ATTACHMENT A – SEDIMENT AND HABITAT ASSESSMENT

Thompson TMDL Project Area: Sediment and Habitat Assessment

Prepared by:

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

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1.0 INTRODUCTION

A detailed sediment and habitat assessment of streams in the Thompson TMDL Project Area (Project Area) was conducted to facilitate development of sediment TMDLs. The Thompson Project Area encompasses an area of approximately 2,511 square miles in Lincoln and Flathead counties in northwestern Montana. The Thompson Project Area includes three TMDL Planning Areas (TPAs): Thompson TPA, a portion of the Lower Flathead TPA, and a portion of the Middle Clark Fork Tributaries TPA. Within the Thompson Project Area, there are nine water body segments listed on the 2012 303(d) List for sediment-related impairments (**Table 1-1**). McGinnis Creek, Lazier Creek, Little Thompson River, and McGregor Creek are listed as impaired due to sediment in the Thompson TPA, while Henry Creek, Lynch Creek and Swamp Creek are listed as impaired due to sediment in the Middle Clark Fork Tributaries TPA. The Little Bitterroot River and Sullivan Creek are listed as impaired due to sediment in the Lower Flathead TPA.

Table 1-1. Waterbody Segments Addressed during the Sediment and Habitat Assessment

TPA	List ID	Waterbody Description
Thompson	MT76N005_070	MCGINNIS CREEK, headwaters to mouth (Little Thompson River)
Thompson	MT76N005_060	LAZIER CREEK, headwaters to mouth (Thompson River)
Thompson	MT76N005_040	LITTLE THOMPSON RIVER, headwaters to mouth (Thompson River), T22N R25W S8
Thompson	MT76N005_030	McGREGOR CREEK, McGregor Lake to mouth (Thompson River)
Middle Clark Fork Tributaries	MT76N003_170	HENRY CREEK, headwaters to mouth (Clark Fork River), T19N R26W S1
Middle Clark Fork Tributaries	MT76N003_010	LYNCH CREEK, headwaters to mouth (Clark Fork River)
Middle Clark Fork Tributaries	MT76N003_160	SWAMP CREEK, West Fork Swamp Creek to mouth (Clark Fork River), T20N R27W S3
Lower Flathead	MT76L002_060	LITTLE BITTERROOT RIVER, Hubbart Reservoir to Flathead Reservation Boundary
Lower Flathead	MT76L002_070	SULLIVAN CREEK, headwaters to Flathead Indian Reservation

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 Thompson 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 Thompson 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 Thompson Project Area.

2.1 Methods

An aerial assessment of streams in the Thompson 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 Thompson 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 Thompson 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	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
	fourth order	4
	fifth order	5
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 67 reaches were delineated during the aerial assessment reach stratification process covering 72.4 miles of stream, excluding Fishtrap Creek which was assessed for potential reference conditions (**Table 2-2**). Based on the level III ecoregion, there were a total of 23 distinct reach types delineated on the nine sediment impaired stream segments in the Thompson 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)
Henry Creek	6	6	6.7
Lazier Creek	10	13	7.5
Little Bitterroot River	6	6	4.9
Lynch Creek	12	17	13.3
Little Thompson River	15	23	19.9
McGregor Creek	9	17	6.8
McGinnis Creek	4	4	5.1
Sullivan Creek	4	6	3.2
Swamp Creek	1	7	4.9
Total	**67**	**99**	**72.4**

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 Thompson 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 September of 2011 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. At least two monitoring reaches were selected per listed stream. 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 16 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 within eight reach types, with the complete sediment and habitat assessment performed at all monitoring sites (**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 four sites in which the bankfull width was less than 10 feet and a monitoring site length of 1,000 feet was used at twelve sites in which the bankfull width was between 10 feet and 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 *Longitudinal Field Methods for the Assessment of TMDL Sediment and Habitat Impairments* (DEQ 2011).

Table 3-1. Reach Types and Monitoring Sites

Reach Type	Number of Reaches	Number of Monitoring Sites	Monitoring Sites
NR-0-1-U	6		
NR-0-2-C	1		
NR-0-2-U	2		
NR-0-3-C	2		
NR-0-3-U	26	6	FTRP06-02, LAZR10-01, LTMP12-01, MCGR06-02, SWMP01-05, SWMP01-06
NR-0-4-C	3	1	FTRP 08-01
NR-0-4-U	9	3	LBTR01-01, LNCH12-02, LTMP14-03
NR-10-1-C	2		
NR-10-1-U	4		
NR-10-3-C	1		
NR-2-1-U	10	1	MGNS02-01
NR-2-2-U	4	1	MGNS03-01
NR-2-3-C	2		
NR-2-3-U	7	2	LAZR08-01
NR-2-4-C	1		
NR-2-4-U	1		
NR-2-5-U	1		
NR-4-1-C	4		
NR-4-1-U	8	1	LNCH09-01
NR-4-2-C	1		
NR-4-2-U	2	1	HNRY04-01
NR-4-3-C	1		
NR-4-3-U	1		

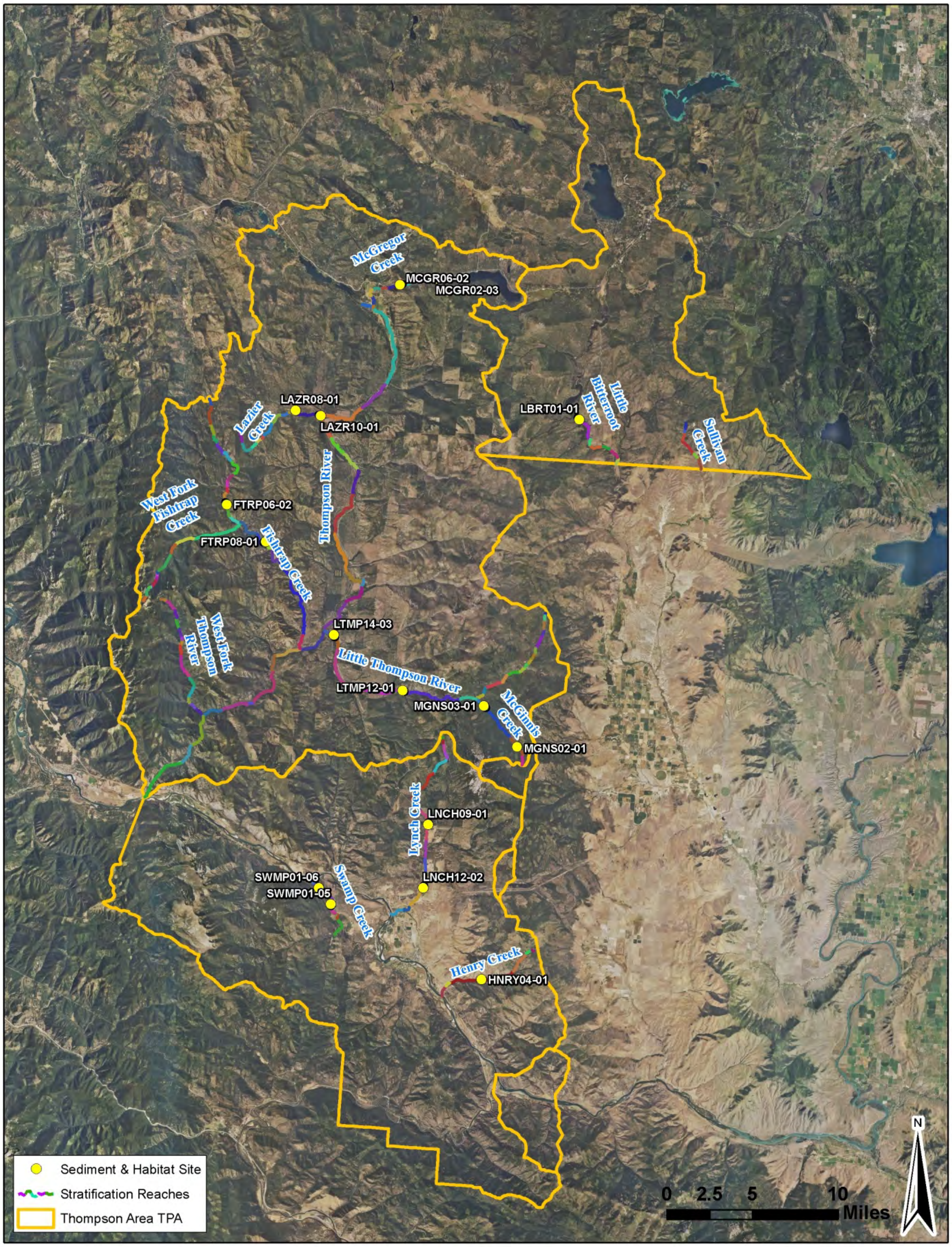


Figure 3-1. Aerial Assessment Reach Stratification

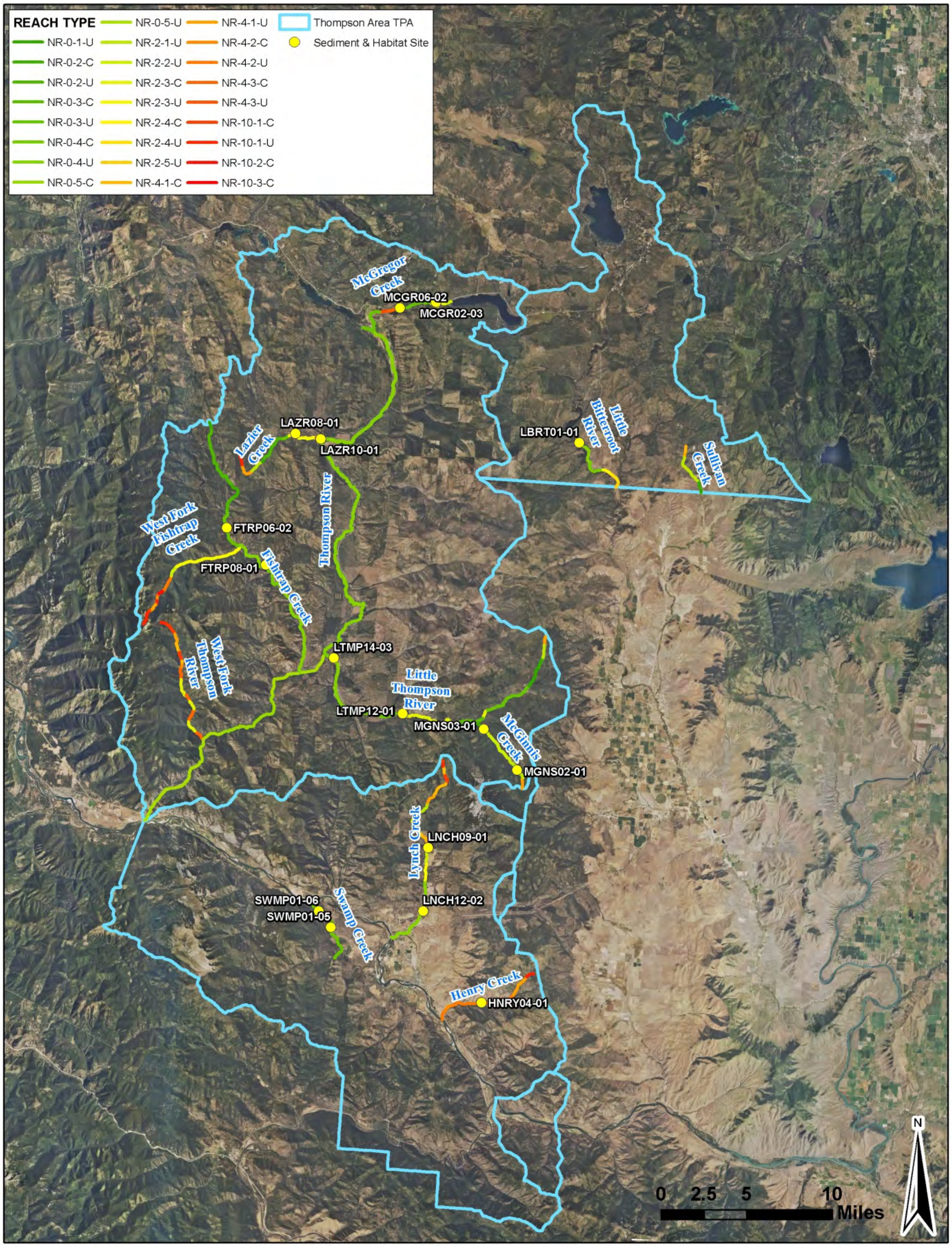


Figure 3-2. Aerial Assessment Reach Types

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 transit level and stadia rod. 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. RSI measurements 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 Thompson Project Area, sediment and habitat parameters were assessed at 16 monitoring sites. Out of the 23 reach types delineated on the sediment impaired stream segments in GIS, sediment and habitat assessments were performed in eight 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**.

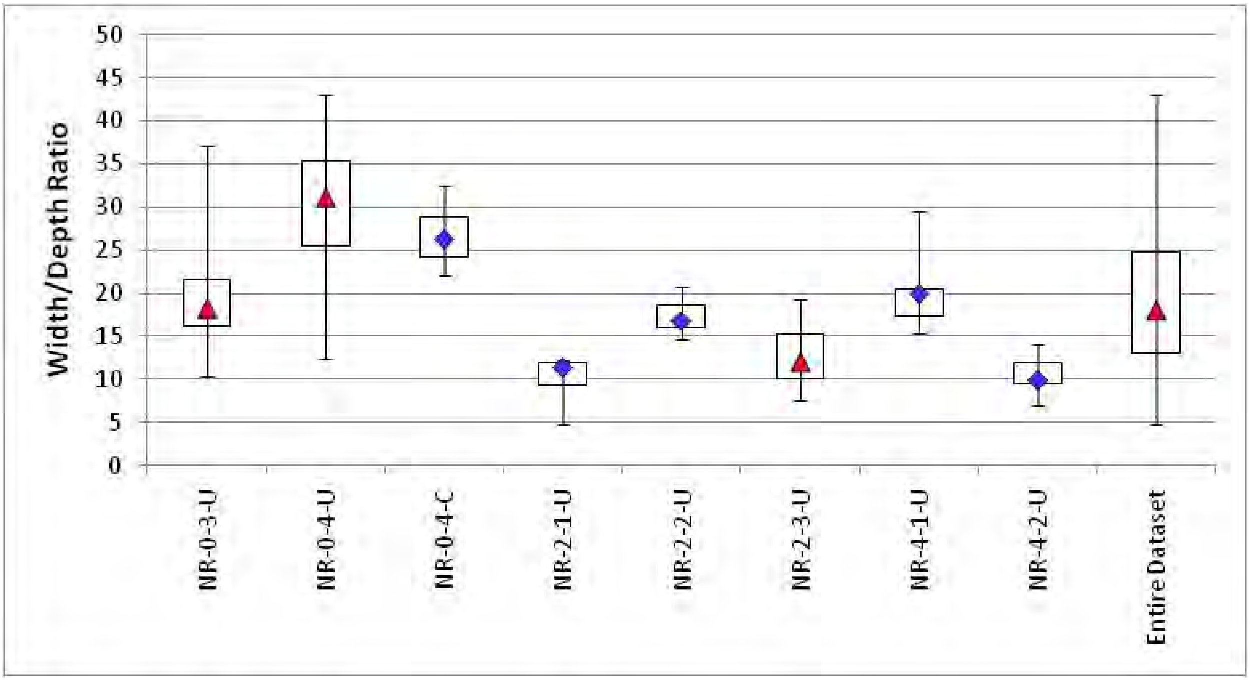
3.2.1 Reach Type Analysis

This section presents a statistical analysis of sediment and habitat base parameters for each of the reach types assessed in the Thompson Project Area. Reach type discussions are based on median values, while summary statistics for the minimum, 25th percentile, 75th 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 9.9 in NR-4-2-U to 31.1 in NR-0-4-U (**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

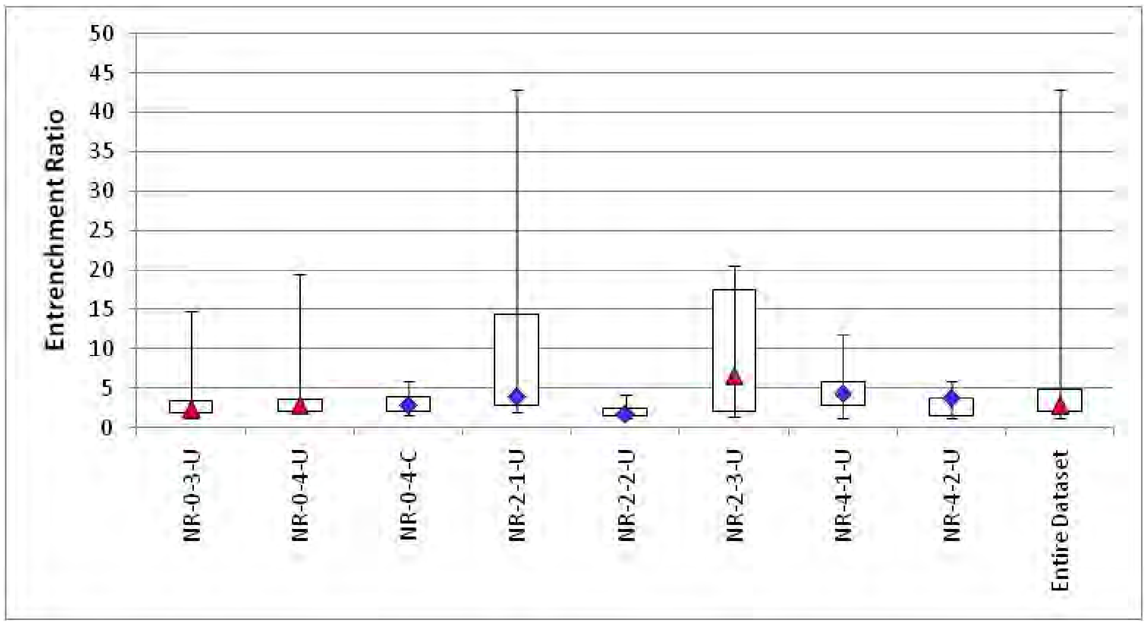
Table 3-2. Width/Depth Ratio

Statistical Parameter	Reach Type								
	NR-0-3-U	NR-0-4-U	NR-0-4-C	NR-2-1-U	NR-2-2-U	NR-2-3-U	NR-4-1-U	NR-4-2-U	Entire Dataset
# of Monitoring Sites	6	3	1	1	1	2	1	1	16
Sample Size	22	14	4	4	5	10	5	5	69
Minimum	10.4	12.4	22.1	4.8	14.5	7.5	15.3	7.0	4.8
25th Percentile	16.1	25.5	24.2	9.2	16.0	10.1	17.3	9.4	13.1
Median	18.2	31.1	26.2	11.3	16.8	12.1	19.9	9.9	18.0
75th Percentile	21.6	35.3	28.9	12.0	18.6	15.3	20.5	12.0	24.8
Maximum	37.1	43.1	32.5	12.2	20.8	19.3	29.6	14.1	43.1
Monitoring Sites	SWMP01-05, SWMP01-06, LTMP12-01, MCGR06-02, LAZR10-01, FTRP06-02	LNCH12-02, LTMP14-03, LBRT01-01	FTRP08-01	MGNS02-01	MGNS03-01	MCGR02-03, LAZR08-01	LNCH09-01	HNRY04-01	

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-2-2-U to 6.5 in NR-2-3-U (**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

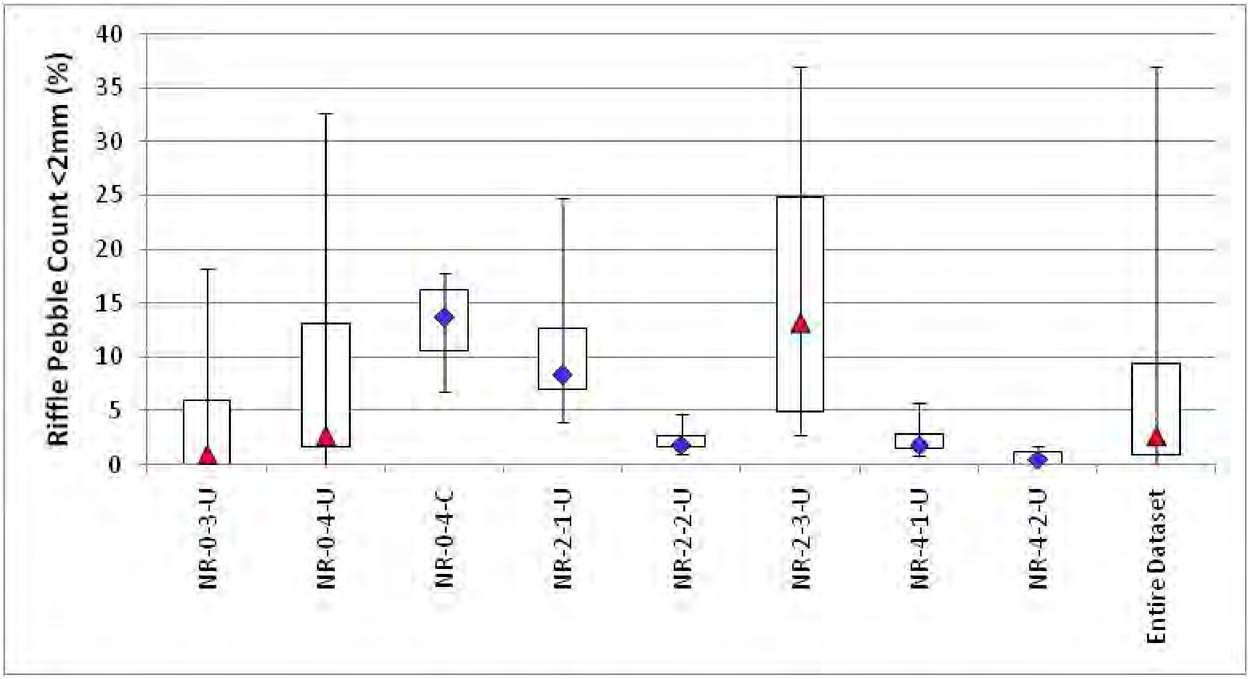
Table 3-3. Entrenchment Ratio

Statistical Parameter	Reach Type								
	NR-0-3-U	NR-0-4-U	NR-0-4-C	NR-2-1-U	NR-2-2-U	NR-2-3-U	NR-4-1-U	NR-4-2-U	Entire Dataset
# of Monitoring Sites	6	3	1	1	1	2	1	1	16
Sample Size	22	14	4	4	5	10	5	5	69
Minimum	1.3	1.9	1.6	2.0	1.3	1.4	1.3	1.2	1.2
25th Percentile	1.9	2.1	2.0	2.8	1.5	2.1	2.8	1.5	2.0
Median	2.3	2.8	2.7	3.9	1.6	6.5	4.2	3.8	2.8
75th Percentile	3.4	3.6	4.0	14.3	2.4	17.5	5.7	3.8	4.8
Maximum	14.8	19.5	5.9	42.8	4.2	20.5	11.8	5.9	42.8
Monitoring Sites	SWMP01-05, SWMP01-06, LTMP12-01, MCGR06-02, LAZR10-01, FTRP06-02	LNCH12-02, LTMP14-03, LBRT01-01	FTRP08-01	MGNS02-01	MGNS03-01	MCGR02-03, LAZR08-01	LNCH09-01	HNRY04-01	

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 1% in NR-0-3-U and NR-4-2-U to 14% in NR-0-4-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

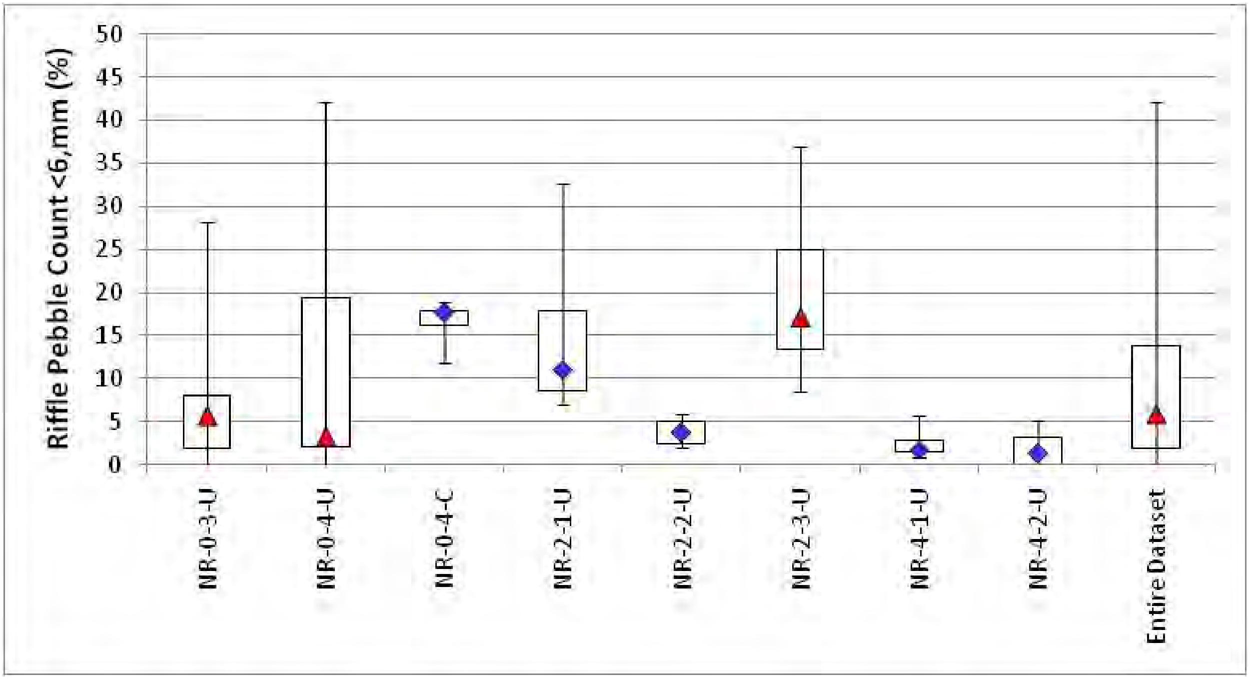
Table 3-4. Riffle Pebble Count <2mm

Statistical Parameter	Reach Type								
	NR-0-3-U	NR-0-4-U	NR-0-4-C	NR-2-1-U	NR-2-2-U	NR-2-3-U	NR-4-1-U	NR-4-2-U	Entire Dataset
# of Monitoring Sites	6	3	1	1	1	2	1	1	16
Sample Size	22	12	4	4	4	8	4	4	62
Minimum	0	0	7	4	1	3	1	0	0
25th Percentile	0	2	11	7	2	5	1	0	1
Median	1	3	14	8	2	13	2	1	3
75th Percentile	6	13	16	13	3	25	3	1	9
Maximum	18	33	18	25	5	37	6	2	37
Monitoring Sites	SWMP01-05, SWMP01-06, LTMP12-01, MCGR06-02, LAZR10-01, FTRP06-02	LNCH12-02, LTMP14-03, LBRT01-01	FTRP08-01	MGNS02-01	MGNS03-01	MCGR02-03, LAZR08-01	LNCH09-01	HNRY04-01	

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 1% in NR-4-2-U to 18% in NR-0-4-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

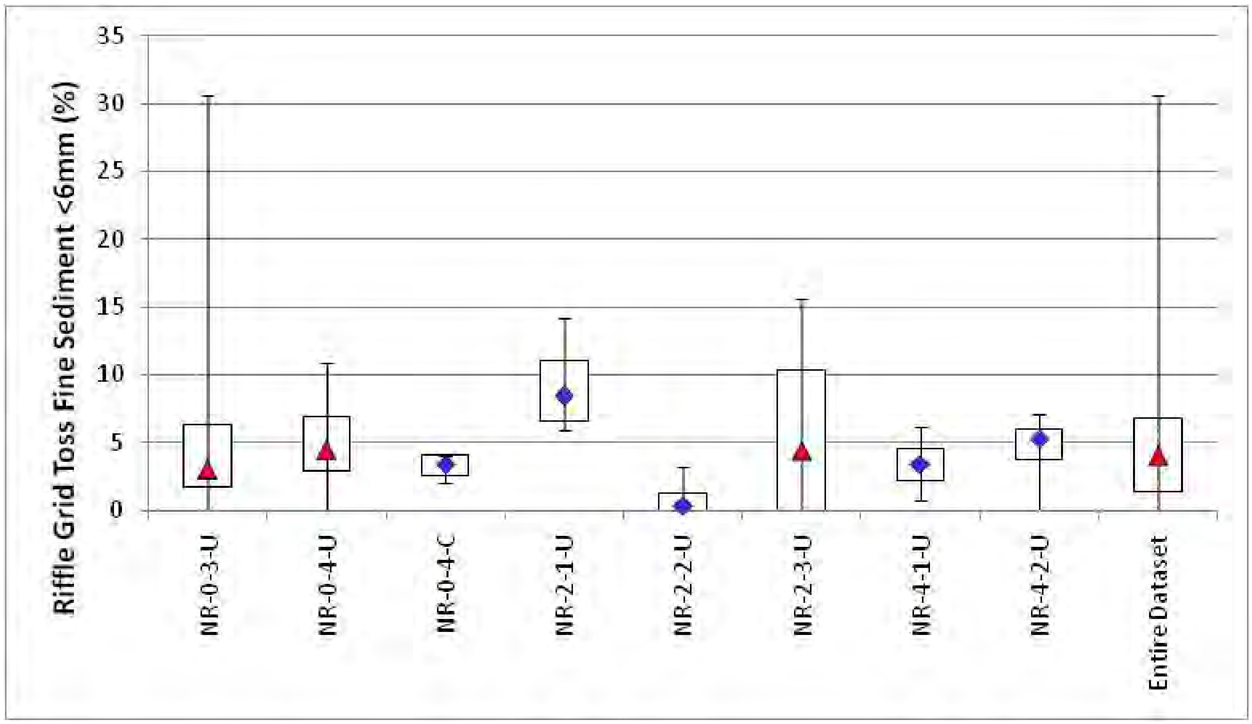
Table 3-5. Riffle Pebble Count <6mm

Statistical Parameter	Reach Type								
	NR-0-3-U	NR-0-4-U	NR-0-4-C	NR-2-1-U	NR-2-2-U	NR-2-3-U	NR-4-1-U	NR-4-2-U	Entire Dataset
# of Monitoring Sites	6	3	1	1	1	2	1	1	16
Sample Size	22	12	4	4	4	8	4	4	62
Minimum	0	0	12	7	2	8	1	0	0
25th Percentile	2	2	16	9	2	13	1	0	2
Median	6	3	18	11	4	17	2	1	6
75th Percentile	8	19	18	18	5	25	3	3	14
Maximum	28	42	19	33	6	37	6	5	42
Monitoring Sites	SWMP01-05, SWMP01-06, LTMP12-01, MCGR06-02, LAZR10-01, FTRP06-02	LNCH12-02, LTMP14-03, LBRT01-01	FTRP08-01	MGNS02-01	MGNS03-01	MCGR02-03, LAZR08-01	LNCH09-01	HNRY04-01	

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 Thompson Project Area range from 0% in NR-2-2-U to 8% in NR-2-1-U (**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

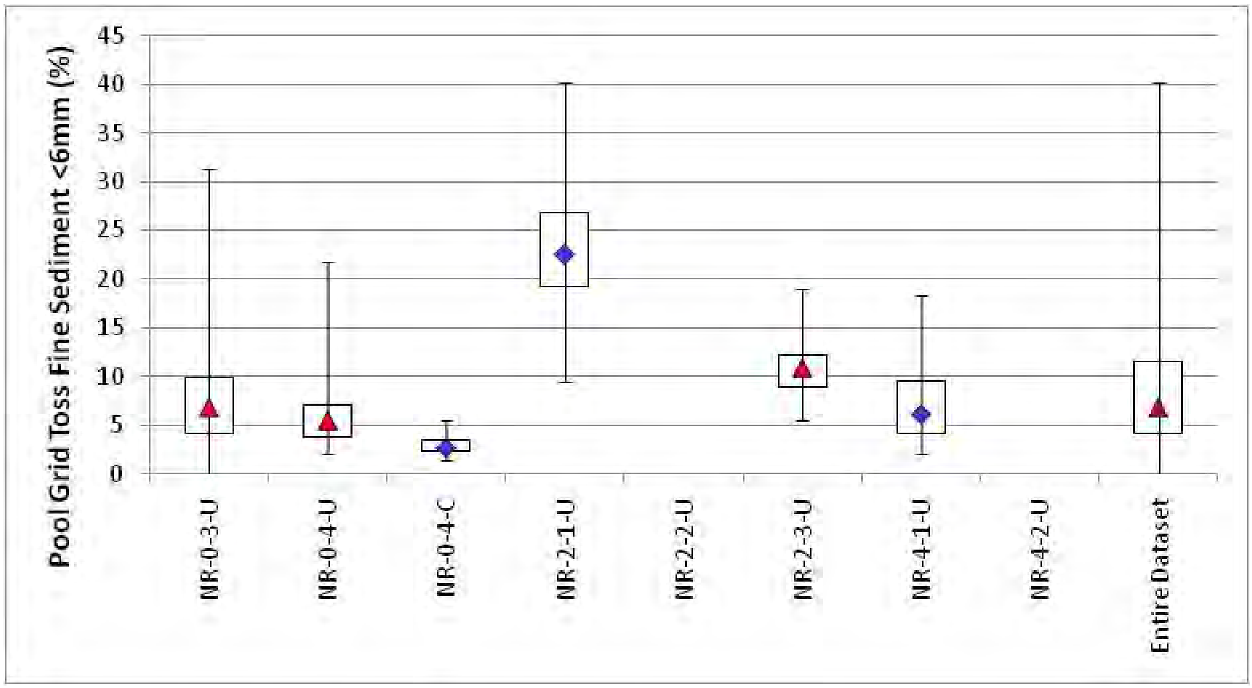
Table 3-6. Riffle Grid Toss Fine Sediment <6mm

Statistical Parameter	Reach Type								
	NR-0-3-U	NR-0-4-U	NR-0-4-C	NR-2-1-U	NR-2-2-U	NR-2-3-U	NR-4-1-U	NR-4-2-U	Entire Dataset
# of Monitoring Sites	6	3	1	1	1	2	1	1	16
Sample Size	22	12	4	4	4	8	4	4	62
Minimum	0	0	2	6	0	0	1	0	0
25th Percentile	2	3	3	7	0	0	2	4	1
Median	3	5	3	8	0	4	3	5	4
75th Percentile	6	7	4	11	1	10	5	6	7
Maximum	31	11	4	14	3	16	6	7	31
Monitoring Sites	SWMP01-05, SWMP01-06, LTMP12-01, MCGR06-02, LAZR10-01, FTRP06-02	LNCH12-02, LTMP14-03, LBRT01-01	FTRP08-01	MGNS02-01	MGNS03-01	MCGR02-03, LAZR08-01	LNCH09-01	HNRY04-01	

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 Thompson Project Area. Median values for pool tail-out grid toss fine sediment <6mm range from 3% in NR-0-4-C to 22% in NR-2-1-U (**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

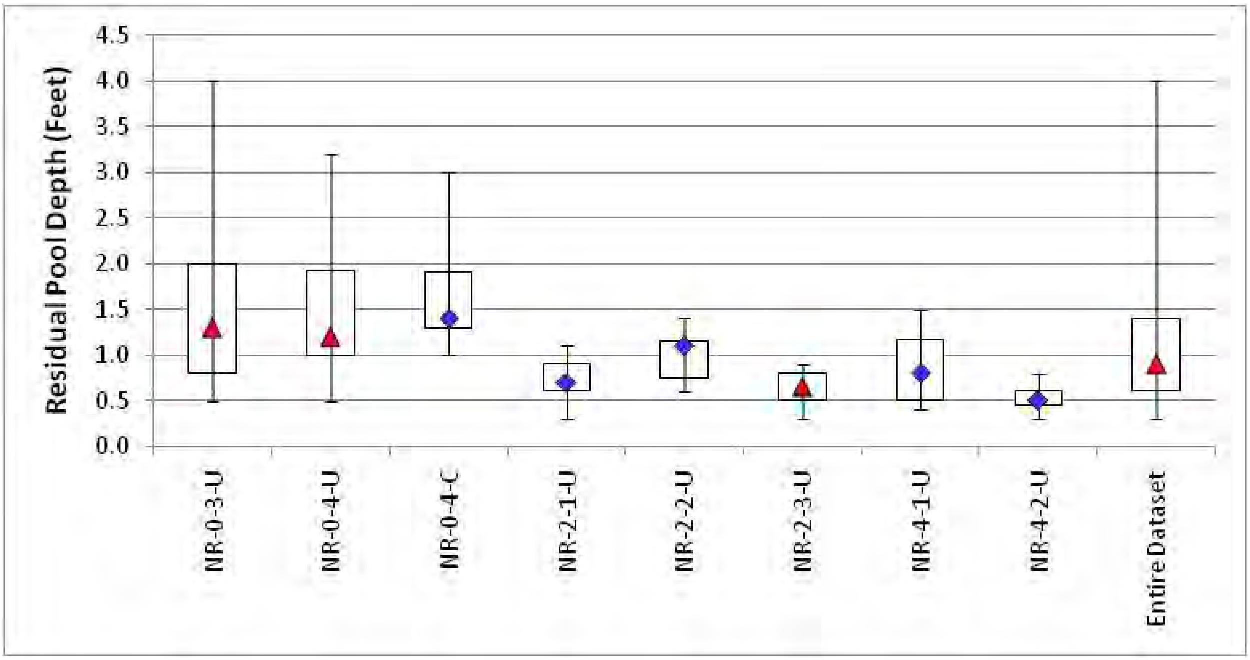
Table 3-7. Pool Tail-out Grid Toss <6mm

Statistical Parameter	Reach Type								
	NR-0-3-U	NR-0-4-U	NR-0-4-C	NR-2-1-U	NR-2-2-U	NR-2-3-U	NR-4-1-U	NR-4-2-U	Entire Dataset
# of Monitoring Sites	6	3	1	1	1	2	1	1	16
Sample Size	30	7	4	4	0	9	9	0	63
Minimum	0	2	1	10		5	2		0
25th Percentile	4	4	2	19		9	4		4
Median	7	5	3	22		11	6		7
75th Percentile	10	7	3	27		12	10		12
Maximum	31	22	5	40		19	18		40
Monitoring Sites	SWMP01-05, SWMP01-06, LTMP12-01, MCGR06-02, LAZR10-01, FTRP06-02	LNCH12-02, LTMP14-03, LBRT01-01	FTRP08-01	MGNS02-01	MGNS03-01	MCGR02-03, LAZR08-01	LNCH09-01	HNRY04-01	

Note: See Table 2-1 for reach type descriptions. No data was collected at the following monitoring sites since no potential spawning gravels were identified: LTMP12-01, LNCH12-02, MGNS03-01, MCGR02-03, and HNRY04-01.

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 0.5 feet in NR-4-2-U to 1.4 feet in NR-0-4-C (**Figure 3-9** and **Table 3-8**). This analysis indicates that the deepest pools are found in low gradient 3rd and 4th order streams in the Thompson 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

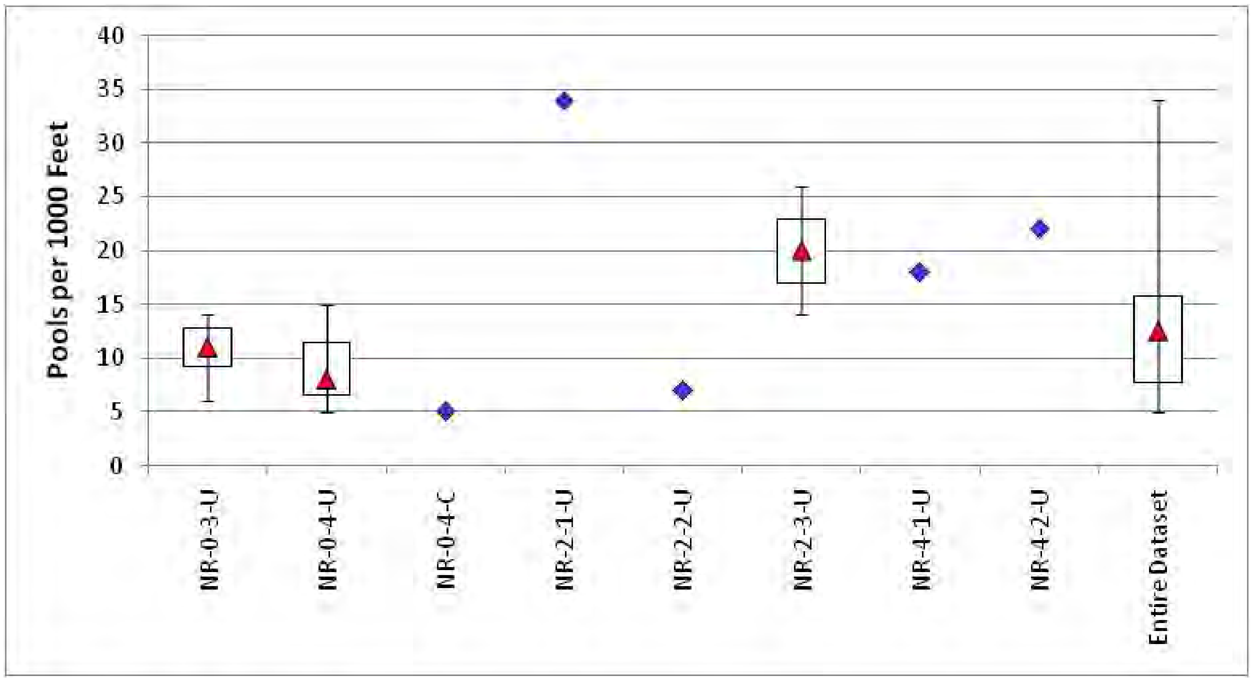
Table 3-8. Residual Pool Depth

Statistical Parameter	Reach Type								
	NR-0-3-U	NR-0-4-U	NR-0-4-C	NR-2-1-U	NR-2-2-U	NR-2-3-U	NR-4-1-U	NR-4-2-U	Entire Dataset
# of Monitoring Sites	6	3	1	1	1	2	1	1	16
Sample Size	57	28	5	17	7	20	18	11	163
Minimum	0.5	0.5	1.0	0.3	0.6	0.3	0.4	0.3	0.3
25th Percentile	0.8	1.0	1.3	0.6	0.8	0.5	0.5	0.5	0.6
Median	1.3	1.2	1.4	0.7	1.1	0.7	0.8	0.5	0.9
75th Percentile	2.0	1.9	1.9	0.9	1.2	0.8	1.2	0.6	1.4
Maximum	4.0	3.2	3.0	1.1	1.4	0.9	1.5	0.8	4.0
Monitoring Sites	SWMP01-05, SWMP01-06, LTMP12-01, MCGR06-02, LAZR10-01, FTRP06-02	LNCH12-02, LTMP14-03, LBRT01-01	FTRP08-01	MGNS02-01	MGNS03-01	MCGR02-03, LAZR08-01	LNCH09-01	HNRY04-01	

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 eight (NR-0-4-U) to 20 (NR-2-3-U) (**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								
	NR-0-3-U	NR-0-4-U	NR-0-4-C	NR-2-1-U	NR-2-2-U	NR-2-3-U	NR-4-1-U	NR-4-2-U	Entire Dataset
# of Monitoring Sites	6	3	*1*	*1*	*1*	2	*1*	*1*	16
Sample Size	6	3	*1*	*1*	*1*	2	*1*	*1*	16
Minimum	6	5	*5*	*34*	*7*	14	*18*	*22*	5
25th Percentile	9	7	*5*	*34*	*7*	17	*18*	*22*	8
Median	11	8	*5*	*34*	*7*	20	*18*	*22*	13
75th Percentile	13	12	*5*	*34*	*7*	23	*18*	*22*	16
Maximum	14	15	*5*	*34*	*7*	26	*18*	*22*	34
Monitoring Sites	SWMP01-05, SWMP01-06, LTMP12-01, MCGR06-02, LAZR10-01, FTRP06-02	LNCH12-02, LTMP14-03, LBRT01-01	FTRP08-01	MGNS02-01	MGNS03-01	MCGR02-03, LAZR08-01	LNCH09-01	HNRY04-01	

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.

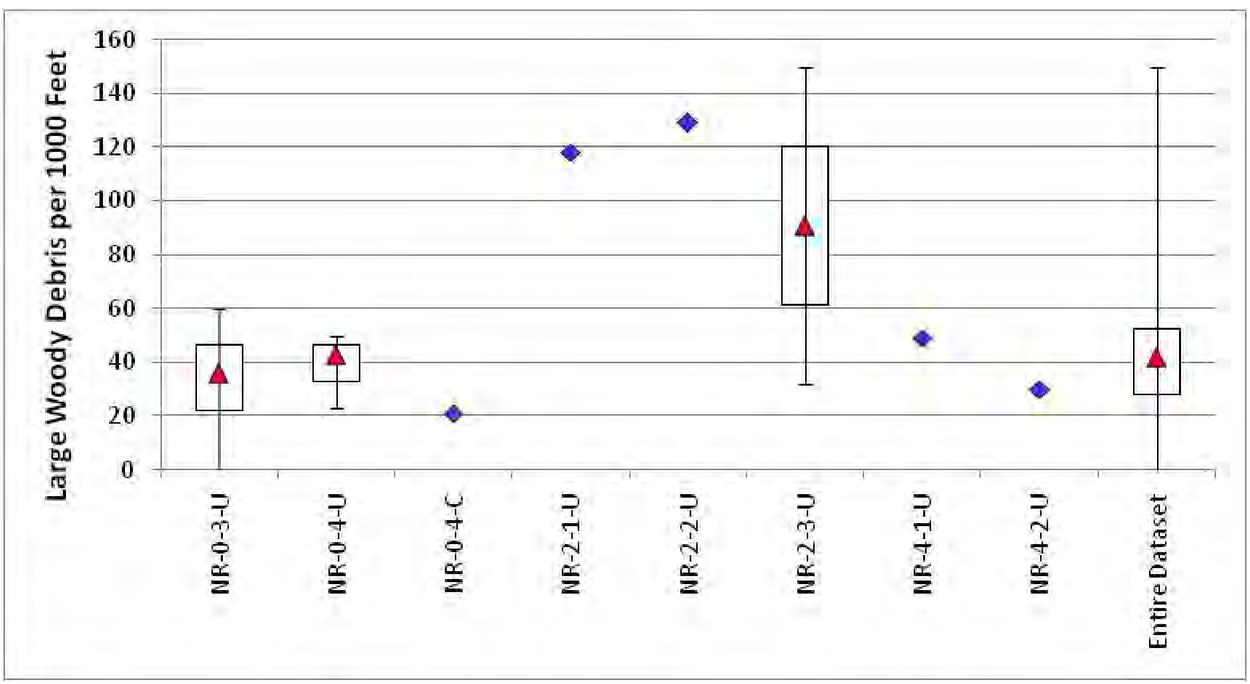
Table 3-10. Pools per Mile

Statistical Parameter	Reach Type								
	NR-0-3-U	NR-0-4-U	NR-0-4-C	NR-2-1-U	NR-2-2-U	NR-2-3-U	NR-4-1-U	NR-4-2-U	Entire Dataset
Minimum	32	26	*26*	*180*	*37*	74	*95*	*116*	26
25th Percentile	49	34	*26*	*180*	*37*	90	*95*	*116*	41
Median	58	42	*26*	*180*	*37*	106	*95*	*116*	66
75th Percentile	67	61	*26*	*180*	*37*	121	*95*	*116*	83
Maximum	74	79	*26*	*180*	*37*	137	*95*	*116*	180

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 per 1,000 feet ranged from 36 in NR-0-3-U to 91 in NR-2-3-U (**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								
	NR-0-3-U	NR-0-4-U	NR-0-4-C	NR-2-1-U	NR-2-2-U	NR-2-3-U	NR-4-1-U	NR-4-2-U	Entire Dataset
# of Monitoring Sites	6	3	*1*	*1*	*1*	2	*1*	*1*	16
Sample Size	6	3	*1*	*1*	*1*	2	*1*	*1*	16
Minimum	0	23	*21*	*118*	*129*	32	*49*	*30*	0
25th Percentile	22	33	*21*	*118*	*129*	62	*49*	*30*	28
Median	36	43	*21*	*118*	*129*	91	*49*	*30*	42
75th Percentile	46	47	*21*	*118*	*129*	121	*49*	*30*	53
Maximum	60	50	*21*	*118*	*129*	150	*49*	*30*	150
Monitoring Sites	SWMP01-05, SWMP01-06, LTMP12-01, MCGR06-02, LAZR10-01, FTRP06-02	LNCH12-02, LTMP14-03, LBRT01-01	FTRP08-01	MGNS02-01	MGNS03-01	MCGR02-03, LAZR08-01	LNCH09-01	HNRY04-01	

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.

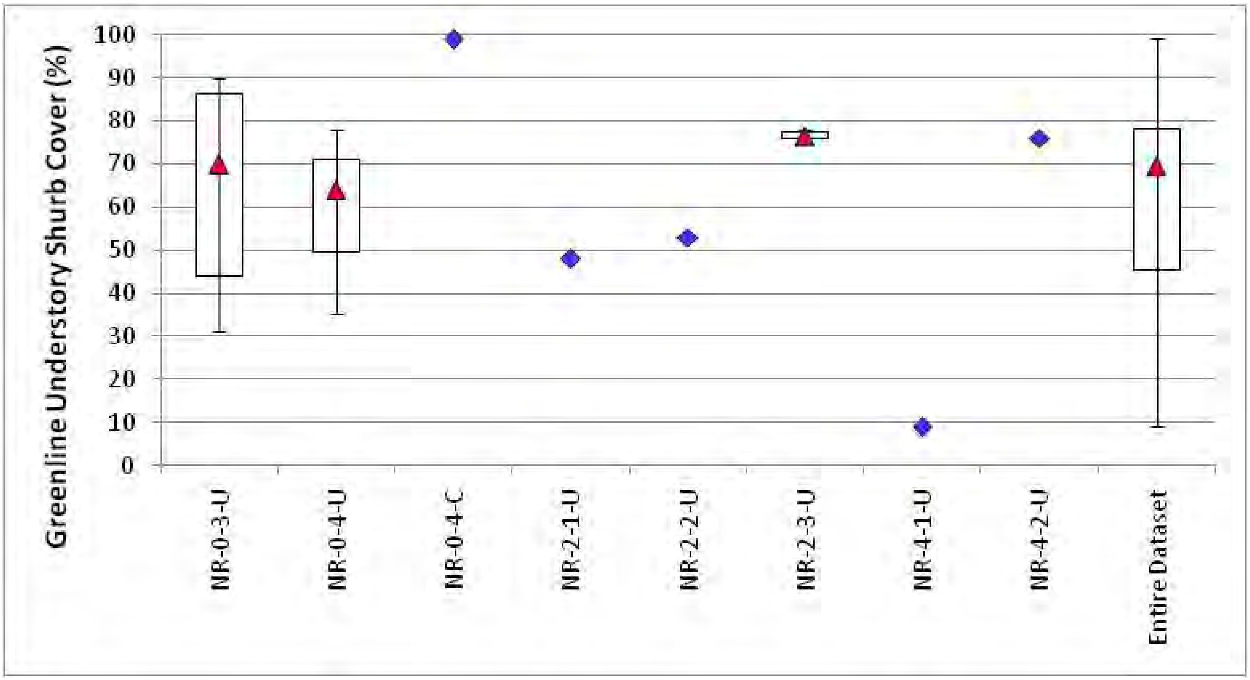
Table 3-12. Large Woody Debris per Mile

Statistical Parameter	Reach Type								
	NR-0-3-U	NR-0-4-U	NR-0-4-C	NR-2-1-U	NR-2-2-U	NR-2-3-U	NR-4-1-U	NR-4-2-U	Entire Dataset
Minimum	0	121	*111*	*623*	*681*	169	*259*	*158*	0
25th Percentile	116	174	*111*	*623*	*681*	325	*259*	*158*	149
Median	191	227	*111*	*623*	*681*	480	*259*	*158*	222
75th Percentile	245	246	*111*	*623*	*681*	636	*259*	*158*	277
Maximum	317	264	*111*	*623*	*681*	792	*259*	*158*	792

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 64% in NR-0-4-U to 77% in NR-2-3-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.
Figure 3-12. Greenline Understory Shrub Cover

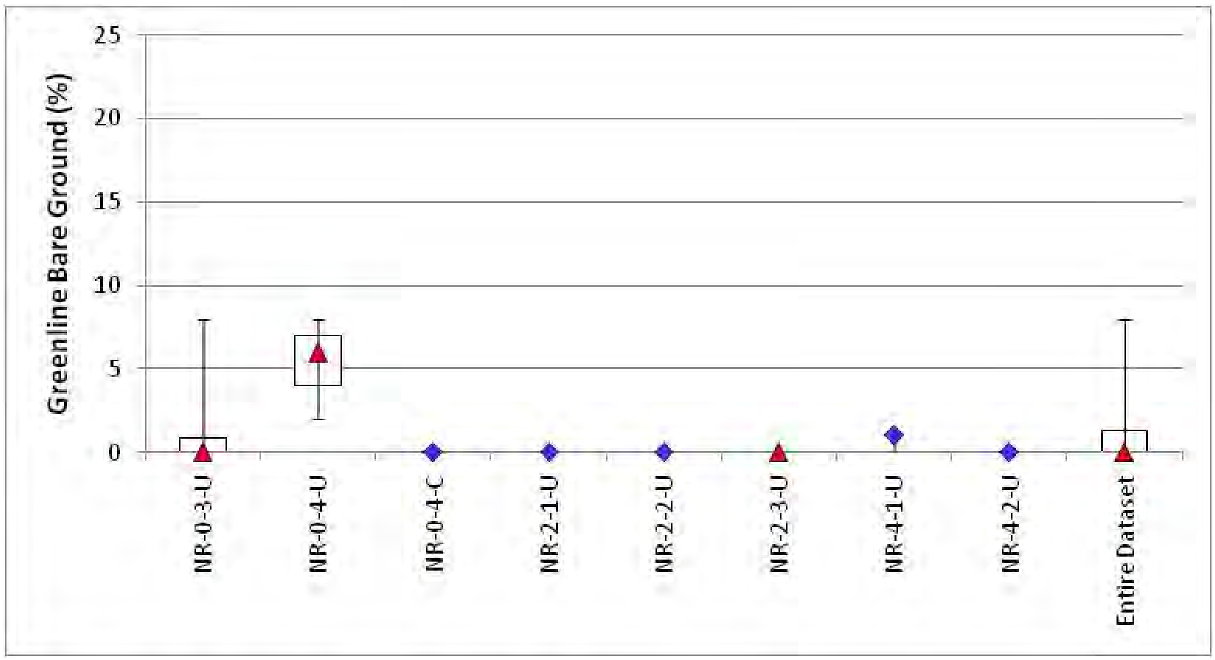
Table 3-13. Greenline Understory Shrub Cover

Statistical Parameter	Reach Type								
	NR-0-3-U	NR-0-4-U	NR-0-4-C	NR-2-1-U	NR-2-2-U	NR-2-3-U	NR-4-1-U	NR-4-2-U	Entire Dataset
# of Monitoring Sites	6	3	*1*	*1*	*1*	2	*1*	*1*	16
Sample Size	6	3	*1*	*1*	*1*	2	*1*	*1*	16
Minimum	31	35	*99*	*48*	*53*	75	*9*	*76*	9
25th Percentile	44	50	*99*	*48*	*53*	76	*9*	*76*	46
Median	70	64	*99*	*48*	*53*	77	*9*	*76*	70
75th Percentile	86	71	*99*	*48*	*53*	77	*9*	*76*	78
Maximum	90	78	*99*	*48*	*53*	78	*9*	*76*	99
Monitoring Sites	SWMP01-05, SWMP01-06, LTMP12-01, MCGR06-02, LAZR10-01, FTRP06-02	LNCH12-02, LTMP14-03, LBRT01-01	FTRP08-01	MGNS02-01	MGNS03-01	MCGR02-03, LAZR08-01	LNCH09-01	HNRY04-01	

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 to 6% in NR-0-4-U (**Figure 3-13** and **Table 3-14**).



Blue diamonds denote reach types with one monitoring site; red triangles denote more than one monitoring site.
Figure 3-13. Greenline Bare Ground

Table 3-14. Greenline Bare Ground

Statistical Parameter	Reach Type								
	NR-0-3-U	NR-0-4-U	NR-0-4-C	NR-2-1-U	NR-2-2-U	NR-2-3-U	NR-4-1-U	NR-4-2-U	Entire Dataset
# of Monitoring Sites	6	3	*1*	*1*	*1*	2	*1*	*1*	16
Sample Size	6	3	*1*	*1*	*1*	2	*1*	*1*	16
Minimum	0	2	*0*	*0*	*0*	0	*1*	*0*	0
25th Percentile	0	4	*0*	*0*	*0*	0	*1*	*0*	0
Median	0	6	*0*	*0*	*0*	0	*1*	*0*	0
75th Percentile	1	7	*0*	*0*	*0*	0	*1*	*0*	1
Maximum	8	8	*0*	*0*	*0*	0	*1*	*0*	8
Monitoring Sites	SWMP01-05, SWMP01-06, LTMP12-01, MCGR06-02, LAZR10-01, FTRP06-02	LNCH12-02, LTMP14-03, LBRT01-01	FTRP08-01	MGNS02-01	MGNS03-01	MCGR02-03, LAZR08-01	LNCH09-01	HNRY04-01	

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 LTMP12-01, followed by LBRT01-01 and LTMP14-03 (**Figure 3-14**).

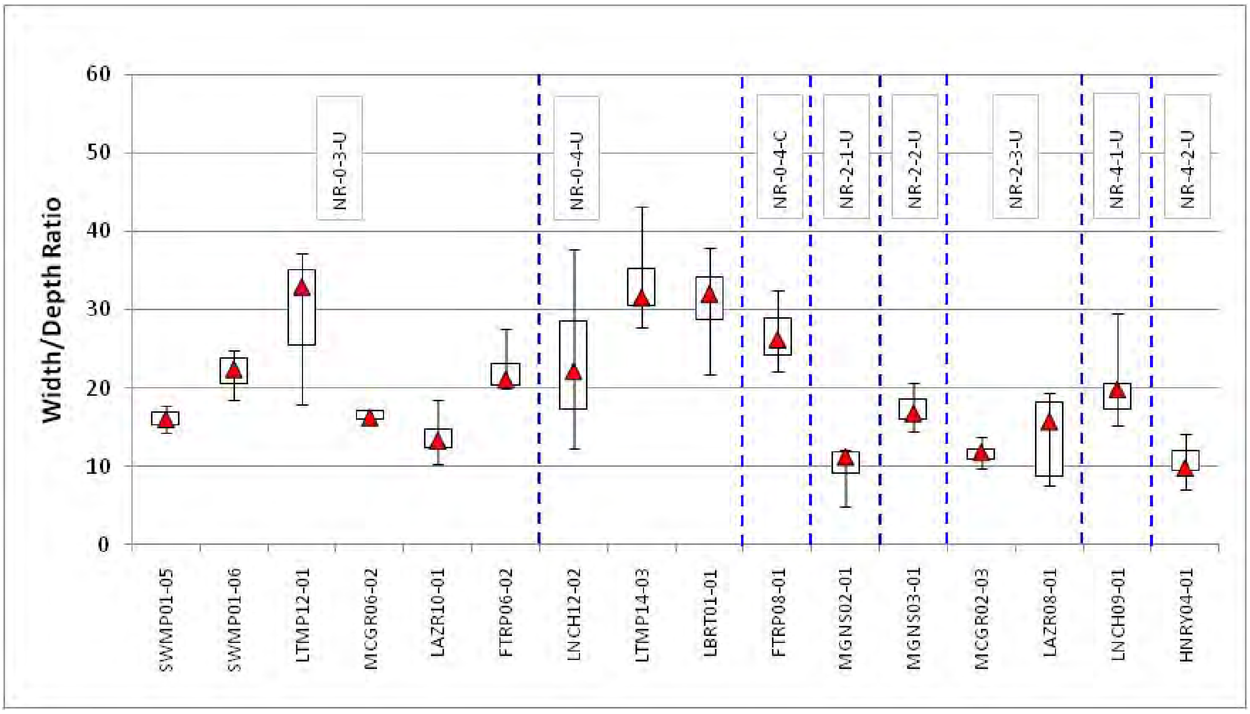


Figure 3-14. Width/Depth Ratio

3.2.2.2 Entrenchment Ratio

Median entrenchment ratio values measured within the Thompson Project Area indicates the following (**Figure 3-15**):

1. MCGR02-03 on McGregor Creek has the greatest amount of floodplain access out of the sites assessed.
2. Moderately entrenched conditions (entrenchment ratio 1.4-2.2) were documented in SWMP01-05, MGNS03-01, LTMP12-01, LTMP14-03, MCGR06-02, LAZR08-01, and FTRP06-02.

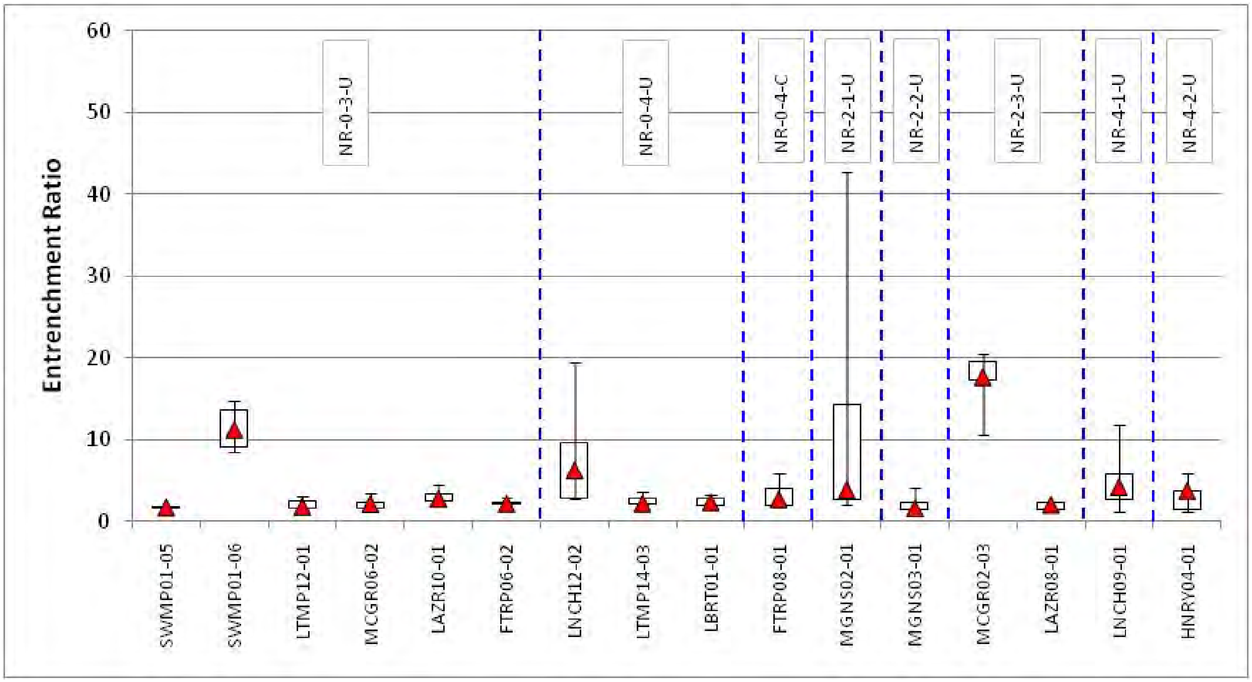


Figure 3-15. Entrenchment Ratio

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 LBRT01-01, followed by MCGR02-03 (**Figure 3-16**).

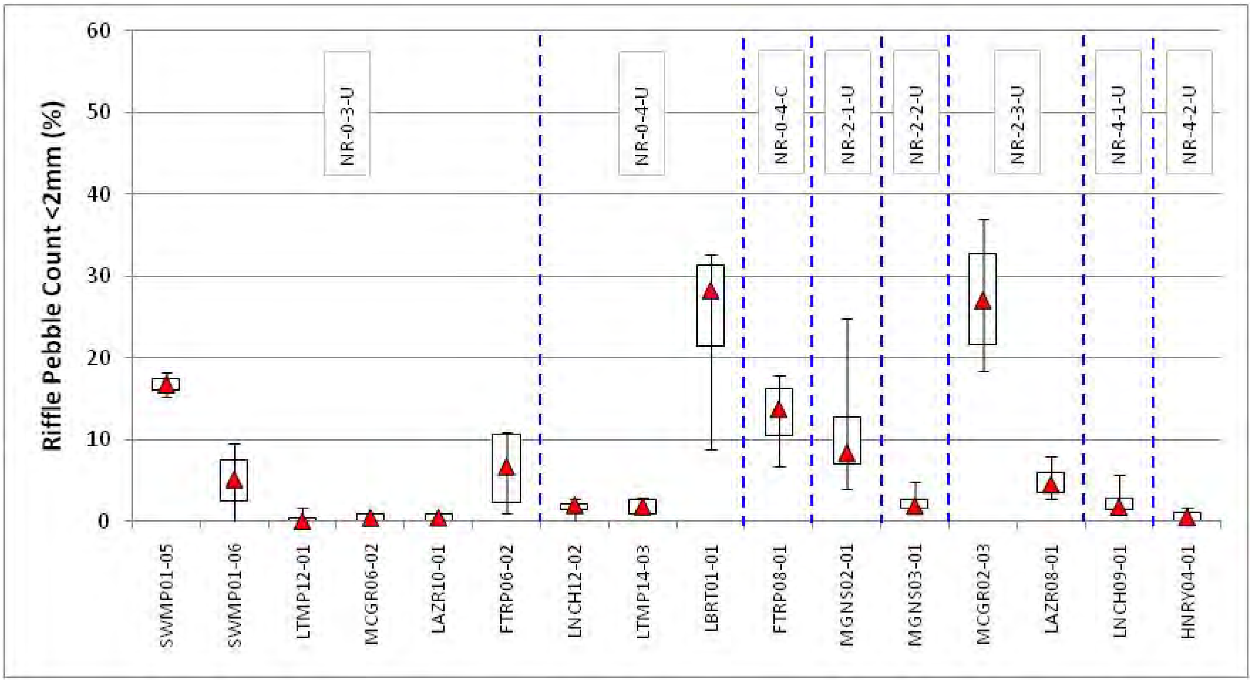


Figure 3-16. Riffle Pebble Count <2mm

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 LBRT01-01, followed by MCGR02-03 (**Figure 3-17**).

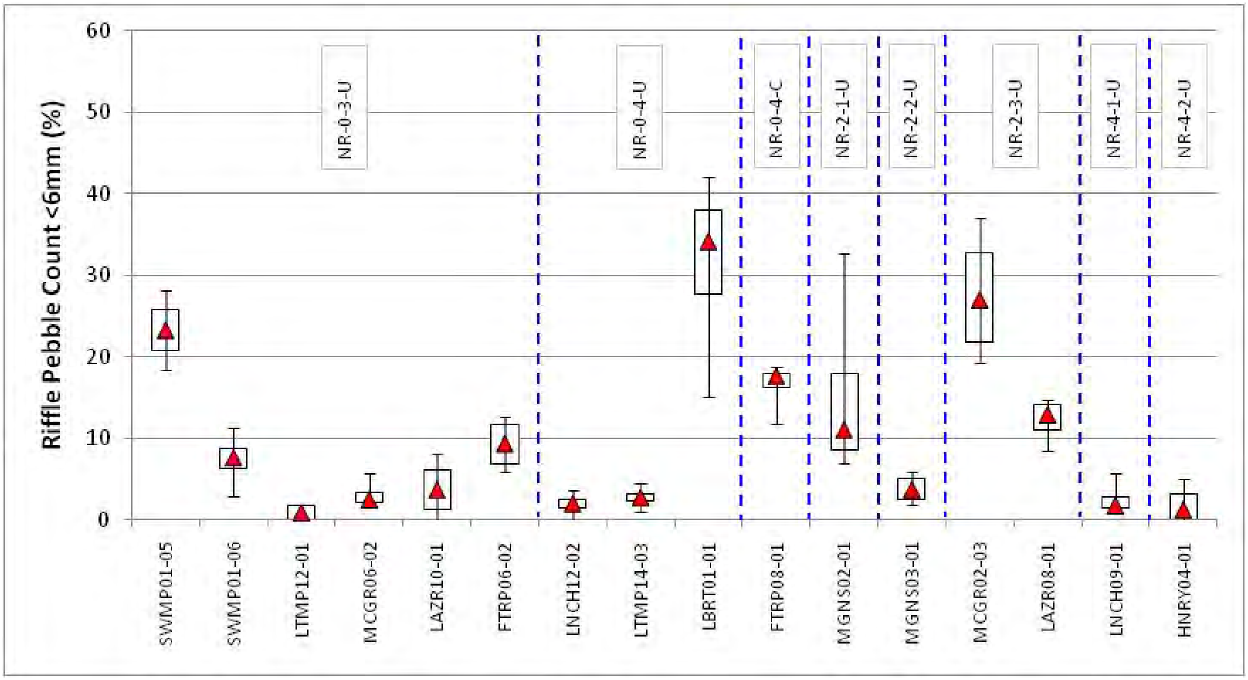


Figure 3-17. Riffle Pebble Count <6mm

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 SWMP01-05, followed by LAZR08-01 (**Figure 3-18**).

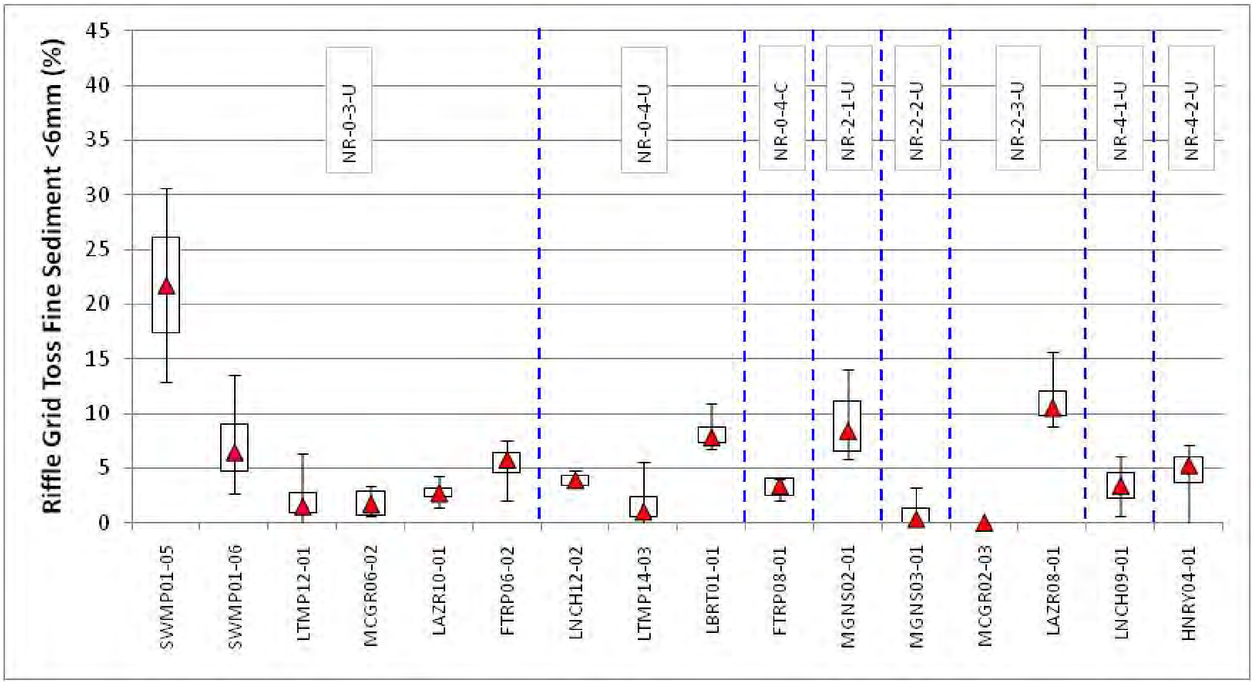


Figure 3-18. Riffle Grid Toss <6mm

3.2.2.6 Riffle Stability Index

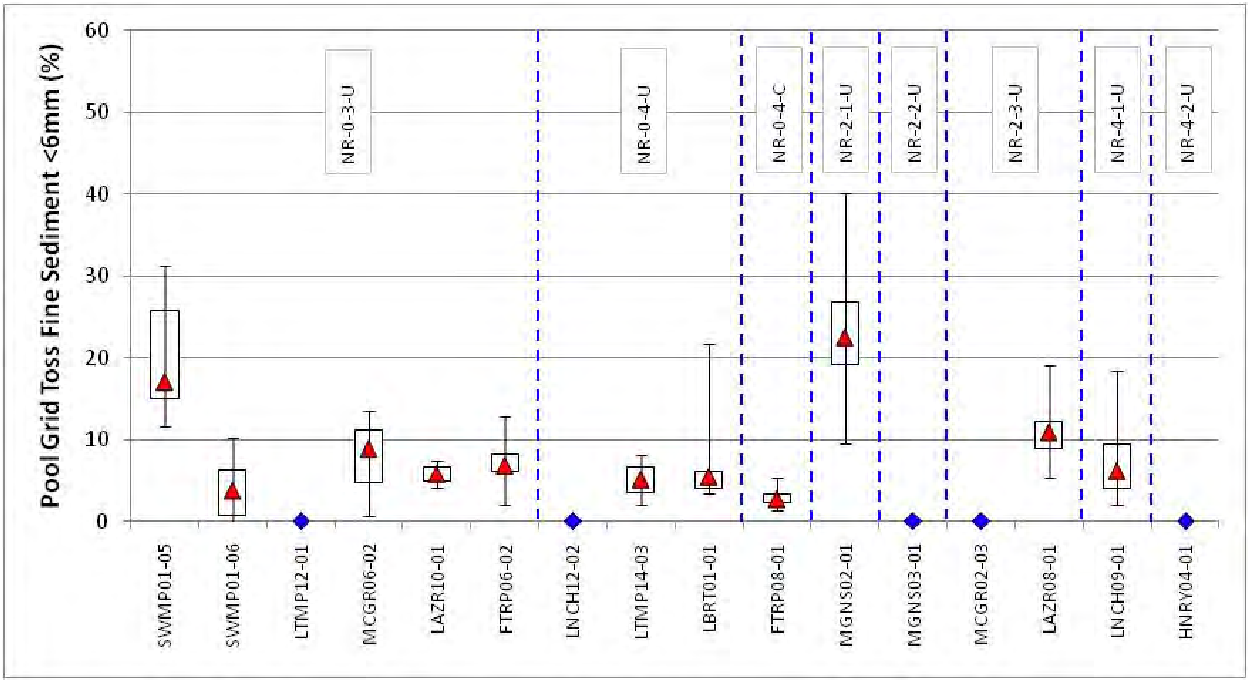
The mobile percentile of particles on the riffle is termed "Riffle Stability Index" (RSI) and provides a useful estimate of the degree of increased sediment supply to riffles. The RSI addresses situations in which increases in gravel bedload from headwater activities is depositing material on riffles and filling pools, and it reflects qualitative differences between reference and managed watersheds. Although the expected range varies some by stream type, increasing RSI values above 40-70 generally indicate increased sediment supply to riffles (Kappesser 2002). In the Thompson Project Area, RSI evaluations were performed in SWMP01-06, LNCH09-01, LTMP14-03, and LTMP12-01 (**Table 3-15**).

Table 3-15. Riffle Stability Index Summary

	Mobile Particle Analysis		Pebble Count Analysis		
Site	**Cell**	**Geometric Mean (mm)**	**Cell**	**D50 (mm)**	**RSI**
SWMP01-06	1	83	1	37	86
SWMP01-06	2	92	2	37	98
LNCH09-01	1	81	1	43	85
LNCH09-01	3	79	3	38	89
LNCH09-01	5	86	5	42	90
LTMP14-03	5	94	5	60	73
LTMP12-01	2	123	2	62	85

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 MGNS02-01, followed by SWMP01-05 and LAZR08-01 (**Figure 3-19**).



Blue diamonds denote sites in which no potential spawning gravels were identified and the pool tail-out grid toss was not performed.

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 SWMP01-05, followed by SWMP01-06 and LBRT01-01 (**Figure 3-20**). The lowest residual pool depth was found in HNRY04-01 and MCGR02-03.

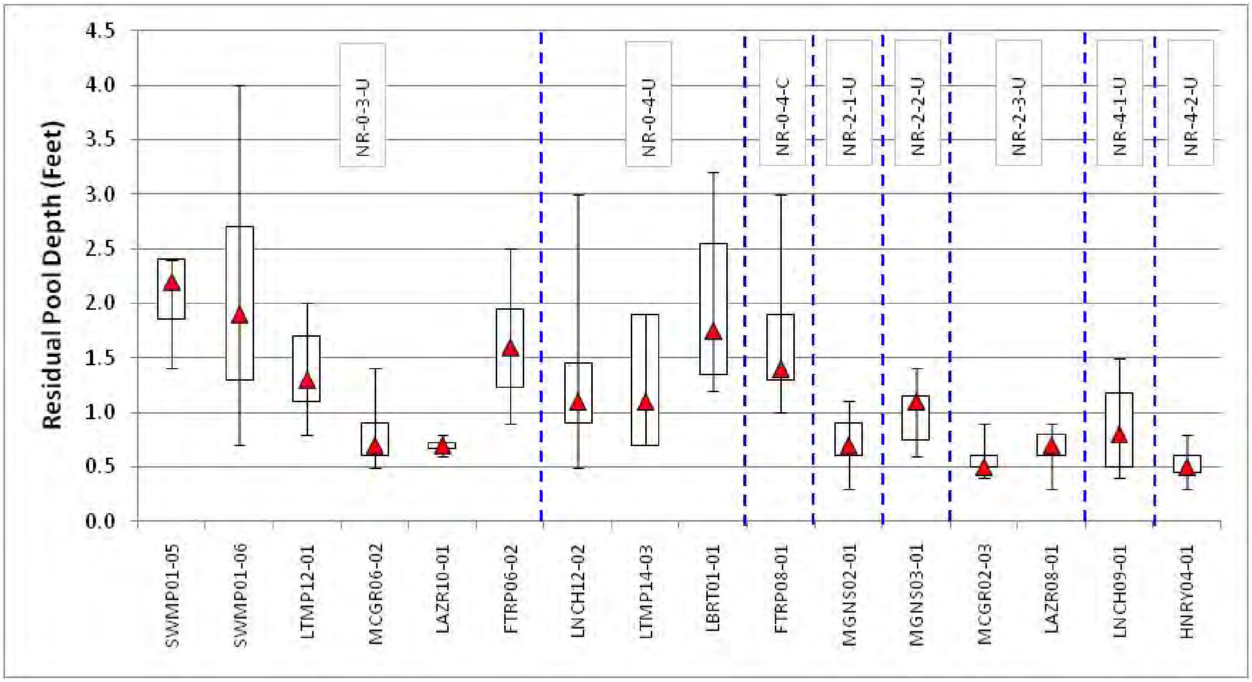


Figure 3-20. Residual Pool Depth

3.2.2.9 Pool and Large Woody Debris Frequency

MGNS02-01 had the greatest number of pools per 1000 feet, followed by LAZR08-01 and HNRY04-01 (**Figure 3-21**). MCGR02-03 had the greatest amount of large woody debris per 1000 feet, followed by MGNS03-01 and MGNS02-01, (**Figure 3-21**).

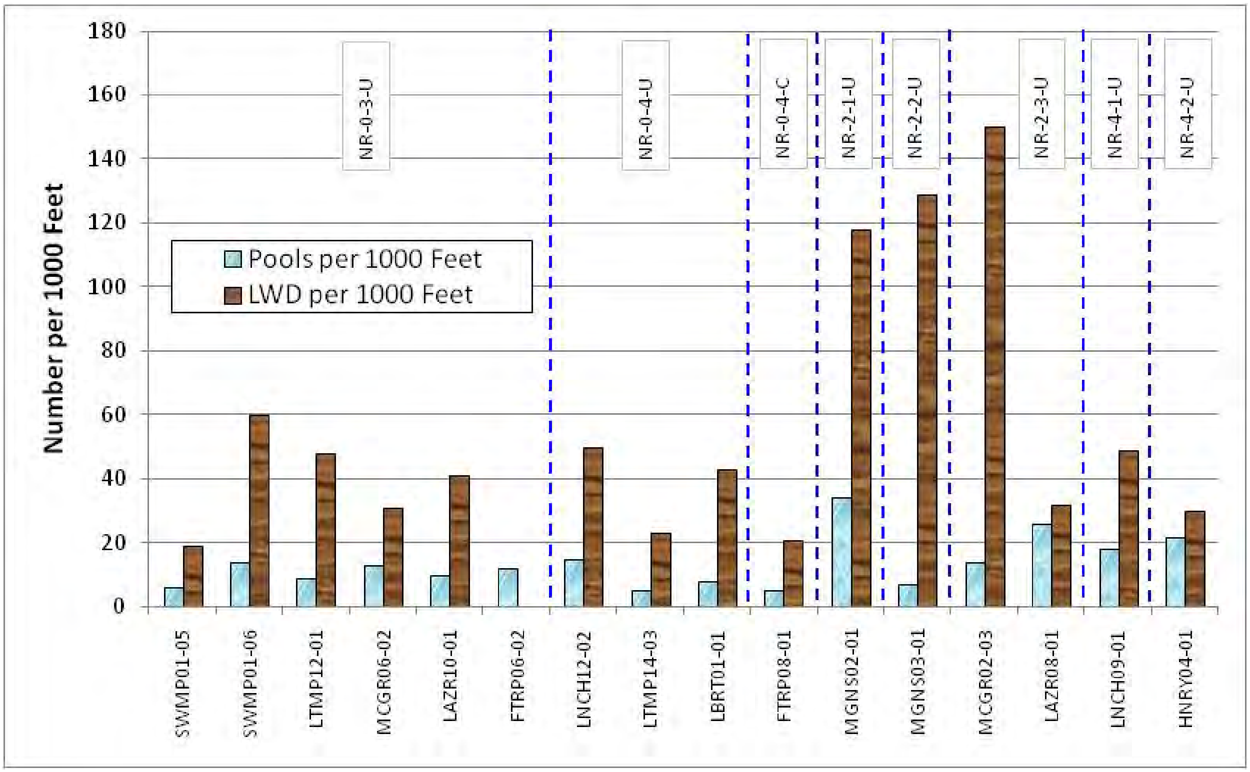


Figure 3-21. Pool and Large Woody Debris Frequency

3.2.2.10 Greenline Understory Shrub Cover

Understory shrub cover exceeded 50% at all except monitoring sites, except LNCH09-01, LNCH12-02, SWMP01-05, SWMP01-06, and MGNS02-01 (**Figure 3-22**).

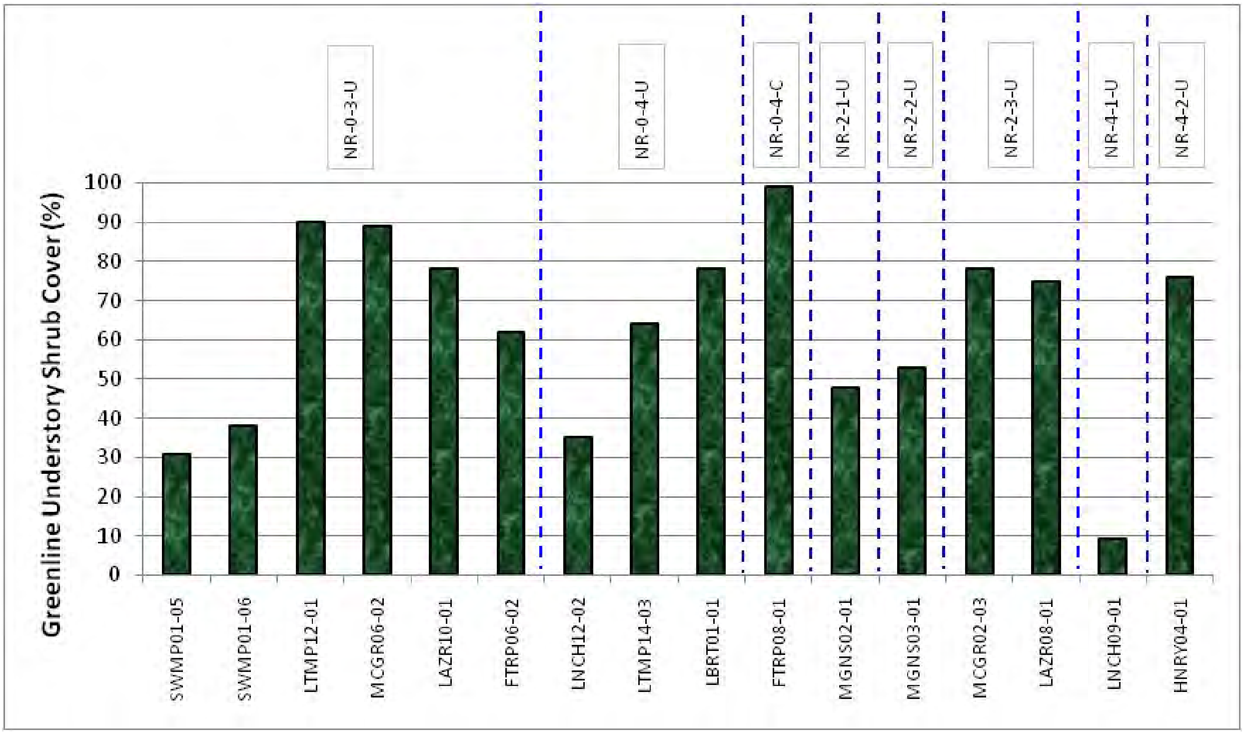


Figure 3-22. Greenline Understory Shrub Cover

3.2.2.11 Greenline Bare Ground

Mean bare ground values equaled or exceeded 5% in SWMP01-05, LNCH12-02, and LBRT01-01, with all other monitoring sites remaining below 5% (**Figure 3-23**).

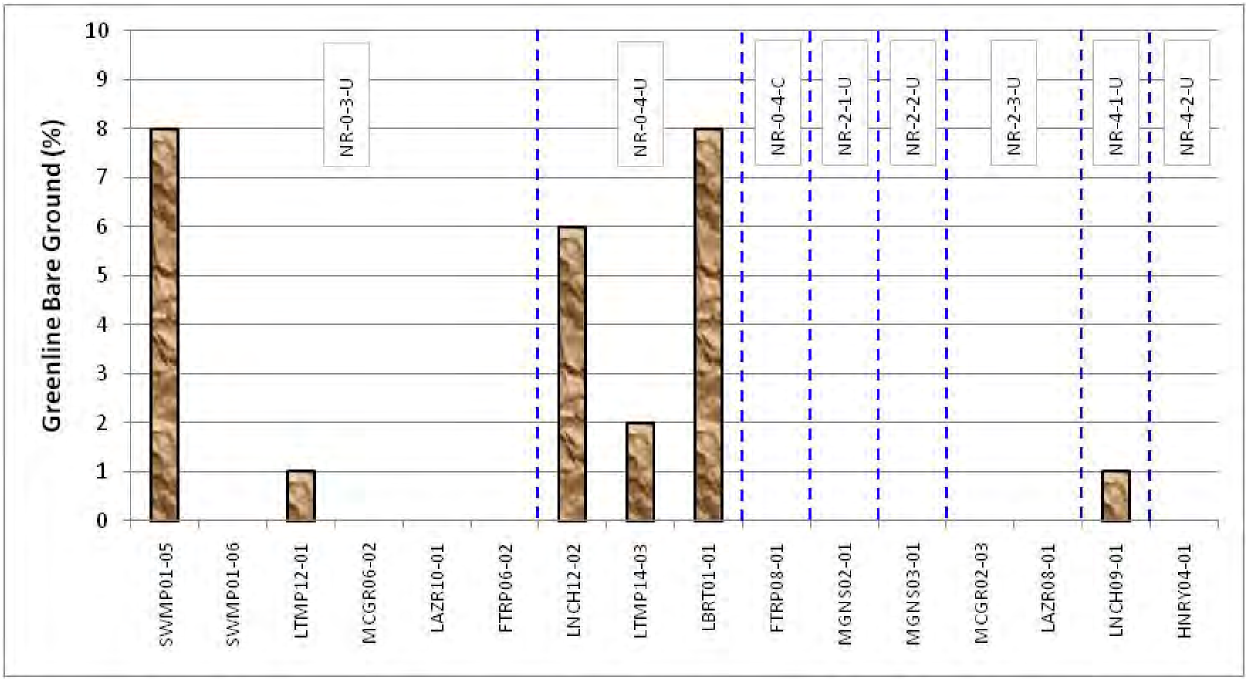


Figure 3-23. Greenline Bare Ground

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 there severity
- Description of stream channel conditions
- Description of streambank erosion conditions
- Description of riparian vegetation conditions

3.2.3.1 Fishtrap Creek – FTRP06-02

The FTRP06-02 monitoring site was assessed for potential reference conditions. Historic timber harvest was observed along this reach and has occurred in the Fishtrap Creek watershed. The monitoring site was located in a meadow area approximately 1.5 miles upstream of the confluence with the West Fork Fishtrap Creek. The meandering stream channel contained a well developed riffle-pool sequence, with deep pools formed at the outsides of meander bends. Pool tail-outs contained appropriate sized spawning gravels. Streambank erosion was occurring at the outsides of meander bends. Failed beaver dams were noted in the reach and eroding sediment deposits behind beaver dams may be a source of fine sediment to this system. Streambanks are comprised of relatively fine grained material, which is perhaps a remnant of historic beaver complexes. Riparian vegetation included small willows, grasses and wetland vegetation. The potential for this reach is a C4 stream type, while the existing condition ranges from C4 to B4c.

3.2.3.2 Fishtrap Creek – FTRP08-01

The FTRP08-01 monitoring site was assessed for potential reference conditions. The monitoring site was located approximately 2.2 miles downstream of the confluence with the West Fork Fishtrap Creek. Historic timber harvest has occurred in the Fishtrap Creek watershed and tree stumps were observed in the riparian corridor along this reach. The Fishtrap McGinnis road parallels the reach, encroaching on the channel at the downstream end of the monitoring site. This reach contained long glides with well-vegetated undercut banks downstream of relatively deep pools at meander bends. Larger gravel in these glides may provide spawning habitat for sufficiently large fish. The streambed was comprised of gravels and small cobbles, with a well defined riffle-pool sequence. Riparian vegetation consisted of alder and red osier dogwood with conifers extending up the hillslope on river right. The potential for this reach is a C4 stream type, while the existing condition ranges from B4c to C4.

3.2.3.3 Henry Creek – HNRY04-01

HNRY04-01 was located adjacent to the road that parallels the stream along the narrow valley bottom. Timber harvest has occurred in the watershed, but not adjacent to the reach. The channel was a relatively straight riffle-dominated cascade with small pocket pools and coarse substrate. Pools were relatively shallow and the substrate was too large to support spawning. The channel was lined with alders and the streambanks contained relatively coarse material, which limits overall sediment loads from streambank erosion, though many of the streambanks were exposed. The potential for this reach is a B3a stream type, while the existing condition ranges from F3a to E3a to C3/4a to B4a. The restoration potential for this reach is low due to the narrow valley bottom, steep channel gradient, large substrate size, and close proximity of the road.

3.2.3.4 Lazier Creek – LAZR08-01

LAZR08-01 was located downstream of the confluence with Whitney Creek. Timber harvest and riparian grazing are the primary land-use activities along this reach, while extensive timber harvest has occurred throughout the Lazier Creek watershed. Portions of this reach were completely overgrown with Hawthorn, rendering them inaccessible, with the remainder of the reach lined with grasses and wetland vegetation. The meandering channel contained a well defined riffle-pool sequence with a fine gravel substrate that created spawning conditions well suited for the small fish that likely inhabit this stream. Streambank erosion was occurring at the outsides of meander bends. The potential for this reach is an E4 stream type, while the existing condition ranges from E4b to B4. The restoration potential for this reach is moderate.

3.2.3.5 Lazier Creek – LAZR10-01

LAZR10-01 is located approximately 0.1 miles upstream of the mouth, where Lazier Creek joins the Thompson River. Historic timber harvest is the primary land-use activity along this reach, while extensive timber harvest has occurred throughout the Lazier Creek watershed. The channel was predominately comprised of long riffles with a cobble substrate and few pools. Streambank erosion was observed at channel bends, though streambanks were generally stabilized by deep rooting vegetation and armored by cobbles and large woody debris. Alder, hawthorn and red osier dogwood comprised the riparian shrub community, with larger conifers on the hillslopes above the stream. The potential for this reach is a B4 stream type, while the existing condition ranges from C4b to E4b to B4. The restoration potential for this reach is moderate and could include increasing riparian shrub density and diversity.

3.2.3.6 Little Bitterroot River – LBRT01-01

LBRT01-01 is located approximately 0.5 miles downstream of Hubbart Reservoir. Grazing is the primary land-use adjacent to this reach, along with timber harvest in the upper watershed. Pugging and hummocking were noted and the wetland vegetation was heavily browsed. Streamflows were relatively high and appeared to be near bankfull during the site visit on September 13, 2011. The cold water was tannic colored and there was an organic smell emanating from the stream. A local rancher indicated that this reservoir is operated for irrigation purposes and the water is shut off in mid-September, leaving only tributary stream inputs to sustain the streamflow. The streambed was composed of fine gravel and sand that easily formed depressions and pools behind large woody debris and overhanging streamside vegetation. The majority of the channel was a deep run, with a few short riffles. There was a layer of fine material coating the streambed and extensive aquatic vegetation. Extensive hoof shear was observed along the grass covered streambanks, though streambank erosion appeared limited due to stable streamflows resulting from reservoir operations that created conditions resembling a spring creek. The potential for this reach given the upstream reservoir is a C4 stream type, while the existing condition ranges from B4c to C4. The restoration potential for this reach is moderate and could involve improved grazing management to encourage the development of a riparian shrub community.

A site visit was also conducted to LBRT01-05 near the lower end of the sediment impaired stream segment of the Little Bitterroot River. This site visit was accompanied by the landowner who provided valuable insight into how the dam was operated. This site was similar to LBRT01-01, though the channel was more sinuous and streambank erosion appeared more severe. This site is actively used for livestock grazing. Woody vegetation was essentially absent along the stream channel and the wetland vegetation was heavily browsed. The channel was a deep run with a streambed comprised of fine gravel and sand, with deep pools at the outsides of meander bends.

3.2.3.7 Little Thompson River – LTMP12-01

LTMP12-01 is located approximately 1.0 miles upstream from the confluence with the North Fork Little Thompson River. A dense band of alders line the stream channel along this reach, covering the narrow valley bottom, while conifers reside on the hillslopes. Historic logging and on-going grazing are the primary land-uses along this reach, with the Little Thompson River Road situated on the river right hillslope. Selective browse of the wetland vegetation along the channel margin was observed and hoof shear was noted along the streambanks. The streambed was comprised of coarse gravel and cobble substrate, with a good distribution of riffles and pools. Multiple depositional features suggest aggradation is occurring and the upper two study cells are braided. In places, the depositional features constrict the channel, leading to the formation of deep pools, though the large substrate size limits spawning potential. Flow constrictions due to depositional features also lead to localized streambank erosion, though the streambanks were comprised of coarse gravel and cobbles, which likely limits the overall retreat rate. A layer of fine silt was noted in slow water areas, potentially from aerial deposition from the adjacent roadbed. Imbricated cobbles on point bars suggest active bedload transport. The potential for this reach is a B3 stream type, while the existing condition ranges from F3 to C3 to B3c. The restoration potential for this reach is low. The addition of large woody debris aggregates to improve pool habitat and enhance channel complexity would likely be beneficial.

3.2.3.8 Little Thompson River – LTMP14-03

LTMP14-03 is located approximately 0.6 miles upstream from the mouth where the Little Thompson River joins the Thompson River. Historic logging and ongoing grazing are the primary land-use activities along this reach, along with extensive logging throughout the Little Thompson River watershed. The Plum Creek Forest Hydrologist noted that a cooperative grazing management plan is in place along the Little Thompson River. The stream channel was primarily comprised of riffle habitat with a cobble substrate and a few deep pools formed by large woody debris, which is generally limited throughout the reach. Spawning potential was limited to a few discrete non-typical locations. Streambanks were generally armored with larger cobbles, which likely limit overall bank retreat, though some channel over-widening was observed. The riparian corridor included alder and conifers, with alder re-appearing following the implementation of the grazing management plan according to the Plum Creek Forest Hydrologist. The potential for this reach is a C3 stream type, while the existing condition ranges from B3c to B4c to C4. The restoration potential for this reach is moderate, with improving conditions noted. The addition of large woody debris aggregates to improve pool habitat and enhance channel complexity would likely be beneficial. In addition, Marten Creek, which is a tributary to the Little Thompson River entering at the downstream end of the LTMP14-03 monitoring site, was slightly turbid during the site visit on September 12, 2011.

3.2.3.9 Lynch Creek – LNCH09-01

LNCH09-01 is located in a forested area that was likely logged at one time. Timber harvest has occurred throughout the Lynch Creek watershed and signs of grazing were observed at the monitoring site. Extensive gravel deposits suggest this reach is aggrading. Historic logging along the channel margin may have destabilized the streambanks, leading to channel over-widening and aggradation as streambank sediment deposited in the channel exceeds the stream's transport capacity. A large deposit of coarse sediment was observed at the boundary between cell 4 and cell 5. Channel aggradation and over-widening, coupled with a lack of deep pools, limits the amount of quality fish habitat within this reach. Streambank erosion was frequent; often occurring where gravel bars direct the flow toward the bank, with the stream commonly eroding into the surrounding forest floor. Understory shrub cover was lacking due to the dense coniferous overstory. The potential for this reach is a B4 stream type, while the existing condition ranges from C4b to F4b. The restoration potential for this reach is low, though watershed wide management practices may influence the level of aggradation observed along this reach.

3.2.3.10 Lynch Creek – LNCH12-02

LNCH12-02 is located downstream of the Lower Lynch Creek Road crossing in an area used for livestock grazing and irrigation water diversion. Hummocking and hoof trampling was noted, resulting in stream channel over-widening and streambank erosion. Streambanks were generally comprised of loose cobble and relatively unconsolidated soil. The stream channel fluctuates between single and multiple channels with coarse gravel and small cobble comprising the substrate. Several deep pools with undercut streambanks provide good fish habitat. Streambank erosion was common and streamside vegetation was comprised primarily of hawthorn and alder, with a few cottonwood trees. The potential for this reach is a C4 stream type, while the existing condition ranges from E4 to C4 to C3. The restoration potential for this reach is high, and could include grazing management and willow plantings, along with timber harvest best management practices in the upper watershed.

3.2.3.11 McGinnis Creek – MGNS02-01

MGNS02-01 was located upstream of the uppermost road crossing in an area that has re-grown following historic timber harvest. Signs of livestock grazing were also observed. Frequent large woody debris led to the formation of small pools. Streambed substrate was comprised of cobbles and small boulders and spawning potential was limited, though some small pockets of spawning sized gravels were observed. Streambank erosion was limited, primarily occurring in areas where large woody debris directed flow towards the streambank. A dense coniferous overstory limits the development of riparian shrubs, though some alders occur along the channel margin. The potential for this reach is a B3 stream type, while the existing condition ranges from C4b to E4b to E3b to B4. The restoration potential for this reach is low.

3.2.3.12 McGinnis Creek – MGNS03-01

MGNS03-01 was located upstream of the Corona Road crossing. Numerous fallen trees spanned the channel, though most remained elevated above the streambed and had relatively little influence on channel morphology. Pools were generally shallow and formed by large woody debris across the channel. Timber harvest is the primary land use within this watershed and likely occurred along this site at one time, though the reach is now forested, with alders along the channel margin and conifers in the overstory. Streambank erosion was limited by the large angular cobble material that comprised the streambanks. The potential for this reach is a B3 stream type, while the existing condition ranges from F3b to C3b to B3. The restoration potential for this reach is low.

3.2.3.13 McGregor Creek – MCGR02-03

The MCGR02-03 monitoring site was located approximately 1.2 miles downstream of McGregor Lake and streamflow is regulated for irrigation purposes. Highway 2 crosses the stream on a large fill slope approximately 500 from upstream from the top of the monitoring site. Timber harvest has occurred along this monitoring site and throughout the McGregor Creek watershed. This small stream channel appeared extremely stable and wetland vegetation was growing into the flowing portion of the channel. The channel contained a cobble substrate and was often spanned by fallen trees, though pool formation was limited. Streambank erosion was limited by the lack of exposed streambanks. Wetland vegetation lines the entire reach, along with sparse young alders. The potential for this reach given the upstream reservoir is an E3 stream type, while the existing condition ranges from C3 to E3. The restoration potential for this reach is low due to the large channel substrate and relative lack of stream power.

3.2.3.14 McGregor Creek – MCGR06-02

MCGR06-02 is located along Highway 2, which has confined the valley bottom reducing the stream’s access to the floodplain. Alders and red osier dogwood line the stream channel, with a forested hillslope on river left and Highway 2 on river right. Historic logging, channelization by Highway 2, and flow regulation from McGregor Lake are the primary anthropogenic disturbances along this reach. The stream channel contained a stable riffle-pool sequence with a streambed comprised of gravel, cobble and small boulders. The boulder formed pools tended to lack spawning sized substrate. Streambank erosion was limited by the extensive shrub cover and large streambank material, while relatively stable streamflows from McGregor Lake may also play a role. The potential for this reach given the constraints placed by Highway 2 is a B4 stream type, while the existing condition ranges from B4c to C4. The restoration potential for this reach is low due to confinement by Highway 2.

During the field assessment in September of 2011, MCGR09-03/04 was also assessed on McGregor Creek upstream of the confluence with the Thompson River. A local ranch caretaker indicated that McGregor Creek “ends” upstream of this reach and they considered this reach to be a ditch. In this reach, McGregor Creek has been channelized to flow through a field used for irrigated agriculture. The stream channel is narrow, deep and somewhat entrenched, with a fine sediment substrate and reed canary grass lining the streambanks. Streambank erosion, a lack of riparian shrub cover, and a fine sediment dominated streambed was also observed along the Thompson River downstream of the confluence with McGregor Creek.

3.2.3.15 Swamp Creek – SWMP01-05

SWMP01-05 was located in a meadow area that may have been logged and was likely grazed historically, though no signs of recent grazing were observed. Historic logging in the upper watershed may have increased water yields, sediment loads, and affected stream morphology. The stream channel was primarily comprised of slow moving runs with deep pools at meander bends and infrequent short riffles. Channel substrate was primarily fine gravel and clay, which limited spawning potential. The stream channel appeared slightly entrenched, with tall eroding streambanks comprised primarily of clay located at meander bends. The channel margin was lined with reed canarygrass, sparse alders, and wetland vegetation at the lower end of point bars. The potential for this reach is a C4 stream type, with an existing condition of B4c that is slightly entrenched. The restoration potential for this reach is moderate and could include an increase in riparian shrub density, along with a decrease in streambank erosion.

3.2.3.16 Swamp Creek – SWMP01-06

SWMP01-06 was located in an area historically used for crop production and grazing that has been allowed to recover over the past 25 years by the current landowner. Historic logging in the upper watershed may have increased water yields, sediment loads, and affected stream morphology along Swamp Creek. The stream channel contained a well developed riffle-pool sequence, with gravel and small cobble substrate creating good potential spawning habitat. Transverse and mid-channel bar depositional features suggest elevated sediment loads from higher in the watershed. The adjacent landowner reported recent beaver activity, though high flows in 2011 removed the beaver dams. Streambank erosion was limited to meadow areas that lacked stabilizing woody streamside vegetation, while areas lined with alders were relatively stable. The potential for this reach is a C4 stream type, which is the existing condition. The restoration potential for this reach is moderate and could include riparian plantings along streambanks that currently lack woody vegetation.

4.0 Streambank Erosion Assessment

4.1 Methods

Streambank erosion data was collected at 16 monitoring sites in the Thompson Project Area. At each of the 16 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 Thompson Project Area include historic timber harvest in Fishtrap Creek, McGregor Creek, and McGinnis Creek, along with historic agricultural practices along Swamp Creek. 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 16 monitoring sites in eight different reach types. For each monitoring site, the streambank erosion sediment load was normalized to 1000 feet. Streambank erosion data was then grouped into five categories for the purpose of analysis and extrapolation, as follows: 1) low gradient (<2% slope) 3rd order reach types (NR-0-3-U), 2) low gradient (<2% slope) 4rd order reach types (NR-0-4-C, NR-0-4-U), 3) moderate gradient (2-4% slope) 1st and 2nd order reach types (NR-2-1-U, NR-2-2-U), 4) moderate gradient (2-4% slope) 3rd order reach types (NR-2-3-U), and 5) high gradient (4-10% slope) 1st and 2nd order reach types (NR-4-1-U, NR04-2-U) (**Table 4-2**).

Table 4-2. Reach Type Data Groupings for Thompson Project Area Monitoring Sites

Reach Type	Number of Monitoring Sites	Monitoring Sites
NR-0-3-U	6	FTRP06-02, LAZR10-01, LTMP12-01, MCGR06-02, SWMP01-05, SWMP01-06
NR-0-4-C	1	FTRP08-01
NR-0-4-U	3	LBTR01-01, LNCH12-02, LTMP14-03
NR-2-1-U	1	MGNS02-01
NR-2-2-U	1	MGNS03-01
NR-2-3-U	2	LAZR08-01, MCGR02-03
NR-4-1-U	1	LNCH09-01
NR-4-2-U	1	HNRY04-01

4.1.2 Streambank Erosion Sediment Loads for Existing Conditions

Streambank erosion sediment loads were developed using field data collected at 16 monitoring sites in the Thompson Project Area in 2011 along with data from 12 monitoring sites in the Kootenai-Fisher Project Area that was also collected in 2011. Field data was divided into the five categories discussed in **Section 4.1.1** and expanded to include field data from the Kootenai-Fisher Project Area as presented in **Table 4-3**. Streambank erosion sediment loads per 1,000 feet of stream for existing conditions averaged 9.75 tons/year for low gradient (<2% slope) 3rd order reach types, 8.82 tons/year for low gradient (<2% slope) 4th order reach types, 2.18 tons/year for moderate gradient (2-4% slope) 1st and 2nd order reach types, 5.60 tons/year for moderate gradient (2-4% slope) 3rd order reach types, and 5.99 tons/year for high gradient (4-10% slope) 1st and 2nd order reach types (**Table 3-4**).

Table 4-3. Reach Type Data Groupings for Streambank Erosion Sediment Load Extrapolation

Reach Type	Number of Monitoring Sites	Monitoring Sites
NR-0-3-U	8	FTRP06-02, LAZR10-01, LTMP12-01, MCGR06-02, SWMP01-05, SWMP01-06, GRNT13-01, QRTZ10-01
NR-0-4-C	1	FTRP08-01
NR-0-4-U	7	LBTR01-01, LNCH12-02, LTMP14-03, LAKE02-01, WOLF08-03, WOLF09-02, WOLF11-03
NR-2-1-U	1	MGNS02-01
NR-2-2-C	1	QRTZ03-01
NR-2-2-U	2	MGNS03-01, RAVN07-01
NR-2-3-U	4	LAZR08-01, MCGR02-03, BRST04-02, BRST04-04
NR-4-1-U	2	LNCH09-01, RAVN04-01
NR-4-2-U	2	HNRY04-01, RAVN06-01

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

Field Assessed Reach Type Category	Number of Monitoring Sites	Average Sediment Load per 1000 Feet (Tons/Year)	Standard Error (Tons/Year)	Minimum (Tons)	Maximum (Tons)
NR-0-3-U	8	9.75	2.14	2.17	21.84
NR-0-4-U, NR-0-4-C	8	8.82	2.27	2.40	19.21
NR-2-1-U, NR-2-2-C, NR-2-2-U	4	2.18	1.22	0.12	5.64
NR-2-3-U	4	5.60	3.03	0.21	14.01
NR-4-1-U, NR-4-2-U	4	5.99	2.92	0.14	13.90

4.1.3 Reducing Streambank Erosion Sediment Loads through Best Management Practices

Sediment loads from streambank erosion through the implementation of all best management practices were estimated by reducing the anthropogenic contribution of bank erosion to 30% from all sites where the anthropogenic portion was greater than 30%. The reduction to 30% is simply an estimate to represent conditions that account for human activity and human influenced bank erosion, but at a percentage that may appropriately reflect all reasonable land, soil, and water conservation practices. This reduction in the anthropogenic sediment load was then summed with the existing natural sediment load to achieve the BMP sediment load. Streambank erosion sediment loads per 1,000 feet of stream for BMP conditions averaged 6.57 tons/year for low gradient (<2% slope) 3rd order reach types, 4.99 tons/year for low gradient (<2% slope) 4th order reach types, 2.05 tons/year for moderate gradient (2-4% slope) 1st and 2nd order reach types, 3.11 tons/year for moderate gradient (2-4% slope) 3rd order reach types, and 4.10 tons/year for high gradient (4-10% slope) 1st and 2nd order reach types (**Table 3-5**).

Table 4-5. Sediment Loads by Reach Type Category with BMPs

Field Assessed Reach Type Category	Number of Monitoring Sites	Average Sediment Load per 1000 Feet (Tons/Year)	Standard Error (Tons/Year)	Minimum (Tons)	Maximum (Tons)
NR-0-3-U	8	6.57	1.49	1.15	15.29
NR-0-4-U, NR-0-4-C	8	4.99	0.95	0.72	8.47
NR-2-1-U, NR-2-2-C, NR-2-2-U	4	2.05	1.24	0.12	5.64
NR-2-3-U	4	3.11	1.23	0.09	5.82
NR-4-1-U, NR-4-2-U	4	4.10	1.83	0.14	8.34

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 2000 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 low gradient (<2% slope) 3rd order reach type NR-0-3-U was applied to all low gradient 2nd and 3rd order reaches in the Thompson Project Area (**Table 4-6**).
3. Existing conditions data from low gradient (<2% slope) 4th order reach types (NR-0-4-C, NR-0-4-U) was applied to all low gradient 4th order reaches in the Thompson Project Area (**Table 4-6**).
4. Existing conditions data from moderate gradient (2-4% slope) 1st and 2nd order reach types (NR-2-1-U, NR-2-2-C, NR-2-2-U) was applied to all moderate gradient 1st and 2nd order reaches in the Thompson Project Area (**Table 4-6**).

5. Existing conditions data from moderate gradient (2-4% slope) 3rd order reach NR-2-3-U was applied to all moderate gradient 3rd, 4th, and 5th order reaches in the Thompson Project Area (**Table 4-6**).

6. Existing conditions data from high gradient (4-10% slope) 1st and 2nd order reach types (NR-4-1-U, NR-4-2-U) was applied to all high gradient 1st, 2nd, and 3rd order reaches, as well as extreme gradient (>10% slope) 3rd order reaches (**Table 4-6**).

7. BMP condition sediment loads were assigned to reaches with predominately natural sediment loads (>70%, based on the aerial assessment) based on the reach type category.

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

Table 4-6. Reach Type Categories for Extrapolation

Field Assessed Reach Type Category	Un-Assessed Reach Types
NR-0-3-U	NR-0-2-C, NR-0-2-U, NR-0-3-C
NR-0-4-U, NR-0-4-C	
NR-2-1-U, NR-2-2-C, NR-2-2-U	
NR-2-3-U	NR-2-3-C, NR-2-4-C, NR-2-4-U, NR-2-5-U, NR-10-3-C
NR-4-1-U, NR-4-2-U	NR-4-1-C, NR-4-2-C, NR-4-3-C, NR-4-3-U

For small 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 3.65 tons/year/1000 feet was applied to these un-assessed streams based on the streambank erosion sediment load for moderate to high gradient (2-10% slope) 2nd and 3rd order streams. 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. These smaller, un-assessed streams also primarily occur in steeper gradient conditions which is why the 0-2% slope reaches were not included in the gross average. Un-assessed 1st order streams were presumed to contribute a load negligible enough to warrant exclusion from the estimate. The streambank erosion sediment load for un-assessed streams was then reduced to include only the fine sediment portion of the sediment load based on the percent of sand/silt for each individual stream segment's subwatershed under the assumption that only the fine sediment load is delivered to the TMDL stream.

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 Best Management Practices (BMPs), streambanks can be stabilized and sediment loads can be reduced. The BMP streambank erosion sediment load for the Thompson Project Area was determined based on reducing the existing anthropogenic sediment load contribution to 30%, which is presumed to represent a reasonable contribution of human caused bank erosion sediment under reasonable land, soil, and water conservation practices. This reduction in the anthropogenic sediment load was then summed with the existing natural sediment load to achieve the BMP sediment load, which was extrapolated to the stream segment scale using 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 (>70%). In addition, no load reduction was applied to the natural sediment load in reaches with <70% natural sources.

2. Percent reductions for monitoring sites with predominately anthropogenic sources of erosion (>30%) were based on the difference between the existing conditions streambank erosion sediment load and the BMP sediment load as depicted in **Table 4-7**.

3. BMP sediment loads presented discussed in **Section 4.1.3** were applied to un-assessed reaches on the 303(d) listed stream segments based on the reach type category (**Table 4-7**).

Table 4-7. Percent Reduction in Streambank Erosion Sediment Loads

Field Assessed Reach Type Category	Number of Monitoring Sites	Average Sediment Load per 1000 Feet (Tons/Year)	Average Sediment Load per 1000 Feet with BMPs (Tons/Year)	Percent Reduction
NR-0-3-U	8	9.75	6.57	33%
NR-0-4-U, NR-0-4-C	8	8.82	4.99	43%
NR-2-1-U, NR-2-2-C, NR-2-2-U	4	2.18	2.05	6%
NR-2-3-U	4	5.60	3.11	44%
NR-4-1-U, NR-4-2-U	4	5.99	4.10	32%

For small streams that did not undergo the stratification process and field analysis, but are tributaries to TMDL streams, a BMP sediment load of 2.36 tons/year/1000 feet (12.25 tons/year/mile) was applied to these un-assessed streams based on the BMP streambank erosion sediment load for moderate to high gradient (2-10% slope) 2nd and 3rd order streams. The BMP sediment load for un-assessed streams was then reduced to include only the fine sediment portion of the sediment load based on the percent of sand/silt for each individual stream segment's subwatershed under the assumption that only the fine sediment load is delivered to the TMDL stream.

4.2 RESULTS

4.2.1 Monitoring Site Sediment Loads

An average annual streambank erosion sediment load of 106 tons/year was attributed to the 132 assessed eroding streambanks within the 16 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 0.2 tons/year in MCGR02-03 on McGregor Creek to 21.8 tons/year in FTRP06-02 on Fishtrap Creek (**Table 4-8**).

Table 4-8. Monitoring Site Estimated Average Annual Sediment Loads due to Streambank Erosion

Stream Segment	Reach ID	Reach Type	Length of Eroding Bank (Feet)	Monitoring Site Length (Feet)	Percent of Reach with Eroding Streambank	Reach Sediment Load (Tons/Year)	Total Sediment Load per 1000 Feet (Tons/Year)
Fishtrap Creek	FTRP06-02	NR-0-3-U	398	1000	20%	21.8	21.8
	FTRP08-01	NR-0-4-C	213	1000	11%	4.8	4.8
Henry Creek	HNRY04-01	NR-4-2-U	110	500	11%	1.8	3.6
Lazier Creek	LAZR08-01	NR-2-3-U	164	500	16%	7.0	14.0
	LAZR10-01	NR-0-3-U	179	800	11%	7.9	9.8
Little Bitterroot River	LBRT01-01	NR-0-4-U	65	1000	3%	2.4	2.4
Lynch Creek	LNCH09-01	NR-4-1-U	138	1000	7%	13.9	13.9
	LNCH12-02	NR-0-4-U	187	1000	9%	4.9	4.9
Little Thompson River	LTMP12-01	NR-0-3-U	154	1000	8%	7.8	7.8
	LTMP14-03	NR-0-4-U	263	1000	13%	9.0	9.0
McGregor Creek	MCGR02-03	NR-2-3-U	19	500	2%	0.1	0.2
	MCGR06-02	NR-0-3-U	93	1000	5%	2.2	2.2
McGinnis Creek	MGNS02-01	NR-2-1-U	63	500	6%	1.0	2.0
	MGNS03-01	NR-2-2-U	61	1000	3%	0.9	0.9
Swamp Creek	SWMP01-05	NR-0-3-U	242	1000	12%	11.2	11.2
	SWMP01-06	NR-0-3-U	206	1000	10%	8.8	8.8

4.2.2 Stream Segment Sediment Loads

Monitoring site sediment loads were extrapolated to each 303(d) listed stream segment based on the reach type groups discussed in **Section 4.1.4**. Stream segment sediment loads were estimated for all 72.4 miles of stream included in the Aerial Assessment Database (**Attachment C**). An average annual sediment load of 2,230 tons/year was attributed to eroding streambanks at the stream segment scale (**Table 4-9**). In the Thompson Project Area, streambank erosion sediment loads ranged from 41.4 tons/year in Sullivan Creek to 676.5 tons/year in the Little Thompson River (**Attachment C**). Swamp Creek had highest sediment load due to streambank erosion per mile of stream, followed by Lazier Creek, while Sullivan Creek had 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 Thompson Project Area (**Figure 4-1**).

Table 4-9. Stream Segment Streambank Erosion Sediment Loads

Stream Segment	Stream Length (Miles)	Sediment Load (Tons/Year)	Load per Mile (Tons/Year)
Henry Creek	6.7	148.7	22.0
Lazier Creek	7.5	291.0	38.7
Little Bitterroot River	4.9	132.9	26.9
Lynch Creek	13.3	384.4	29.0
Little Thompson River (excluding McGinnis Creek)	19.9	676.5	34.0
McGregor Creek	6.8	234.5	34.4
McGinnis Creek	5.1	69.5	13.6
Sullivan Creek	3.2	41.4	13.0
Swamp Creek	4.9	251.3	51.1
Total	**72.4**	**2,230**	**30.8**

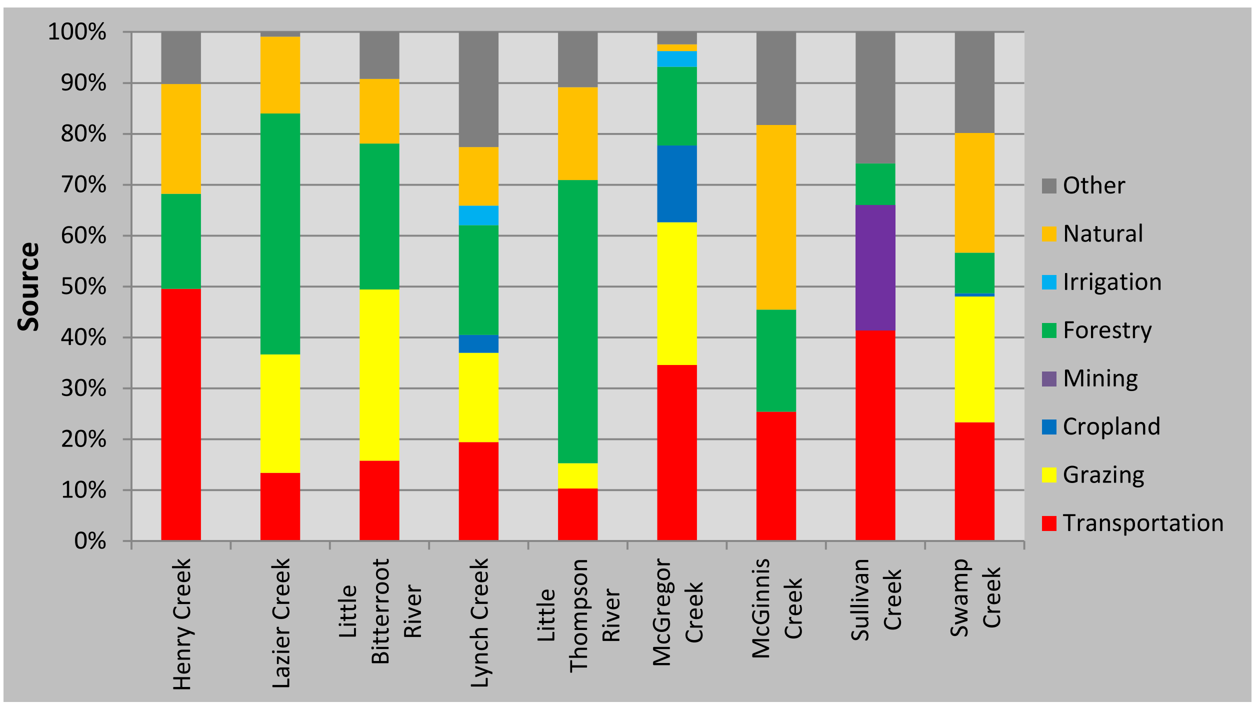


Figure 4-1. Stream Segment Streambank Erosion Sources

4.2.2.1 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 4-10**). 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 Thompson 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 Henry Creek, Little Thompson River, and Lynch Creek.

Table 4-10. Stream Segment Streambank Composition

Stream Segment	Coarse Gravel >6mm (Percent)	Fine Gravel <6mm & >2mm (Percent)	Sand/Silt <2mm (Percent)
Fishtrap Creek	5%	12%	82%
Henry Creek	40%	30%	30%
Lazier Creek	18%	17%	64%
Little Bitterroot River	0%	10%	90%
Little Thompson River	43%	19%	38%
Lynch Creek	31%	26%	43%
McGinnis Creek	26%	10%	64%
McGregor Creek	18%	23%	59%
Swamp Creek	17%	10%	74%

4.2.3 Sub-watershed Streambank Erosion Sediment Loads

Average annual streambank erosion sediment loads at the sub-watershed scale were estimated for the assessed stream segments in the Thompson 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 72.4 miles of stream were included in the Aerial Assessment Database and there are a total of 142.6 miles of stream in the assessed sub-watersheds based on a modified version of the 1:100,000 NHD stream layer in which ditches and 1st order streams were removed (**Table 4-9**). For the purposes of estimating an annual average sub-watershed streambank erosion sediment load, streambank erosion sediment inputs from un-assessed streams were assumed to be 3.65 tons/year/1000 feet (19.25 tons/year/mile) based on the average value of 2nd and 3rd order streams. The streambank erosion sediment load for un-assessed streams was then reduced to include only the fine sediment portion of the sediment load based on the percent of sand/silt for each individual stream segment's sub-watershed. Based on this analysis, a total streambank erosion sediment load of 3,060 tons per year is estimated at the sub-watershed scale for the Thompson Project Area (**Table 4-10**).

4.2.4 Sub-watershed Streambank Erosion Sediment Load Reductions

Streambank erosion sediment load reductions for each sediment 303(d) listed sub-watershed in the Thompson Project Area are provided in **Table 4-11**. Potential reductions in anthropogenic loading as a result of the application of BMPs range from 16% in McGinnis Creek to 36% in the Little Bitteroot River. The loading reductions listed in **Table 4-11** were calculated based on the achievable reductions in loading to the 303(d) listed water body segments.

Table 4-11. Sub-watershed Streambank Erosion Sediment Loads

Stream Segment	Stream Length (Miles)	Stream Segment Sediment Load (Tons/Year)	Sub-watershed Stream Length (Miles) (excluding 1st order streams)	Un-assessed Stream Length (Miles)	Total Sediment Load Applied to Un-assessed Stream Length (19.25 Tons/Year/Mile)	Subwatershed % Fine Sediment	Fine Sediment Load Applied to Un-assessed Stream Length (Tons/Year)	Sub-watershed Sediment Load (Tons/Year)	Total Load per Mile (Tons/Year)
Henry Creek	6.7	148.7	6.8	0.1	1.1	30%	0.3	149.0	21.9
Lazier Creek	7.5	291.0	11.5	3.9	76.0	64%	48.7	339.6	29.6
Little Bitterroot River	4.9	132.9	23.4	18.5	355.4	90%	319.9	452.8	19.3
Lynch Creek	13.3	384.4	21.4	8.1	155.5	43%	66.9	451.2	21.1
Little Thompson River (excluding McGinnis Creek)	19.9	676.5	43.0	23.1	443.8	38%	168.7	845.1	19.7
McGregor Creek	6.8	234.5	10.7	3.9	75.6	59%	44.6	279.1	26.0
McGinnis Creek	5.1	69.5	5.3	0.2	3.0	64%	1.9	71.4	13.5
Sullivan Creek	3.2	41.4	3.2	0.0	0.0	n/a		41.4	13.1
Swamp Creek	4.9	251.3	17.4	12.5	241.2	74%	178.5	429.8	24.6
Total	**72.4**	**2,230**	**142.6**	**70.2**	**1,352**		**829**	**3,060**	**21.5**

Table 4-12. Sub-watershed Streambank Erosion 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 (Tons/Year)	Percent Reduction in Total Sediment Load
	Stream Segment Sediment Load (Tons/Year)	Anthropogenic Stream Segment Load (Tons/Year)	Natural Stream Segment Sediment Load (Tons/Year)	Fine Sediment Load Applied to Un-assessed Stream Length (Tons/Year)	Sub-watershed Sediment Load (Tons/Year)	BMP Stream Segment Sediment Load (Tons/Year)	BMP Anthropogenic Stream Segment Sediment Load (Tons/Year)	Natural Stream Segment Sediment Load (Tons/Year)	BMP Fine Sediment Load Applied to Un-assessed Stream Length (Tons/Year)	BMP Sub-watershed Sediment Load (Tons/Year)		
Henry Creek	148.7	116.6	32.1	0.3	149.0	111.9	79.8	32.1	0.2	112.1	36.9	25%
Lazier Creek	291.0	247.1	43.9	48.7	339.6	197.2	153.3	43.9	31.5	228.7	110.9	33%
Little Bitterroot River	132.9	116.0	16.9	319.9	452.8	82.1	65.2	16.9	206.9	289.0	163.8	36%
Lynch Creek	384.4	340.2	44.2	66.9	451.2	256.9	212.7	44.2	43.2	300.2	151.0	33%
Little Thompson River (excluding McGinnis Creek)	676.5	552.9	123.5	168.7	845.1	470.3	346.8	123.5	109.1	579.4	265.7	31%
McGregor Creek	234.5	231.4	3.1	44.6	279.1	158.1	155.0	3.1	28.9	187.0	92.1	33%
McGinnis Creek	69.5	44.3	25.2	1.9	71.4	58.5	33.3	25.2	1.2	59.8	11.7	16%
Sullivan Creek	41.4	41.4	0.0		41.4	33.5	33.5	0.0	0.0	33.5	7.9	19%
Swamp Creek	251.3	192.4	59.0	178.5	429.8	188.6	129.6	59.0	115.4	304.0	125.8	29%
Total	**2,230**	**1,882**	**348**	**829**	**3,060**	**1,557**	**1,209**	**348**	**536**	**2,094**	**966**	**32%**

5.0 Assumptions and Uncertainty

The Thomson Project Area 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 Thompson 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 2011 sediment and habitat assessment in the Thompson 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 67 reaches were delineated during the aerial assessment reach stratification process covering 72.4 miles of stream. Based on the level III ecoregion, there were a total of 23 distinct reach types and sediment and habitat parameters were assessed at 16 monitoring sites. Statistical analysis of the sediment and habitat data from the 16 monitoring sites will aid in developing sediment TMDL targets that are specific for the Thompson Project Area, while streambank erosion data will be utilized in the sediment TMDL. Within the 16 monitoring sites, an average annual sediment load of 106 tons/year was attributed to the 132 assessed eroding streambanks and average annual sediment load of 2,230 tons/year was estimated for the listed stream segments. Out of the 142.6 miles of stream within the assessed sub-watersheds, a total sediment load of 3,060 tons per year was estimated at the sub-watershed scale. It is estimated that this sediment load can be reduced to 2,094 tons/year, which is a 32% reduction in sediment load from streambank erosion.

7.0 References

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Attachment A

Aerial Assessment Database

STREAM	REACH_ID	REACH	SUBREACH	REACH_TYPE	LENGTH_FT	PRI_ECOREG	SEC_ECOREG	STREAM_ORD	CONFINE	GRADIENT	HB_TRIGGER	SB_TRIGGER	LB_LANDUSE	LB_ANTHRO	LB_RP_VEG	LB_RP_HLTH	RB_LANDUSE	RB_ANTHRO	RB_RP_VEG	RB_RP_HLTH	ANTHRO_TRA	ANTHRO_GRA	ANTHRO_CRO	ANTHRO_MIN	ANTHRO_FOR	ANTHRO_IRR	ANTHRO_NAT	ANTHRO_OTH	ANTHRO_TOT
Henry Creek	HNRY 01-01	01	01	NR-10-1-U	483	15e		1	U	>10	Start		Forest	No	Mature Coniferous	Good	Forest	No	Mature Coniferous	Good	0	0	0	0	0	0	100	0	100
Henry Creek	HNRY 02-01	02	01	NR-10-1-U	1958	15a	15e	1	U	>10	Ecoregion		Forest	No	Mature Coniferous	Good	Forest	Yes	Grass	Fair	0	0	0	0	100	0	0	0	100
Henry Creek	HNRY 03-01	03	01	NR-4-1-U	7107	15a		1	U	4-10	Gradient		Forest	No	Mature Coniferous	Good	Forest	Yes	Mature Coniferous	Fair	70	0	0	0	30	0	0	0	100
Henry Creek	HNRY 04-01	04	01	NR-4-2-U	20834	15a		2	U	4-10	Stream Order		Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	70	0	0	0	30	0	0	0	100
Henry Creek	HNRY 05-01	05	01	NR-4-2-C	1617	15a		2	C	4-10	Confinement		Forest	Yes	Brush	Fair	Forest	No	Brush	Fair	70	0	0	0	0	0	30	0	100
Henry Creek	HNRY 06-01	06	01	NR-4-2-U	3616	15a		2	U	4-10	Confinement		Rural Res./Hobby Farm	Yes	Brush	Fair	Rural Res./Hobby Farm	Yes	Mature Coniferous	Fair	30	0	0	0	0	0	0	70	100
Lazier Creek	LAZR 01-01	01	01	NR-10-1-U	2597	15l	15l	1	U	>10	Start		Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	10	0	0	0	90	0	0	0	100
Lazier Creek	LAZR 02-01	02	01	NR-4-1-U	5570	15l	15l	1	U	4-10	Gradient		Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	30	0	0	0	70	0	0	0	100
Lazier Creek	LAZR 03-01	03	01	NR-2-1-U	1677	15l	15l	1	U	2-<4	Gradient		Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	40	0	0	0	60	0	0	0	100
Lazier Creek	LAZR 03-02	03	02	NR-2-1-U	2571	15l	15l	1	U	2-<4	Gradient	Landuse	Forest	No	Brush	Good	Forest	No	Brush	Good	10	0	0	0	0	0	90	0	100
Lazier Creek	LAZR 04-01	04	01	NR-0-1-U	1260	15l	15l	1	U	<2	Gradient		Forest	No	Brush	Good	Forest	No	Brush	Good	0	0	0	0	0	0	100	0	100
Lazier Creek	LAZR 05-01	05	01	NR-0-2-U	4401	15l	15l	2	U	<2	Stream Order		Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	10	0	0	0	10	0	80	0	100
Lazier Creek	LAZR 05-02	05	02	NR-0-2-U	4809	15l	15l	2	U	<2	Stream Order	Landuse	Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	50	0	0	0	20	0	30	0	100
Lazier Creek	LAZR 06-01	06	01	NR-0-3-U	2548	15l	15l	3	U	<2	Stream Order		Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	0	0	0	0	70	0	30	0	100
Lazier Creek	LAZR 07-01	07	01	NR-2-3-U	1423	15l	15l	3	U	2-<4	Gradient		Forest	No	Brush	Fair	Forest	Yes	Brush	Fair	0	0	0	0	50	0	50	0	100
Lazier Creek	LAZR 08-01	08	01	NR-2-3-U	8530	15l	15	3	U	2-<4	Tributary		Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	0	0	0	0	100	0	0	0	100
Lazier Creek	LAZR 09-01	09	01	NR-10-3-C	1451	15l	15	3	C	>10	Gradient, Confinement		Forest	Yes	Brush	Poor	Forest	Yes	Brush	Fair	0	0	0	0	100	0	0	0	100
Lazier Creek	LAZR 10-01	10	01	NR-0-3-U	550	15l	15	3	U	<2	Gradient, Confinement		Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	0	0	0	0	100	0	0	0	100
Lazier Creek	LAZR 10-02	10	02	NR-0-3-U	2263	15l	15	3	U	<2	Gradient, Confinement		Hay/Pasture	Yes	Grass	Poor	Hay/Pasture	Yes	Grass	Poor	10	90	0	0	0	0	0	0	100
Little Bitterroot River	LBRT 01-01	01	01	NR-0-4-U	10884	15l		4	U	<2	Start		Forest	Yes	Grass	Fair	Forest	No	Grass	Fair	30	0	0	0	70	0	0	0	100
Little Bitterroot River	LBRT 02-01	02	01	NR-0-4-C	1942	15l		4	C	<2	Confinement		Forest	Yes	Mature Coniferous	Fair	Forest	No	Mature Coniferous	Fair	0	0	0	0	50	0	50	0	100
Little Bitterroot River	LBRT 03-01	03	01	NR-0-4-C	4788	15l		4	C	<2	Waterfall		Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	30	0	0	0	60	0	0	10	100
Little Bitterroot River	LBRT 04-01	04	01	NR-2-4-C	2120	15l		4	C	2-<4	Gradient		Forest	No	Brush	Fair	Forest	No	Brush	Fair	10	0	0	0	20	0	70	0	100
Little Bitterroot River	LBRT 05-01	05	01	NR-2-4-U	3976	15l		4	U	2-<4	Confinement		Forest	Yes	Grass	Poor	Forest	Yes	Grass	Poor	20	80	0	0	0	0	0	0	100
Little Bitterroot River	LBRT 06-01	06	01	NR-2-5-U	2369	15l		5	U	2-<4	Stream Order		Forest	Yes	Grass	Poor	Forest	Yes	Grass	Poor	20	80	0	0	0	0	0	0	100
Lynch Creek	LNCH 01-01	01	01	NR-10-1-C	1139	15l		1	C	>10	Start		Forest	No	Mature Coniferous	Good	Forest	No	Mature Coniferous	Good	0	0	0	0	0	0	100	0	100
Lynch Creek	LNCH 02-01	02	01	NR-10-1-U	764	15l		1	U	>10	Confinement		Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	30	0	0	0	70	0	0	0	100
Lynch Creek	LNCH 03-01	03	01	NR-4-1-C	2951	15l		1	C	4-10	Gradient, Confinement		Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	30	0	0	0	70	0	0	0	100
Lynch Creek	LNCH 04-01	04	01	NR-10-1-C	2911	15l		1	C	>10	Gradient		Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	0	0	0	0	100	0	0	0	100
Lynch Creek	LNCH 05-01	05	01	NR-4-1-C	6014	15a	15l	1	C	4-10	Gradient		Forest	No	Mature Coniferous	Good	Forest	No	Mature Coniferous	Good	0	0	0	0	0	0	100	0	100
Lynch Creek	LNCH 06-01	06	01	NR-4-1-U	2708	15a	15l	1	U	4-10	Confinement		Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	50	0	0	0	50	0	0	0	100
Lynch Creek	LNCH 07-01	07	01	NR-2-1-U	11434	15a		1	U	2-<4	Gradient		Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	30	0	0	0	70	0	0	0	100
Lynch Creek	LNCH 07-02	07	02	NR-2-1-U	1060	15a		1	U	2-<4	Gradient	road	Road	Yes	Mature Coniferous	Fair	Road	Yes	Mature Coniferous	Fair	80	0	0	0	20	0	0	0	100
Lynch Creek	LNCH 08-01	08	01	NR-4-1-C	3117	15a		1	C	4-10	Gradient, Confinement		Road	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	100	0	0	0	0	0	0	0	100
Lynch Creek	LNCH 09-01	09	01	NR-4-1-U	3625	15a		1	U	4-10	Confinement		Forest	No	Mature Coniferous	Good	Forest	No	Mature Coniferous	Good	0	0	0	0	0	0	100	0	100
Lynch Creek	LNCH 10-01	10	01	NR-2-2-U	4240	15a		2	U	2-<4	Stream Order		Forest	No	Brush	Good	Forest	No	Brush	Good	0	0	0	0	0	0	100	0	100
Lynch Creek	LNCH 11-01	11	01	NR-2-3-U	5835	15a		3	U	2-<4	Stream Order		Rural Res./Hobby Farm	Yes	Brush	Fair	Rural Res./Hobby Farm	Yes	Brush	Fair	20	30	0	0	30	10	0	10	100
Lynch Creek	LNCH 12-01	12	01	NR-0-4-U	8183	15a		4	U	<2	Stream Order		Hay/Pasture	Yes	Mature Decidious	Fair	Rural Res./Hobby Farm	Yes	Grass	Poor	10	30	0	0	20	0	10	30	100
Lynch Creek	LNCH 12-02	12	02	NR-0-4-U	3053	15a		4	U	<2	Stream Order	Landuse, Landcover	Hay/Pasture	Yes	Grass	Fair	Hay/Pasture	Yes	Mature Decidious	Fair	0	50	50	0	0	0	0	0	100
Lynch Creek	LNCH 12-03	12	03	NR-0-4-U	5541	15a		4	U	<2	Stream Order	Landuse, Landcover	Rural Res./Hobby Farm	Yes	Grass	Poor	Rural Res./Hobby Farm	Yes	Grass	Poor	40	0	0	0	0	0	0	60	100
Lynch Creek	LNCH 12-04	12	04	NR-0-4-U	2577	15a		4	U	<2	Stream Order	Landuse, Landcover	Hay/Pasture	Yes	Grass	Poor	Hay/Pasture	Yes	Bare	Poor	0	40	60	0	0	0	0	0	100
Lynch Creek	LNCH 12-05	12	05	NR-0-4-U	4945	15a		4	U	<2	Stream Order	Diversion to impoundment	Hay/Pasture	Yes	Grass	Poor	Hay/Pasture	Yes	Grass	Poor	0	40	0	0	0	20	0	40	100
Little Thompson River	LTMP 01-01	01	01	NR-4-1-U	769	15e		1	U	4-10	Start		Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	0	0	0	0	100	0	0	0	100
Little Thompson River	LTMP 02-01	02	01	NR-4-1-U	2009	15l	15e	1	U	4-10	Ecoregion		Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	0	0	0	0	100	0	0	0	100
Little Thompson River	LTMP 03-01	03	01	NR-2-1-U	2131	15l	15e	1	U	2-<4	Gradient		Forest	Yes	Grass	Fair	Forest	Yes	Grass	Fair	0	0	0	0	100	0	0	0	100
Little Thompson River	LTMP 03-02	03	02	NR-2-1-U	2504	15l	15l	1	U	2-<4	Lake	Gradient	Forest	Yes	Grass	Fair	Forest	Yes	Grass	Fair	0	50	0	0	50	0	0	0	100
Little Thompson River	LTMP 04-01	04	01	NR-0-1-U	4365	15l	15l	1	U	<2	Gradient		Forest	Yes	Grass	Fair	Forest	Yes	Grass	Fair	10	0	0	0	90	0	0	0	100
Little Thompson River	LTMP 04-02	04	02	NR-0-1-U	2178	15l	15l	1	U	<2	Gradient	Landcover	Range	Yes	Grass	Fair	Range	Yes	Grass	Fair	0	100	0	0	0	0	0	0	100
Little Thompson River	LTMP 04-03	04	03	NR-0-1-U	1402	15l	15l	1	U	<2	Gradient	Landcover	Forest	Yes	Grass	Fair	Forest	Yes	Brush	Fair	0	0	0	0	100	0	0	0	100
Little Thompson River	LTMP 04-04	04	04	NR-0-1-U	1702	15l	15l	1	U	<2	Gradient	Landcover	Forest	No	Grass	Fair	Forest	No	Grass	Fair	0	0	0	0	20	0	80	0	100
Little Thompson River	LTMP 05-01	05	01	NR-0-3-U	2350	15l	15l	3	U	<2	Stream Order		Forest	Yes	Brush	Fair	Forest	No	Brush	Fair	0	0	0	0	90	0	10	0	100
Little Thompson River	LTMP 05-02	05	02	NR-0-3-U	1596	15l	15l	3	U	<2	Stream Order	Landuse	Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	30	0	0	0	0	0	0	70	100
Little Thompson River	LTMP 06-01	06	01	NR-0-3-U	4477	15l	15l	3	U	<2	Tributary		Forest	No	Brush	Good	Forest	No	Brush	Good	0	0	0	0	50	0	50	0	100
Little Thompson River	LTMP 06-02	06	02	NR-0-3-U	2880	15l	15l	3	U	<2	Tributary	Beaver	Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	0	0	0	0	100	0	0	0	100
Little Thompson River	LTMP 07-01	07	01	NR-0-3-U	5048	15l	15l	3	U	<2	Tributary		Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	0	0	0	0	100	0	0	0	100
Little Thompson River	LTMP 08-01	08	01	NR-2-3-C	2942	15l	15l	3	C	2-<4	Gradient, Confinement		Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	30	0	0	0	50	0	20	0	100
Little Thompson River	LTMP 09-01	09	01	NR-0-3-C	2679	15l	15l	3	C	<2	Gradient		Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	30	0	0	0	70	0	0	0	100
Little Thompson River	LTMP 10-01	10	01	NR-0-3-C	5022	15l	15l	3	C	<2	Tributary		Forest	No	Brush	Good	Forest	Yes	Brush	Fair	0	0	0	0	70	0	30	0	100
Little Thompson River	LTMP 11-01	11	01	NR-2-3-C	19455	15l	15l	3	C	2-<4	Gradient		Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	0	0	0	0	70	0	30	0	100
Little Thompson River	LTMP 12-01	12	01	NR-0-3-U	6287	15l	15l	3	U	<2	Gradient, Confinement		Forest	No	Brush	Good	Forest	No	Brush	Good	0	0	0	0	20	0	80	0	100
Little Thompson River	LTMP 13-01	13	01	NR-0-3-U	12911	15l	15l	3	U	<2	Tributary		Forest	No	Brush	Good	Forest	No	Brush	Good	10	0	0	0	10	0	80	0	100
Little Thompson River	LTMP 14-01	14	01	NR-0-4-U	14455	15l	15l	4	U	<2	Tributary		Forest	Yes	Bare	Poor	Forest	Yes	Grass	Poor	10	0	0	0	60	0	0	30	100
Little Thompson River	LTMP 14-02	14	02	NR-0-4-U	3381	15l	15l	4	U	<2	Tributary	Landuse	Hay/Pasture	Yes	Grass	Poor	Road	Yes	Mature Deciduous	Poor	70	30	0	0	0	0	0	0	100
Little Thompson River	LTMP 14-03	14	03	NR-0-4-U	1294	15l	15l	4	U	<2	Tributary	Landuse	Forest	yes	Mature Deciduous	Poor	Forest	Yes	Mature Deciduous	Fair	0	20	0	0	70	0	0	10	100
Little Thompson River	LTMP 15-01	15	01	NR-0-4-C	3289	15l	15l	4	C	<2	Confinement		Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Brush	Fair	50	0	0	0	50	0	0	0	100

STREAM	REACH_ID	REACH	SUBREACH	REACH_TYPE	LENGTH_FT	PRI_ECOREG	SEC_ECOREG	STREAM_ORD	CONFINE	GRADIENT	HB_TRIGGER	SB_TRIGGER	LB_LANDUSE	LB_ANTHRO	LB_RP_VEG	LB_RP_HLTH	RB_LANDUSE	RB_ANTHRO	RB_RP_VEG	RB_RP_HLTH	ANTHRO_TRA	ANTHRO_GRA	ANTHRO_CRO	ANTHRO_MIN	ANTHRO_FOR	ANTHRO_IRR	ANTHRO_NAT	ANTHRO_OTH	ANTHRO_TOT
McGregor Creek	MCGR 01-01	01	01	NR-2-2-U	1014	15l	15l	2	U	2-<4	Start		Rural Res./Hobby Farm	Yes	Brush	Fair	Road	Yes	Brush	Fair	80	0	0	0	0	0	0	20	100
McGregor Creek	MCGR 01-02	01	02	NR-2-2-U	1303	15l	15l	2	U	2-<4	Start	Landcover	Forest	Yes	Grass	Fair	Road	Yes	Grass		80	0	0	0	20	0	0	0	100
McGregor Creek	MCGR 02-01	02	01	NR-2-3-U	538	15l	15l	3	U	2-<4	Stream Order		Forest	Yes	Brush	Fair	Road	Yes	Brush	Fair	80	0	0	0	20	0	0	0	100
McGregor Creek	MCGR 02-02	02	02	NR-2-3-U	2131	15l	15l	3	U	2-<4	Stream Order	Landcover	Forest	Yes	Brush	Fair	Forest	No	Brush	Good	90	0	0	0	0	0	0	10	100
McGregor Creek	MCGR 02-03	02	03	NR-2-3-U	2339	15l	15l	3	U	2-<4	Stream Order	Landcover	Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	70	0	0	0	30	0	0	0	100
McGregor Creek	MCGR 02-04	02	04	NR-2-3-U	1232	15l	15l	3	U	2-<4	Stream Order	Landcover	Forest	Yes	Grass	Fair	Forest	No	Grass	Fair	70	0	0	0	0	0	0	30	100
McGregor Creek	MCGR 03-01	03	01	NR-0-3-U	1900			3	U	<2	Gradient		Forest	No	Brush	Fair	Hay/Pasture	Yes	Brush	Fair	10	80	0	0	0	0	0	10	100
McGregor Creek	MCGR 04-01	04	01	NR-0-3-U	1811	15l	15l	3	U	<2	Gradient	Landcover	Forest	Yes	Brush	Fair	Road	Yes	Brush		80	0	0	0	20	0	0	0	100
McGregor Creek	MCGR 05-01	05	01	NR-0-3-U	1461			3	U	<2	Gradient	Landcover	Forest	Yes	Grass	Fair	Road	Yes	Brass	Fair	50	0	0	0	50	0	0	0	100
McGregor Creek	MCGR 06-01	06	01	NR-0-3-U	1778	15l	15l	3	U	<2	Lake	Road, Landuse	Forest	Yes	Mature Coniferous	Fair	Road	Yes	Brush	Fair	50	0	0	0	50	0	0	0	100
McGregor Creek	MCGR 06-02	06	02	NR-0-3-U	5487	15l	15l	3	U	<2	Lake		Forest	Yes	Mature Coniferous	Fair	Road	Yes	Grass	Poor	50	0	0	0	50	0	0	0	100
McGregor Creek	MCGR 07-01	07	01	NR-4-3-C	2787	15l	15l	3	C	4-10	Gradient, Confinement		Forest	Yes	Mature Coniferous	Fair	Road	Yes	Grass	Poor	70	0	0	0	30	0	0	0	100
McGregor Creek	MCGR 08-01	08	01	NR-4-3-U	2112	15l	15l	3	U	4-10	Confinement		Forest	Yes	Mature Coniferous	Fair	Forest	No	Mature Coniferous	Good	30	0	0	0	70	0	0	0	100
McGregor Creek	MCGR 09-01	09	01	NR-0-3-U	2747	15l	15l	3	U	<2	Gradient		Hay/Pasture	Yes	Mature Deciduous	Fair	Forest	Yes	Mature Deciduous	Fair	10	80	0	0	0	10	0	0	100
McGregor Creek	MCGR 09-02	09	02	NR-0-3-U	2527	15l	15l	3	U	<2	Gradient	Landcover	Hay/Pasture	Yes	Grass	Poor	Hay/Pasture	Yes	Grass	Poor	0	90	0	0	0	10	0	0	100
McGregor Creek	MCGR 09-03	09	03	NR-0-3-U	4035	15l	15l	3	U	<2	Gradient	Landuse	Hay/Pasture	Yes	Brush	Poor	Hay/Pasture	Yes	Brush	Poor	10	0	90	0	0	0	0	0	100
McGregor Creek	MCGR 09-04	09	04	NR-0-3-U	751	15l	15l	3	U	<2	Gradient	Landuse	Hay/Pasture	Yes	Brush	Fair	Hay/Pasture	Yes	Brush	Fair	0	100	0	0	0	0	0	0	100
McGinnis Creek	MGNS 01-01	01	01	NR-4-1-U	2667	15l	15l	1	U	4-10	Start		Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	0	0	0	0	40	0	60	0	100
McGinnis Creek	MGNS 02-01	02	01	NR-2-1-U	7203	15l	15l	1	U	2-<4	Gradient		Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	10	0	0	0	50	0	40	0	100
McGinnis Creek	MGNS 03-01	03	01	NR-2-2-U	14584	15l	15l	2	U	2-<4	Stream Order		Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	50	0	0	0	50	0	0	0	100
McGinnis Creek	MGNS 04-01	04	01	NR-0-2-C	2585	15l	15l	2	C	<2	Gradient, Confinement		Forest	Yes	Grass	Poor	Forest	Yes	Grass	Poor	70	0	0	0	30	0	0	0	100
Sullivan Creek	SLVN 01-01	01	01	NR-4-1-C	1686	15l		1	C	4-10	Start		Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	60	0	0	40	0	0	0	0	100
Sullivan Creek	SLVN 02-01	02	01	NR-4-1-U	1875	15l		1	U	4-10	Confinement		Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	50	0	0	20	30	0	0	0	100
Sullivan Creek	SLVN 03-01	03	01	NR-2-1-U	1589	15l		1	U	2-<4	Gradient		Forest	Yes	Brush	Fair	Forest	Yes	Brush	Fair	0	0	0	0	0	0	0	100	100
Sullivan Creek	SLVN 03-02	03	02	NR-2-1-U	5983	15l		1	U	2-<4	Gradient	Landcover	Forest	Yes	Mature Coniferous	Fair	Forest	Yes	Mature Coniferous	Fair	20	0	0	30	0	0	0	50	100
Sullivan Creek	SLVN 03-03	03	03	NR-2-1-U	1653	15l		1	U	2-<4	Gradient	Landcover	Road	Yes	Bare	Poor	Range	Yes	Grass	Poor	80	0	0	0	0	0	0	20	100
Sullivan Creek	SLVN 04-01	04	01	NR-0-1-U	3993	15l		1	U	<2	Gradient		Road	Yes	Grass	Poor	Range	Yes	Grass	Poor	50	50	0	0	0	0	0	0	100
Swamp Creek	SWMP 01-01	01	01	NR-0-3-U	6743	15a		3	U	<2	Start		Forest	Yes	Mature Coniferous	Fair	Rural Res./Hobby Farm	Yes	Mature Coniferous	Fair	40	0	0	0	30	0	0	30	100
Swamp Creek	SWMP 01-02	01	02	NR-0-3-U	1556	15a		3	U	<2	Start	Land use	Road	Yes	Bare	Poor	Forest	Yes	Bare	Poor	50	30	0	0	0	0	0	20	100
Swamp Creek	SWMP 01-03	01	03	NR-0-3-U	382	15a		3	U	<2	Start	Land use	Hay/Pasture	Yes	Grass	Poor	Rural Res./Hobby Farm	Yes	Grass	Poor	0	60	40	0	0	0	0	0	100
Swamp Creek	SWMP 01-04	01	04	NR-0-3-U	2060	15a		3	U	<2	Start	Landcover	Forest	No	Mature Deciduous	Fair	Range	Yes	Grass	Fair	0	60	0	0	0	0	10	30	100
Swamp Creek	SWMP 01-05	01	05	NR-0-3-U	4198	15a		3	U	<2	Start	Land use	Hay/Pasture	Yes	Grass	Fair	Hay/Pasture	Yes	Grass	Fair	10	90	0	0	0	0	0	0	100
Swamp Creek	SWMP 01-06	01	06	NR-0-3-U	8191	15a		3	U	<2	Start	Landcover	Forest	Yes	Mature Coniferous	Fair	Road	Yes	Mature Coniferous	Fair	30	30	0	0	0	0	20	20	100
Swamp Creek	SWMP 01-07	01	07	NR-0-3-U	2816	15a		3	U	<2	Start	Landcover, stream mouth	Forest	Yes	Brush	Fair	Road	Yes	Brush	Fair	90	0	0	0	0	0	0	10	100

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
SWMP01-05	9/7/11	1	NR-0-3-U	B4c	C4	2.10	0.1	<2%	17.3	20.8	1.20	14.4	1.8	28.3	1.6	21	15	18	13		6	2.1	19	0	19	31	8	1	0	1	6
SWMP01-05	9/7/11	2	NR-0-3-U					<2%																							
SWMP01-05	9/7/11	3	NR-0-3-U					<2%																							
SWMP01-05	9/7/11	4	NR-0-3-U					<2%																							
SWMP01-05	9/7/11	5	NR-0-3-U	B4c	C4	2.10	0.1	<2%	24.0	32.4	1.35	17.8	2.0	44.0	1.8	15	18	28	31												
HNRY04-01	9/7/11	1	NR-4-2-U	F3a	B3a	1.20	5.1	4-<10%	10.0	10.6	1.06	9.4	2.0	12.0	1.2	88	0	0	7		22	0.5	8	2	30	76	0	0	31	116	17
HNRY04-01	9/7/11	2	NR-4-2-U	E3a	B3a	1.20	5.1	4-<10%	10.0	10.1	1.01	9.9	1.5	37.5	3.8	104	0	0	5												
HNRY04-01	9/7/11	3	NR-4-2-U	E3a	B3a	1.20	5.1	4-<10%	8.5	10.3	1.21	7.0	1.6	50.5	5.9	49	2	3	0												
HNRY04-01	9/7/11	4	NR-4-2-U	C3/4a	B3a	1.20	5.1	4-<10%	12.0	12.0	1.00	12.0	1.4	45.0	3.8																
HNRY04-01	9/7/11	5	NR-4-2-U	B4a	B3a	1.20	5.1	4-<10%	11.0	8.6	0.78	14.1	1.2	16.5	1.5	40	1	5	6												
SWMP01-06	9/8/11	1	NR-0-3-U	C4	C4	1.98	0.6	<2%	24.0	27.0	1.13	21.3	1.8	354.0	>14.8	37	7	8	14	86	14	2.0	38	4	60	38	0	0	20	48	31
SWMP01-06	9/8/11	2	NR-0-3-U	C4	C4	1.98	0.6	<2%	25.5	26.3	1.03	24.8	1.6	335.5	>13.2	37	0	3	5	98											
SWMP01-06	9/8/11	3	NR-0-3-U	C4	C4	1.98	0.6	<2%	26.8	30.4	1.13	23.6	1.6	246.8	>9.2	43	3	7	7												
SWMP01-06	9/8/11	4	NR-0-3-U					<2%																							
SWMP01-06	9/8/11	5	NR-0-3-U	C4	C4	1.98	0.6	<2%	27.0	39.3	1.46	18.6	1.8	229.0	>8.5	31	9	11	3												
MGNS02-01	9/8/11	1	NR-2-1-U	C4b	B3	1.14	2.4	2-<4%	10.0	8.2	0.82	12.2	1.2	30.0	3.0	58	8	9	7		34	0.7	42	14	118	48	0	0	14	200	36
MGNS02-01	9/8/11	2	NR-2-1-U	E4b	B3	1.14	2.4	2-<4%	5.5	6.3	1.14	4.8	1.5	235.5	>42.8	42	25	33	14												
MGNS02-01	9/8/11	3	NR-2-1-U					2-<4%																							
MGNS02-01	9/8/11	4	NR-2-1-U	E3b	B3	1.14	2.4	2-<4%	9.5	7.6	0.80	11.9	1.5	45.5	4.8	68	9	13	6												
MGNS02-01	9/8/11	5	NR-2-1-U	B4	B3	1.14	2.4	2-<4%	9.0	7.6	0.84	10.7	1.2	18.0	2.0	35	4	7	10												
MGNS03-01	9/8/11	1	NR-2-2-U	F3b	B3	1.14	2.5	2-<4%	21.5	22.3	1.04	20.8	1.5	27.5	1.3	92	2	3	0		7	1.0	35	13	129	53	0	0	3	34	63
MGNS03-01	9/8/11	2	NR-2-2-U	B3	B3	1.14	2.5	2-<4%	16.0	15.2	0.95	16.8	1.5	26.0	1.6	97	1	2	0												
MGNS03-01	9/8/11	3	NR-2-2-U	B3	B3	1.14	2.5	2-<4%	19.0	19.4	1.02	18.6	1.7	28.0	1.5	104	5	5	1												
MGNS03-01	9/8/11	4	NR-2-2-U	C3b	B3	1.14	2.5	2-<4%	20.2	28.1	1.39	14.5	1.8	85.2	4.2																
MGNS03-01	9/8/11	5	NR-2-2-U	C3b	B3	1.14	2.5	2-<4%	17.0	18.1	1.07	16.0	1.5	40.0	2.4	73	2	6	3												
LNCH09-01	9/9/11	1	NR-4-1-U	C4b	B4	1.37	3.2	4-<10%	10.2	5.1	0.50	20.5	0.8	120.2	11.8	43	2	2	4	85	18	0.8	33	3	49	9	1	0	29	104	200
LNCH09-01	9/9/11	2	NR-4-1-U	F4b	B4	1.37	3.2	4-<10%	11.0	7.9	0.72	15.3	1.1	14.0	1.3	40	2	2	6												
LNCH09-01	9/9/11	3	NR-4-1-U	C4b	B4	1.37	3.2	4-<10%	10.6	6.5	0.61	17.3	1.0	60.6	5.7	38	6	6	3	89											
LNCH09-01	9/9/11	4	NR-4-1-U	C4b	B4	1.37	3.2	4-<10%	13.7	6.4	0.46	29.6	0.7	37.7	2.8																
LNCH09-01	9/9/11	5	NR-4-1-U	C4b	B4	1.37	3.2	4-<10%	10.8	5.9	0.54	19.9	0.9	45.8	4.2	42	1	1	1	90											
LNCH12-02	9/9/11	1	NR-0-4-U	E4/C4	C4	1.14	1.5	<2%	10.8	11.4	1.06	10.2	1.4	30.8	2.9	55	0	0	4		15	1.3	17	5	50	35	6	0	16	20	15
LNCH12-02	9/9/11	2	NR-0-4-U	C4	C4	1.14	1.5	<2%	15.6	12.9	0.83	18.9	1.2	97.6	6.3	60	3	4	4												
LNCH12-02	9/9/11	3	NR-0-4-U	C4	C4	1.14	1.5	<2%	13.0	13.7	1.05	12.4	1.2	253.0	19.5	51	2	2	3												
LNCH12-02	9/9/11	4	NR-0-4-U	C4	C4	1.14	1.5	<2%	25.3	25.1	0.99	25.5	1.5	245.3	9.7																
LNCH12-02	9/9/11	5	NR-0-4-U	C3	C4	1.14	1.5	<2%	29.0	22.3	0.77	37.7	1.3	79.0	2.7	81	2	2	5												
LTMP14-03	9/12/11	1	NR-0-4-U	B3c	C3	1.20	0.9	<2%	34.4	42.7	1.24	27.7	1.7	76.4	2.2	71	3	3	6		5	1.3	10	3	23	64	2	0	13	119	60
LTMP14-03	9/12/11	2	NR-0-4-U	B4c	C3	1.20	0.9	<2%	55.2	70.7	1.28	43.1	2.3	115.2	2.1	60	3	4	1												
LTMP14-03	9/12/11	3	NR-0-4-U	B4c	C3	1.20	0.9	<2%	42.0	50.0	1.19	35.3	2.1	86.0	2.0	51	1	3	0												
LTMP14-03	9/12/11	4	NR-0-4-U	C4	C3	1.20	0.9	<2%	38.5	48.6	1.26	30.5	2.1	108.5	2.8																
LTMP14-03	9/12/11	5	NR-0-4-U	C4	C3	1.20	0.9	<2%	35.6	40.1	1.13	31.6	2.2	129.6	3.6	60	1	1	1	73											

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
LTMP12-01	9/12/11	1	NR-0-3-U	F3	B3	1.23	1.7	<2%	30.0	27.3	0.91	33.0	1.4	39.0	1.3	73	0	2	1		9	1.4	13	5	48	90	1	0	7	91	93
LTMP12-01	9/12/11	2	NR-0-3-U	C3	B3	1.23	1.7	<2%	19.6	21.3	1.09	18.0	1.9	60.6	3.1	62	0	0	0	85											
LTMP12-01	9/12/11	3	NR-0-3-U	B3c	B3	1.23	1.7	<2%	35.5	33.9	0.96	37.1	1.6	65.5	1.8	59	0	0	6												
LTMP12-01	9/12/11	4	NR-0-3-U		B3			<2%								66	2	2	2												
LTMP12-01	9/12/11	5	NR-0-3-U					<2%																							
LBRT01-01	9/13/11	1	NR-0-4-U	B4c	C4	1.23	0.3	<2%	54.7	96.3	1.76	31.1	2.8	109.7	2.0	11	31	42	8		8	2.0	27	4	43	78	8	0	25	55	62
LBRT01-01	9/13/11	2	NR-0-4-U	C4	C4	1.23	0.3	<2%	54.5	89.8	1.65	33.1	2.7	179.5	3.3	13	33	37	11												
LBRT01-01	9/13/11	3	NR-0-4-U	B4c	C4	1.23	0.3	<2%	50.0	66.0	1.32	37.9	2.1	95.0	1.9	24	9	15	7												
LBRT01-01	9/13/11	4	NR-0-4-U					<2%																							
LBRT01-01	9/13/11	5	NR-0-4-U	C4	C4	1.23	0.3	<2%	34.2	53.6	1.57	21.8	2.5	94.2	2.8	15	26	32	7												
MCGR02-03	9/13/11	1	NR-2-3-U	C3	E3	1.02	0.7	2-<4%	13.5	14.9	1.10	12.3	1.6	233.5	17.3	126	23	23	0		14	0.6	42	20	150	78	0	0	15	200	134
MCGR02-03	9/13/11	2	NR-2-3-U	C3	E3	1.02	0.7	2-<4%	13.3	12.7	0.96	13.8	1.8	233.3	>17.6	218	18	19	0												
MCGR02-03	9/13/11	3	NR-2-3-U	E3	E3	1.02	0.7	2-<4%	11.2	10.6	0.94	11.9	1.4	219.2	>19.6	128	37	37	0												
MCGR02-03	9/13/11	4	NR-2-3-U	E3	E3	1.02	0.7	2-<4%	11.2	12.7	1.14	9.9	1.8	229.2	>20.5																
MCGR02-03	9/13/11	5	NR-2-3-U	E3	E3	1.02	0.7	2-<4%	10.5	10.1	0.96	10.9	1.4	110.5	10.5	126	31	31	0												
MCGR06-02	9/14/11	1	NR-0-3-U	B4c	B4	1.10	1.9	<2%	19.4	24.1	1.24	15.6	1.8	31.4	1.6	42	0	2	3		13	0.8	26	1	31	89	0	0	24	13	23
MCGR06-02	9/14/11	2	NR-0-3-U	C4	B4	1.10	1.9	<2%	20.4	24.1	1.18	17.3	1.7	48.4	2.4	38	0	2	1												
MCGR06-02	9/14/11	3	NR-0-3-U	B4c	B4	1.10	1.9	<2%	19.9	24.3	1.22	16.3	1.7	33.9	1.7	50	1	6	3												
MCGR06-02	9/14/11	4	NR-0-3-U	B4c	B4	1.10	1.9	<2%	17.2	18.4	1.07	16.0	1.6	37.2	2.2																
MCGR06-02	9/14/11	5	NR-0-3-U	C4	B4	1.10	1.9	<2%	19.8	22.8	1.15	17.2	1.8	69.8	3.5	55	1	3	1												
LAZR08-01	9/14/11	1	NR-2-3-U			1.66	2-<4%	2-<4%	5.6	4.2	0.74	7.5	1.1	7.6	1.4						26	0.7	20	2	32	75	0	0	7	200	48
LAZR08-01	9/14/11	2	NR-2-3-U	E4b	E4	1.66	2-<4%	2-<4%	5.5	3.4	0.62	8.9	1.0	13.5	2.5	19	4	8	9												
LAZR08-01	9/14/11	3	NR-2-3-U	B4	E4	1.66	2-<4%	2-<4%	9.8	5.0	0.51	19.3	0.8	13.8	1.4	14	5	14	16												
LAZR08-01	9/14/11	4	NR-2-3-U	B4	E4	1.66	2-<4%	2-<4%	10.2	5.7	0.56	18.2	1.0	21.2	2.1	15	8	12	11												
LAZR08-01	9/14/11	5	NR-2-3-U	E4b	E4	1.66	2-<4%	2-<4%	7.4	3.5	0.47	15.8	0.8	17.4	2.4	15	3	15	10												
LAZR10-01	9/14/11	1	NR-0-3-U	C4b	B4	1.18	2.6	<2%	11.9	10.4	0.87	13.7	1.6	52.9	4.4	41	0	0	1		10	0.7	28	4	41	78	0	0	48	160	59
LAZR10-01	9/14/11	2	NR-0-3-U	E4b	B4	1.18	2.6	<2%	10.5	10.6	1.01	10.4	1.4	30.5	2.9	39	0	6	4												
LAZR10-01	9/14/11	3	NR-0-3-U	C4b	B4	1.18	2.6	<2%	13.2	9.4	0.72	18.5	1.4	36.2	2.7	31	1	2	3												
LAZR10-01	9/14/11	4	NR-0-3-U	B4	B4	1.18	2.6	<2%	11.9	10.8	0.91	13.1	1.6	24.9	2.1	33	1	8	3												
LAZR10-01	9/14/11	5	NR-0-3-U					<2%																							
FTRP08-01	9/15/11	1	NR-0-4-C	B4c	C4	1.24	0.5	<2%	47.0	67.9	1.45	32.5	2.0	76.8	1.6	22	18	19	4		5	1.7	16	1	21	99	0	0	11	200	53
FTRP08-01	9/15/11	2	NR-0-4-C	B4c	C4	1.24	0.5	<2%	46.0	76.6	1.67	27.6	2.4	96.3	2.1	31	12	18	4												
FTRP08-01	9/15/11	3	NR-0-4-C					<2%																							
FTRP08-01	9/15/11	4	NR-0-4-C	C4	C4	1.24	0.5	<2%	40.0	64.4	1.61	24.8	2.1	135.2	3.4	27	16	18	3												
FTRP08-01	9/15/11	5	NR-0-4-C	C4	C4	1.24	0.5	<2%	37.0	62.0	1.68	22.1	2.1	217.0	5.9	32	7	12	2												
FTRP06-02	9/15/11	1	NR-0-3-U	C4	C4	1.20	0.5	<2%	23.0	25.8	1.12	20.5	1.5	68.0	3.0	25	1	6	2		12	1.6	0	0	0	62	0	0	0	112	69
FTRP06-02	9/15/11	2	NR-0-3-U					<2%																							
FTRP06-02	9/15/11	3	NR-0-3-U	B4c	C4	1.20	0.5	<2%	25.0	31.4	1.26	19.9	1.8	55.0	2.2	24	11	11	5												
FTRP06-02	9/15/11	4	NR-0-3-U	B4c	C4	1.20	0.5	<2%	28.0	28.4	1.02	27.6	1.5	61.2	2.2	30	3	7	7												
FTRP06-02	9/15/11	5	NR-0-3-U	B4c	C4	1.20	0.5	<2%	26.5	32.4	1.22	21.7	1.8	56.8	2.1	21	11	13	6												

Reach ID	Reach Type	Pool	Residual Depth (Feet)	Spawning Gravels Identified	Pool Tail-out Fines (%)
HNRY04-01	NR-4-2-U	1	0.6		
HNRY04-01	NR-4-2-U	2	0.5		
HNRY04-01	NR-4-2-U	3	0.3		
HNRY04-01	NR-4-2-U	4	0.4		
HNRY04-01	NR-4-2-U	5	0.5		
HNRY04-01	NR-4-2-U	6	0.6		
HNRY04-01	NR-4-2-U	7	0.8		
HNRY04-01	NR-4-2-U	8	0.5		
HNRY04-01	NR-4-2-U	9	0.4		
HNRY04-01	NR-4-2-U	10	0.6		
HNRY04-01	NR-4-2-U	11	0.8		
LNCH09-01	NR-4-1-U	1	0.4	Y	4
LNCH09-01	NR-4-1-U	2	0.9		
LNCH09-01	NR-4-1-U	3	0.9	Y	10
LNCH09-01	NR-4-1-U	4	0.8		
LNCH09-01	NR-4-1-U	5	0.5		
LNCH09-01	NR-4-1-U	6	0.5	Y	18
LNCH09-01	NR-4-1-U	7	1.2	Y	7
LNCH09-01	NR-4-1-U	8	1.2	Y	6
LNCH09-01	NR-4-1-U	9	0.8		
LNCH09-01	NR-4-1-U	10	0.4	Y	12
LNCH09-01	NR-4-1-U	11	0.4		
LNCH09-01	NR-4-1-U	12	1.1	Y	6
LNCH09-01	NR-4-1-U	13	0.5	Y	2
LNCH09-01	NR-4-1-U	14	1.3	Y	4
LNCH09-01	NR-4-1-U	15	0.8		
LNCH09-01	NR-4-1-U	16	1.5		
LNCH09-01	NR-4-1-U	17	1.2		
LNCH09-01	NR-4-1-U	18	0.5		
LNCH12-02	NR-0-4-U	1	2.0		
LNCH12-02	NR-0-4-U	2	3.0		
LNCH12-02	NR-0-4-U	3	0.5		
LNCH12-02	NR-0-4-U	4	1.2		
LNCH12-02	NR-0-4-U	5	1.0		
LNCH12-02	NR-0-4-U	6	0.6		
LNCH12-02	NR-0-4-U	7	1.0		
LNCH12-02	NR-0-4-U	8	0.8		
LNCH12-02	NR-0-4-U	9	0.8		
LNCH12-02	NR-0-4-U	10	1.5		
LNCH12-02	NR-0-4-U	11	1.1		
LNCH12-02	NR-0-4-U	12	1.1		
LNCH12-02	NR-0-4-U	13	1.0		
LNCH12-02	NR-0-4-U	14	1.4		
LNCH12-02	NR-0-4-U	15	2.3		
SWMP01-05	NR-0-3-U	1	1.4	Y	26
SWMP01-05	NR-0-3-U	2	2.4	Y	12
SWMP01-05	NR-0-3-U	3	2.4	Y	15
SWMP01-05	NR-0-3-U	4	2.4		
SWMP01-05	NR-0-3-U	5	1.8	Y	31
SWMP01-05	NR-0-3-U	6	2.0	Y	17

Reach ID	Reach Type	Pool	Residual Depth (Feet)	Spawning Gravels Identified	Pool Tail-out Fines (%)
SWMP01-06	NR-0-3-U	1	2.3	Y	5
SWMP01-06	NR-0-3-U	2	1.9	Y	5
SWMP01-06	NR-0-3-U	3	0.8	Y	0
SWMP01-06	NR-0-3-U	4	1.3	Y	10
SWMP01-06	NR-0-3-U	5	2.1		
SWMP01-06	NR-0-3-U	6	4.0	Y	0
SWMP01-06	NR-0-3-U	7	3.2	Y	3
SWMP01-06	NR-0-3-U	8	1.1	Y	1
SWMP01-06	NR-0-3-U	9	1.5	Y	7
SWMP01-06	NR-0-3-U	10	0.7		
SWMP01-06	NR-0-3-U	11	1.6		
SWMP01-06	NR-0-3-U	12	2.7	Y	8
SWMP01-06	NR-0-3-U	13			
SWMP01-06	NR-0-3-U	14	2.9	Y	1
MGNS02-01	NR-2-1-U	1	0.8		
MGNS02-01	NR-2-1-U	2	0.9		
MGNS02-01	NR-2-1-U	3	0.7		
MGNS02-01	NR-2-1-U	4	0.8		
MGNS02-01	NR-2-1-U	5	0.4		
MGNS02-01	NR-2-1-U	6	0.3		
MGNS02-01	NR-2-1-U	7	1.1		
MGNS02-01	NR-2-1-U	8	1.0	Y	22
MGNS02-01	NR-2-1-U	9	0.5		
MGNS02-01	NR-2-1-U	10	0.5		
MGNS02-01	NR-2-1-U	11	0.6	Y	40
MGNS02-01	NR-2-1-U	12	0.9		
MGNS02-01	NR-2-1-U	13	0.6		
MGNS02-01	NR-2-1-U	14	0.6		
MGNS02-01	NR-2-1-U	15	0.6		
MGNS02-01	NR-2-1-U	16	1.1	Y	22
MGNS02-01	NR-2-1-U	17	1.1	Y	10
MGNS03-01	NR-2-2-U	1	0.7		
MGNS03-01	NR-2-2-U	2	1.1		
MGNS03-01	NR-2-2-U	3	1.1		
MGNS03-01	NR-2-2-U	4	1.2		
MGNS03-01	NR-2-2-U	5	1.4		
MGNS03-01	NR-2-2-U	6	0.6		
MGNS03-01	NR-2-2-U	7	0.8		
LTMP12-01	NR-0-3-U	1	1.7		
LTMP12-01	NR-0-3-U	2	1.1		
LTMP12-01	NR-0-3-U	3	1.6		
LTMP12-01	NR-0-3-U	4	2.0		
LTMP12-01	NR-0-3-U	5	1.3		
LTMP12-01	NR-0-3-U	6	0.8		
LTMP12-01	NR-0-3-U	7	1.1		
LTMP12-01	NR-0-3-U	8	1.3		
LTMP12-01	NR-0-3-U	9	2.0		

Reach ID	Reach Type	Pool	Residual Depth (Feet)	Spawning Gravels Identified	Pool Tail-out Fines (%)
LTMP14-03	NR-0-4-U	1	0.7	Y	8
LTMP14-03	NR-0-4-U	2	0.7		
LTMP14-03	NR-0-4-U	3	1.9		
LTMP14-03	NR-0-4-U	4	1.9		
LTMP14-03	NR-0-4-U	5	1.1	Y	2
LBRT01-01	NR-0-4-U	1	2.1	Y	5
LBRT01-01	NR-0-4-U	2	2.7	Y	3
LBRT01-01	NR-0-4-U	3	1.2		
LBRT01-01	NR-0-4-U	4	3.2	N	22
LBRT01-01	NR-0-4-U	5	2.5	Y	4
LBRT01-01	NR-0-4-U	6	1.2		
LBRT01-01	NR-0-4-U	7	1.4	Y	6
LBRT01-01	NR-0-4-U	8	1.4		
MCGR02-03	NR-2-3-U	1	0.9		
MCGR02-03	NR-2-3-U	2	0.6		
MCGR02-03	NR-2-3-U	3	0.5		
MCGR02-03	NR-2-3-U	4	0.5		
MCGR02-03	NR-2-3-U	5	0.6		
MCGR02-03	NR-2-3-U	6	0.4		
MCGR02-03	NR-2-3-U	7	0.5		
MCGR06-02	NR-0-3-U	1	0.9		
MCGR06-02	NR-0-3-U	2	1.4		
MCGR06-02	NR-0-3-U	3	0.7	Y	1
MCGR06-02	NR-0-3-U	4	0.6		
MCGR06-02	NR-0-3-U	5	0.8		
MCGR06-02	NR-0-3-U	6	0.7		
MCGR06-02	NR-0-3-U	7	0.9	Y	9
MCGR06-02	NR-0-3-U	8	0.6		
MCGR06-02	NR-0-3-U	9	0.6		
MCGR06-02	NR-0-3-U	10	1.1		
MCGR06-02	NR-0-3-U	11	0.7		
MCGR06-02	NR-0-3-U	12	0.5	Y	14
MCGR06-02	NR-0-3-U	13	1.0		
LAZR08-01	NR-2-3-U	1	0.4	Y	12
LAZR08-01	NR-2-3-U	2	0.6	Y	5
LAZR08-01	NR-2-3-U	3	0.9	Y	9
LAZR08-01	NR-2-3-U	4	0.7	Y	9
LAZR08-01	NR-2-3-U	5	0.9	Y	12
LAZR08-01	NR-2-3-U	6	0.8		
LAZR08-01	NR-2-3-U	7	0.7	Y	19
LAZR08-01	NR-2-3-U	8	0.9		
LAZR08-01	NR-2-3-U	9	0.3	Y	7
LAZR08-01	NR-2-3-U	10	0.7	Y	18
LAZR08-01	NR-2-3-U	11	0.5		
LAZR08-01	NR-2-3-U	12	0.8		
LAZR08-01	NR-2-3-U	13	0.7	Y	11

Reach ID	Reach Type	Pool	Residual Depth (Feet)	Spawning Gravels Identified	Pool Tail-out Fines (%)
LAZR10-01	NR-0-3-U	1	0.7	Y	7
LAZR10-01	NR-0-3-U	2	0.7	Y	4
LAZR10-01	NR-0-3-U	3	0.8		
LAZR10-01	NR-0-3-U	4	0.6		
FTRP06-02	NR-0-3-U	1	1.5	Y	13
FTRP06-02	NR-0-3-U	2	2.3	Y	8
FTRP06-02	NR-0-3-U	3	1.8	Y	6
FTRP06-02	NR-0-3-U	4	2.5	Y	2
FTRP06-02	NR-0-3-U	5	2.1	Y	7
FTRP06-02	NR-0-3-U	6	1.7	Y	7
FTRP06-02	NR-0-3-U	7	1.0	Y	6
FTRP06-02	NR-0-3-U	8	1.5		
FTRP06-02	NR-0-3-U	9	1.9	Y	4
FTRP06-02	NR-0-3-U	10	1.0	Y	9
FTRP06-02	NR-0-3-U	11	1.3	Y	8
FTRP06-02	NR-0-3-U	12	0.9		
FTRP08-01	NR-0-4-C	1	3.0	Y	5
FTRP08-01	NR-0-4-C	2	1.9	Y	3
FTRP08-01	NR-0-4-C	3	1.3	Y	3
FTRP08-01	NR-0-4-C	4	1.0		
FTRP08-01	NR-0-4-C	5	1.4	Y	1

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)
Henry Creek	HNRY 01-01	NR-10-1-U	0.00	483	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
Henry Creek	HNRY 02-01	NR-10-1-U	0.00	1958	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
Henry Creek	HNRY 03-01	NR-4-1-U	5.99	7107	42.6	70	0	0	0	30	0	0	0	29.8	0.0	0.0	0.0	12.8	0.0	0.0	0.0
Henry Creek	**HNRY 04-01**	**NR-4-2-U**	**3.59**	**20834**	**74.8**	**40.9**	**0.0**	**0.0**	**0.0**	**20.0**	**0.0**	**39.1**	**0.0**	**30.6**	**0.0**	**0.0**	**0.0**	**15.0**	**0.0**	**29.2**	**0.0**
Henry Creek	HNRY 05-01	NR-4-2-C	5.99	1617	9.7	70	0	0	0	0	0	30	0	6.8	0.0	0.0	0.0	0.0	0.0	2.9	0.0
Henry Creek	HNRY 06-01	NR-4-2-U	5.99	3616	21.7	30	0	0	0	0	0	0	70	6.5	0.0	0.0	0.0	0.0	0.0	0.0	15.2
Henry Creek			TOTAL	35615	148.7								TOTAL	73.7	0.0	0.0	0.0	27.7	0.0	32.1	15.2
Henry Creek													PERCENT	0.50	0.00	0.00	0.00	0.19	0.00	0.22	0.10
Lazier Creek	LAZR 01-01	NR-10-1-U	0.00	2597	0.0	10	0	0	0	90	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lazier Creek	LAZR 02-01	NR-4-1-U	5.99	5570	33.4	30	0	0	0	70	0	0	0	10.0	0.0	0.0	0.0	23.4	0.0	0.0	0.0
Lazier Creek	LAZR 03-01	NR-2-1-U	2.18	1677	3.7	40	0	0	0	60	0	0	0	1.5	0.0	0.0	0.0	2.2	0.0	0.0	0.0
Lazier Creek	LAZR 03-02	NR-2-1-U	1.78	2571	4.6	10	0	0	0	0	0	90	0	0.5	0.0	0.0	0.0	0.0	0.0	4.1	0.0
Lazier Creek	LAZR 04-01	NR-0-1-U	0.00	1260	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
Lazier Creek	LAZR 05-01	NR-0-2-U	3.31	4401	14.6	10	0	0	0	10	0	80	0	1.5	0.0	0.0	0.0	1.5	0.0	11.7	0.0
Lazier Creek	LAZR 05-02	NR-0-2-U	9.75	4809	46.9	50	0	0	0	20	0	30	0	23.4	0.0	0.0	0.0	9.4	0.0	14.1	0.0
Lazier Creek	LAZR 06-01	NR-0-3-U	9.75	2548	24.8	0	0	0	0	70	0	30	0	0.0	0.0	0.0	0.0	17.4	0.0	7.5	0.0
Lazier Creek	LAZR 07-01	NR-2-3-U	5.60	1423	8.0	0	0	0	0	50	0	50	0	0.0	0.0	0.0	0.0	4.0	0.0	4.0	0.0
Lazier Creek	**LAZR 08-01**	**NR-2-3-U**	**14.01**	**8530**	**119.5**	**0.0**	**40.0**	**0.0**	**0.0**	**60.0**	**0.0**	**0.0**	**0.0**	**0.0**	**47.8**	**0.0**	**0.0**	**71.7**	**0.0**	**0.0**	**0.0**
Lazier Creek	LAZR 09-01	NR-10-3-C	5.60	1451	8.1	0	0	0	0	100	0	0	0	0.0	0.0	0.0	0.0	8.1	0.0	0.0	0.0
Lazier Creek	**LAZR 10-01**	**NR-0-3-U**	**9.83**	**550**	**5.4**	**0.0**	**2.1**	**0.0**	**0.0**	**0.0**	**0.0**	**48.4**	**49.6**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**2.6**	**2.7**
Lazier Creek	LAZR 10-02	NR-0-3-U	9.75	2263	22.1	10	90	0	0	0	0	0	0	2.2	19.9	0.0	0.0	0.0	0.0	0.0	0.0
Lazier Creek			TOTAL	39651	291.0								TOTAL	39.0	67.8	0.0	0.0	137.6	0.0	43.9	2.7
Lazier Creek													PERCENT	0.13	0.23	0.00	0.00	0.47	0.00	0.15	0.01
Little Bitterroot River	**LBRT 01-01**	**NR-0-4-U**	**2.40**	**10884**	**26.1**	**0.0**	**62.3**	**0.0**	**0.0**	**7.1**	**0.0**	**0.0**	**30.6**	**0.0**	**16.3**	**0.0**	**0.0**	**1.9**	**0.0**	**0.0**	**8.0**
Little Bitterroot River	LBRT 02-01	NR-0-4-C	8.82	1942	17.1	0	0	0	0	50	0	50	0	0.0	0.0	0.0	0.0	8.6	0.0	8.6	0.0
Little Bitterroot River	LBRT 03-01	NR-0-4-C	8.82	4788	42.2	30	0	0	0	60	0	0	10	12.7	0.0	0.0	0.0	25.3	0.0	0.0	4.2
Little Bitterroot River	LBRT 04-01	NR-2-4-C	5.60	2120	11.9	10	0	0	0	20	0	70	0	1.2	0.0	0.0	0.0	2.4	0.0	8.3	0.0
Little Bitterroot River	LBRT 05-01	NR-2-4-U	5.60	3976	22.3	20	80	0	0	0	0	0	0	4.5	17.8	0.0	0.0	0.0	0.0	0.0	0.0
Little Bitterroot River	LBRT 06-01	NR-2-5-U	5.60	2369	13.3	20	80	0	0	0	0	0	0	2.7	10.6	0.0	0.0	0.0	0.0	0.0	0.0
Little Bitterroot River			TOTAL	26079	132.9								TOTAL	21.0	44.7	0.0	0.0	38.1	0.0	16.9	12.2
Little Bitterroot River													PERCENT	0.16	0.34	0.00	0.00	0.29	0.00	0.13	0.09
Lynch Creek	LNCH 01-01	NR-10-1-C	0.00	1139	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
Lynch Creek	LNCH 02-01	NR-10-1-U	0.00	764	0.0	30	0	0	0	70	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lynch Creek	LNCH 03-01	NR-4-1-C	5.99	2951	17.7	30	0	0	0	70	0	0	0	5.3	0.0	0.0	0.0	12.4	0.0	0.0	0.0
Lynch Creek	LNCH 04-01	NR-10-1-C	0.00	2911	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
Lynch Creek	LNCH 05-01	NR-4-1-C	1.91	6014	11.5	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	11.5	0.0
Lynch Creek	LNCH 06-01	NR-4-1-U	5.99	2708	16.2	50	0	0	0	50	0	0	0	8.1	0.0	0.0	0.0	8.1	0.0	0.0	0.0
Lynch Creek	LNCH 07-01	NR-2-1-U	2.18	11434	24.9	30	0	0	0	70	0	0	0	7.5	0.0	0.0	0.0	17.4	0.0	0.0	0.0
Lynch Creek	LNCH 07-02	NR-2-1-U	2.18	1060	2.3	80	0	0	0	20	0	0	0	1.8	0.0	0.0	0.0	0.5	0.0	0.0	0.0
Lynch Creek	LNCH 08-01	NR-4-1-C	5.99	3117	18.7	100	0	0	0	0	0	0	0	18.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lynch Creek	**LNCH 09-01**	**NR-4-1-U**	**13.90**	**3625**	**50.4**	**0.0**	**0.0**	**0.0**	**0.0**	**40.0**	**0.0**	**30.0**	**30.0**	**0.0**	**0.0**	**0.0**	**0.0**	**20.2**	**0.0**	**15.1**	**15.1**
Lynch Creek	LNCH 10-01	NR-2-2-U	1.78	4240	7.5	0	0	0	0	0	0	100	0	0.0	0.0	0.0	0.0	0.0	0.0	7.5	0.0
Lynch Creek	LNCH 11-01	NR-2-3-U	5.60	5835	32.7	20	30	0	0	30	10	0	10	6.5	9.8	0.0	0.0	9.8	3.3	0.0	3.3
Lynch Creek	LNCH 12-01	NR-0-4-U	8.82	8183	72.2	10	30	0	0	20	0	10	30	7.2	21.7	0.0	0.0	14.4	0.0	7.2	21.7
Lynch Creek	**LNCH 12-02**	**NR-0-4-U**	**4.94**	**3053**	**15.1**	**0.0**	**62.5**	**0.0**	**0.0**	**0.0**	**18.8**	**18.8**	**0.0**	**0.0**	**9.4**	**0.0**	**0.0**	**0.0**	**2.8**	**2.8**	**0.0**
Lynch Creek	LNCH 12-03	NR-0-4-U	8.82	5541	48.9	40	0	0	0	0	0	0	60	19.5	0.0	0.0	0.0	0.0	0.0	0.0	29.3
Lynch Creek	LNCH 12-04	NR-0-4-U	8.82	2577	22.7	0	40	60	0	0	0	0	0	0.0	9.1	13.6	0.0	0.0	0.0	0.0	0.0
Lynch Creek	LNCH 12-05	NR-0-4-U	8.82	4945	43.6	0	40	0	0	0	20	0	40	0.0	17.4	0.0	0.0	0.0	8.7	0.0	17.4
Lynch Creek			TOTAL	70096	384.4								TOTAL	74.7	67.4	13.6	0.0	82.8	14.8	44.2	86.8
Lynch Creek													PERCENT	0.19	0.18	0.04	0.00	0.22	0.04	0.11	0.23
Little Thompson River	LTMP 01-01	NR-4-1-U	5.99	769	4.6	0	0	0	0	100	0	0	0	0.0	0.0	0.0	0.0	4.6	0.0	0.0	0.0
Little Thompson River	LTMP 02-01	NR-4-1-U	5.99	2009	12.0	0	0	0	0	100	0	0	0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0
Little Thompson River	LTMP 03-01	NR-2-1-U	2.18	2131	4.6	0	0	0	0	100	0	0	0	0.0	0.0	0.0	0.0	4.6	0.0	0.0	0.0
Little Thompson River	LTMP 03-02	NR-2-1-U	2.18	2504	5.5	0	50	0	0	50	0	0	0	0.0	2.7	0.0	0.0	2.7	0.0	0.0	0.0
Little Thompson River	LTMP 04-01	NR-0-1-U	0.00	4365	0.0	10	0	0	0	90	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Little Thompson River	LTMP 04-02	NR-0-1-U	0.00	2178	0.0	0	100	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Little Thompson River	LTMP 04-03	NR-0-1-U	0.00	1402	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
Little Thompson River	LTMP 04-04	NR-0-1-U	0.00	1702	0.0	0	0	0	0	20	0	80	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Little Thompson River	LTMP 05-01	NR-0-3-U	9.75	2350	22.9	0	0	0	0	90	0	10	0	0.0	0.0	0.0	0.0	20.6	0.0	2.3	0.0
Little Thompson River	LTMP 05-02	NR-0-3-U	9.75	1596	15.6	30	0	0	0	0	0	0	70	4.7	0.0	0.0	0.0	0.0	0.0	0.0	10.9
Little Thompson River	LTMP 06-01	NR-0-3-U	9.75	4477	43.6	0	0	0	0	50	0	50	0	0.0	0.0	0.0	0.0	21.8	0.0	21.8	0.0
Little Thompson River	LTMP 06-02	NR-0-3-U	9.75	2880	28.1	0	0	0	0	100	0	0	0	0.0	0.0	0.0	0.0	28.1	0.0	0.0	0.0
Little Thompson River	LTMP 07-01	NR-0-3-U	9.75	5048	49.2	0	0	0	0	100	0	0	0	0.0	0.0	0.0	0.0	49.2	0.0	0.0	0.0
Little Thompson River	LTMP 08-01	NR-2-3-C	5.60	2942	16.5	30	0	0	0	50	0	20	0	4.9	0.0	0.0	0.0	8.2	0.0	3.3	0.0
Little Thompson River	LTMP 09-01	NR-0-3-C	9.75	2679	26.1	30	0	0	0	70	0	0	0	7.8	0.0	0.0	0.0	18.3	0.0	0.0	0.0
Little Thompson River	LTMP 10-01	NR-0-3-C	9.75	5022	49.0	0	0	0	0	70	0	30	0	0.0	0.0	0.0	0.0	34.3	0.0	14.7	0.0
Little Thompson River	LTMP 11-01	NR-2-3-C	5.60	19455	108.9	0	0	0	0	70	0	30	0	0.0	0.0	0.0	0.0	76.3	0.0	32.7	0.0
Little Thompson River	**LTMP 12-01**	**NR-0-3-U**	**7.81**	**6287**	**49.1**	**0.0**	**40.0**	**0.0**	**0.0**	**0.0**	**0.0**	**20.0**	**40.0**	**0.0**	**19.6**	**0.0**	**0.0**	**0.0**	**0.0**	**9.8**	**19.6**
Little Thompson River	LTMP 13-01	NR-0-3-U	3.31	12911	42.7	10	0	0	0	10	0	80	0	4.3	0.0	0.0	0.0	4.3	0.0	34.2	0.0
Little Thompson River	LTMP 14-01	NR-0-4-U	8.82	14455	127.5	10	0	0	0	60	0	0	30	12.7	0.0	0.0	0.0	76.5	0.0	0.0	38.2
Little Thompson River	LTMP 14-02	NR-0-4-U	8.82	3381	29.8	70	30	0	0	0	0	0	0	20.9	8.9	0.0	0.0	0.0	0.0	0.0	0.0
Little Thompson River	**LTMP 14-03**	**NR-0-4-U**	**8.98**	**1294**	**11.6**	**0.0**	**20.0**	**0.0**	**0.0**	**0.0**	**0.0**	**40.8**	**39.2**	**0.0**	**2.3**	**0.0**	**0.0**	**0.0**	**0.0**	**4.7**	**4.6**
Little Thompson River	LTMP 15-01	NR-0-4-C	8.82	3289	29.0	50	0	0	0	50	0	0	0	14.5	0.0	0.0	0.0	14.5	0.0	0.0	0.0
Little Thompson River			TOTAL	105126	676.5								TOTAL	69.8	33.6	0.0	0.0	376.1	0.0	123.5	73.3
Little Thompson River													PERCENT	0.10	0.05	0.00	0.00	0.56	0.00	0.18	0.11
McGregor Creek	MCGR 01-01	NR-2-2-U	2.18	1014	2.2	80	0	0	0	0	0	0	20	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.4
McGregor Creek	MCGR 01-02	NR-2-2-U	2.18	1303	2.8	80	0	0	0	20	0	0	0	2.3	0.0	0.0	0.0	0.6	0.0	0.0	0.0
McGregor Creek	MCGR 02-01	NR-2-3-U	5.60	538	3.0	80	0	0	0	20	0	0	0	2.4	0.0	0.0	0.0	0.6	0.0	0.0	0.0
McGregor Creek	MCGR 02-02	NR-2-3-U	5.60	2131	11.9	90	0	0	0	0	0	0	10	10.7	0.0	0.0	0.0	0.0	0.0	0.0	1.2
McGregor Creek	**MCGR 02-03**	**NR-2-3-U**	**0.21**	**2339**	**0.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**80.0**	**20.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.4**	**0.1**
McGregor Creek	MCGR 02-04	NR-2-3-U	5.60	1232	6.9	70	0	0	0	0	0	0	30	4.8	0.0	0.0	0.0	0.0	0.0	0.0	2.1
McGregor Creek	MCGR 03-01	NR-0-3-U	9.75	1900	18.5	10	80	0	0	0	0	0	10	1.9	14.8	0.0	0.0	0.0	0.0	0.0	1.9
McGregor Creek	MCGR 04-01	NR-0-3-U	9.75	1811	17.7	80	0	0	0	20	0	0	0	14.1	0.0	0.0	0.0	3.5	0.0	0.0	0.0
McGregor Creek	MCGR 05-01	NR-0-3-U	9.75	1461	14.2	50	0	0	0	50	0	0	0	7.1	0.0	0.0	0.0	7.1	0.0	0.0	0.0
McGregor Creek	MCGR 06-01	NR-0-3-U	9.75	1778	17.3	50	0	0	0	50	0	0	0	8.7	0.0	0.0	0.0	8.7	0.0	0.0	0.0
McGregor Creek	**MCGR 06-02**	**NR-0-3-U**	**2.17**	**5487**	**11.9**	**43.4**	**0.0**	**0.0**	**0.0**	**16.8**	**16.8**	**23.1**	**0.0**	**5.2**	**0.0**	**0.0**	**0.0**	**2.0**	**2.0**	**2.8**	**0.0**
McGregor Creek	MCGR 07-01	NR-4-3-C	5.99	2787	16.7	70	0	0	0	30	0	0	0	11.7	0.0	0.0	0.0	5.0	0.0	0.0	0.0
McGregor Creek	MCGR 08-01	NR-4-3-U	5.99	2112	12.6	30	0	0	0	70	0	0	0	3.8	0.0	0.0	0.0	8.9	0.0	0.0	0.0
McGregor Creek	MCGR 09-01	NR-0-3-U	9.75	2747	26.8	10	80	0	0	0	10	0	0	2.7	21.4	0.0	0.0	0.0	2.7	0.0	0.0
McGregor Creek	MCGR 09-02	NR-0-3-U	9.75	2527	24.6	0	90	0	0	0	10	0	0	0.0	22.2	0.0	0.0	0.0	2.5	0.0	0.0
McGregor Creek	MCGR 09-03	NR-0-3-U	9.75	4035	39.3	10	0	90	0	0	0	0	0	3.9	0.0	35.4	0.0	0.0	0.0	0.0	0.0
McGregor Creek	MCGR 09-04	NR-0-3-U	9.75	751	7.3	0	100	0	0	0	0	0	0	0.0	7.3	0.0	0.0	0.0	0.0	0.0	0.0
McGregor Creek			TOTAL	35954	234.5								TOTAL	81.1	65.7	35.4	0.0	36.4	7.1	3.1	5.7
McGregor Creek													PERCENT	0.35	0.28	0.15	0.00	0.16	0.03	0.01	0.02

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)
McGinnis Creek	MGNS 01-01	NR-4-1-U	5.99	2667	16.0	0	0	0	0	40	0	60	0	0.0	0.0	0.0	0.0	6.4	0.0	9.6	0.0
McGinnis Creek	**MGNS 02-01**	**NR-2-1-U**	**2.05**	**7203**	**14.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**60.0**	**40.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**8.9**	**5.9**
McGinnis Creek	**MGNS 03-01**	**NR-2-2-U**	**0.93**	**14584**	**13.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**50.0**	**50.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**6.8**	**6.8**
McGinnis Creek	MGNS 04-01	NR-0-2-C	9.75	2585	25.2	70	0	0	0	30	0	0	0	17.6	0.0	0.0	0.0	7.6	0.0	0.0	0.0
McGinnis Creek			**TOTAL**	**27039**	**69.5**								**TOTAL**	**17.6**	**0.0**	**0.0**	**0.0**	**14.0**	**0.0**	**25.2**	**12.7**
McGinnis Creek													**PERCENT**	**0.25**	**0.00**	**0.00**	**0.00**	**0.20**	**0.00**	**0.36**	**0.18**
Sullivan Creek	SLVN 01-01	NR-4-1-C	5.99	1686	10.1	60	0	0	40	0	0	0	0	6.1	0.0	0.0	4.0	0.0	0.0	0.0	0.0
Sullivan Creek	SLVN 02-01	NR-4-1-U	5.99	1875	11.2	50	0	0	20	30	0	0	0	5.6	0.0	0.0	2.2	3.4	0.0	0.0	0.0
Sullivan Creek	SLVN 03-01	NR-2-1-U	2.18	1589	3.5	0	0	0	0	0	0	0	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5
Sullivan Creek	SLVN 03-02	NR-2-1-U	2.18	5983	13.0	20	0	0	30	0	0	0	50	2.6	0.0	0.0	3.9	0.0	0.0	0.0	6.5
Sullivan Creek	SLVN 03-03	NR-2-1-U	2.18	1653	3.6	80	0	0	0	0	0	0	20	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Sullivan Creek	SLVN 04-01	NR-0-1-U	0.00	3993	0.0	50	50	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sullivan Creek			**TOTAL**	**16778**	**41.4**								**TOTAL**	**17.2**	**0.0**	**0.0**	**10.2**	**3.4**	**0.0**	**0.0**	**10.7**
Sullivan Creek													**PERCENT**	**0.41**	**0.00**	**0.00**	**0.25**	**0.08**	**0.00**	**0.00**	**0.26**
Swamp Creek	SWMP 01-01	NR-0-3-U	9.75	6743	65.7	40	0	0	0	30	0	0	30	26.3	0.0	0.0	0.0	19.7	0.0	0.0	19.7
Swamp Creek	SWMP 01-02	NR-0-3-U	9.75	1556	15.2	50	30	0	0	0	0	0	20	7.6	4.6	0.0	0.0	0.0	0.0	0.0	3.0
Swamp Creek	SWMP 01-03	NR-0-3-U	9.75	382	3.7	0	60	40	0	0	0	0	0	0.0	2.2	1.5	0.0	0.0	0.0	0.0	0.0
Swamp Creek	SWMP 01-04	NR-0-3-U	9.75	2060	20.1	0	60	0	0	0	0	10	30	0.0	12.0	0.0	0.0	0.0	0.0	2.0	6.0
Swamp Creek	**SWMP 01-05**	**NR-0-3-U**	**11.23**	**4198**	**47.1**	**0.0**	**20.0**	**0.0**	**0.0**	**1.0**	**0.0**	**40.0**	**39.0**	**0.0**	**9.4**	**0.0**	**0.0**	**0.5**	**0.0**	**18.9**	**18.4**
Swamp Creek	**SWMP 01-06**	**NR-0-3-U**	**8.79**	**8191**	**72.0**	**0.0**	**47.1**	**0.0**	**0.0**	**0.0**	**0.0**	**52.9**	**0.0**	**0.0**	**33.9**	**0.0**	**0.0**	**0.0**	**0.0**	**38.1**	**0.0**
Swamp Creek	SWMP 01-07	NR-0-3-U	9.75	2816	27.5	90	0	0	0	0	0	0	10	24.7	0.0	0.0	0.0	0.0	0.0	0.0	2.7
Swamp Creek			**TOTAL**	**25946**	**251.3**								**TOTAL**	**58.6**	**62.2**	**1.5**	**0.0**	**20.2**	**0.0**	**59.0**	**49.9**
Swamp Creek													**PERCENT**	**0.23**	**0.25**	**0.01**	**0.00**	**0.08**	**0.00**	**0.23**	**0.20**