

APPENDIX E - SEDIMENT TOTAL MAXIMUM DAILY LOADS

E.1 SEDIMENT

E.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. It is not expected that daily loads will drive implementation activities.

E.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. However, there are no gages in the Chippewa Creek watershed and suspended sediment is not monitored at any of the gages within the Musselshell River watershed. Since sediment loading in the Chippewa Creek watershed is associated with nonpoint sources, the hydrograph is assumed to be a reasonable surrogate for sediment loading to stream (i.e. peak contributions during periods of runoff and high flow). The closest gage to Chippewa Creek with an extensive flow record is the Musselshell River at Mosby (gage 06130500); it has discharge values dating back to 1930. The gage at Mosby is downstream of the confluence with the McDonald Creek, which Chippewa Creek is a tributary to, and likely has similar temporal hydrologic patterns to the Chippewa Creek. Therefore, mean daily discharge values from almost 80 years of record at the gage on the Musselshell River at Mosby were used to calculate daily sediment values for the Chippewa Creek sediment TMDL.

Using the mean of daily mean discharge values from the gage, a daily percentage relative to the mean annual discharge was calculated for each day (**Table E-1**). The daily percentages were multiplied by the total average annual load associated with the TMDL percent reductions in **Section 5.6.2** to calculate the daily load. The daily loads are shown graphically in **Figure E-1** and may be computed by using the daily percentages in **Table E-1** and the annual TMDL of 58.76 tons.

For instance, the total allowable annual sediment load for Chippewa Creek is 58.76 tons. To determine the TMDL for January 1, 58.76 tons is multiplied by 0.06% which provides a daily load for Chippewa Creek on January 1st of 0.03769 tons (78.4 pounds). 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 section. If desired, daily allocations may be obtained by applying allocations provided in **Section 5.6.2** to the daily load.

Table E-1. USGS Stream Gage 06130500 (Musselshell River at Mosby MT) - Percent of mean annual discharge based on mean of daily mean values for each day for 78 - 79 years of record in, cfs (calculation period Oct 1, 1930 through September 30, 2010)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.06%	0.08%	0.23%	0.41%	0.29%	0.69%	0.64%	0.13%	0.14%	0.09%	0.09%	0.08%
2	0.07%	0.08%	0.33%	0.36%	0.31%	0.67%	0.60%	0.12%	0.12%	0.09%	0.09%	0.08%
3	0.08%	0.08%	0.48%	0.32%	0.32%	0.71%	0.55%	0.14%	0.12%	0.09%	0.09%	0.08%
4	0.07%	0.09%	0.40%	0.30%	0.32%	0.80%	0.58%	0.13%	0.11%	0.08%	0.09%	0.08%
5	0.07%	0.09%	0.37%	0.29%	0.33%	0.73%	0.55%	0.12%	0.11%	0.08%	0.09%	0.08%
6	0.08%	0.10%	0.36%	0.29%	0.38%	0.74%	0.56%	0.13%	0.11%	0.09%	0.09%	0.08%
7	0.08%	0.11%	0.40%	0.30%	0.49%	0.76%	0.52%	0.13%	0.11%	0.08%	0.09%	0.08%
8	0.08%	0.10%	0.40%	0.30%	0.47%	0.82%	0.44%	0.12%	0.14%	0.08%	0.09%	0.07%
9	0.08%	0.10%	0.43%	0.29%	0.47%	0.99%	0.40%	0.12%	0.12%	0.08%	0.09%	0.07%
10	0.08%	0.10%	0.43%	0.29%	0.48%	1.03%	0.38%	0.11%	0.12%	0.08%	0.09%	0.07%
11	0.08%	0.10%	0.44%	0.29%	0.55%	0.96%	0.33%	0.13%	0.11%	0.08%	0.09%	0.07%
12	0.07%	0.11%	0.49%	0.28%	0.52%	1.07%	0.32%	0.11%	0.11%	0.08%	0.08%	0.07%
13	0.07%	0.13%	0.48%	0.27%	0.51%	0.99%	0.33%	0.11%	0.12%	0.08%	0.08%	0.07%
14	0.07%	0.24%	0.46%	0.27%	0.49%	1.04%	0.36%	0.10%	0.11%	0.08%	0.08%	0.07%
15	0.07%	0.28%	0.43%	0.28%	0.48%	1.00%	0.30%	0.12%	0.11%	0.08%	0.08%	0.07%
16	0.08%	0.27%	0.40%	0.29%	0.50%	0.97%	0.28%	0.14%	0.11%	0.08%	0.09%	0.07%
17	0.08%	0.29%	0.40%	0.29%	0.49%	1.14%	0.25%	0.13%	0.11%	0.08%	0.09%	0.07%
18	0.08%	0.26%	0.48%	0.30%	0.52%	1.25%	0.24%	0.12%	0.11%	0.08%	0.09%	0.07%
19	0.08%	0.24%	0.49%	0.28%	0.59%	1.15%	0.23%	0.11%	0.17%	0.08%	0.08%	0.07%
20	0.08%	0.23%	0.48%	0.28%	0.64%	1.08%	0.23%	0.12%	0.13%	0.09%	0.08%	0.07%
21	0.08%	0.21%	0.58%	0.28%	0.69%	1.10%	0.25%	0.12%	0.12%	0.09%	0.08%	0.07%
22	0.08%	0.19%	0.63%	0.27%	0.62%	1.08%	0.20%	0.12%	0.11%	0.09%	0.08%	0.07%
23	0.08%	0.17%	0.59%	0.27%	0.63%	0.95%	0.18%	0.12%	0.10%	0.10%	0.08%	0.07%
24	0.08%	0.17%	0.56%	0.28%	0.69%	0.89%	0.18%	0.11%	0.10%	0.09%	0.08%	0.07%
25	0.08%	0.23%	0.59%	0.27%	0.79%	0.87%	0.17%	0.11%	0.22%	0.09%	0.08%	0.07%
26	0.08%	0.31%	0.57%	0.26%	0.74%	0.82%	0.16%	0.11%	0.18%	0.09%	0.08%	0.07%
27	0.08%	0.27%	0.60%	0.26%	0.73%	0.82%	0.26%	0.11%	0.12%	0.09%	0.08%	0.07%
28	0.08%	0.25%	0.58%	0.26%	0.73%	0.88%	0.22%	0.11%	0.11%	0.09%	0.08%	0.07%
29	0.08%	0.19%	0.53%	0.28%	0.70%	0.79%	0.16%	0.11%	0.10%	0.09%	0.08%	0.07%
30	0.08%	--	0.48%	0.29%	0.73%	0.69%	0.15%	0.11%	0.09%	0.09%	0.08%	0.06%
31	0.08%	--	0.44%	--	0.70%	--	0.14%	0.12%	--	0.09%	--	0.06%

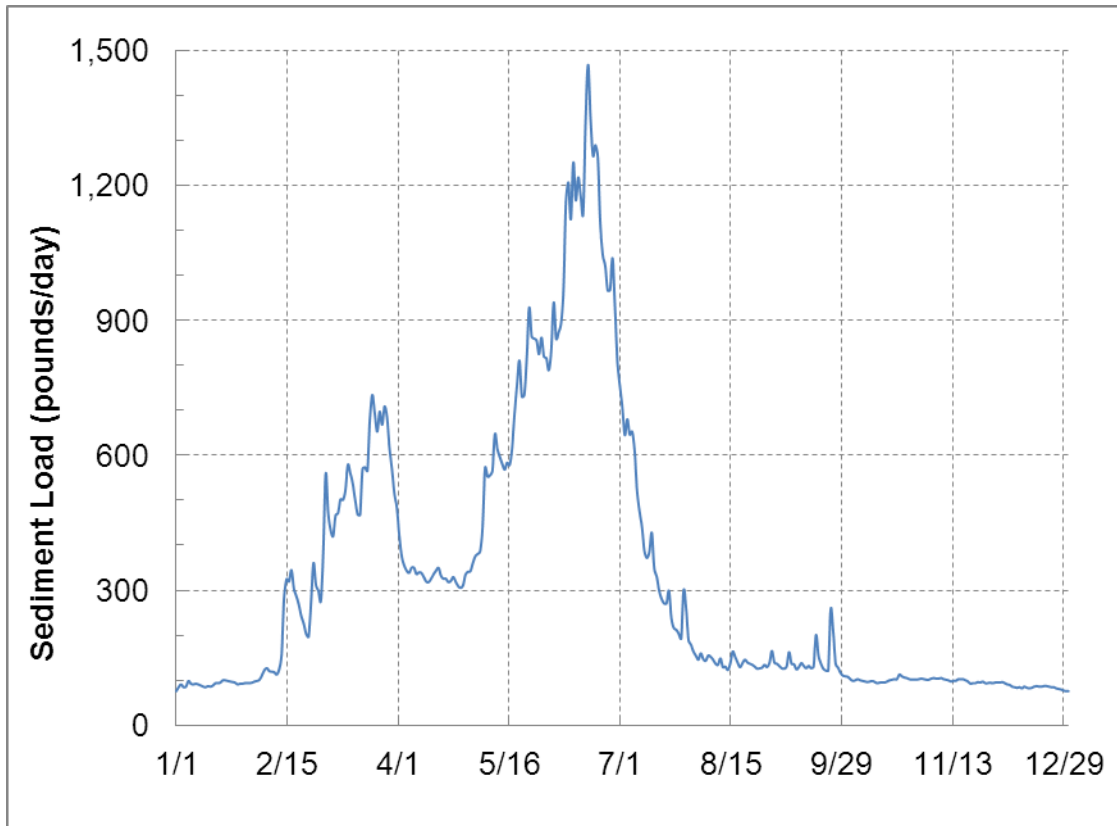


Figure E-1. Average daily sediment load for Chippewa Creek (MT40B002_040).

