
Raven Creek	RAVN 01-01	NR-10-1-U	0.00	471	0.0	0	0	0	0	100	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Raven Creek	RAVN 01-02	NR-10-1-U	0.00	108	0.0	100	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Raven Creek	RAVN 02-01	NR-10-1-C	0.00	2667	0.0	0	0	0	0	100	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Raven Creek	RAVN 03-01	NR-10-1-U	0.00	2456	0.0	0	0	0	0	100	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Raven Creek	**RAVN 04-01**	**NR-4-1-U**	**6.32**	**4479**	**28.3**	**0.0**	**0.0**	**0.0**	**0.0**	**38.5**	**0.0**	**61.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**10.9**	**0.0**	**17.4**	**0.0**
Raven Creek	**RAVN 05-01**	**NR-4-2-U**	**0.14**	**2772**	**0.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**100.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.4**	**0.0**
Raven Creek	**RAVN 06-01**	**NR-2-2-U**	**0.12**	**616**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**100.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**0.0**
Raven Creek			**TOTAL**	**13569**	**28.8**								**TOTAL**	**0.0**	**0.0**	**0.0**	**0.0**	**10.9**	**0.0**	**17.9**	**0.0**
Raven Creek													**PERCENT**	**0.00**	**0.00**	**0.00**	**0.00**	**0.38**	**0.00**	**0.62**	**0.00**
Wolf Creek	WOLF 01-01	NR-2-1-U	2.81	2271	6.4	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	6.4	0.0
Wolf Creek	WOLF 02-01	NR-2-2-U	2.81	1519	4.3	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0
Wolf Creek	WOLF 02-02	NR-2-2-U	2.81	948	2.7	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	0.0
Wolf Creek	WOLF 02-03	NR-2-2-U	2.81	1000	2.8	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0
Wolf Creek	WOLF 03-01	NR-10-2-C	0.00	391	0.0	100	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wolf Creek	WOLF 04-01	NR-2-2-U	2.81	1476	4.1	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	0.0
Wolf Creek	WOLF 05-01	NR-0-3-U	9.42	14509	136.7	10	0	0	0	0	0	90	0	13.7	0.0	0.0	0.0	0.0	0.0	123.0	0.0
Wolf Creek	WOLF 05-02	NR-0-3-U	22.00	11032	242.7	80	0	0	0	20	0	0	0	194.2	0.0	0.0	0.0	48.5	0.0	0.0	0.0
Wolf Creek	WOLF 05-03	NR-0-3-U	22.00	5069	111.5	50	0	0	0	50	0	0	0	55.8	0.0	0.0	0.0	55.8	0.0	0.0	0.0
Wolf Creek	WOLF 06-01	NR-2-3-U	6.32	6203	39.2	0	0	0	0	100	0	0	0	0.0	0.0	0.0	0.0	39.2	0.0	0.0	0.0
Wolf Creek	WOLF 07-01	NR-2-4-U	6.32	2188	13.8	20	10	0	0	10	0	60	0	2.8	1.4	0.0	0.0	1.4	0.0	8.3	0.0
Wolf Creek	WOLF 08-01	NR-0-4-U	22.00	3318	73.0	10	0	0	0	20	0	70	0	7.3	0.0	0.0	0.0	14.6	0.0	51.1	0.0
Wolf Creek	WOLF 08-02	NR-0-4-U	22.00	6926	152.4	20	0	0	0	70	0	10	0	30.5	0.0	0.0	0.0	106.7	0.0	15.2	0.0
Wolf Creek	**WOLF 08-03**	**NR-0-4-U**	**19.21**	**14108**	**271.0**	**0.0**	**87.4**	**0.0**	**0.0**	**0.0**	**0.0**	**12.6**	**TOTAL**	**0.0**	**236.9**	**0.0**	**0.0**	**0.0**	**0.0**	**34.1**	**0.0**
Wolf Creek	WOLF 08-04	NR-0-4-U	22.00	9140	201.1	10	0	0	0	70	0	20	**PERCENT**	20.1	0.0	0.0	0.0	140.8	0.0	40.2	0.0
Wolf Creek	WOLF 08-05	NR-0-4-U	22.00	4941	108.7	20	40	0	0	30	0	10	0	21.7	43.5	0.0	0.0	32.6	0.0	10.9	0.0
Wolf Creek	WOLF 09-01	NR-0-4-U	22.00	2666	58.7	0	50	0	0	20	0	30	0	0.0	29.3	0.0	0.0	11.7	0.0	17.6	0.0
Wolf Creek	**WOLF 09-02**	**NR-0-4-U**	**18.36**	**25937**	**476.2**	**0.0**	**59.9**	**0.0**	**0.0**	**23.9**	**0.0**	**16.2**	**0.0**	**0.0**	**285.4**	**0.0**	**0.0**	**113.9**	**0.0**	**76.9**	**0.0**
Wolf Creek	WOLF 10-01	NR-0-4-U	22.00	7326	161.2	30	10	0	0	0	0	30	30	48.4	16.1	0.0	0.0	0.0	0.0	48.4	48.4
Wolf Creek	WOLF 10-02	NR-0-4-U	22.00	11468	252.3	100	0	0	0	0	0	0	0	252.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wolf Creek	WOLF 10-03	NR-0-4-U	22.00	4146	91.2	50	0	0	0	0	0	50	0	45.6	0.0	0.0	0.0	0.0	0.0	45.6	0.0
Wolf Creek	WOLF 10-04	NR-0-4-U	22.00	12540	275.9	60	0	0	0	0	0	40	0	165.5	0.0	0.0	0.0	0.0	0.0	110.3	0.0
Wolf Creek	WOLF 11-01	NR-0-4-U	22.00	41193	906.3	50	0	0	0	50	0	0	0	453.1	0.0	0.0	0.0	453.1	0.0	0.0	0.0
Wolf Creek	WOLF 11-02	NR-0-4-U	22.00	5909	130.0	70	0	0	0	0	0	30	0	91.0	0.0	0.0	0.0	0.0	0.0	39.0	0.0
Wolf Creek	**WOLF 11-03**	**NR-0-4-U**	**6.44**	**7875**	**50.7**	**16.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**83.7**	**0.0**	**8.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**42.5**	**0.0**
Wolf Creek	WOLF 11-04	NR-0-4-U	22.00	3205	70.5	30	0	0	0	70	0	0	0	21.2	0.0	0.0	0.0	49.4	0.0	0.0	0.0
Wolf Creek			**TOTAL**	**207304**	**3843.2**								**TOTAL**	**1431.3**	**612.6**	**0.0**	**0.0**	**1067.6**	**0.0**	**683.4**	**48.4**
Wolf Creek													**PERCENT**	**0.37**	**0.16**	**0.00**	**0.00**	**0.28**	**0.00**	**0.18**	**0.01**

Stream Segment	Reach ID	Reach Type	Sediment Load per 1000 Feet (Tons/Year)	Length (Feet)	Reach Sediment Load (Tons/Year)	Transportation (Percent)	Grazing (Percent)	Cropland (Percent)	Mining (Percent)	Silviculture (Percent)	Irrigation (Percent)	Natural (Percent)	Other (Percent)	Transportation (Tons/Year)	Grazing (Tons/Year)	Cropland (Tons/Year)	Mining (Tons/Year)	Silviculture (Tons/Year)	Irrigation (Tons/Year)	Natural (Tons/Year)	Other (Tons/Year)
Cramer Creek	CRAM 01-01	MR-4-1-U	24.82	6388	158.5	20	0	0	0	0	0	0	80	31.7	0.0	0.0	0.0	0.0	0.0	0.0	126.8
Cramer Creek	CRAM 02-01	MR-4-1-C	24.82	2765	68.6	20	0	0	0	80	0	0	0	13.7	0.0	0.0	0.0	54.9	0.0	0.0	0.0
Cramer Creek	CRAM 03-01	MR-4-2-C	24.82	7350	182.4	20	0	0	0	80	0	0	0	36.5	0.0	0.0	0.0	145.9	0.0	0.0	0.0
Cramer Creek	CRAM 04-01	MR-2-2-C	24.82	2951	73.2	10	0	0	0	70	0	20	0	7.3	0.0	0.0	0.0	51.3	0.0	14.6	0.0
Cramer Creek	**CRAM 05-01**	**MR-4-2-C**	**39.25**	**17662**	**693.2**	**23**	**73**	**0**	**0**	**0**	**0**	**4**	**0**	**162.1**	**506.7**	**0.0**	**0.0**	**0.0**	**0.0**	**24.4**	**0.0**
Cramer Creek	CRAM 06-01	MR-2-2-C	24.82	8905	221.0	20	0	0	0	60	0	20	0	44.2	0.0	0.0	0.0	132.6	0.0	44.2	0.0
Cramer Creek	CRAM 07-01	MR-0-3-U	24.82	3991	99.1	0	30	0	0	10	10	40	10	0.0	29.7	0.0	0.0	9.9	9.9	39.6	9.9
Cramer Creek	**CRAM 07-02**	**MR-0-3-U**	**35.94**	**2066**	**74.3**	**0**	**0**	**0**	**0**	**20**	**0**	**50**	**30**	**0.0**	**0.0**	**0.0**	**0.0**	**14.9**	**0.0**	**37.1**	**22.3**
Cramer Creek	CRAM 07-03	MR-0-3-U	24.82	2011	49.9	0	50	40	0	0	10	0	0	0.0	25.0	20.0	0.0	0.0	5.0	0.0	0.0
Cramer Creek	CRAM 08-01	MR-0-3-U	24.82	1866	46.3	0	40	30	0	0	30	0	0	0.0	18.5	13.9	0.0	0.0	13.9	0.0	0.0
Cramer Creek	CRAM 08-02	MR-0-3-U	24.82	7299	181.2	50	20	30	0	0	0	0	0	90.6	36.2	54.4	0.0	0.0	0.0	0.0	0.0
Cramer Creek			**total**	**63255**	**1847.8**								**TOTAL**	**386.2**	**616.2**	**88.2**	**0.0**	**409.5**	**28.8**	**160.0**	**159.0**
Cramer Creek													**PERCENT**	**0.21**	**0.33**	**0.05**	**0.00**	**0.22**	**0.02**	**0.09**	**0.09**
Deep Creek	DEEP 01-01	MR-10-1-C	0.00	2467	0.0	10	0	0	0	50	0	40	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deep Creek	DEEP 02-01	MR-4-1-C	24.82	3194	79.3	50	0	0	50	0	0	0	0	39.6	0.0	0.0	39.6	0.0	0.0	0.0	0.0
Deep Creek	DEEP 02-02	MR-4-1-C	24.82	2413	59.9	20	0	0	0	80	0	0	0	12.0	0.0	0.0	0.0	47.9	0.0	0.0	0.0
Deep Creek	DEEP 03-01	MR-2-2-C	24.82	4560	113.2	50	0	0	0	30	0	20	0	56.6	0.0	0.0	0.0	34.0	0.0	22.6	0.0
Deep Creek	DEEP 04-01	MR-4-2-C	24.82	4144	102.9	40	0	0	0	40	0	20	0	41.1	0.0	0.0	0.0	41.1	0.0	20.6	0.0
Deep Creek	DEEP 05-01	MR-4-2-C	24.82	4026	99.9	60	0	0	0	10	0	30	0	60.0	0.0	0.0	0.0	10.0	0.0	30.0	0.0
Deep Creek	DEEP 05-02	MR-4-2-C	24.82	2575	63.9	30	30	0	0	40	0	0	0	19.2	19.2	0.0	0.0	25.6	0.0	0.0	0.0
Deep Creek	DEEP 06-01	MR-2-2-C	24.82	3509	87.1	0	0	0	100	0	0	0	0	0.0	0.0	0.0	87.1	0.0	0.0	0.0	0.0
Deep Creek			**total**	**26889**	**606.1**								**TOTAL**	**228.5**	**19.2**	**0.0**	**126.7**	**158.6**	**0.0**	**73.2**	**0.0**
Deep Creek													**PERCENT**	**0.38**	**0.03**	**0.00**	**0.21**	**0.26**	**0.00**	**0.12**	**0.00**
Flat Creek	FLAT 01-01	NR-10-1-U	0.00	3276	0.0	0	0	0	0	0	0	50	50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Flat Creek	FLAT 02-01	NR-10-1-C	0.00	9056	0.0	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Flat Creek	FLAT 03-01	NR-4-1-C	12.57	1386	17.4	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	17.4	0.0
Flat Creek	FLAT 04-01	NR-4-2-C	12.57	4964	62.4	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	62.4	0.0
Flat Creek	FLAT 05-01	NR-2-2-C	12.57	3049	38.3	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	38.3	0.0
Flat Creek	**FLAT 06-01**	**NR-4-2-C**	**25.14**	**2507**	**63.0**	**0**	**0**	**0**	**0**	**40**	**0**	**60**	**0**	**0.0**	**0.0**	**0.0**	**0.0**	**25.2**	**0.0**	**37.9**	**0.0**
Flat Creek	**FLAT 06-02**	**NR-4-2-C**	**9.60**	**4430**	**42.5**	**0**	**0**	**0**	**20**	**0**	**0**	**80**	**0**	**0.0**	**0.0**	**0.0**	**8.5**	**0.0**	**0.0**	**34.0**	**0.0**
Flat Creek	FLAT 07-01	NR-2-2-U	24.82	4192	104.0	20	0	0	0	0	0	10	70	20.8	0.0	0.0	0.0	0.0	0.0	10.4	72.8
Flat Creek	FLAT 08-01	NR-4-2-C	24.82	2422	60.1	80	0	0	0	0	0	20	0	48.1	0.0	0.0	0.0	0.0	0.0	12.0	0.0
Flat Creek	**FLAT 09-01**	**NR-2-2-C**	**18.32**	**7087**	**129.8**	**0**	**0**	**0**	**12**	**8**	**0**	**80**	**0**	**0.0**	**0.0**	**0.0**	**15.6**	**10.4**	**0.0**	**103.9**	**0.0**
Flat Creek			**total**	**42369**	**517.7**								**TOTAL**	**68.9**	**0.0**	**0.0**	**24.1**	**35.6**	**0.0**	**316.3**	**72.8**
Flat Creek													**PERCENT**	**0.13**	**0.00**	**0.00**	**0.05**	**0.07**	**0.00**	**0.61**	**0.14**
Grant Creek	GRNT 01-01	MR-10-1-U	0.00	1720	0.0	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grant Creek	GRNT 02-01	MR-4-1-U	12.57	2908	36.6	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	36.6	0.0
Grant Creek	GRNT 03-01	MR-10-1-U	0.00	3884	0.0	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grant Creek	GRNT 04-01	MR-4-2-U	12.57	7879	99.0	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	99.0	0.0
Grant Creek	GRNT 05-01	MR-10-2-C	0.00	910	0.0	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grant Creek	GRNT 06-01	MR-4-2-C	12.57	7826	98.4	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	98.4	0.0
Grant Creek	GRNT 07-01	MR-2-2-U	24.82	2731	67.8	0	0	0	0	0	0	70	30	0.0	0.0	0.0	0.0	0.0	0.0	47.5	20.3
Grant Creek	GRNT 08-01	MR-4-2-U	12.57	3002	37.7	0	0	0	0	0	0	90	10	0.0	0.0	0.0	0.0	0.0	0.0	34.0	3.8
Grant Creek	**GRNT 08-02**	**MR-4-2-U**	**12.51**	**3587**	**44.9**	**0**	**0**	**0**	**0**	**0**	**0**	**80**	**20**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**35.9**	**9.0**
Grant Creek	GRNT 09-01	MR-2-3-U	24.82	9622	238.8	0	0	0	0	0	0	10	90	0.0	0.0	0.0	0.0	0.0	0.0	23.9	214.9
Grant Creek	GRNT 10-01	MR-2-3-U	24.82	13402	332.6	0	0	0	0	0	10	0	90	0.0	0.0	0.0	0.0	0.0	33.3	0.0	299.4
Grant Creek	GRNT 11-01	MR-0-3-U	24.82	3371	83.7	0	0	0	0	0	0	50	50	0.0	0.0	0.0	0.0	0.0	0.0	41.8	41.8
Grant Creek	**GRNT 11-02**	**MR-0-3-U**	**24.84**	**3231**	**80.3**	**89**	**0**	**0**	**0**	**0**	**0**	**11**	**0**	**71.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**9.0**	**0.0**
Grant Creek	GRNT 11-03	MR-0-3-U	24.82	4795	119.0	50	0	0	0	0	0	0	50	59.5	0.0	0.0	0.0	0.0	0.0	0.0	59.5
Grant Creek	GRNT 12-01	MR-0-3-U	24.82	4738	117.6	40	0		0	0		0	60	47.0	0.0	0.0	0.0	0.0	0.0	0.0	70.6
Grant Creek	GRNT 12-02	MR-0-3-U	24.82	11414	283.3	0	0	20	0	0	60	0	20	0.0	0.0	56.7	0.0	0.0	170.0	0.0	56.7
Grant Creek	**GRNT 12-03**	**MR-0-3-U**	**17.34**	**6968**	**120.8**	**0**	**0**	**20**	**0**	**0**	**60**	**0**	**20**	**0.0**	**0.0**	**24.2**	**0.0**	**0.0**	**72.5**	**0.0**	**24.2**
Grant Creek	GRNT 13-01	MR-0-3-U	24.82	7161	177.7	0	30	30	0	0	10	0	30	0.0	53.3	53.3	0.0	0.0	17.8	0.0	53.3
Grant Creek			**total**	**99148**	**1938.2**								**TOTAL**	**177.8**	**53.3**	**134.1**	**0.0**	**0.0**	**293.5**	**425.9**	**853.4**
Grant Creek													**PERCENT**	**0.09**	**0.03**	**0.07**	**0.00**	**0.00**	**0.15**	**0.22**	**0.44**
Mulkey Creek	MULK 01-01	MR-2-1-U	24.82	400	9.9	0	0	0	0	100	0	0	0	0.0	0.0	0.0	0.0	9.9	0.0	0.0	0.0
Mulkey Creek	MULK 02-01	MR-2-1-U	24.82	4327	107.4	10	20	0	0	60	0	10	0	10.7	21.5	0.0	0.0	64.4	0.0	10.7	0.0
Mulkey Creek	**MULK 03-01**	**MR-4-1-C**	**7.03**	**1657**	**11.6**	**0**	**70**	**0**	**0**	**20**	**0**	**0**	**10**	**0.0**	**8.2**	**0.0**	**0.0**	**2.3**	**0.0**	**0.0**	**1.2**
Mulkey Creek	MULK 03-02	MR-4-1-C	24.82	1816	45.1	10	30	0	0	60	0	0	0	4.5	13.5	0.0	0.0	27.0	0.0	0.0	0.0
Mulkey Creek	MULK 04-01	MR-10-1-C	0.00	4428	0.0	0	30	0	0	70	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mulkey Creek	MULK 04-02	MR-10-1-C	0.00	2675	0.0	30	0	0	0	50	0	20	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mulkey Creek	MULK 05-01	MR-10-2-C	0.00	5034	0.0	40	0	0	0	0	0	60	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mulkey Creek	MULK 06-01	MR-4-3-U	24.82	1135	28.2	20	50	0	0	30	0	0	0	5.6	14.1	0.0	0.0	8.4	0.0	0.0	0.0
Mulkey Creek	MULK 07-01	MR-2-3-U	24.82	1842	45.7	20	50	0	0	30	0	0	0	9.1	22.9	0.0	0.0	13.7	0.0	0.0	0.0
Mulkey Creek	MULK 08-01	MR-4-3-U	24.82	3292	81.7	60	30	0	0	10	0	0	0	49.0	24.5	0.0	0.0	8.2	0.0	0.0	0.0
Mulkey Creek	MULK 09-01	MR-2-3-U	24.82	5018	124.5	70	20	0	0	0	0	10	0	87.2	24.9	0.0	0.0	0.0	0.0	12.5	0.0
Mulkey Creek			**total**	**31624**	**454.2**								**TOTAL**	**166.2**	**129.5**	**0.0**	**0.0**	**134.1**	**0.0**	**23.2**	**1.2**
Mulkey Creek													**PERCENT**	**0.37**	**0.29**	**0.00**	**0.00**	**0.30**	**0.00**	**0.05**	**0.00**
Petty Creek	PETT 01-01	NR-2-3-U	24.82	2705	67.1	0	40	0	0	0	10	50	0	0.0	26.9	0.0	0.0	0.0	6.7	33.6	0.0
Petty Creek	PETT 02-01	NR-0-3-U	24.82	2284	56.7	0	50	0	0	0	10	10	30	0.0	28.3	0.0	0.0	0.0	5.7	5.7	17.0
Petty Creek	**PETT 03-01**	**NR-0-3-U**	**28.89**	**6330**	**182.9**	**30**	**0**	**20**	**0**	**0**	**0**	**20**	**30**	**54.9**	**0.0**	**36.6**	**0.0**	**0.0**	**0.0**	**36.6**	**54.9**
Petty Creek	PETT 04-01	NR-0-3-U	24.82	7046	174.9	10	20	0	0	0	0	10	60	17.5	35.0	0.0	0.0	0.0	0.0	17.5	104.9
Petty Creek	PETT 04-02	NR-0-3-U	24.82	4923	122.2	40	0	50	0	0	0	0	10	48.9	0.0	61.1	0.0	0.0	0.0	0.0	12.2
Petty Creek	PETT 05-01	NR-0-3-U	24.82	5762	143.0	20	0	20	0	0	0	0	60	28.6	0.0	28.6	0.0	0.0	0.0	0.0	85.8
Petty Creek	PETT 06-01	NR-0-3-C	24.82	9255	229.7	70	0	0	0	0	0	30	0	160.8	0.0	0.0	0.0	0.0	0.0	68.9	0.0
Petty Creek	**PETT 07-01**	**NR-0-3-U**	**18.55**	**4155**	**77.1**	**20**	**0**	**0**	**0**	**0**	**0**	**80**	**0**	**15.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**61.7**	**0.0**
Petty Creek	**PETT 07-02**	**NR-0-3-U**	**36.82**	**5739**	**211.3**	**78**	**0**	**0**	**0**	**0**	**0**	**16**	**6**	**163.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**34.8**	**12.6**
Petty Creek	PETT 08-01	NR-0-3-U	24.82	14070	349.2	60	0	0	0	30	0	10	0	209.5	0.0	0.0	0.0	104.8	0.0	34.9	0.0
Petty Creek	PETT 09-01	NR-0-3-U	24.82	2163	53.7	50	0	0	0	0	0	0	50	26.8	0.0	0.0	0.0	0.0	0.0	0.0	26.8
Petty Creek			**total**	**64432**	**1667.8**								**TOTAL**	**726.3**	**90.2**	**126.3**	**0.0**	**104.8**	**12.4**	**293.6**	**314.3**
Petty Creek													**PERCENT**	**0.44**	**0.05**	**0.08**	**0.00**	**0.06**	**0.01**	**0.18**	**0.19**

Stream Segment	Reach ID	Reach Type	Sediment Load per 1000 Feet (Tons/Year)	Length (Feet)	Reach Sediment Load (Tons/Year)	Transportation (Percent)	Grazing (Percent)	Cropland (Percent)	Mining (Percent)	Silviculture (Percent)	Irrigation (Percent)	Natural (Percent)	Other (Percent)	Transportation (Tons/Year)	Grazing (Tons/Year)	Cropland (Tons/Year)	Mining (Tons/Year)	Silviculture (Tons/Year)	Irrigation (Tons/Year)	Natural (Tons/Year)	Other (Tons/Year)
Rattler Gulch	RATT 01-01	MR-4-1-U	24.82	2146	53.3	20	0	0	0	80	0	0	0	10.7	0.0	0.0	0.0	42.6	0.0	0.0	0.0
Rattler Gulch	RATT 02-01	MR-4-1-U	24.82	4569	113.4	30	0	0	0	70	0	0	0	34.0	0.0	0.0	0.0	79.4	0.0	0.0	0.0
Rattler Gulch	RATT 03-01	MR-2-2-U	24.82	2833	70.3	40	0	0	0	60	0	0	0	28.1	0.0	0.0	0.0	42.2	0.0	0.0	0.0
Rattler Gulch	RATT 03-02	MR-2-2-U	24.82	3508	87.1	50	0	0	0	50	0	0	0	43.5	0.0	0.0	0.0	43.5	0.0	0.0	0.0
Rattler Gulch	**RATT 04-01**	**MR-2-2-C**	**14.73**	**2261**	**33.3**	**20**	**70**	**0**	**0**	**10**	**0**	**0**	**0**	**6.7**	**23.3**	**0.0**	**0.0**	**3.3**	**0.0**	**0.0**	**0.0**
Rattler Gulch	RATT 05-01	MR-2-2-U	24.82	2099	52.1	30	50	0	0	20	0	0	0	15.6	26.1	0.0	0.0	10.4	0.0	0.0	0.0
Rattler Gulch	RATT 06-01	MR-2-2-C	24.82	1593	39.5	50	0	0	0	50	0	0	0	19.8	0.0	0.0	0.0	19.8	0.0	0.0	0.0
Rattler Gulch	RATT 07-01	MR-4-2-C	24.82	3280	81.4	50	0	0	0	50	0	0	0	40.7	0.0	0.0	0.0	40.7	0.0	0.0	0.0
Rattler Gulch	RATT 07-02	MR-4-2-C	24.82	5999	148.9	30	0	0	0	70	0	0	0	44.7	0.0	0.0	0.0	104.2	0.0	0.0	0.0
Rattler Gulch	RATT 07-03	MR-4-2-C	24.82	3093	76.8	70	0	0	0	30	0	0	0	53.7	0.0	0.0	0.0	23.0	0.0	0.0	0.0
Rattler Gulch	RATT 07-04	MR-4-2-C	24.82	1075	26.7	40	60	0	0	0	0	0	0	10.7	16.0	0.0	0.0	0.0	0.0	0.0	0.0
Rattler Gulch	RATT 08-01	MR-2-2-U	24.82	8571	212.7	10	80	0	0	0	0	10	0	21.3	170.2	0.0	0.0	0.0	0.0	21.3	0.0
Rattler Gulch	RATT 09-01	MR-2-3-U	24.82	1638	40.7	10	90	0	0	0	0	0	0	4.1	36.6	0.0	0.0	0.0	0.0	0.0	0.0
Rattler Gulch			**total**	**42665**	**1036.1**								**TOTAL**	**333.5**	**272.1**	**0.0**	**0.0**	**409.2**	**0.0**	**21.3**	**0.0**
Rattler Gulch													**PERCENT**	**0.32**	**0.26**	**0.00**	**0.00**	**0.39**	**0.00**	**0.02**	**0.00**
Tenmile Creek	TENM 01-01	MR-10-1-U	0.00	1439	0.0	0	0	0	0	100	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tenmile Creek	TENM 02-01	MR-4-1-U	24.82	8487	210.6	20	30	0	0	40	0	10	0	42.1	63.2	0.0	0.0	84.3	0.0	21.1	0.0
Tenmile Creek	**TENM 03-01**	**MR-2-2-C**	**18.20**	**7822**	**142.4**	**24**	**38**	**0**	**0**	**10**	**0**	**28**	**0**	**33.9**	**54.3**	**0.0**	**0.0**	**14.2**	**0.0**	**39.9**	**0.0**
Tenmile Creek	TENM 03-02	MR-2-2-C	24.82	5294	131.4	10	30	0	20	0	0	0	40	13.1	39.4	0.0	26.3	0.0	0.0	0.0	52.6
Tenmile Creek	TENM 04-01	MR-4-2-C	24.82	2958	73.4	30	0	0	0	0	0	70	0	22.0	0.0	0.0	0.0	0.0	0.0	51.4	0.0
Tenmile Creek			**total**	**25999**	**557.8**								**TOTAL**	**111.2**	**156.9**	**0.0**	**26.3**	**98.5**	**0.0**	**112.4**	**52.6**
Tenmile Creek													**PERCENT**	**0.20**	**0.28**	**0.00**	**0.05**	**0.18**	**0.00**	**0.20**	**0.09**
Trout Creek	TROU 01-01	NR-2-3-U	12.57	4151	52.2	10	0	0	0	0	0	90	0	5.2	0.0	0.0	0.0	0.0	0.0	47.0	0.0
Trout Creek	TROU 02-01	NR-0-3-U	12.57	6417	80.7	0	0	0	0	0	0	80	20	0.0	0.0	0.0	0.0	0.0	0.0	64.5	16.1
Trout Creek	**TROU 03-01**	**NR-2-3-C**	**3.16**	**3041**	**9.6**	**10**	**0**	**0**	**0**	**10**	**0**	**80**	**0**	**1.0**	**0.0**	**0.0**	**0.0**	**1.0**	**0.0**	**7.7**	**0.0**
Trout Creek	TROU 04-01	NR-4-3-C	24.82	6743	167.4	10	0	0	0	70	0	20	0	16.7	0.0	0.0	0.0	117.1	0.0	33.5	0.0
Trout Creek	TROU 05-01	NR-2-3-C	24.82	3252	80.7	20	0	0	0	60	0	20	0	16.1	0.0	0.0	0.0	48.4	0.0	16.1	0.0
Trout Creek	TROU 06-01	NR-2-3-U	24.82	2166	53.8	50	0	0	0	0	0	50	0	26.9	0.0	0.0	0.0	0.0	0.0	26.9	0.0
Trout Creek	TROU 06-02	NR-2-3-U	24.82	1631	40.5	70	0	0	0	0	0	30	0	28.3	0.0	0.0	0.0	0.0	0.0	12.1	0.0
Trout Creek	TROU 07-01	NR-0-3-U	24.82	1687	41.9	0	0	0	100	0	0	0	0	0.0	0.0	0.0	41.9	0.0	0.0	0.0	0.0
Trout Creek	TROU 08-01	NR-0-3-C	24.82	2808	69.7	50	0	0	0	30	0	20	0	34.8	0.0	0.0	0.0	20.9	0.0	13.9	0.0
Trout Creek	TROU 09-01	NR-0-3-U	24.82	3971	98.6	10	0	0	0	0	0	0	90	9.9	0.0	0.0	0.0	0.0	0.0	0.0	88.7
Trout Creek	TROU 10-01	NR-0-3-U	12.57	2790	35.1	10	0	0	0	0	0	90	0	3.5	0.0	0.0	0.0	0.0	0.0	31.6	0.0
Trout Creek	TROU 10-02	NR-0-3-U	12.57	4965	62.4	20	0	0	0	0	0	80	0	12.5	0.0	0.0	0.0	0.0	0.0	49.9	0.0
Trout Creek	TROU 11-01	NR-0-3-C	24.82	2517	62.5	70	0	0	0	0	0	30	0	43.7	0.0	0.0	0.0	0.0	0.0	18.7	0.0
Trout Creek	TROU 12-01	NR-0-3-U	24.82	5921	147.0	60	0	0	0	0	0	40	0	88.2	0.0	0.0	0.0	0.0	0.0	58.8	0.0
Trout Creek	TROU 12-02	NR-0-3-U	24.82	2738	68.0	0	0	0	0	0	0	30	70	0.0	0.0	0.0	0.0	0.0	0.0	20.4	47.6
Trout Creek	TROU 12-03	NR-0-3-U	**7.80**	15083	117.6	**0**	**0**	**0**	**0**	**10**	**0**	**76**	**14**	**0.0**	**0.0**	**0.0**	**0.0**	**11.8**	**0.0**	**90.0**	**15.9**
Trout Creek	TROU 12-04	NR-0-3-U	24.82	9269	230.1	20	0	0	0	0	0	0	80	46.0	0.0	0.0	0.0	0.0	0.0	0.0	184.1
Trout Creek			**total**	**79150**	**1417.5**								**TOTAL**	**332.9**	**0.0**	**0.0**	**41.9**	**199.2**	**0.0**	**491.1**	**352.4**
Trout Creek													**PERCENT**	**0.23**	**0.00**	**0.00**	**0.03**	**0.14**	**0.00**	**0.35**	**0.25**
West Fork Petty Creek	WFPY 01-01	NR-10-1-C	0.00	5259	0.0	0	0	0	0	100	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
West Fork Petty Creek	WFPY 02-01	NR-4-1-C	24.82	4339	107.7	0	0	0	0	60	0	40	0	0.0	0.0	0.0	0.0	64.6	0.0	43.1	0.0
West Fork Petty Creek	**WFPY 03-01**	**NR-4-2-C**	**18.08**	**10129**	**183.1**	**0**	**0**	**0**	**0**	**19**	**0**	**81**	**0**	**0.0**	**0.0**	**0.0**	**0.0**	**34.1**	**0.0**	**149.0**	**0.0**
West Fork Petty Creek	WFPY 04-01	NR-2-2-U	24.82	8411	208.8	10	0	0	0	40	0	50	0	20.9	0.0	0.0	0.0	83.5	0.0	104.4	0.0
West Fork Petty Creek	WFPY 04-02	NR-2-2-U	24.82	12222	303.4	30	0	0	0	20	0	20	30	91.0	0.0	0.0	0.0	60.7	0.0	60.7	91.0
West Fork Petty Creek			**total**	**40361**	**802.9**								**TOTAL**	**111.9**	**0.0**	**0.0**	**0.0**	**242.9**	**0.0**	**357.1**	**91.0**
West Fork Petty Creek													**PERCENT**	**0.14**	**0.00**	**0.00**	**0.00**	**0.30**	**0.00**	**0.44**	**0.11**