APPENDIX C - BANK EROSION ASSESSMENT, MADISON TMDL PLANNING AREA

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C1.0 INTRODUCTION

This appendix presents an assessment of sediment loading due to streambank erosion in the Madison TMDL Planning Area (TPA) located in Madison and Gallatin counties. Sediment loads due to streambank erosion were estimated based on field data collected at 42 monitoring sites in summer 2014.

The streambank erosion assessment involved several procedures. First, streams were stratified into similar reaches using an aerial assessment performed in GIS. Streambank erosion data was then collected in the field at selected monitoring sites, and sediment loads were estimated based on field surveys of streambanks. Sediment loads from field assessed monitoring sites were then extrapolated to the unassessed stream reaches and segments in each impaired watershed to estimate a loading for the watershed. Finally, the potential for reducing human influenced streambank erosion was evaluated by decreasing the level of loading to be similar to that at unimpaired reaches, or by estimating the load if erosion at high-eroding banks was reduced. Detailed methods describing each procedure, as well as results, are provided in the following sections.

C2.0 DATA COLLECTION

C2.1 AERIAL ASSESSMENT REACH STRATIFICATION

Prior to field data collection, an aerial assessment of streams in the Madison River TPA was conducted using GIS. Data layers were used to stratify streams into distinct reaches based on landscape and land-use factors following techniques described in *Watershed Stratification Methodology for TMDL Sediment and Habitat Investigations* (Montana Department of Environmental Quality, 2008).

The reach stratification process was completed for the mainstem segments of the following sediment-listed streams in the Madison TPA: Antelope Creek, Bear Creek, Blaine Spring Creek, Cherry Creek, Elk Creek, Hot Springs Creek, Moore Creek, North Meadow Creek, Red Canyon Creek, Ruby Creek, South Meadow Creek, Watkins Creek, and Wigwam Creek. It was also completed for stream segments in the following non-listed streams: Elk River, Gazelle Creek, Hot Springs Creek, Indian Creek, Jack Creek, No Man Creek, O'Dell Spring Creek, West Fork Madison River.

The aerial assessment reach stratification process involved dividing each stream into distinct reaches based on four watershed characteristics. A reach type is defined as a unique combination of EPA Ecoregion, valley gradient, Strahler stream order, and valley confinement, and is designated using the following naming convention based on the reach type identifiers provided in **Table C-1**:

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

Table C-1. Reach Type Identifiers

Watershed Characteristic	Stratification Category	Reach Type Identifier
Level III Ecoregion	Northern Rockies	NR
	Canadian Rockies	CR
Valley Gradient	0-2%	0
	2-4%	2
	4-10%	4
	> 10%	10

Table C-1. Reach Type Identifiers

Watershed Characteristic	Stratification Category	Reach Type Identifier
Strahler Stream Order	first order	1
	second order	2
	third order	3
	fourth order	4
	fifth order	5
Confinement	confined	C
	unconfined	U

For example, a reach identified as NR-0-3-U is in the Northern Rockies Level III Ecoregion, has a valley gradient of 0-2%, is a 3rd order stream, and is within an unconfined valley.

Streambank erosion data was collected at 42 example monitoring sites at which reach surveys were conducted which were 500, 1000, or 2000 feet long based on bankfull width of the stream: the larger the bankfull width, the longer the monitored reach. In this assessment, a sampled reach was referred to as a ”site”. These monitoring sites included the 28 sites located within impaired watersheds, as well as 14 located in unimpaired watersheds. **Table C-2** describes the distribution of sampled sites across different reach types. The sites sampled for the bank erosion assessment (**Table C-3**) were the same sites sampled to determine if stream segments were meeting sediment targets, as described in **Appendix B**.

Table C-2. Stratified reach types within the Madison TPA, and the number of monitoring sites within each type

Level III Ecoregion	Valley Gradient	Strahler Stream Order	Confine-ment	Reach Type	Total Number of Reaches	Number of Monitoring Sites/Reaches
Middle Rockies	<2%	1	U	MR-0-1-U	1	-
		2	C	MR-0-2-C	7	1
			U	MR-0-2-U	13	1
		3	C	MR-0-3-C	3	1
			U	MR-0-3-U	68	10
		4	C	MR-0-4-C	2	1
			U	MR-0-4-U	25	5
		5	U	MR-0-5-U	1	-
		6	C	MR-0-6-C	5	-
			U	MR-0-6-U	17	-
	2-4%	1	U	MR-2-1-U	11	1
		2	C	MR-2-2-C	17	-
			U	MR-2-2-U	32	4
		3	C	MR-2-3-C	21	1
			U	MR-2-3-U	47	10
		4	C	MR-2-4-C	1	-
			U	MR-2-4-U	8	1
		6	C	MR-2-6-C	1	-
			U	MR-2-6-U	2	-
	4-10%	1	C	MR-4-1-C	21	-
			U	MR-4-1-U	49	2
		2	C	MR-4-2-C	16	-
			U	MR-4-2-U	45	3

Table C-2. Stratified reach types within the Madison TPA, and the number of monitoring sites within each type

Level III Ecoregion	Valley Gradient	Strahler Stream Order	Confine-ment	Reach Type	Total Number of Reaches	Number of Monitoring Sites/Reaches
		3	C	MR-4-3-C	18	-
			U	MR-4-3-U	14	-
		4	C	MR-4-4-C	5	-
			U	MR-4-4-U	2	-
	>10%	1	C	MR-10-1-C	16	-
			U	MR-10-1-U	34	-
		2	C	MR-10-2-C	11	1
			U	MR-10-2-U	7	-
		3	C	MR-10-3-C	4	-
			U	MR-10-3-U	2	-
Totals:					**526**	**42**

C2.2 FIELD SURVEYS

Field data collection utilized the approach described the in *Longitudinal Field Methods for the Assessment of TMDL Sediment and Habitat Impairments* (Montana Department of Environmental Quality, 2007).

At each eroding bank, Bank Erosion Hazard Index (BEHI) measurements were performed and the Near Bank Stress (NBS) was estimated or determined based on field measurements (Rosgen,2001). Bank erosion severity was rated from “very low” to “extreme” based on the BEHI score, which was determined by the following six parameters: bank height, bankfull height, root depth, root density, bank angle, and surface protection. Near Bank Stress was 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 based on current or observed human disturbances within the riparian corridor adjacent to each bank, as well as historical land-use practices in the surrounding landscape. The following near-stream source categories were used: transportation (roads), grazing, cropland, mining, logging, irrigation, natural, and “other”. Naturally eroding streambanks were considered those with no observed or known historic human impacts in the riparian zone, while the “other” category was chosen when streambank erosion resulted from a source not specifically identified in the list. If multiple sources were observed, then a percent of the total was estimated for each source at each bank.

Table C-3. Monitoring sites assessed in each watershed by reach type

Reach Type	waterbody	Monitoring Sites
MR-0-2-C	West Fork Madison River	WFMA 14-02
MR-0-2-U	O’Dell Spring Creek	ODEL 02-01
MR-0-3-C	Indian Creek	INDN 25-01
MR-0-3-U	Cherry Creek, Elk Creek, Hot Springs Creek, Jack Creek, Moore Creek, South Meadow Creek	CHRR 18-02, CHRR 20-01, ELKC 05-01, ELKC 11-01, HOTS 10-01, JACK 14-03, JACK 14-06, MOOR 09-01, MOOR 09-04, SMDW 19-01
MR-0-4-C	West Fork Madison River	WFMA 25-01

Table C-3. Monitoring sites assessed in each watershed by reach type

Reach Type	waterbody	Monitoring Sites
MR-0-4-U	Bear Creek, Blaine Spring Creek, North Meadow Creek, West Fork Madison River	BEAR 09-03, BEAR 10-01, BLNS 06-01, NMDW 17-01, WFMA 26-01
MR-2-1-U	Buford Creek	BFRD 07-01
MR-2-2-U	Antelope Creek, Elk River, Red Canyon Creek	ALTP 04-02, ELKR 04-01, RCYN 08-01, RCYN 09-02
MR-2-3-C	Ruby Creek	RUBY 17-01
MR-2-3-U	Blaine Spring Creek, Elk Creek, Elk River, Indian Creek, North Meadow Creek, Ruby Creek, South Meadow Creek, Watkins Creek, Wigwam Creek	BLNS 04-01, ELKC 06-02, ELKR 18-01, INDN 23-01 NMDW 14-02, RUBY 18-02, SMDW 18-01, WATK 12-01, WATK 14-01, WGWM 18-01
MR-2-4-U	Hot Springs Creek	HOTS 16-01
MR-4-1-U	Buford Creek, Hot Springs Creek	BFRD 06-01, HOTS 05-01
MR-4-2-U	Gazelle Creek, Red Canyon Creek, Wigwam Creek	GAZL 16-01, RCYN 07-01, WGWM 08-01
MR-10-2-C	Gazelle Creek	GAZL 09-01

C3.0 SAMPLED REACHES-SEDIMENT LOAD CALCULATIONS

For each eroding streambank, the average annual sediment load was estimated based on the BANCS model, which incorporates the BEHI score and near bank stress (Rosgen, 2001; Rosgen, 2006). Annual retreat rates were estimated based on those measured from the Lamar River in Yellowstone National Park (Rosgen, 2001) (**Table C-4**).

Table C-4. Streambank erosion retreat rates (ft/year) from Lamar River, YNP were applied

BEHI	Near Bank Stress					
	very low	low	moderate	high	very high	extreme
very Low	0.002	0.004	0.009	0.021	0.050	0.12
low	0.02	0.04	0.10	0.24	0.57	1.37
moderate	0.10	0.17	0.28	0.47	0.79	1.33
high - very high	0.37	0.53	0.76	1.09	1.57	2.26
extreme	0.98	1.21	1.49	1.83	2.25	2.76

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. The bulk density of streambank material was assumed to average 1.3 tons/cubic yard (USDI 1998). This process resulted in a sediment load from each eroding bank expressed in tons/year. The sum of loading across all banks gave a loading estimate for the site/reach. To standardize across the reaches, the sum of all loading at the site was multiplied by the necessary value to obtain the amount of sediment loading in a 1,000-foot reach. For instance, if only 500 feet were sampled, the value was multiplied by two.

To obtain an estimate of amount of natural bank erosion, at a bank, the total bank erosion was multiplied by the proportion of the surrounding riparian zone without obvious current or historical human impacts. This was summed across the reach to obtain an estimate of natural bank erosion for the reach.

Below are equations used to estimate total bank erosion and natural bank erosion rates:

$$Total\ Bank\ Erosion - Bank\ \left(\frac{Tons}{Yr}\right) = \frac{Length\ Eroding\ Bank\ (ft) * Retreat\left(\frac{ft}{yr}\right) * Bank\ Height\ (ft)}{27\ \frac{cubic\ yards}{cubic\ feet}} * 1.3 \frac{Tons}{Cubic\ Yard}$$

$$Natural\ Bank\ Erosion\ \left(\frac{Tons}{Yr}\right) = Total\ Bank\ Erosion\ \left(\frac{Tons}{Yr}\right) * Proportion\ in\ Natural\ Conditions$$

Estimated bank erosion loading rates varied widely from two tons/year/1000 feet to 143 tons/year/1000 feet (**Table C-5**).

Table C-5. Estimated bank erosion loading rates by monitoring site

Stream	Site/Reach ID	Reach Type	Length of Eroding Banks (Feet)	Monitoring Site Length (Feet)	Eroding Bank (% of Reach)	% Natural Erosion	Sediment Load (Tons/Year)	Load per 1000 feet (Tons/Year)
Antelope Creek	ATLP04-02a	MR-2-2-U	883	500	88%	33	26	52
	ATLP10-10a	MR-4-3-C	229	1000	11%	95	17	17
Bear Creek	BEAR09-03a	MR-0-4-U	151	500	15%	8	6	12
	BEAR10-01a	MR-0-4-U	176	500	18%	55	7	14
Buford Creek	BFRD06-01a	MR-4-1-U	64	110	29%	100	3	27
	BFRD07-01a	MR-2-1-U	420	500	42%	88	14	28
Blaine Spring Creek	BLNS04-01a	MR-2-3-U	350	500	35%	62	18	36
	BLNS06-01a	MR-0-4-U	1267	1000	63%	75	68	68
Cherry Creek	CHRR18-02a	MR-0-3-U	1167	1000	58%	48	143	143
	CHRR20-01a	MR-0-3-U	1245	1000	62%	80	56	56
Elk Creek	ELKC 05-01a	MR-0-3-U	742	500	74%	91	32	64
	ELKC 11-01a	MR-0-3-U	481	500	48%	50	36	72
Elk River	ELKR04-01a	MR-2-2-U	251	500	25%	100	20	40
	ELKR18-01a	MR-2-3-U	503	1000	25%	30	17	17
Gazelle Creek	GAZL09-01a	MR-10-2-C	322	400	40%	90	5	13
	GAZL16-01a	MR-4-2-U	267	500	27%	100	3	6

Table C-5. Estimated bank erosion loading rates by monitoring site

Stream	Site/Reach ID	Reach Type	Length of Eroding Banks (Feet)	Monitoring Site Length (Feet)	Eroding Bank (% of Reach)	% Natural Erosion	Sediment Load (Tons/Year)	Load per 1000 feet (Tons/Year)
Hot Springs Creek	HOTS05-01a	MR-4-1-U	238	500	24%	7	3	6
	HOTS10-01a	MR-0-3-U	212	500	21%	52	20	40
	HOTS16-01a	MR-2-4-U	561	1000	28%	43	40	40
Indian Creek	INDN23-01a	MR-2-3-U	233	700	17%	100	9	13
	INDN25-01a	MR-0-3-C	136	1000	7%	37	2	2
Jack Creek	JACK14-03a	MR-0-3-U	1016	1000	51%	14	95	95
	JACK14-06a	MR-0-3-U	935	1000	47%	40	51	51
Moore Creek	MOOR09-01a	MR-0-3-U	531	500	53%	47	21	42
	MOOR09-04a	MR-0-3-U	618	500	62%	60	30	60
North Meadow Creek	NMDW14-02a	MR-2-3-U	1108	800	69%	20	23	29
	NMDW17-01a	MR-0-4-U	480	500	48%	65	21	42
O'Dell Spring Creek	ODEL02-01a	MR-0-2-U	1178	1000	59%	80	24	24
Red Canyon Creek	RCYN07-01a	MR-4-2-U	419	1000	21%	90	23	23
	RCYN08-01a	MR-2-2-U	1097	1000	55%	71	70	70
	RCYN09-02a	MR-2-2-U	599	500	60%	42	39	78
Ruby Creek	RUBY17-01a	MR-2-3-C	869	1000	43%	22	57	57
	RUBY18-02a	MR-2-3-U	613	1000	31%	77	16	16
South Meadow Creek	SMDW18-01a	MR-2-3-U	318	1000	16%	25	18	18
	SMDW19-01a	MR-0-3-U	982	500	98%	20	34	68
Watkins Creek	WATK12-01a	MR-2-3-U	792	1000	40%	30	28	28
	WATK14-01a	MR-2-3-U	304	500	30%	100	9	18
West Fork Madison	WFMA14-02a	MR-0-2-C	195	500	20%	53	33	66
	WFMA25-01a	MR-0-4-C	242	1000	12%	30	34	34

Table C-5. Estimated bank erosion loading rates by monitoring site

Stream	Site/Reach ID	Reach Type	Length of Eroding Banks (Feet)	Monitoring Site Length (Feet)	Eroding Bank (% of Reach)	% Natural Erosion	Sediment Load (Tons/Year)	Load per 1000 feet (Tons/Year)
	WFMA26-01a	MR-0-4-U	805	1000	40%	58	91	91
Wigwam Creek	WGWM08-01a	MR-4-2-C	130	500	13%	10	6	12
	WGWM18-01a	MR-2-3-U	403	1000	20%	54	14	14

Based on the riparian assessment, the biggest cause of bank erosion was natural sources, followed by grazing-related activities, and historic sources (**Table C-6** and **C-7**). Historic sources refer to grazing or other activities that occurred in the past, but the banks are still recovering. At most reaches, road impacts and residential activities were estimated to contribute low amounts of bank erosion (**Table C-7**).

Table C-6. Estimated sediment load from banks by source at sampled reaches

Stream	Reach ID	Reach Type	Reach Sediment Load (Tons/Yr)	Road Load		Grazing Load		Natural Load		Residential %		Other %		Historic %	
				%	Tons/Yr	%	Tons/Yr	%	Tons/Yr	%	Tons/Yr	%	Tons/Yr	%	Tons/Yr
Antelope Creek	ATLP04-02a	MR-2-2-U	25.7	0%	0.0	67%	17.2	33%	8.5	0%	0.0	0%	0.0	0%	0.0
	ATLP10-01a	MR-4-3-C	16.8	0%	0.0	5%	0.9	95%	15.9	0%	0.0	0%	0.0	0%	0.0
Bear Creek	BEAR09-03a	MR-0-4-U	6.1	0%	0.0	92%	5.6	8%	0.5	0%	0.0	0%	0.0	0%	0.0
	BEAR10-01a	MR-0-4-U	7.2	0%	0.0	45%	3.3	55%	4.0	0%	0.0	0%	0.0	0%	0.0
Buford Creek	BFRD06-01a	MR-4-1-U	3.1	0%	0.0	0%	0.0	100 %	3.1	0%	0.0	0%	0.0	0%	0.0
	BFRD07-01a	MR-2-1-U	13.9	0%	0.0	12%	1.7	88%	12.2	0%	0.0	0%	0.0	0%	0.0
Blaine Spring Creek	BLNS04-01a	MR-2-3-U	18.4	0%	0.0	0%	0.0	62%	11.5	0%	0.0	17%	3.1	21%	3.8
	BLNS06-01a	MR-0-4-U	68.0	0%	0.0	25%	17.1	75%	50.9	0%	0.0	0%	0.0	0%	0.0
Cherry Creek	CHRR18-02a	MR-0-3-U	142.5	0%	0.0	0%	0.0	48%	68.7	0%	0.0	0%	0.0	52%	73.8
Cherry Creek	CHRR20-01a	MR-0-3-U	56.0	0%	0.0	0%	0.0	80%	44.8	0%	0.0	0%	0.0	20%	11.2
Elk Creek	ELKC 05-01a	MR-0-3-U	31.5	0%	0.0	9%	2.9	91%	28.6	0%	0.0	0%	0.0	0%	0.0
Elk Creek	ELKC 11-01a	MR-0-3-U	36.4	0%	0.0	0%	0.0	50%	18.2	0%	0.0	0%	0.0	50%	18.2
Elk River	ELKR04-01a	MR-2-2-U	20.2	0%	0.0	0%	0.0	100 %	20.2	0%	0.0	0%	0.0	0%	0.0
Elk River	ELKR18-01a	MR-2-3-U	17.1	0%	0.0	70%	11.9	30%	5.2	0%	0.0	0%	0.0	0%	0.0
Gazelle Creek	GAZL09-01a	MR-10-2-C	5.0	0%	0.0	10%	0.5	90%	4.5	0%	0.0	0%	0.0	0%	0.0
Gazelle Creek	GAZL16-01a	MR-4-2-U	3.4	0%	0.0	0%	0.0	100 %	3.4	0%	0.0	0%	0.0	0%	0.0
Hot Springs Creek	HOTS05-01a	MR-4-1-U	3.2	0%	0.0	93%	3.0	7%	0.2	0%	0.0	0%	0.0	0%	0.0

Table C-6. Estimated sediment load from banks by source at sampled reaches

Stream	Reach ID	Reach Type	Reach Sediment Load (Tons/Yr)	Road Load		Grazing Load		Natural Load		Residential %		Other %		Historic %	
				%	Tons/Yr	%	Tons/Yr	%	Tons/Yr	%	Tons/Yr	%	Tons/Yr	%	Tons/Yr
Hot Springs Creek	HOTS10-01a	MR-0-3-U	20.3	0%	0.0	6%	1.3	52%	10.7	0%	0.0	0%	0.0	41%	8.4
Hot Springs Creek	HOTS16-01a	MR-2-4-U	40.2	48 %	19.3	0%	0.0	43%	17.4	0%	0.0	0%	0.0	9%	3.5
Indian Creek	INDN23-01a	MR-2-3-U	8.6	0%	0.0	0%	0.0	100 %	8.6	0%	0.0	0%	0.0	0%	0.0
Indian Creek	INDN25-01a	MR-0-4-C	2.2	0%	0.0	0%	0.0	37%	0.8	0%	0.0	54%	1.2	9%	0.2
Jack Creek	JACK14-03a	MR-0-3-U	94.6	0%	0.0	0%	0.0	14%	12.8	0%	0.0	35%	33.3	51%	48.5
Jack Creek	JACK14-06a	MR-0-3-U	50.5	19 %	9.5	0%	0.0	40%	20.3	0%	0.0	32%	16.0	0%	0.0
Moore Creek	MOOR09-01a	MR-0-3-U	20.9	0%	0.0	0%	0.0	47%	9.8	0%	0.0	0%	0.0	53%	11.0
Moore Creek	MOOR09-04a	MR-0-3-U	29.7	0%	0.0	40%	11.9	60%	17.8	0%	0.0	0%	0.0	0%	0.0
North Meadow Creek	NMDW14-02a	MR-2-3-U	23.0	0%	0.0	80%	18.4	20%	4.6	0%	0.0	0%	0.0	0%	0.0
North Meadow Creek	NMDW17-01a	MR-0-4-U	21.1	0%	0.0	0%	0.0	65%	13.6	11%	2.3	5%	1.2	19%	4.0
O'Dell Creek	ODEL02-01a	MR-0-2-U	43.8	0%	0.0	0%	0.0	80%	35.1	0%	0.0	20%	8.8	0%	0.0
Red Canyon Creek	RCYN07-01a	MR-4-2-U	22.9	7%	1.6	3%	0.7	90%	20.5	0%	0.0	0%	0.0	0%	0.0
Red Canyon Creek	RCYN08-01a	MR-2-2-U	70.4	22 %	15.4	0%	0.0	71%	50.0	0%	0.0	7%	5.0	0%	0.0
Red Canyon Creek	RCYN09-02a	MR-2-2-U	39.4	0%	0.0	8%	3.0	42%	16.7	0%	0.0	0%	0.0	50%	19.7
Ruby Creek	RUBY17-01a	MR-2-3-C	57.2	0%	0.0	76%	43.5	22%	12.4	0%	0.0	2%	1.2	0%	0.0
Ruby Creek	RUBY18-02a	MR-2-3-U	15.8	0%	0.0	0%	0.0	77%	12.2	0%	0.0	0%	0.0	23%	3.6
South Meadow Creek	SMDW18-01a	MR-2-3-U	17.9	0%	0.0	75%	13.4	25%	4.5	0%	0.0	0%	0.0	0%	0.0

Table C-6. Estimated sediment load from banks by source at sampled reaches

Stream	Reach ID	Reach Type	Reach Sediment Load (Tons/Yr)	Road Load		Grazing Load		Natural Load		Residential %		Other %		Historic %	
				%	Tons/Yr	%	Tons/Yr	%	Tons/Yr	%	Tons/Yr	%	Tons/Yr	%	Tons/Yr
South Meadow Creek	SMDW19-01a	MR-0-3-U	34.0	0%	0.0	80%	27.2	20%	6.8	0%	0.0	0%	0.0	0%	0.0
Watkins Creek	WATK12-01a	MR-2-3-U	28.2	0%	0.0	53%	14.8	30%	8.4	0%	0.0	18%	5.0	0%	0.0
Watkins Creek	WATK14-01a	MR-2-3-U	8.8	0%	0.0	0%	0.0	100 %	8.8	0%	0.0	0%	0.0	0%	0.0
West Fork Madison River	WFMA14-02a	MR-0-2-C	33.4	0%	0.0	47%	15.5	53%	17.9	0%	0.0	0%	0.0	0%	0.0
West Fork Madison River	WFMA25-01a	MR-0-4-C	33.7	21 %	7.0	78%	26.3	1%	0.4	0%	0.0	0%	0.0	0%	0.0
West Fork Madison River	WFMA26-01a	MR-0-4-U	90.5	0%	0.0	0%	0.0	58%	52.8	0%	0.0	0%	0.0	42%	37.7
Wigwam Creek	WGWM08-01a	MR-4-2-C	6.1	0%	0.0	0%	0.0	54%	3.3	0%	0.0	0%	0.0	46%	2.8
Wigwam Creek	WGWM18-01a	MR-2-3-U	14.0	0%	0.0	90%	12.6	10%	1.4	0%	0.0	0%	0.0	0%	0.0

Table C-7. Summary of erosion sources at sampled reaches

Source	Sediment Load (Tons/Year)	Sediment Load (Percent)
Natural	655.1	51.1
Roads	52.9	4.1
Riparian Grazing	252.7	19.7
Other	72.5	5.7
Residential/Urban	2.3	0.2
Historic	246.5	19.2
Total	**1282.1**	**100**

C4.0 SEDIMENT LOAD EXTRAPOLATION

Sediment load extrapolations were performed for monitoring sites, stream reaches, and stream segments, which are defined as follows:

Monitoring Site/Reach *- A 500, 1,000, or 2,000 foot section of a stream reach where field monitoring was conducted (as in Table C-3)*

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

Stream Segment *-A group of stream reaches within the same sub drainage (e.g., "Antelope Creek"). The total loading from each impaired segment was determined by summing the loading for all reaches in the segment. Several non-impaired segments were also evaluated.*

Average annual sediment loads from monitoring reaches were extrapolated to the unsampled stream reaches based on similar reach type characteristics and land use (**Table C-8**). Although a large number of reach types were estimated to be present in the Madison TPA, for extrapolation these were grouped together into broad types that were expected to have similar loading. Gradient, order, and land use characteristics were estimated for field reaches using field surveys, and for unsampled reaches based on aerial photography and Digital Elevation Models according to the aerial assessment procedure.

C4.1 REACH TYPE SEDIMENT LOADS

Based on an exploratory analysis, sampled sites found to have >70% of the riparian zone in natural vegetation based on aerial surveys also had lower loading rates This information was used to estimate average loading in unsampled reaches based on land use information from aerial surveys (**Table C-8**). First order and high gradient streams had the lowest loading estimates. However, fewer sampled reaches were found in these categories and they represented a lower proportion of the total reaches present. Therefore, for these reaches, the average across all sites was used.

Table C-8. Average reach loading rates assigned to unsampled reaches

Description	% of Riparian Zone in Natural Vegetation	Reach ID	Reach Type	Average Reach Type Load Per 1000 Feet (Tons/Year)	Average Reach Type Sediment Load per 1000 Feet (Tons/Year)
Low gradient streams (0-2% gradient), non first-order	≤70%	JACK14-03a	MR-0-3-U	94.6	59.8
		SMDW19-01a	MR-0-3-U	68.0	
		JACK14-06a	MR-0-3-U	50.5	
		MOOR09-01a	MR-0-3-U	41.7	
		CHRR18-02a	MR-0-3-U	142.5	
		ELKC 11-01a	MR-0-3-U	72.8	
		HOTS10-01a	MR-0-3-U	40.7	
		MOOR09-04a	MR-0-3-U	59.3	
		WFMA25-01a	MR-0-4-C	33.7	
		BEAR09-03a	MR-0-4-U	12.3	
		NMDW17-01a	MR-0-4-U	42.3	
		CHRR20-01a	MR-0-3-U	55.9	
		ELKC 05-01a	MR-0-3-U	63.1	
Low gradient streams (0-2% gradient), non first-order	>70%	WFMA14-02a	MR-0-2-C	66.8	43.5
		INDN25-01a	MR-0-4-C	2.2	
		BEAR10-01a	MR-0-4-U	14.4	
		WFMA26-01a	MR-0-4-U	90.5	
		ODEL02-01a	MR-0-2-U	43.8	
		BLNS06-01a	MR-0-4-U	67.9	
		ODEL02-01a	MR-0-2-U	24.3	
Mid gradient streams (2-4% gradient), non first-order	≤ 70%	RCYN09-02a	MR-2-2-U	78.8	38.1
		RCYN08-01a	MR-2-2-U	70.4	
		RUBY17-01a	MR-2-3-C	57.2	
		WGWM18-01a	MR-2-3-U	14.0	
		NMDW14-02a	MR-2-3-U	28.8	
		SMDW18-01a	MR-2-3-U	17.9	
		ELKR18-01a	MR-2-3-U	17.1	
		BLNS04-01a	MR-2-3-U	36.9	
		HOTS16-01a	MR-2-4-U	40.2	
		ELKR04-01a	MR-2-2-U	40.3	
		WATK14-01a	MR-2-3-U	17.6	
Mid gradient streams (2-4% gradient), non first-order	>70%	ATLP04-02a	MR-2-2-U	51.4	27.0
		WATK12-01a	MR-2-3-U	28.2	
		INDN23-01a	MR-2-3-U	12.4	
		RUBY18-02a	MR-2-3-U	15.9	
High gradient streams (4-10%), non first-order	0-100%	GAZL16-01a	MR-4-2-U	6.9	14.0
		RCYN07-01a	MR-4-2-U	22.9	
		WGWM08-01a	MR-4-2-C	12.3	

Table C-8. Average reach loading rates assigned to unsampled reaches

Description	% of Riparian Zone in Natural Vegetation	Reach ID	Reach Type	Average Reach Type Load Per 1000 Feet (Tons/Year)	Average Reach Type Sediment Load per 1000 Feet (Tons/Year)
very high gradient streams (>10%)	0-100%	GAZL09-01a	MR-10-2-C	12.4	12.4
first Order Streams	0-100%	BFRD07-01a	MR-2-1-U	27.8	20.7
		HOTS05-01a	MR-4-1-U	6.4	
		BFRD06-01a	MR-4-1-U	27.8	

C4.2 SEGMENT SEDIMENT LOADS

Stream segment sediment loads were estimated for all Madison River TPA stream segments impaired for sediment per Montana's 2020 Integrated Report, including Antelope Creek, Bear Creek, Blaine Spring Creek, Cherry Creek, Elk Creek, Hot Springs Creek, Moore Creek, North Meadow Creek, Red Canyon Creek, Ruby Creek, South Meadow Creek, Watkins Creek, and Wigwam Creek. It was also completed for stream segments in the following non-listed streams: Elk River, Gazelle Creek, Hot Springs Creek, Indian Creek, Jack Creek, No Man Creek, O'Dell Spring Creek, West Fork Madison River.

Total stream segment loads calculated by summing the cumulative sediment load of all reaches within each segment as illustrated in the following tables.

C4.2.1 Antelope Creek Sediment Loads

A total of 14 reaches were delineated for the Antelope Creek drainage (**Table C-9**). A large number of these were low gradient reaches with a riparian zone with ≤70% in natural vegetation, which were assigned a higher loading rate than streams in > 70% natural vegetation. First order streams also comprised a large number of the stream reaches and were assigned a loading rate of 20.7 tons/yr/1000 ft.

Table C-9. Estimated annual sediment loads for Antelope Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
Antelope Creek	ATLP 05-01	MR-0-2-U	860	2	0	50	59.8	NA	59.8	51.4
Antelope Creek	ATLP 05-02	MR-0-2-U	1005	2	0	50	59.8	NA	59.8	60.1
Antelope Creek	ATLP 09-01	MR-0-3-C	1588	3	0	80	43.5	NA	43.5	69.1
Antelope Creek	ATLP 06-01	MR-0-3-U	11874	3	0	45	59.8	NA	59.8	710.1
Antelope Creek	ATLP 07-01	MR-0-3-U	3862	3	0	30	59.8	NA	59.8	230.9

Table C-9. Estimated annual sediment loads for Antelope Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
Antelope Creek	ATLP 08-01	MR-0-3-U	5451	3	0	30	59.8	NA	59.8	325.9
Antelope Creek	ATLP 02-01	MR-10-1-C	650	1	10	90	20.7	NA	20.7	13.5
Antelope Creek	ATLP 01-01	MR-10-1-U	1837	1	10	90	20.7	NA	20.7	38.0
Antelope Creek	ATLP 01-02	MR-10-1-U	2137	1	10	90	20.7	NA	20.7	44.2
Antelope Creek	ATLP 04-01	MR-2-2-U	2445	2	2	90	27	NA	27.0	66.0
Antelope Creek	ATLP 04-02	MR-2-2-U	3039	2	2	75	27	51.37	51.4	156.1
Antelope Creek	ATLP 04-03	MR-2-2-U	4316	2	2	40	38.1	NA	38.1	164.4
Antelope Creek	ATLP 03-01	MR-4-1-C	4526	1	4	90	20.7	NA	20.7	93.7
Antelope Creek	ATLP 10-01	MR-4-3-C	5467	3	4	90	14	16.81	16.8	91.9
										Total: 2115.4 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used

C4.2.2 Bear Creek Sediment Loads

A total of 18 reaches were delineated for the Bear Creek drainage (**Table C-10**). While several of these were high gradient or first order streams, most were low gradient, higher orders streams with low percentage of the riparian zone in natural vegetation. Thus, they had a high extrapolated sediment loading rate of 59.8 tons/yr/1,000 ft.

Table C-10. Estimated annual sediment loads for Bear Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapol-ated	Field Assessed	Estimated *	
Bear Creek	BEAR 03-01	MR-4-1-U	747	1	4	80	20.7	NA	20.7	15.5
Bear Creek	BEAR 04-01	MR-4-2-U	964	2	4	70	14	NA	14.0	13.5
Bear Creek	BEAR 05-01	MR-4-3-U	1877	3	4	80	14	NA	14.0	26.3
Bear Creek	BEAR 06-01	MR-2-3-U	1684	3	2	50	38.1	NA	38.1	64.2
Bear Creek	BEAR 07-01	MR-2-3-U	19297	3	2	10	38.1	NA	38.1	735.2
Bear Creek	BEAR 08-01	MR-0-3-U	7990	3	0	30	59.8	NA	59.8	477.8
Bear Creek	BEAR 08-02	MR-0-3-U	3409	3	0	30	59.8	NA	59.8	203.9
Bear Creek	BEAR 08-03	MR-0-3-U	7940	3	0	20	59.8	NA	59.8	474.8
Bear Creek	BEAR 08-04	MR-0-3-U	19877	3	0	20	59.8	NA	59.8	1188.7
Bear Creek	BEAR 08-05	MR-0-3-U	16750	3	0	10	59.8	NA	59.8	1001.6
Bear Creek	BEAR 09-01	MR-0-4-U	5395	4	0	10	59.8	NA	59.8	322.6

Table C-10. Estimated annual sediment loads for Bear Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapol-ated	Field Assessed	Estimated *	
Bear Creek	BEAR 09-02	MR-0-4-U	12901	4	0	10	59.8	NA	59.8	771.5
Bear Creek	BEAR 09-03	MR-0-4-U	5751	4	0	10	59.8	12.26	12.3	70.5
Bear Creek	BEAR 09-04	MR-0-4-U	9297	4	0	20	59.8	NA	59.8	555.9
Bear Creek	BEAR 10-01	MR-0-4-U	4867	4	0	80	43.5	14.40	14.4	70.1
Bear Creek	BEAR 11-01	MR-0-4-U	5577	4	0	30	59.8	NA	59.8	333.5
Bear Creek	BEAR 11-02	MR-0-4-U	4619	4	0	30	59.8	NA	59.8	276.2
Bear Creek	BEAR 11-03	MR-0-4-U	6497	4	0	70	59.8	NA	59.8	388.5
										Total: 6990.27 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.3 Buford Creek Sediment Loads

A total of seven reaches were delineated in the Buford Creek drainage (**Table C-11**). Most of these were first order unsampled reaches with an estimated loading rate of 20.7 tons/year/1000 feet.

Table C-11. Estimated sediment loads for Buford Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated *	
Buford Creek	BFRD 02-01	MR-4-1-U	1307	1	4	80	20.7	NA	20.7	27.1
Buford Creek	BFRD 03-01	MR-10-1-U	2974	1	10	80	20.7	NA	20.7	61.6
Buford Creek	BFRD 04-01	MR-4-1-C	1751	1	4	80	20.7	NA	20.7	36.3
Buford Creek	BFRD 05-01	MR-4-1-U	1017	1	4	80	20.7	NA	20.7	21.0
Buford Creek	BFRD 05-02	MR-4-1-U	3214	1	4	80	20.7	NA	20.7	66.5
Buford Creek	BFRD 06-01	MR-4-1-U	7490	1	4	80	20.7	27.82	27.8	208.4
Buford Creek	BFRD 06-02	MR-2-1-U	4327	1	2	50	20.7	6.40	6.4	27.7
										Total: 448.5 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.4 Blaine Creek Sediment Loads

A total of seven reaches were delineated for Blaine Spring Creek drainage (**Table C-12**). These were primarily low and mid gradient reaches with $\leq$ 70% natural vegetation and relatively high estimated loading rates.

Table C-12. Estimated sediment loads for Blaine Spring Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
Blaine Spring Creek	BLNS 02-01	MR-4-1-U	5160	1	4	30	20.7	NA	20.7	106.8
Blaine Spring Creek	BLNS 03-01	MR-2-2-U	1266	2	2	40	38.1	NA	38.1	48.2
Blaine Spring Creek	BLNS 03-02	MR-2-2-U	3110	2	2	30	38.1	NA	38.1	118.5
Blaine Spring Creek	BLNS 04-01	MR-2-3-U	7589	3	2	40	38.1	36.87	36.9	279.8
Blaine Spring Creek	BLNS 05-01	MR-2-4-U	1774	4	2	40	38.1	NA	38.1	67.6
Blaine Spring Creek	BLNS 06-01	MR-0-4-U	20829	4	0	70	59.8	67.95	68.0	1415.3
Blaine Spring Creek	BLNS 07-01	MR-0-4-U	7883	4	0	70	59.8	NA	59.8	471.4
										Total: 2507.6 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.5 Cherry Creek Sediment Loads

A total of 28 reaches were delineated for the Cherry Creek drainage (**Table C-13**). These spanned many reach types and land uses, with many of the first order and high-gradient reaches having a high percentage of the riparian zone in natural vegetation. However, the lower gradient reaches tended to have a low percentage of the riparian zone in natural vegetation and therefore a higher estimated loading rate.

Table C-13. Estimated sediment loads for Cherry Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Gradient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
Cherry Creek	CHRR 02-01	MR-4-1-U	2138	1	4	100	20.7	NA	20.7	44.3
Cherry Creek	CHRR 03-01	MR-2-1-U	7611	1	2	100	20.7	NA	20.7	157.6
Cherry Creek	CHRR 04-01	MR-4-1-C	2240	1	4	100	20.7	NA	20.7	46.4
Cherry Creek	CHRR 05-01	MR-10-2-C	2292	2	10	100	12.5	NA	12.5	28.6
Cherry Creek	CHRR 06-01	MR-4-3-U	1372	3	4	75	14	NA	14.0	19.2
Cherry Creek	CHRR 06-02	MR-4-3-U	2223	3	4	30	14	NA	14.0	31.1
Cherry Creek	CHRR 07-01	MR-4-3-C	2803	3	4	30	14	NA	14.0	39.2
Cherry Creek	CHRR 07-02	MR-4-3-C	2388	3	4	100	14	NA	14.0	33.4
Cherry Creek	CHRR 08-01	MR-2-3-C	9295	3	2	100	27	NA	27.0	251.0
Cherry Creek	CHRR 09-01	MR-2-3-U	2265	3	2	80	27	NA	27.0	61.2
Cherry Creek	CHRR 10-01	MR-2-3-U	1975	3	2	70	38.1	NA	38.1	75.3
Cherry Creek	CHRR 10-02	MR-2-3-U	3583	3	2	50	38.1	NA	38.1	136.5
Cherry Creek	CHRR 10-03	MR-2-3-U	1422	3	2	60	38.1	NA	38.1	54.2

Table C-13. Estimated sediment loads for Cherry Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Gradient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
Cherry Creek	CHRR 11-01	MR-0-3-U	7748	3	0	50	59.8	NA	59.8	463.3
Cherry Creek	CHRR 11-02	MR-0-3-U	2988	3	0	60	59.8	NA	59.8	178.7
Cherry Creek	CHRR 12-01	MR-0-3-U	694	3	0	50	59.8	NA	59.8	41.5
Cherry Creek	CHRR 13-01	MR-0-3-U	5644	3	0	40	59.8	NA	59.8	337.5
Cherry Creek	CHRR 13-02	MR-0-3-U	2819	3	0	30	59.8	NA	59.8	168.6
Cherry Creek	CHRR 13-03	MR-0-3-U	1441	3	0	40	59.8	NA	59.8	86.2
Cherry Creek	CHRR 14-01	MR-0-3-U	5099	3	0	60	59.8	NA	59.8	304.9
Cherry Creek	CHRR 15-01	MR-4-3-C	1986	3	4	60	14	NA	14.0	27.8
Cherry Creek	CHRR 15-02	MR-4-3-C	9395	3	4	80	14	NA	14.0	131.5
Cherry Creek	CHRR 16-01	MR-10-3-C	2118	3	10	80	12.5	NA	12.5	26.5
Cherry Creek	CHRR 17-01	MR-4-3-U	2330	3	4	60	14	NA	14.0	32.6
Cherry Creek	CHRR 17-02	MR-4-3-U	1663	3	4	80	14	NA	14.0	23.3
Cherry Creek	CHRR 18-01	MR-0-3-U	29334	3	0	60	59.8	142.54	142.5	4181.4
Cherry Creek	CHRR 19-01	MR-0-3-U	1617	3	0	70	59.8	NA	59.8	96.7
Cherry Creek	CHRR 20-01	MR-0-3-U	7206	3	0	40	59.8	55.92	55.9	403.0
										Total: 7481.4 Tons/Year

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.6 Elk Creek Sediment Loads

A total of 14 reaches were delineated for the Elk Creek drainage (**Table C-14**). These consisted of a variety or reach types, most with a relatively low percentage (≤70%) of the riparian zone in natural vegetation and a high estimated loading rate from bank erosion.

Table C-14. Estimated sediment loads for Elk Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed*	Estimated	
Elk Creek	ELKC 02-01	MR-4-2-C	2975	2	4	60	14	NA	14.0	41.6
Elk Creek	ELKC 03-01	MR-4-2-U	6411	2	4	50	14	NA	14.0	89.8
Elk Creek	ELKC 04-01	MR-2-3-U	2589	3	2	55	38.1	NA	38.1	98.7
Elk Creek	ELKC 04-02	MR-2-3-U	2329	3	2	70	38.1	NA	38.1	88.7
Elk Creek	ELKC 05-01	MR-0-3-U	11967	3	0	50	59.8	63.09	63.1	755.1
Elk Creek	ELKC 06-01	MR-2-3-U	4398	3	2	60	38.1	NA	38.1	167.6

Table C-14. Estimated sediment loads for Elk Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed*	Estimated	
Elk Creek	ELKC 06-02	MR-2-3-U	10198	3	2	70	38.1	NA	38.1	388.6
Elk Creek	ELKC 06-03	MR-2-3-U	2546	3	2	50	38.1	NA	38.1	97.0
Elk Creek	ELKC 07-01	MR-0-3-U	17603	3	0	20	59.8	NA	59.8	1052.7
Elk Creek	ELKC 08-01	MR-0-3-U	1535	3	0	30	59.8	NA	59.8	91.8
Elk Creek	ELKC 09-01	MR-0-3-U	6360	3	0	15	59.8	NA	59.8	380.3
Elk Creek	ELKC 10-01	MR-0-3-U	2167	3	0	40	59.8	NA	59.8	129.6
Elk Creek	ELKC 11-01	MR-0-3-U	14851	3	0	30	59.8	72.75	72.8	1080.4
Elk Creek	ELKC 11-02	MR-0-3-U	6319	3	0	0	59.8	NA	59.8	377.9
										Total: 4839.5 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.7 Elk River Sediment Loads

A total of three 23 reaches were delineated along the Elk River mainstem (**Table C-15**). Many of these reaches had > 70% of vegetation in natural condition and a low estimated bank erosion loading rate.

Table C-15. Estimated sediment loads for Elk River

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
Elk River	ELKR 02-01	MR-4-1-U	1155	1	4	80	20.7	NA	20.7	23.9
Elk River	ELKR 02-02	MR-4-1-U	1898	1	4	60	20.7	NA	20.7	39.3
Elk River	ELKR 03-01	MR-2-1-U	3664	1	2	70	20.7	NA	20.7	75.9
Elk River	ELKR 04-01	MR-2-2-U	5292	2	2	60	38.1	40.30	40.3	213.3
Elk River	ELKR 05-01	MR-4-2-U	1043	2	4	70	14	NA	14.0	14.6
Elk River	ELKR 05-02	MR-4-2-U	1579	2	4	70	14	NA	14.0	22.1
Elk River	ELKR 06-01	MR-10-2-C	731	2	10	70	12.5	NA	12.5	9.1
Elk River	ELKR 07-01	MR-10-2-C	1136	2	10	70	12.5	NA	12.5	14.2
Elk River	ELKR 08-01	MR-4-2-U	1226	2	4	70	14	NA	14.0	17.2
Elk River	ELKR 09-01	MR-4-2-C	4627	2	4	80	14	NA	14.0	64.8
Elk River	ELKR 10-01	MR-2-2-C	2306	2	2	80	27	NA	27.0	62.3
Elk River	ELKR 10-02	MR-2-2-C	1503	2	2	80	27	NA	27.0	40.6
Elk River	ELKR 11-01	MR-0-2-U	4198	2	0	80	43.5	NA	43.5	182.6

Table C-15. Estimated sediment loads for Elk River

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
Elk River	ELKR 11-02	MR-0-2-U	3778	2	0	90	43.5	NA	43.5	164.3
Elk River	ELKR 12-01	MR-2-2-C	3406	2	2	90	27	NA	27.0	92.0
Elk River	ELKR 13-01	MR-4-2-C	4139	2	4	90	14	NA	14.0	57.9
Elk River	ELKR 14-01	MR-2-2-U	4079	2	2	90	27	NA	27.0	110.1
Elk River	ELKR 15-01	MR-2-3-U	3143	3	2	90	27	NA	27.0	84.9
Elk River	ELKR 16-01	MR-2-3-U	9612	3	2	90	27	NA	27.0	259.5
Elk River	ELKR 16-02	MR-2-3-U	8354	3	2	80	27	NA	27.0	225.6
Elk River	ELKR 17-01	MR-2-3-U	6291	3	2	80	27	NA	27.0	169.8
Elk River	ELKR 17-02	MR-2-3-U	4423	3	2	60	38.1	NA	38.1	168.5
Elk River	ELKR 18-01	MR-2-3-U	2706	3	2	40	38.1	17.10	17.1	46.3
										Total: 2158.8 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.8 Gazelle Creek Sediment Loads

A total of 15 reaches were sampled in the Gazelle Creek drainage (**Table C-16**). These were comprised primarily of higher gradient and first order streams with > 70% of the riparian zone in natural condition. The mid-gradient streams present in the drainage had low estimated loading from bank erosion, also due to the riparian zone being in > 70% natural vegetation.

Table C-16. Estimated sediment loads for Gazelle Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated *	
Gazelle Creek	GAZL 02-01	MR-4-1-C	2568	1	4	90	20.7	NA	20.7	53.2
Gazelle Creek	GAZL 03-01	MR-4-2-C	2154	2	4	90	14	NA	14.0	30.2
Gazelle Creek	GAZL 04-01	MR-4-2-U	7008	2	4	90	14	NA	14.0	98.1
Gazelle Creek	GAZL 05-01	MR-10-2-C	841	2	10	90	12.5	NA	12.5	10.5
Gazelle Creek	GAZL 06-01	MR-4-2-U	3362	2	4	90	14	NA	14.0	47.1
Gazelle Creek	GAZL 07-01	MR-2-2-C	3002	2	2	90	21.6	NA	21.6	64.8
Gazelle Creek	GAZL 08-01	MR-4-2-U	3540	2	4	90	14	NA	14.0	49.6
Gazelle Creek	GAZL 09-01	MR-10-2-C	1458	2	10	90	12.5	12.52	12.5	18.3
Gazelle Creek	GAZL 10-01	MR-4-2-U	1636	2	4	90	14	NA	14.0	22.9

Table C-16. Estimated sediment loads for Gazelle Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated *	
Gazelle Creek	GAZL 11-01	MR-2-2-U	3450	2	2	90	21.6	NA	21.6	74.5
Gazelle Creek	GAZL 12-01	MR-10-2-U	1271	2	10	90	12.5	NA	12.5	15.9
Gazelle Creek	GAZL 13-01	MR-4-2-U	1453	2	4	90	14	NA	14.0	20.3
Gazelle Creek	GAZL 14-01	MR-2-2-C	2666	2	2	90	21.6	NA	21.6	57.6
Gazelle Creek	GAZL 15-01	MR-4-2-C	3426	2	4	90	14	NA	14.0	48.0
Gazelle Creek	GAZL 16-01	MR-4-2-U	2731	2	4	90	14	6.88	6.9	18.8
										Total: 678.9 tons/year

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.9 Hot Springs Creek Sediment Loads

A total of 20 reaches were delineated in the Hot Spring Creek drainage (**Table C-17**). The first order streams had a high percentage of the riparian zone in natural conditions. However, the more prevalent low-gradient stream reaches typically had 0 percent of the riparian zone in natural conditions resulting in a high estimated amount of loading from bank erosion.

Table C-17. Estimated sediment loads for Hot Springs Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
Mid Frk Hot Springs Creek	HOTS 02-01	MR-10-1-C	4473	1	10	90	20.7	NA	20.7	92.6
Mid Frk Hot Springs Creek	HOTS 02-02	MR-10-1-C	1332	1	10	90	20.7	NA	20.7	27.6
Mid Frk Hot Springs Creek	HOTS 03-01	MR-4-1-C	6223	1	4	80	20.7	NA	20.7	128.8
Mid Frk Hot Springs Creek	HOTS 04-01	MR-4-1-U	1813	1	4	40	20.7	NA	20.7	37.5
Mid Frk Hot Springs Creek	HOTS 05-01	MR-4-1-U	2489	1	4	80	20.7	6.40	6.4	15.9
Hot Springs Creek	HOTS 06-01	MR-4-2-C	1742	2	4	90	14	NA	14.0	24.4
Hot Springs Creek	HOTS 07-01	MR-2-2-C	3832	2	2	90	27	NA	27.0	103.5
Hot Springs Creek	HOTS 08-01	MR-2-3-C	4208	3	2	90	27	NA	27.0	113.6
Hot Springs Creek	HOTS 08-02	MR-2-3-C	4728	3	2	60	38.1	NA	38.1	180.1
Hot Springs Creek	HOTS 09-01	MR-0-3-U	4034	3	0	80	43.5	NA	43.5	175.5
Hot Springs Creek	HOTS 10-01	MR-0-3-U	11469	3	0	50	59.8	40.66	40.7	466.4

Table C-17. Estimated sediment loads for Hot Springs Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
Hot Springs Creek	HOTS 10-02	MR-0-3-U	1756	3	0	0	59.8	NA	59.8	105.0
Hot Springs Creek	HOTS 11-01	MR-0-3-U	2011	3	0	0	59.8	NA	59.8	120.2
Hot Springs Creek	HOTS 12-01	MR-0-3-U	2381	3	0	0	59.8	NA	59.8	142.4
Hot Springs Creek	HOTS 13-01	MR-0-4-U	4575	4	0	10	59.8	NA	59.8	273.6
Hot Springs Creek	HOTS 13-02	MR-0-4-U	3085	4	0	0	59.8	NA	59.8	184.5
Hot Springs Creek	HOTS 14-01	MR-0-4-U	5228	4	0	0	59.8	NA	59.8	312.6
Hot Springs Creek	HOTS 15-01	MR-0-4-U	6748	4	0	0	59.8	NA	59.8	403.5
Hot Springs Creek	HOTS 15-02	MR-0-4-U	13061	4	0	0	59.8	NA	59.8	781.1
Hot Springs Creek	HOTS 16-01	MR-2-4-U	4860	4	2	0	38.1	40.23	40.2	195.5
										Total: 3884.3 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.10 Indian Creek Sediment Loads

A total of 29 reaches were delineated in the Indian Creek drainage (**Table C-18**), spanning a wide range of reach types and levels of riparian health. In general, estimated bank loading rates were relatively low due to the large percentage of reaches having riparian zone vegetation estimated to be in > 70% natural conditions.

Table C-18. Estimated sediment loads in Indian Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
Indian Creek	INDN 02-01	MR-4-1-U	1644	1	4	0	20.7	NA	20.7	34.0
Indian Creek	INDN 03-01	MR-4-1-C	386	1	4	0	20.7	NA	20.7	8.0
Indian Creek	INDN 04-01	MR-4-1-U	1068	1	4	60	20.7	NA	20.7	22.1
Indian Creek	INDN 05-01	MR-4-1-C	1531	1	4	50	20.7	NA	20.7	31.7
Indian Creek	INDN 06-01	MR-4-1-U	784	1	4	40	20.7	NA	20.7	16.2
Indian Creek	INDN 07-01	MR-4-2-U	439	2	4	40	14	NA	14.0	6.1
Indian Creek	INDN 08-01	MR-4-2-C	1300	2	4	100	14	NA	14.0	18.2
Indian Creek	INDN 09-01	MR-2-2-C	1660	2	2	100	21.6	NA	21.6	35.8
Indian Creek	INDN 10-01	MR-2-2-U	1556	2	2	100	21.6	NA	21.6	33.6
Indian Creek	INDN 10-02	MR-2-2-U	3160	2	2	100	21.6	NA	21.6	68.3
Indian Creek	INDN 10-03	MR-2-2-U	858	2	2	100	21.6	NA	21.6	18.5

Table C-18. Estimated sediment loads in Indian Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
Indian Creek	INDN 11-01	MR-4-2-U	3279	2	4	100	14	NA	14.0	45.9
Indian Creek	INDN 12-01	MR-2-2-U	3458	2	2	100	21.6	NA	21.6	74.7
Indian Creek	INDN 13-01	MR-4-3-U	872	3	4	100	20.7	NA	20.7	34.0
Indian Creek	INDN 14-01	MR-4-3-C	1678	3	4	100	20.7	NA	20.7	8.0
Indian Creek	INDN 15-01	MR-2-3-C	9699	3	2	100	20.7	NA	20.7	22.1
Indian Creek	INDN 16-01	MR-4-3-C	3417	3	4	100	20.7	NA	20.7	31.7
Indian Creek	INDN 16-02	MR-4-3-C	1880	3	4	100	20.7	NA	20.7	16.2
Indian Creek	INDN 17-01	MR-10-3-C	2548	3	10	100	14	NA	14.0	6.1
Indian Creek	INDN 18-01	MR-2-3-U	8749	3	2	100	14	NA	14.0	18.2
Indian Creek	INDN 19-01	MR-2-3-C	3646	3	2	100	27	NA	27.0	44.8
Indian Creek	INDN 20-01	MR-4-3-C	2550	3	4	100	27	NA	27.0	42.0
Indian Creek	INDN 21-01	MR-2-3-C	4532	3	2	100	27	NA	27.0	85.3
Indian Creek	INDN 22-01	MR-2-3-C	1805	3	2	80	27	NA	27.0	23.2
Indian Creek	INDN 23-01	MR-2-3-U	5822	3	2	80	14	NA	14.0	45.9
Indian Creek	INDN 24-01	MR-2-3-C	17858	3	2	20	27	NA	27.0	93.4
Indian Creek	INDN 25-01	MR-0-3-C	3010	3	0	20	14	NA	14.0	12.2
Indian Creek	INDN 26-01	MR-0-3-U	1497	3	0	20	14	NA	14.0	23.5
Indian Creek	INDN 26-02	MR-0-3-U	2451	3	0	20	27	NA	27.0	261.9
										Total: 2410.5 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.11 Jack Creek Sediment Loads

A total of 24 reaches were delineated in Jack Creek drainage. These spanned the entire range of reach types and amount of natural vegetation. However, most reaches had $\leq$ 70% of the riparian zone in natural vegetation and had high estimated loading from stream banks (**Table C-19**). Field surveys and aerial photography indicated a large amount of the bank erosion may be from historical sources, such as past grazing.

Table C-19. Estimated sediment loads in Jack Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
Jack Creek	JACK 02-01	MR-2-3-C	3222	3	2	100	21.6	NA	21.6	69.6
Jack Creek	JACK 03-01	MR-4-3-C	2554	3	4	100	14	NA	14.0	35.7
Jack Creek	JACK 04-01	MR-2-3-C	1101	3	2	20	27	NA	27.0	87.0
Jack Creek	JACK 05-01	MR-2-3-U	657	3	2	10	14	NA	14.0	35.7
Jack Creek	JACK 05-02	MR-2-3-U	1784	3	2	0	38.1	NA	38.1	41.9
Jack Creek	JACK 06-01	MR-0-3-U	3708	3	0	0	38.1	NA	38.1	25.0
Jack Creek	JACK 06-02	MR-0-3-U	509	3	0	0	38.1	NA	38.1	68.0
Jack Creek	JACK 07-01	MR-2-3-C	7596	3	2	100	59.8	NA	59.8	221.8
Jack Creek	JACK 08-01	MR-4-3-C	4657	3	4	100	59.8	NA	59.8	30.4
Jack Creek	JACK 09-01	MR-2-3-U	1447	3	2	100	27	NA	27.0	205.1
Jack Creek	JACK 10-01	MR-2-3-U	4734	3	2	30	14	NA	14.0	65.2
Jack Creek	JACK 11-01	MR-2-3-U	1098	3	2	20	27	NA	27.0	39.1
Jack Creek	JACK 11-02	MR-2-3-U	1727	3	2	10	38.1	NA	38.1	180.4
Jack Creek	JACK 11-03	MR-2-3-U	2022	3	2	10	38.1	NA	38.1	41.8
Jack Creek	JACK 12-01	MR-2-3-C	7004	3	2	20	38.1	NA	38.1	65.8
Jack Creek	JACK 13-01	MR-2-3-U	5576	3	2	40	38.1	NA	38.1	77.0
Jack Creek	JACK 13-02	MR-2-3-U	6246	3	2	40	38.1	NA	38.1	266.9
Jack Creek	JACK 14-01	MR-0-3-U	4477	3	0	30	38.1	NA	38.1	212.4
Jack Creek	JACK 14-02	MR-0-3-U	2053	3	0	0	38.1	NA	38.1	238.0
Jack Creek	JACK 14-03	MR-0-3-U	2651	3	0	10	59.8	NA	59.8	267.7
Jack Creek	JACK 14-04	MR-0-3-U	2461	3	0	0	59.8	NA	59.8	122.8
Jack Creek	JACK 14-05	MR-0-3-U	3126	3	0	0	59.8	94.55	94.6	250.6
Jack Creek	JACK 14-06	MR-0-3-U	6809	3	0	40	59.8	NA	59.8	147.2
Jack Creek	JACK 14-07	MR-0-3-U	4243	3	0	0	59.8	NA	59.8	186.9
										Total: 3474.5 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.12 Moore Creek Sediment Loads

A total of 13 reaches were delineated in Moore Creek (Table C-20). These spanned a range of stream types but generally had high estimated loading from bank erosion due to a large amount of low and mid gradient reaches, and a low percentage of natural vegetation present in the riparian zone.

Table C-20. Estimated sediment loads in Moore Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
Moore Creek	MOOR 01-02	MR-10-1-U	1377	1	10	100	20.7	NA	20.7	28.5
Moore Creek	MOOR 02-01	MR-4-1-C	3496	1	4	20	20.7	NA	20.7	72.4
Moore Creek	MOOR 03-01	MR-4-1-C	13631	1	4	10	20.7	NA	20.7	282.2
Moore Creek	MOOR 04-01	MR-2-1-U	2602	1	2	80	20.7	NA	20.7	53.9
Moore Creek	MOOR 05-01	MR-2-2-C	4019	2	2	60	38.1	NA	38.1	153.1
Moore Creek	MOOR 06-01	MR-2-2-U	4734	2	2	30	38.1	NA	38.1	180.4
Moore Creek	MOOR 07-01	MR-2-3-U	4303	3	2	20	38.1	NA	38.1	163.9
Moore Creek	MOOR 07-02	MR-2-3-U	3032	3	2	20	38.1	NA	38.1	115.5
Moore Creek	MOOR 08-01	MR-2-3-C	2844	3	2	30	38.1	NA	38.1	108.3
Moore Creek	MOOR 09-01	MR-0-3-U	8420	3	0	10	59.8	41.71	41.7	351.2
Moore Creek	MOOR 09-02	MR-0-3-U	6884	3	0	10	59.8	NA	59.8	411.7
Moore Creek	MOOR 09-03	MR-0-3-U	7980	3	0	0	59.8	NA	59.8	477.2
Moore Creek	MOOR 09-04	MR-0-3-U	18947	3	0	0	59.8	59.34	59.3	1124.3
										Total: 3522.5 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.13 North Meadow Creek Sediment Loads

A total of 28 stream reaches were delineated in North Meadow Creek drainage (**Table C-21**). Whereas the first order streams had mostly natural vegetation in the riparian zone, the lower gradient reaches exhibited very little riparian vegetation in natural conditions, resulting in high estimated loading rates from bank erosion.

Table C-21. Estimated sediment loads in North Meadow Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
N Meadow Creek	NMDW 01-02	MR-10-1-U	736	1	10	100	20.7	NA	20.7	15.2
N Meadow Creek	NMDW 02-01	MR-4-1-U	3061	1	4	100	20.7	NA	20.7	63.4
N Meadow Creek	NMDW 02-02	MR-4-1-U	3390	1	4	100	20.7	NA	20.7	70.2
N Meadow Creek	NMDW 03-01	MR-10-1-U	2179	1	10	80	20.7	NA	20.7	45.1

Table C-21. Estimated sediment loads in North Meadow Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
N Meadow Creek	NMDW 04-01	MR-2-1-U	1701	1	2	90	20.7	NA	20.7	35.2
N Meadow Creek	NMDW 04-02	MR-2-1-U	272	1	2	100	20.7	NA	20.7	5.6
N Meadow Creek	NMDW 04-03	MR-2-1-U	673	1	2	50	20.7	NA	20.7	13.9
N Meadow Creek	NMDW 04-04	MR-2-1-U	742	1	2	60	20.7	NA	20.7	15.4
N Meadow Creek	NMDW 05-01	MR-4-1-U	2035	1	4	10	20.7	NA	20.7	42.1
N Meadow Creek	NMDW 06-01	MR-4-2-U	6097	2	4	10	14	NA	14.0	85.4
N Meadow Creek	NMDW 06-02	MR-4-2-U	2985	2	4	10	14	NA	14.0	41.8
N Meadow Creek	NMDW 07-01	MR-2-2-U	1100	2	2	20	38.1	NA	38.1	41.9
N Meadow Creek	NMDW 07-02	MR-2-2-U	692	2	2	20	38.1	NA	38.1	26.3
N Meadow Creek	NMDW 07-03	MR-2-2-U	1440	2	2	20	38.1	NA	38.1	54.9
N Meadow Creek	NMDW 08-01	MR-4-3-U	1774	3	4	0	14	NA	14.0	24.8
N Meadow Creek	NMDW 08-02	MR-4-3-U	2104	3	4	0	14	NA	14.0	29.5
N Meadow Creek	NMDW 08-03	MR-4-3-U	1193	3	4	20	14	NA	14.0	16.7
N Meadow Creek	NMDW 09-01	MR-2-3-U	1030	3	2	20	38.1	NA	38.1	39.3
N Meadow Creek	NMDW 09-02	MR-2-3-U	1771	3	2	30	38.1	NA	38.1	67.5
N Meadow Creek	NMDW 10-01	MR-4-3-U	3203	3	4	20	14	NA	14.0	44.8
N Meadow Creek	NMDW 11-01	MR-10-3-U	1720	3	10	50	12.5	NA	12.5	21.5
N Meadow Creek	NMDW 12-01	MR-4-3-U	1372	3	4	50	14	NA	14.0	19.2
N Meadow Creek	NMDW 13-01	MR-2-3-U	4862	3	2	30	38.1	NA	38.1	185.3

Table C-21. Estimated sediment loads in North Meadow Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
N Meadow Creek	NMDW 14-01	MR-2-3-U	11842	3	2	80	27	NA	27.0	319.7
N Meadow Creek	NMDW 14-02	MR-2-3-U	5572	3	2	20	38.1	28.79	28.8	160.4
N Meadow Creek	NMDW 15-01	MR-0-3-U	8100	3	0	30	59.8	NA	59.8	484.4
N Meadow Creek	NMDW 16-01	MR-0-3-U	14900	3	0	0	59.8	NA	59.8	891.0
N Meadow Creek	NMDW 17-01	MR-0-4-U	9861	4	0	0	59.8	42.28	42.3	416.9
										Total: 3277.4 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.14 No Man Creek Sediment Loads

A total of 15 stream reaches were delineated in No Man Creek drainage (**Table C-22**). This drainage was comprised largely of first order and high gradient stream reaches, which were estimated to have low estimated bank erosion.

Table C-22. Estimated sediment loads in No Man Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
No Man Creek	NOMN 02-01	MR-10-1-C	2027	1	10	100	20.7	NA	20.7	42.0
No Man Creek	NOMN 03-01	MR-10-1-U	1719	1	10	100	20.7	NA	20.7	35.6
No Man Creek	NOMN 04-01	MR-4-1-U	1229	1	4	100	20.7	NA	20.7	25.4
No Man Creek	NOMN 05-01	MR-4-1-U	419	1	4	100	20.7	NA	20.7	8.7
No Man Creek	NOMN 05-02	MR-4-1-U	617	1	4	100	20.7	NA	20.7	12.8
No Man Creek	NOMN 06-01	MR-10-1-C	2438	1	10	100	20.7	NA	20.7	50.5
No Man Creek	NOMN 07-01	MR-10-1-U	2815	1	10	100	20.7	NA	20.7	58.3
No Man Creek	NOMN 08-01	MR-10-2-U	1576	2	10	100	12.5	NA	12.5	19.7
No Man Creek	NOMN 09-01	MR-4-2-C	3328	2	4	100	14	NA	14.0	46.6
No Man Creek	NOMN 10-01	MR-4-2-U	4857	2	4	100	14	NA	14.0	68.0
No Man Creek	NOMN 11-01	MR-10-2-C	7599	2	10	100	12.5	NA	12.5	95.0
No Man Creek	NOMN 12-01	MR-4-2-U	678	2	4	100	14	NA	14.0	9.5
No Man Creek	NOMN 13-01	MR-4-2-U	1013	2	4	100	14	NA	14.0	14.2

Table C-22. Estimated sediment loads in No Man Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
No Man Creek	NOMN 14-01	MR-4-2-C	872	2	4	100	14	NA	14.0	12.2
No Man Creek	NOMN 15-01	MR-4-2-U	1077	2	4	90	14	NA	14.0	15.1
* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.										**513.4 Tons/Yr**

C4.2.15 O'Dell Spring Creek Sediment Loads

A total of 8 reaches were delineated in O'Dell Spring Creek drainage (**Table C-23**). The riparian zone in this drainage was generally > 70% in natural conditions, which resulted in low stream bank erosion estimates for the primarily low-gradient stream reaches present.

Table C-23. Estimated sediment loads in O'Dell Spring Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
O'Dell Spring Creek	ODEL 02-01	MR-0-2-U	5540	2	0	70	59.8	24.30	24.3	134.6
O'Dell Spring Creek	ODEL 03-01	MR-0-3-U	2459	3	0	80	43.5	NA	43.5	106.9
O'Dell Spring Creek	ODEL 03-02	MR-0-3-U	11235	3	0	80	43.5	NA	43.5	488.7
O'Dell Spring Creek	ODEL 03-03	MR-0-3-U	11238	3	0	80	43.5	NA	43.5	488.9
O'Dell Spring Creek	ODEL 03-04	MR-0-3-U	7742	3	0	60	59.8	NA	59.8	463.0
O'Dell Spring Creek	ODEL 04-01	MR-0-4-U	3219	4	0	70	59.8	NA	59.8	192.5
O'Dell Spring Creek	ODEL 04-02	MR-0-4-U	3769	4	0	40	59.8	NA	59.8	225.4
O'Dell Spring Creek	ODEL 04-03	MR-0-4-U	8865	4	0	40	59.8	NA	59.8	530.1
* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.										**Total: 2630.1 Tons/Yr**

C4.2.16 Red Canyon Sediment Loads

A total of 10 reaches were delineated in Red Canyon Creek drainage which varied in riparian condition. The first order reaches had an estimate 100 percentage of the banks in natural vegetation, but the mid-gradient reaches had only 0-40% of the riparian zone in natural vegetation conditions. Bank loading estimates were high for these mid-gradient reaches (**Table C-24**).

Table C-24. Estimated sediment loads in Red Canyon Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated *	
Red Canyon Creek	RCYN 02-01	MR-10-1-U	3154	1	10	100	20.7	NA	20.7	65.3
Red Canyon Creek	RCYN 03-01	MR-4-1-U	2628	1	4	100	20.7	NA	20.7	54.4

Table C-24. Estimated sediment loads in Red Canyon Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated *	
Red Canyon Creek	RCYN 04-01	MR-4-1-C	1962	1	4	100	20.7	NA	20.7	40.6
Red Canyon Creek	RCYN 05-01	MR-10-1-C	567	1	10	100	20.7	NA	20.7	11.7
Red Canyon Creek	RCYN 06-01	MR-10-2-C	883	2	10	100	12.5	NA	12.5	11.0
Red Canyon Creek	RCYN 07-01	MR-4-2-U	8281	2	4	40	14	22.87	22.9	189.4
Red Canyon Creek	RCYN 08-01	MR-2-2-U	1894	2	2	40	38.1	70.40	70.4	133.3
Red Canyon Creek	RCYN 08-02	MR-2-2-U	1868	2	2	40	38.1	NA	38.1	71.2
Red Canyon Creek	RCYN 09-01	MR-2-2-U	8475	2	2	0	38.1	NA	38.1	322.9
Red Canyon Creek	RCYN 09-02	MR-2-2-U	1799	2	2	0	38.1	78.81	78.8	141.8
* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.										**1040.7 Tons/Yr**

C4.2.17 Ruby Creek Sediment Loads

A total of 19 reaches were delineated in Ruby Creek drainage (**Table C-25**). Many of these had a large percentage of the riparian zone in natural condition. The exception was some of the mid-gradient reaches near the mouth, which had a much poorer riparian condition and higher amounts of estimated loading from bank erosion.

Table C-25. Estimated sediment loads in Ruby Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated *	
Ruby Creek	RUBY 02-01	MR-4-1-C	4338	1	4	100	20.7	NA	20.7	89.8
Ruby Creek	RUBY 03-01	MR-4-1-C	815	1	4	80	20.7	NA	20.7	16.9
Ruby Creek	RUBY 04-01	MR-10-1-C	2201	1	10	90	20.7	NA	20.7	45.6
Ruby Creek	RUBY 05-01	MR-4-1-C	1993	1	4	90	20.7	NA	20.7	41.3
Ruby Creek	RUBY 06-01	MR-10-1-C	4359	1	10	100	20.7	NA	20.7	90.2
Ruby Creek	RUBY 07-01	MR-4-1-C	1007	1	4	90	20.7	NA	20.7	20.8
Ruby Creek	RUBY 07-02	MR-4-1-C	706	1	4	90	20.7	NA	20.7	14.6
Ruby Creek	RUBY 08-01	MR-10-1-C	3398	1	10	100	20.7	NA	20.7	70.3
Ruby Creek	RUBY 08-02	MR-4-1-C	8734	1	4	100	20.7	NA	20.7	180.8
Ruby Creek	RUBY 09-01	MR-4-1-U	3160	1	4	100	20.7	NA	20.7	65.4
Ruby Creek	RUBY 10-01	MR-2-1-C	4108	1	2	100	20.7	NA	20.7	85.0
Ruby Creek	RUBY 11-01	MR-2-2-U	2801	2	2	100	27	NA	27.0	75.6
Ruby Creek	RUBY 12-01	MR-2-2-C	13789	2	2	100	27	NA	27.0	372.3

Table C-25. Estimated sediment loads in Ruby Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated *	
Ruby Creek	RUBY 13-01	MR-2-3-C	4568	3	2	100	27	NA	27.0	123.3
Ruby Creek	RUBY 14-01	MR-2-3-C	9585	3	2	90	27	NA	27.0	258.8
Ruby Creek	RUBY 15-01	MR-2-3-C	4591	3	2	80	27	NA	27.0	123.9
Ruby Creek	RUBY 15-02	MR-2-3-U	4180	3	2	20	38.1	NA	38.1	159.3
Ruby Creek	RUBY 16-01	MR-2-3-C	2425	3	2	30	38.1	NA	38.1	92.4
Ruby Creek	RUBY 17-01	MR-2-3-U	2552	3	2	40	38.1	57.32	57.3	146.3
										Total: 2072.7 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.18 South Meadow Creek Sediment Loads

A total of 20 reaches were delineated in South Meadow Creek drainage (**Table C-26**). A considerable number of these reaches were in first order streams with low estimated amounts of loading from bank erosion. However, the lower gradient, larger streams near the mouth were estimated to contribute high sediment loads from banks due to the riparian zone having little natural vegetation.

Table C-26. Estimated sediment loads in South Meadow Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
S Meadow Creek	SMDW 02-01	MR-4-1-U	624	1	4	100	20.7	NA	20.7	12.9
S Meadow Creek	SMDW 03-01	MR-10-1-U	1586	1	10	100	20.7	NA	20.7	32.8
S Meadow Creek	SMDW 04-01	MR-10-1-U	814	1	10	100	20.7	NA	20.7	16.9
S Meadow Creek	SMDW 05-01	MR-10-1-U	2777	1	10	90	20.7	NA	20.7	57.5
S Meadow Creek	SMDW 06-01	MR-4-1-U	2866	1	4	95	20.7	NA	20.7	59.3
S Meadow Creek	SMDW 07-01	MR-10-1-U	2252	1	10	95	20.7	NA	20.7	46.6
S Meadow Creek	SMDW 08-01	MR-4-1-U	1445	1	4	90	20.7	NA	20.7	29.9
S Meadow Creek	SMDW 09-01	MR-10-1-U	1430	1	10	80	20.7	NA	20.7	29.6
S Meadow Creek	SMDW 10-01	MR-4-1-C	1115	1	4	80	20.7	NA	20.7	23.1
S Meadow Creek	SMDW 11-01	MR-10-1-U	3651	1	10	80	20.7	NA	20.7	75.6
S Meadow Creek	SMDW 12-01	MR-4-1-U	3689	1	4	65	20.7	NA	20.7	76.4
S Meadow Creek	SMDW 13-01	MR-10-1-U	1556	1	10	80	20.7	NA	20.7	32.2
S Meadow Creek	SMDW 14-01	MR-4-1-U	1149	1	4	80	20.7	NA	20.7	23.8
S Meadow Creek	SMDW 15-01	MR-10-1-U	1360	1	10	70	20.7	NA	20.7	28.1

Table C-26. Estimated sediment loads in South Meadow Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
S Meadow Creek	SMDW 16-01	MR-4-1-U	1937	1	4	70	20.7	NA	20.7	40.1
S Meadow Creek	SMDW 17-01	MR-4-2-U	6030	2	4	20	14	NA	14.0	84.4
S Meadow Creek	SMDW 17-02	MR-4-2-U	5772	2	4	60	14	NA	14.0	80.8
S Meadow Creek	SMDW 18-01	MR-2-3-U	4156	3	2	60	38.1	17.87	17.9	74.3
S Meadow Creek	SMDW 19-01	MR-0-3-U	14059	3	0	20	59.8	68.02	68.0	956.3
S Meadow Creek	SMDW 19-02	MR-0-3-U	4207	3	0	50	59.8	NA	59.8	251.6
										Total: 2032.2 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.19 Watkins Creek Sediment Loads

A total of 13 reaches were delineated in the Watkins Creek drainage. These were estimated to have low loading from bank erosion due to higher gradients and > 70% natural vegetation in most reaches (Table **C-27**).

Table C-27. Estimated sediment loads in Watkins Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated *	
Watkins Creek	WATK 02-01	MR-10-1-U	634	1	10	100	20.7	NA	20.7	13.1
Watkins Creek	WATK 03-01	MR-4-1-C	1141	1	4	100	20.7	NA	20.7	23.6
Watkins Creek	WATK 04-01	MR-10-1-C	1835	1	10	90	20.7	NA	20.7	38.0
Watkins Creek	WATK 05-01	MR-10-2-C	675	2	10	90	12.5	NA	12.5	8.4
Watkins Creek	WATK 06-01	MR-10-2-U	2207	2	10	100	12.5	NA	12.5	27.6
Watkins Creek	WATK 07-01	MR-4-2-U	4322	2	4	80	14	NA	14.0	60.5
Watkins Creek	WATK 08-01	MR-10-2-C	2280	2	10	100	12.5	NA	12.5	28.5
Watkins Creek	WATK 09-01	MR-4-2-U	2005	2	4	100	14	NA	14.0	28.1
Watkins Creek	WATK 10-01	MR-2-3-U	2274	3	2	80	27	NA	27.0	61.4
Watkins Creek	WATK 11-01	MR-4-3-U	2467	3	4	80	14	NA	14.0	34.5
Watkins Creek	WATK 12-01	MR-2-3-U	5867	3	2	80	27	28.20	28.2	165.5
Watkins Creek	WATK 13-01	MR-4-3-U	3336	3	4	80	14	NA	14.0	46.7
Watkins Creek	WATK 14-01	MR-2-3-U	6593	3	2	30	38.1	17.64	17.6	116.3
										Total: 652.2 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.20 West Fork Madison River Sediment Loads

A total of 30 reaches were delineated in the West Fork Madison River drainage. The loading estimate from bank erosion was low for most reaches, given that the riparian zone was generally >70% in natural vegetation (**Table C-28**).

Table C-28. Estimated sediment loads in West Fork Madison River

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
WFk Madison River	WFMA 02-01	MR-4-1-C	4578	1	4	90	20.7	NA	20.7	94.8
WFk Madison River	WFMA 03-01	MR-10-1-C	881	1	10	90	20.7	NA	20.7	18.2
WFk Madison River	WFMA 04-01	MR-4-1-U	4505	1	4	80	20.7	NA	20.7	93.3
WFk Madison River	WFMA 05-01	MR-10-1-C	959	1	10	90	20.7	NA	20.7	19.9
WFk Madison River	WFMA 05-02	MR-10-1-C	529	1	10	90	20.7	NA	20.7	11.0
WFk Madison River	WFMA 06-01	MR-4-1-U	4350	1	4	90	20.7	NA	20.7	90.0
WFk Madison River	WFMA 07-01	MR-2-1-U	2359	1	2	90	20.7	NA	20.7	48.8
WFk Madison River	WFMA 08-01	MR-2-2-C	1734	2	2	90	27	NA	27.0	46.8
WFk Madison River	WFMA 09-01	MR-2-2-C	4875	2	2	80	27	NA	27.0	131.6
WFk Madison River	WFMA 10-01	MR-0-2-C	4732	2	0	85	43.5	NA	43.5	205.9
WFk Madison River	WFMA 11-01	MR-0-2-U	8697	2	0	80	43.5	NA	43.5	378.3
WFk Madison River	WFMA 12-01	MR-0-2-C	6540	2	0	85	43.5	NA	43.5	284.5
WFk Madison River	WFMA 13-01	MR-0-2-U	9241	2	0	80	43.5	NA	43.5	402.0
WFk Madison River	WFMA 14-01	MR-0-2-C	1416	2	0	90	43.5	NA	43.5	61.6
WFk Madison River	WFMA 14-02	MR-0-2-C	5964	2	0	90	43.5	66.79	66.8	398.3
WFk Madison River	WFMA 15-01	MR-2-2-C	4965	2	2	90	27	NA	27.0	134.1
WFk Madison River	WFMA 16-01	MR-0-2-C	8258	2	0	90	43.5	NA	43.5	359.2
WFk Madison River	WFMA 16-02	MR-0-2-C	5996	2	0	90	43.5	NA	43.5	260.8
WFk Madison River	WFMA 17-01	MR-2-2-C	1322	2	2	90	27	NA	27.0	35.7
WFk Madison River	WFMA 18-01	MR-2-2-C	2610	2	2	90	27	NA	27.0	70.5
WFk Madison River	WFMA 18-02	MR-2-2-C	2027	2	2	90	27	NA	27.0	54.7
WFk Madison River	WFMA 19-01	MR-0-2-C	28305	2	0	90	43.5	NA	43.5	1231.3
WFk Madison River	WFMA 20-01	MR-0-3-U	21993	3	0	80	43.5	NA	43.5	956.7
WFk Madison River	WFMA 21-01	MR-0-3-U	1716	3	0	80	43.5	NA	43.5	74.6
WFk Madison River	WFMA 22-01	MR-0-3-U	11756	3	0	80	43.5	NA	43.5	511.4

Table C-28. Estimated sediment loads in West Fork Madison River

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
WFk Madison River	WFMA 23-01	MR-0-3-U	2827	3	0	80	43.5	NA	43.5	123.0
WFk Madison River	WFMA 24-01	MR-0-3-C	3898	3	0	80	43.5	NA	43.5	169.6
WFk Madison River	WFMA 25-01	MR-0-4-C	19803	4	0	70	59.8	NA	59.8	1184.2
WFk Madison River	WFMA 25-02	MR-0-4-C	23371	4	0	60	59.8	33.66	33.7	786.6
WFk Madison River	WFMA 26-01	MR-0-4-C	6470	4	0	80	43.5	90.53	90.5	585.7
										Total: 8822.9 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.2.21 Wigwam Creek Sediment Loads

A total of 19 reaches were delineated in the Wigwam Creek drainage. The majority of Wigwam Creek drainage was estimated to have low sediment loads from bank erosion, being comprised of small streams with relatively high gradients. In addition, the riparian zone along Wigwam Creek was primarily in > 70% natural vegetation. The exception was near the mouth of Wigwam Creek, which was estimated to have high loads from bank erosion due to low gradients and a lack of natural vegetation in the riparian zone (**Table C-29**).

Table C-29. Estimated sediment loads in Wigwam Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
Wigwam Creek	WGWM 02-01	MR-4-1-C	2841	1	4	90	20.7	NA	20.7	58.8
Wigwam Creek	WGWM 03-01	MR-10-1-U	998	1	10	90	20.7	NA	20.7	20.7
Wigwam Creek	WGWM 04-01	MR-4-1-C	2454	1	4	80	20.7	NA	20.7	50.8
Wigwam Creek	WGWM 05-01	MR-10-1-C	1128	1	10	80	20.7	NA	20.7	23.4
Wigwam Creek	WGWM 06-01	MR-10-2-C	835	2	10	90	12.5	NA	12.5	10.4
Wigwam Creek	WGWM 07-01	MR-10-2-C	915	2	10	90	12.5	NA	12.5	11.4
Wigwam Creek	WGWM 08-01	MR-4-2-C	7135	2	4	70	14	12.28	12.3	87.6
Wigwam Creek	WGWM 09-01	MR-2-3-C	3722	3	2	80	27	NA	27.0	100.5
Wigwam Creek	WGWM 10-01	MR-4-3-C	7972	3	4	90	14	NA	14.0	111.6
Wigwam Creek	WGWM 11-01	MR-2-3-C	4159	3	2	90	27	NA	27.0	112.3
Wigwam Creek	WGWM 12-01	MR-4-3-C	2005	3	4	90	14	NA	14.0	28.1
Wigwam Creek	WGWM 13-01	MR-10-3-C	837	3	10	90	12.5	NA	12.5	10.5
Wigwam Creek	WGWM 14-01	MR-4-3-C	2256	3	4	90	14	NA	14.0	31.6
Wigwam Creek	WGWM 14-02	MR-4-3-C	2197	3	4	80	14	NA	14.0	30.8

Table C-29. Estimated sediment loads in Wigwam Creek

Stream	Reach ID	Reach Type	Length (feet)	Strahler Order	Grad-ient Class	% Natural Veg	Load Per 1000 Feet (Tons/Yr/1000 Feet)			Total Load (Tons/Year)
							Extrapolated	Field Assessed	Estimated*	
Wigwam Creek	WGWM 15-01	MR-2-3-C	3542	3	2	40	38.1	NA	38.1	135.0
Wigwam Creek	WGWM 15-02	MR-2-3-C	1005	3	2	0	38.1	NA	38.1	38.3
Wigwam Creek	WGWM 16-01	MR-2-3-C	2466	3	2	10	38.1	NA	38.1	94.0
Wigwam Creek	WGWM 17-01	MR-2-3-C	5188	3	2	70	38.1	NA	38.1	197.7
Wigwam Creek	WGWM 18-01	MR-2-3-C	8290	3	2	10	38.1	13.99	14.0	116.0
										Total: 1269.3 Tons/Yr

* If reach was sampled, actual field loading value was used; otherwise extrapolated value was used.

C4.3 BMP SEDIMENT LOADS

For low and mid gradient streams (0-2% and >2%-4%) in low riparian condition (≤70% natural conditions), the sediment load if BMPs were implemented was estimated as the average of low and mid gradient streams with high riparian condition (Table C-30). For low and mid gradient reaches with already high riparian condition, no change was made in the estimated load. Because too few >4-10% gradient were sampled, a different method was used. To estimate BMP loads in these reaches, the BEHI score at individual banks within sampled reaches was changed from extreme to very high, very high to high, and high to moderate, and then the loading was estimated by taking the average of these reduced values. This new average was applied to estimate the BMP load at unsampled mid-gradient reaches. No different BMP load was estimated for very high (4-10%) gradient and first order unsampled reaches. These reaches tended to have riparian zones in high condition. Also, they comprised a low percentage of reaches in most watersheds.

The drainages with the highest estimated percent reduction in sediment load due to BMP's (>30%) include Blaine Spring Creek, Elk Creek, Moore Creek, Red Canyon Creek, and South Meadow Creek (**Tables C-30** and **C-31**). However, this is an estimate based on our aerial assessment of the riparian zone and may vary due to already-implemented BMPs are other local conditions.

Table C-30. Stream characteristics used to estimate BMP Loads at unsampled reaches

Gradient	Order	Riparian Condition	BMP Action	Pre-BMP Load (Tons/Yr/1000 Ft)	Post-BMP Load (Tons/Yr/1000 Ft)
0-2%	Non 1st	High, > 70% Riparian Zone in Natural Condition	NONE	43.5	43.5
0-2%	Non 1st	Low, ≤ 70% Riparian Zone in Natural Condition	Change to average at reaches with riparian zone in high condition	59.8	43.5
>2-4%	Non 1st	High, > 70% Riparian Zone in Natural Condition	NONE	27.0	27.0
>2-4%	Non 1st	Low, ≤ 70% Riparian Zone in Natural Condition	Change to average at reaches with riparian zone in high condition	38.1	27.0

Table C-30. Stream characteristics used to estimate BMP Loads at unsampled reaches

Gradient	Order	Riparian Condition	BMP Action	Pre-BMP Load (Tons/Yr/1000 Ft)	Post-BMP Load (Tons/Yr/1000 Ft)
>4-10%	Non 1st	Any	Average at sampled reaches after changing bank erosion from extreme to very high, very high to high, and from high to moderate	14.0	11.3
> 10%	Non 1st	Any	NONE	12.5	12.5
Any	1st	Any	NONE	20.7	20.7

Table C-31. Estimated reduction in sediment loads with BMP's

Watershed	Estimated Load (Tons/Yr)	BMP Load Estimated Load (Tons/Yr)	% Reduction
Antelope Creek*	2115.4	1612.9	23.8
Bear Creek*	6990.27	5059.4	27.6
Buford Creek	448.5	448.5	0.0
Blaine Spring Creek*	2507.6	1545.2	38.4
Cherry Creek*	7481.4	5835.0	22.0
Elk Creek*	4839.5	3346.0	30.9
Elk River	2158.8	2009.4	6.9
Gazelle Creek	678.9	617.9	9.0
Hot Springs Creek	3884.3	2801.1	27.9
Indian Creek	2410.5	2103.9	12.7
Jack Creek	3474.5	2499.9	28.1
Moore Creek*	3522.5	2199.4	37.6
North Meadow Creek*	3277.4	2508.3	23.5
No Man Creek	513.4	481.5	6.2
O'Dell Spring Creek	2630.1	2169.1	17.5
Red Canyon Creek*	1014.7	701.2	30.9
Ruby Creek*	2072.7	1914.2	7.6
South Meadow Creek*	2032.2	1378.1	32.2
Watkins Creek*	652.2	459.2	29.6
West Fork Madison River	8822.9	7516.7	14.8
Wigwam Creek*	1269.3	1044.2	17.7

*considered impaired for sediment

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