

APPENDIX H - TOTAL MAXIMUM DAILY LOADS

H.1 SEDIMENT

H.1.1 OVERVIEW

A percent reduction based on average yearly loading was used as the primary approach for expressing the sediment TMDLs within this document because there is uncertainty associated with the loads derived from the source assessment, and using the estimated sediment loads alone creates a rigid perception that the loads are absolutely conclusive. However, in this appendix the TMDL is expressed using daily loads to satisfy an additional EPA required TMDL element. Daily loads should not be considered absolutely conclusive and may be refined in the future as part of the adaptive management process. The TMDLs may not be feasible at all locations within the watershed but if the allocations are followed, sediment loads are expected to be reduced to a degree that the sediment targets are met and beneficial uses are no longer impaired. It is not expected that daily loads will drive implementation activities.

H.1.2 APPROACH

The preferred approach for calculating daily sediment loads is to use a nearby water quality gage with a long-term dataset for flow and suspended sediment. Although there is one streamflow gage on the Tobacco River (#12301300) that has been in operation since 1958, it does not have a long-term record for suspended sediment. The closest gage to the Tobacco River TPA with a long-term record of flow and suspended sediment is the USGS station on the Fisher River near Libby (#12302055). Because the Fisher watershed has a similar climate and hydrologic pattern as the Tobacco River watershed, with spring runoff occurring within a similar timeframe and most sediment loading occurring during periods of runoff and high flow, using data from the Fisher River gage is assumed to be a reasonable approach for calculating daily sediment loads in the Tobacco River TPA.

A sediment rating curve was developed using daily flow and suspended solids load data collected from 1967 through 1976, which is the only period of record with available daily suspended sediment data (**Figure H-1**). Sediment load records during January of 1974 were removed from the rating curve because these values corresponded to an extreme flood event that was not deemed representative of typical conditions in the Tobacco River watershed. The daily mean discharge based on 42 years of record (1968-2010) at the USGS gage was then plugged into the equation for the sediment rating curve to get a daily suspended sediment load. Although the suspended sediment load is only a portion of the total load from the source assessment, it provides an approximation of the relationship between sediment and flow in the Tobacco River TPA. Based on the sum of the calculated daily sediment loads, a daily percentage relative to the annual suspended sediment load was calculated for each day. The daily percentages were then applied to the total average annual loads associated with the TMDL percent reductions from **Section 5.0** to determine the average daily load.

To conserve resources, this appendix contains daily loads for the Tobacco River as an example. As discussed in **Section 5.7.3.8**, the TMDL for the Tobacco River is a 11% reduction in the total average annual sediment load, which is roughly equivalent to 20,600 tons/year. The daily percentages discussed above were then multiplied by the annual load of 20,600 tons to get a daily expression of the Tobacco

River TMDL (**Figure H-2, Table H-1**). For all other **waterbodies**, daily TMDLs may be derived by using the daily percentages in **Table H-2** and the TMDLs expressed as an average annual load, which are discussed in **Section 5.7** and presented in **Table H-2**. The daily loads are a composite of the allocations, but as allocations are not feasible on a daily basis, they are not contained within this appendix. If desired, daily allocations may be obtained by applying allocations provided in **Section 5.7** to the daily load.

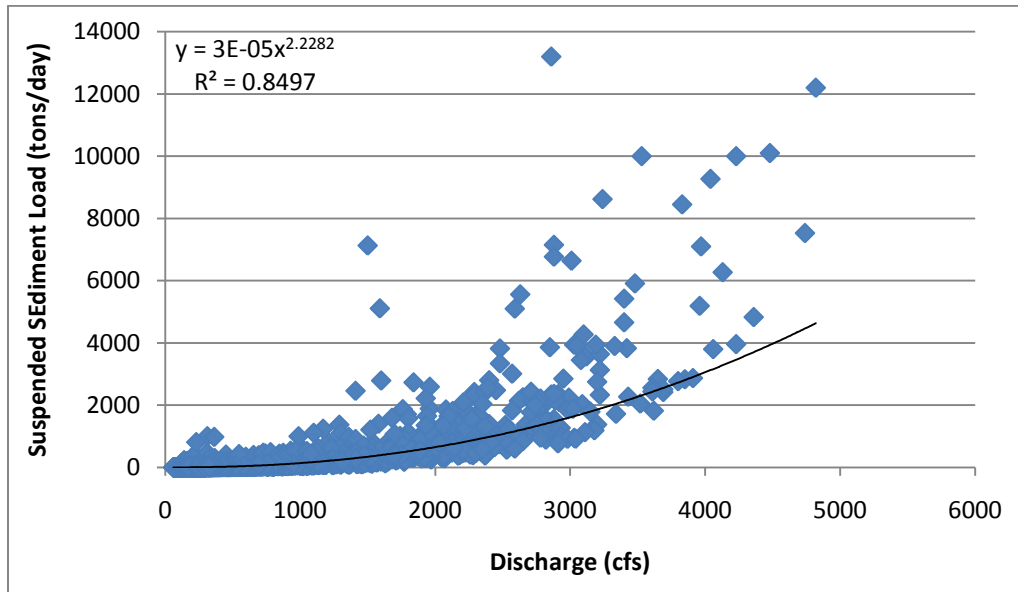


Figure H-1. Sediment Rating Curve for Fisher River based on USGS gage 12302055

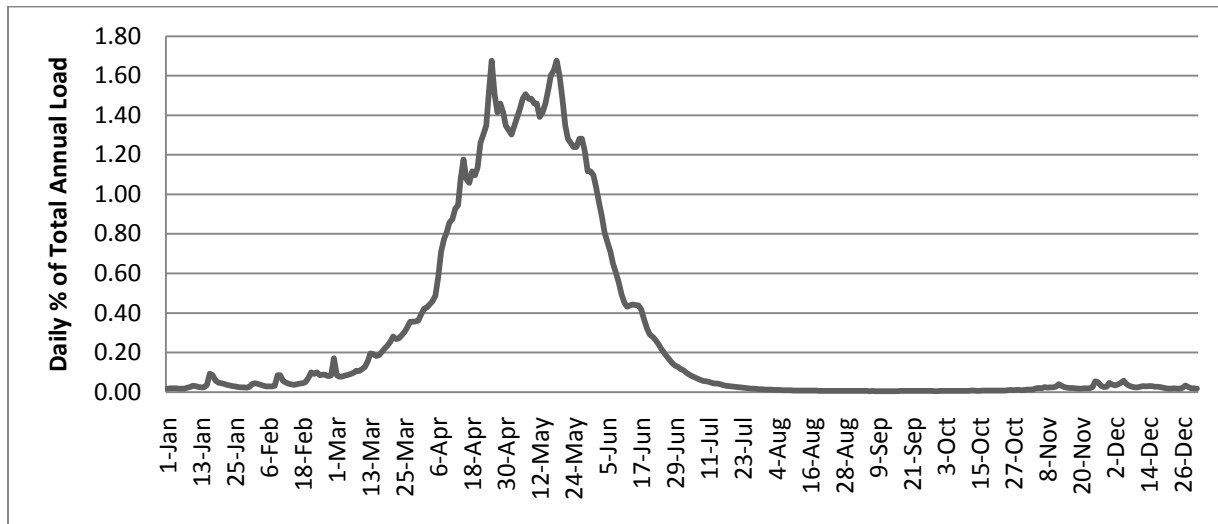


Figure H-2. TMDL for the Tobacco River

Table H-1. Daily Sediment TMDL for the Tobacco River

Month	Day	Daily % of annual load	Tobacco River TMDL (tons/day)	Month	Day	Daily % of annual load	Tobacco River TMDL (tons/day)
Jan	1	0.02	3.5	Feb	17	0.04	9.2
Jan	2	0.02	3.8	Feb	18	0.05	9.4
Jan	3	0.02	3.8	Feb	19	0.05	10.8

Table H-1. Daily Sediment TMDL for the Tobacco River

Month	Day	Daily % of annual load	Tobacco River TMDL (tons/day)	Month	Day	Daily % of annual load	Tobacco River TMDL (tons/day)
Jan	4	0.02	4.0	Feb	20	0.07	15.5
Jan	5	0.02	3.7	Feb	21	0.10	20.9
Jan	6	0.02	3.6	Feb	22	0.09	19.2
Jan	7	0.02	3.7	Feb	23	0.10	20.8
Jan	8	0.02	4.6	Feb	24	0.09	17.9
Jan	9	0.03	5.2	Feb	25	0.09	18.4
Jan	10	0.03	6.8	Feb	26	0.09	18.3
Jan	11	0.03	6.4	Feb	27	0.08	16.9
Jan	12	0.03	5.2	Feb	28	0.08	17.5
Jan	13	0.02	4.9	Feb	29	0.17	35.6
Jan	14	0.02	5.0	Mar	1	0.09	17.9
Jan	15	0.04	7.3	Mar	2	0.08	16.2
Jan	16	0.09	19.5	Mar	3	0.08	16.3
Jan	17	0.09	17.8	Mar	4	0.08	17.6
Jan	18	0.06	12.0	Mar	5	0.09	18.1
Jan	19	0.05	10.0	Mar	6	0.09	19.1
Jan	20	0.04	9.3	Mar	7	0.10	20.5
Jan	21	0.04	8.7	Mar	8	0.11	22.4
Jan	22	0.04	7.7	Mar	9	0.11	22.1
Jan	23	0.03	7.0	Mar	10	0.12	24.1
Jan	24	0.03	6.3	Mar	11	0.13	26.4
Jan	25	0.03	6.1	Mar	12	0.16	32.5
Jan	26	0.03	5.4	Mar	13	0.19	40.6
Jan	27	0.02	5.1	Mar	14	0.19	40.1
Jan	28	0.02	4.8	Mar	15	0.18	38.1
Jan	29	0.02	4.7	Mar	16	0.19	39.2
Jan	30	0.02	5.2	Mar	17	0.20	42.5
Jan	31	0.04	8.3	Mar	18	0.22	45.8
Feb	1	0.05	9.5	Mar	19	0.23	48.8
Feb	2	0.04	8.8	Mar	20	0.25	52.9
Feb	3	0.04	7.5	Mar	21	0.28	58.6
Feb	4	0.03	6.6	Mar	22	0.27	56.1
Feb	5	0.03	6.1	Mar	23	0.27	56.6
Feb	6	0.03	5.9	Mar	24	0.29	59.7
Feb	7	0.03	5.9	Mar	25	0.30	63.1
Feb	8	0.03	6.7	Mar	26	0.33	68.1
Feb	9	0.09	17.9	Mar	27	0.36	74.1
Feb	10	0.09	17.8	Mar	28	0.36	74.1
Feb	11	0.06	11.7	Mar	29	0.36	74.5
Feb	12	0.05	9.9	Mar	30	0.36	75.4
Feb	13	0.04	8.7	Mar	31	0.39	82.3
Feb	14	0.04	8.0	Apr	1	0.42	88.0
Feb	15	0.04	7.7	Apr	2	0.43	89.5
Feb	16	0.04	8.3	Apr	3	0.04	9.2
Apr	4	0.44	92.4	May	21	1.48	309.1
Apr	5	0.46	95.7	May	22	1.35	280.7

Table H-1. Daily Sediment TMDL for the Tobacco River

Month	Day	Daily % of annual load	Tobacco River TMDL (tons/day)	Month	Day	Daily % of annual load	Tobacco River TMDL (tons/day)
Apr	6	0.49	101.4	May	23	1.28	267.1
Apr	7	0.58	121.2	May	24	1.26	262.7
Apr	8	0.71	147.9	May	25	1.24	258.3
Apr	9	0.77	161.1	May	26	1.24	258.3
Apr	10	0.81	168.0	May	27	1.28	267.1
Apr	11	0.86	178.5	May	28	1.28	267.1
Apr	12	0.87	182.2	May	29	1.22	253.9
Apr	13	0.93	193.2	May	30	1.12	232.6
Apr	14	0.94	197.0	May	31	1.12	232.6
Apr	15	1.08	224.4	Jun	1	1.10	228.5
Apr	16	1.18	245.3	Jun	2	1.04	216.4
Apr	17	1.08	224.4	Jun	3	0.96	200.8
Apr	18	1.06	220.4	Jun	4	0.89	185.8
Apr	19	1.12	232.6	Jun	5	0.81	168.0
Apr	20	1.10	228.5	Jun	6	0.76	157.8
Apr	21	1.14	236.8	Jun	7	0.71	147.9
Apr	22	1.26	262.7	Jun	8	0.65	135.6
Apr	23	1.30	271.6	Jun	9	0.61	126.2
Apr	24	1.35	280.7	Jun	10	0.55	115.5
Apr	25	1.53	318.9	Jun	11	0.49	102.7
Apr	26	1.68	349.2	Jun	12	0.45	93.9
Apr	27	1.51	314.0	Jun	13	0.43	89.9
Apr	28	1.41	294.7	Jun	14	0.44	91.4
Apr	29	1.46	304.3	Jun	15	0.44	92.4
Apr	30	1.41	294.7	Jun	16	0.44	91.7
May	1	1.35	280.7	Jun	17	0.44	91.4
May	2	1.32	276.2	Jun	18	0.42	87.3
May	3	1.30	271.6	Jun	19	0.37	76.8
May	4	1.35	280.7	Jun	20	0.32	67.4
May	5	1.39	290.0	Jun	21	0.29	60.7
May	6	1.44	299.5	Jun	22	0.28	58.4
May	7	1.48	309.1	Jun	23	0.26	54.9
May	8	1.51	314.0	Jun	24	0.25	51.3
May	9	1.48	309.1	Jun	25	0.22	46.2
May	10	1.48	309.1	Jun	26	0.20	41.7
May	11	1.46	304.3	Jun	27	0.18	37.8
May	12	1.46	304.3	Jun	28	0.16	33.8
May	13	1.39	290.0	Jun	29	0.15	30.7
May	14	1.41	294.7	Jun	30	0.13	28.0
May	15	1.46	304.3	Jul	1	0.13	26.7
May	16	1.53	318.9	Jul	2	0.12	24.1
May	17	1.60	333.9	Jul	3	0.11	22.8
May	18	1.63	339.0	Jul	4	0.10	20.4
May	19	1.68	349.2	Jul	5	0.09	18.6
May	20	1.60	333.9	Jul	6	0.08	16.9
Jul	7	0.07	15.4	Aug	22	0.01	1.3

Table H-1. Daily Sediment TMDL for the Tobacco River

Month	Day	Daily % of annual load	Tobacco River TMDL (tons/day)	Month	Day	Daily % of annual load	Tobacco River TMDL (tons/day)
Jul	8	0.07	14.1	Aug	23	0.01	1.3
Jul	9	0.06	12.9	Aug	24	0.01	1.3
Jul	10	0.06	11.7	Aug	25	0.01	1.3
Jul	11	0.06	11.5	Aug	26	0.01	1.3
Jul	12	0.05	10.8	Aug	27	0.01	1.3
Jul	13	0.05	9.8	Aug	28	0.01	1.3
Jul	14	0.04	9.2	Aug	29	0.01	1.2
Jul	15	0.04	9.1	Aug	30	0.01	1.2
Jul	16	0.04	8.3	Aug	31	0.01	1.2
Jul	17	0.04	7.5	Sep	1	0.01	1.2
Jul	18	0.03	6.8	Sep	2	0.01	1.1
Jul	19	0.03	6.3	Sep	3	0.01	1.2
Jul	20	0.03	5.9	Sep	4	0.01	1.2
Jul	21	0.03	5.6	Sep	5	0.01	1.1
Jul	22	0.02	5.1	Sep	6	0.01	1.1
Jul	23	0.02	4.8	Sep	7	0.01	1.1
Jul	24	0.02	4.5	Sep	8	0.01	1.1
Jul	25	0.02	4.1	Sep	9	0.01	1.1
Jul	26	0.02	4.0	Sep	10	0.01	1.1
Jul	27	0.02	3.7	Sep	11	0.01	1.1
Jul	28	0.02	3.5	Sep	12	0.00	1.0
Jul	29	0.02	3.3	Sep	13	0.01	1.1
Jul	30	0.01	3.0	Sep	14	0.01	1.1
Jul	31	0.01	2.9	Sep	15	0.00	1.0
Aug	1	0.01	2.7	Sep	16	0.00	1.0
Aug	2	0.01	2.6	Sep	17	0.01	1.1
Aug	3	0.01	2.5	Sep	18	0.01	1.1
Aug	4	0.01	2.4	Sep	19	0.01	1.3
Aug	5	0.01	2.3	Sep	20	0.01	1.4
Aug	6	0.01	2.2	Sep	21	0.01	1.3
Aug	7	0.01	2.1	Sep	22	0.01	1.3
Aug	8	0.01	2.0	Sep	23	0.01	1.2
Aug	9	0.01	1.9	Sep	24	0.01	1.2
Aug	10	0.01	1.8	Sep	25	0.01	1.1
Aug	11	0.01	1.7	Sep	26	0.01	1.1
Aug	12	0.01	1.7	Sep	27	0.01	1.1
Aug	13	0.01	1.6	Sep	28	0.01	1.1
Aug	14	0.01	1.6	Sep	29	0.01	1.1
Aug	15	0.01	1.5	Sep	30	0.01	1.1
Aug	16	0.01	1.5	Oct	1	0.01	1.1
Aug	17	0.01	1.5	Oct	2	0.01	1.1
Aug	18	0.01	1.5	Oct	3	0.01	1.2
Aug	19	0.01	1.4	Oct	4	0.01	1.2
Aug	20	0.01	1.4	Oct	5	0.01	1.2
Aug	21	0.01	1.3	Oct	6	0.01	1.3
Oct	7	0.01	1.2	Nov	22	0.02	3.9

Table H-1. Daily Sediment TMDL for the Tobacco River

Month	Day	Daily % of annual load	Tobacco River TMDL (tons/day)	Month	Day	Daily % of annual load	Tobacco River TMDL (tons/day)
Oct	8	0.01	1.2	Nov	23	0.02	3.8
Oct	9	0.01	1.2	Nov	24	0.02	4.0
Oct	10	0.01	1.2	Nov	25	0.03	5.2
Oct	11	0.01	1.2	Nov	26	0.05	11.4
Oct	12	0.01	1.3	Nov	27	0.05	10.4
Oct	13	0.01	1.5	Nov	28	0.03	6.8
Oct	14	0.01	1.4	Nov	29	0.02	5.2
Oct	15	0.01	1.4	Nov	30	0.03	5.6
Oct	16	0.01	1.4	Dec	1	0.05	9.8
Oct	17	0.01	1.5	Dec	2	0.04	7.8
Oct	18	0.01	1.6	Dec	3	0.03	7.0
Oct	19	0.01	1.5	Dec	4	0.04	7.8
Oct	20	0.01	1.5	Dec	5	0.05	9.5
Oct	21	0.01	1.5	Dec	6	0.06	12.2
Oct	22	0.01	1.5	Dec	7	0.04	8.6
Oct	23	0.01	1.5	Dec	8	0.03	6.6
Oct	24	0.01	1.6	Dec	9	0.03	5.5
Oct	25	0.01	1.6	Dec	10	0.02	4.8
Oct	26	0.01	2.0	Dec	11	0.02	4.9
Oct	27	0.01	2.2	Dec	12	0.03	5.7
Oct	28	0.01	2.1	Dec	13	0.03	6.2
Oct	29	0.01	2.2	Dec	14	0.03	5.8
Oct	30	0.01	2.2	Dec	15	0.03	6.3
Oct	31	0.01	2.0	Dec	16	0.03	6.2
Nov	1	0.01	2.3	Dec	17	0.03	5.7
Nov	2	0.01	2.6	Dec	18	0.03	5.6
Nov	3	0.01	2.6	Dec	19	0.03	5.2
Nov	4	0.01	3.1	Dec	20	0.02	4.6
Nov	5	0.02	3.8	Dec	21	0.02	4.0
Nov	6	0.02	4.4	Dec	22	0.02	3.7
Nov	7	0.02	3.8	Dec	23	0.02	3.7
Nov	8	0.03	5.3	Dec	24	0.02	3.8
Nov	9	0.02	4.7	Dec	25	0.02	3.7
Nov	10	0.02	4.9	Dec	26	0.02	3.6
Nov	11	0.02	4.9	Dec	27	0.02	4.6
Nov	12	0.03	5.7	Dec	28	0.03	6.9
Nov	13	0.04	8.2	Dec	29	0.03	5.2
Nov	14	0.03	6.7	Dec	30	0.02	4.1
Nov	15	0.03	5.5	Dec	31	0.02	3.8
Nov	16	0.02	4.5				
Nov	17	0.02					
Nov	18	0.02					
Nov	19	0.02					
Nov	20	0.02					
Nov	21	0.02					

Table H-2. Sediment TMDLs expressed as an average annual load (tons/year)

Stream Segment	Waterbody #	TMDL expressed as average annual load (tons/year)
DEEP CREEK , headwaters to mouth (Fortine Creek)	MT76D004_080	540
EDNA CREEK , headwaters to mouth (Fortine Creek)	MT76D004_030	510
FORTINE CREEK , headwaters to confluence with Graves Creek (mouth), which is the headwaters of the Tobacco River	MT76D004_020	10,900
LIME CREEK , headwaters to mouth (Fortine Creek)	MT76D004_050	510
SINCLAIR CREEK , headwaters to mouth (Tobacco River)	MT76D004_091	1,100
SWAMP CREEK , headwaters to the mouth (Fortine Creek)	MT76D004_040	1,500
THERRIAULT CREEK , headwaters to the Tobacco River	MT76D004_070	450
TOBACCO RIVER , confluence of Grave Creek & Fortine Creek to mouth (Lake Koocanusa)	MT76D004_010	20,600

