STUDY PERFORMANCE REPORT

State: Michigan **Project No.:** F-80-R-8

Study No.: 230702 **Title:** Effects of sediment traps on Michigan river channels

Period Covered: October 1, 2006 to September 30, 2007

Study Objectives: To quantify the effect of sediment removal efforts on the channel morphology of select Michigan streams. More specifically, to 1) identify the rate and spatial extent of change in riverbed elevation and substrate conditions, and 2) relate these data to hydrologic, gradient, and valley characteristics of each stream.

Summary: I re-surveyed previously-established transects in the Baldwin and Little Manistee rivers. Data collected in 2007 continue to show that excavation of sediment traps generally had only small effects on mean channel depth and substrate, with changes occurring both upstream and downstream of the trap. Trap excavation initiated a headcut above the sediment trap at six of the seven reaches surveyed in this study. The lateral position of the channels at all sites remained constant, indicating little side cutting had occurred. Changes in channel area remain variable among study sites and appeared as likely to occur at transects proximal to sediment traps as at transects located further upstream or downstream.

Findings: Jobs 2, 3, and 4 were scheduled for 2006-07, and progress is reported below.

Job 2. Title: Survey bed elevations and substrate conditions.−I re-surveyed bed elevations and recorded substrate composition from visual observations and pebble counts at previously-established transects in the Baldwin and Little Manistee rivers. One transect below the sediment trap on the Baldwin River was lost in 2007 (the permanent transect pins were missing) and is therefore removed from subsequent analyses. Differential GPS coordinates will be used in an attempt to re-establish this transect in 2008.

Job 3. Title: Analyze data.−When compared to data collected in previous years (Table 1 and 2), data from 2007 continue to show variable changes in depth and substrate in stream reaches where sediment traps were constructed. Similar to other reaches in this study, initial excavation created a headcut upstream of the sediment trap in the Baldwin River. Channel depth upstream of the sediment trap increased by 0.9 ft from 2006-07, one year after the trap was first excavated, while channel depth downstream of the sediment trap increased by 0.4 ft during the same time period (Table 1). Although these changes in depth are more substantial than those observed in other study reaches, they are partially due to the large amount of loose sediment in transit within this system. Visual observation data indicated that silt and detritus substrates increased upstream and downstream of the trap, while sand decreased (Table 2). However, pebble count data collected in 2006 and 2007 indicate that 100% of the particles above and below the trap are still sand or finer and show no increase in coarser substrates (Figure 1). Lateral position of the channel remained the same throughout the reach.

Little change has occurred in bed elevations and substrate upstream and downstream of a trap that has been operating since 2002 in the Little Manistee River. Contrary to expectation, the mean depth throughout the entire study reach has become shallower since the first survey was conducted in 2002, indicating that the channel is aggrading (Table 1). No net change in visually observed substrate occurred upstream of the trap from 2002–07, while sand decreased and gravel increased slightly below the trap during the same time period (Table 2). Since the increase in gravel substrate downstream of the sediment trap cannot be explained by an increase in mean channel depth, it appears that observer bias continues among different field crews. Pebble count data collected in 2005 and 2007 support the observation that little change in substrate has occurred in the study reach and indicate that overall, coarser particle sizes are more frequent upstream of the sediment trap compared to downstream (Figure 2). The shape and lateral position of the channel was constant from 2002 to 2007, reflecting only minor adjustments and varying little by transect location (upstream or downstream of the sediment trap).

The spatial extent of change in channel form (particularly cross-sectional area) at both sites was variable and displayed no discernable pattern. Changes in channel form were as likely to occur close to sediment traps as at transects located further upstream or downstream.

Job 4. Title: Write annual performance reports.−This progress report was prepared.

Prepared by: Todd C. Wills
Date: September 30, 2007

Table 1.–Summary of change in mean channel depth following sediment trap excavation for seven study reaches over a six-year period. Post-excavation data are in bold. Pre-excavation data were not collected in the Boardman or Little Manistee rivers. U = upstream, d = downstream of sediment trap.

River	Location	Mean channel depth (ft)						N[a]	Net change (ft)
		2002	2003	2004	2005	2006	2007		
Au Sable	u	1.9	**2.0**	**1.9**	–	–	–	301	0.0
	d	1.9	**2.1**	**2.1**	–	–	–	599	0.2
Baldwin	u	–	–	–	–	4.0	**4.9**	217	0.9
	d	–	–	–	–	4.2	**4.6**	346	0.4
Boardman	u	–	**2.6**	**2.6**	–	–	–	175	0.0
	d	–	**2.2**	**2.1**	–	–	–	403	-0.1
E. Br. Au Sable	u	1.8	**1.9**	**1.9**	–	–	–	242	0.1
	d	2.1	**2.1**	**2.0**	–	–	–	454	-0.1
Little Manistee	u	**3.4**	**3.3**	**–**	**3.3**	–	**3.2**	380	-0.2
	d	**3.7**	**3.7**	**–**	**3.6**	–	**3.2**	815	-0.5
Silver Lead Cr.	u	–	1.6	1.7	**2.0**	**1.9**	–	334	0.3
	d	–	1.4	1.5	**1.6**	**1.7**	–	700	0.2
Twomile Cr.	u	–	–	2.4	**2.6**	**2.7**	–	216	0.3
	d	–	–	2.3	**2.5**	**2.5**	–	511	0.2

[a] Total number of depth measurements collected.

Table 2.–Summary of net change in visually classified substrate data following sediment trap excavation for seven study river reaches. Pre-excavation data were not collected in the Boardman or Little Manistee rivers. Substrate categories (and dimensions in mm) were silt (0.004–0.063), sand (0.064–2), gravel (3–64), small cobble (65–128), large cobble (129–256) and other (clay, boulder, or wood). U = upstream, d = downstream of sediment trap.

River		Net change (%)						
(Time period)	Location	Silt or detritus	Sand	Gravel	Small cobble	Large cobble	Other	N[a]
Au Sable	u	-5	-9	14	0	0	0	276
(2002–04)	d	-2	-10	4	0	0	8	547
Baldwin	u	19	-21	1	0	0	1	166
(2006–07)	d	16	-12	0	0	0	-4	293
Boardman	u	-1	3	-8	-5	0	10	161
(2003–04)	d	-3	6	-5	-5	0	8	373
E. Br. Au Sable	u	0	-25	29	0	0	-4	218
(2002–04)	d	4	-16	7	0	0	5	412
Little Manistee	u	0	0	0	0	0	0	340
(2002–07)	d	2	-13	13	-1	0	0	735
Silver Lead Cr.	u	2	-49	41	0	3	3	304
(2003–07)	d	8	-24	19	0	0	-3	637
Twomile Cr.	u	-30	47	0	0	0	-17	191
(2004–06)	d	-24	37	0	0	0	-14	464

[a] Total number of substrate observations.

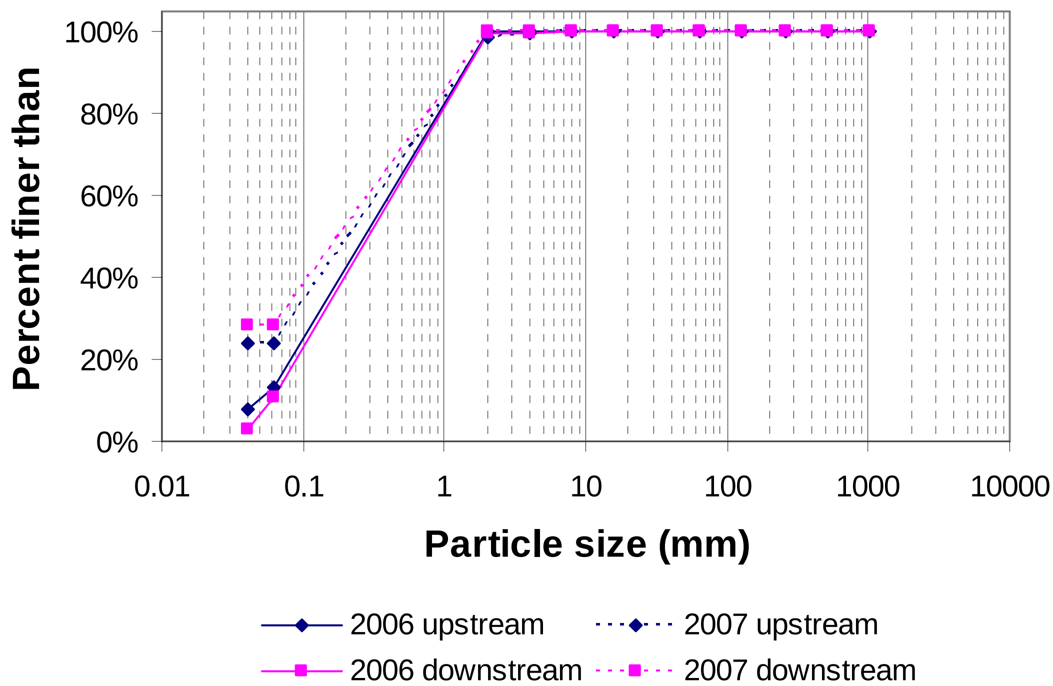

Figure 1.–Cumulative frequency of substrate particle size from pebble counts in the Baldwin River before (2006) and after (2007) sediment trap excavation. Substrate particle size categories (and dimensions in mm) were organic and clay (0–0.04mm), silt (0.05–0.062mm), sand (0.063–2mm), very fine gravel (2–4mm), fine gravel (5–8mm), medium gravel (9–16mm), coarse gravel (17–32mm), very coarse gravel (33–64mm), small cobble (65–128mm), large cobble (129–256mm), small boulder (257–512mm), and medium boulder (>512mm).

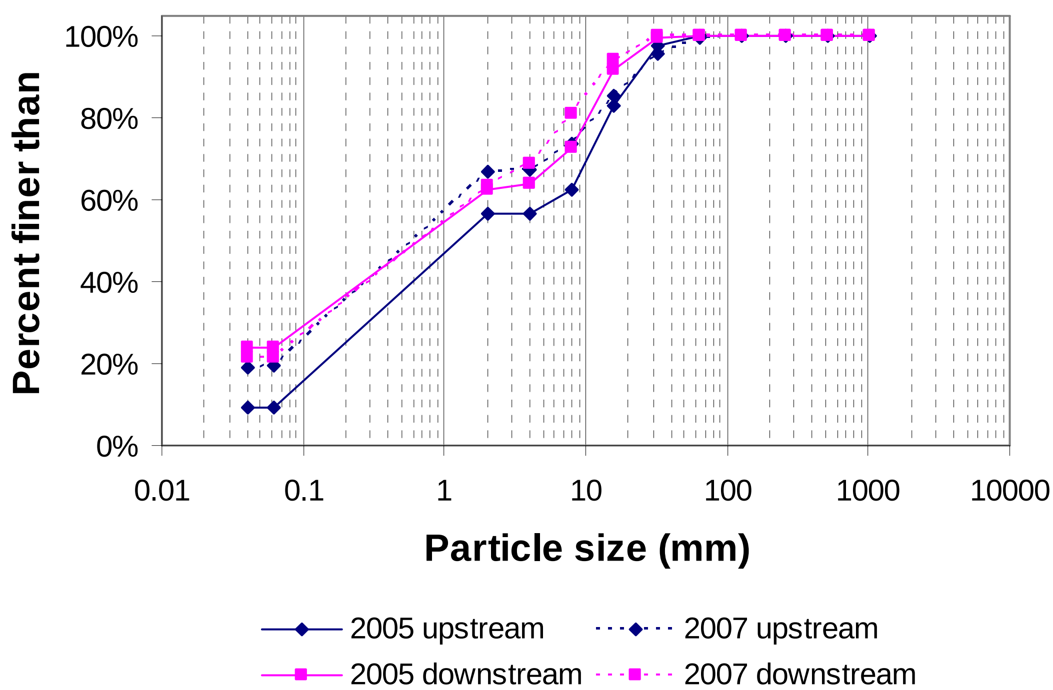

Figure 2.–Cumulative frequency of substrate particle size from pebble counts in the Little Manistee River four (2005) and six (2007) years after sediment trap excavation. Substrate particle size categories (and dimensions in mm) were organic and clay (0–0.04mm), silt (0.05–0.062mm), sand (0.063–2mm), very fine gravel (2–4mm), fine gravel (5–8mm), medium gravel (9–16mm), coarse gravel (17–32mm), very coarse gravel (33–64mm), small cobble (65–128mm), large cobble (129–256mm), small boulder (257–512mm), and medium boulder (>512mm).