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Channel Change in 2007 at Selected Sites on the Marias River, Montana, Following a 2006 High-Flow Release from Tiber Dam

Data Series 410

U.S. Department of the Interior
U.S. Geological Survey

Cover. Marias River at IS study site, August 19, 2007.

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U.S. Geological Survey, Reston, Virginia: 2009

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Suggested citation:
Auble, G.T., and Bowen, Z.H., 2009, Channel change in 2007 at selected sites on the Marias River, Montana, following a 2006 high-flow release from Tiber Dam: U.S. Geological Survey Data Series 410, 4 p.

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Conversion Factors

SI to Inch/Pound

Multiply	By	To obtain
	Length	
meter (m)	3.281	foot (ft)
meter (m)	1.094	yard (yd)
	Area	
square meter (m^2)	10.76	square foot (ft^2)
	Volume	
cubic meter (m^3)	35.31	cubic foot (ft^3)
cubic meter (m^3)	1.308	cubic yard (yd^3)
	Flow rate	
cubic meter per second (m^3/s)	70.07	acre-foot per day (acre-ft/d)
cubic meter per second (m^3/s)	35.31	cubic foot per second (ft^3/s)

Vertical coordinate data was determined relative to the North American Vertical Datum of 88 (NAVD 88).

Horizontal coordinate data was determined relative to the North American Datum of 83 (99) (NAD 83).

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Introduction

In June 2006, an opportunistic high-flow release was made from Tiber Dam on the Marias River in Montana to investigate possible alternatives for partially restoring the river's natural flow pattern and variability. At two sites along the river, we measured channel geometry in 2006 before and after the high-flow release to evaluate channel change and alteration of physical habitat (Auble and Bowen, 2008). Here we provide data from a resurvey of those sites, conducted in August 2007.

Methods

Methods generally follow those used in the 2006 surveys (Auble and Bowen, 2008). We determined positions using a Trimble survey-grade GPS (global positioning system) operating in real-time kinematic (RTK) mode. Survey control was based on an initial base station occupation of National Geodetic Survey (National Geodetic Survey, 2006) control point U95RESET (PID AB7734), with site measurements made from secondary benchmarks. The 2007 resurvey was conducted in a stake-out-to-point mode reoccupying the points along each of the 20 cross sections. On two cross sections, additional points were added in a stake-out-to-line mode to represent new break points where the bank lip had eroded. All of the 2007 surveying was done by wading.

We used Trimble Geomatics Office software to process GPS observations. Horizontal coordinate information is referenced to the North American Datum of 1983 (1999) (NAD 83[99]) and vertical coordinate information is referenced to North American Vertical Datum of 1988 (NAVD 88). We used WinXSPRO and SigmaPlot 10 to produce the figures presented here.

Results

The high-flow release in June of 2006 had a peak instantaneous discharge of 136 m^3/s at gage 06101500 downstream from Tiber Dam (U.S. Geological Survey, 2008a). This peak was relatively high in the postdam period of 1957–2006, in which only four years had higher peak discharges downstream from Tiber Dam (maximum of 295 m^3/s in 1964). In contrast, at gage 06099500 upstream from Tiber Dam (U.S. Geological Survey, 2008b), 30 of the 50 years in the same interval had peak discharges greater or equal to 136 m^3/s, with two years (1964 and 1975) exceeding 2,000 m^3/s.

The highest instantaneous discharge between September 2006 and August 2007 downstream from Tiber Dam was 31 m^3/s on February 5, 2007. This peak was small compared to the 136 m^3/s of 2006 and was less than half the median peak annual discharge of 64 m^3/s downstream from Tiber Dam in the 1957–2006 postdam period.

Channel change at the resurveyed intensive study sites was small in 2007 compared to the changes reported by Auble and Bowen (2008) during the high flow release of 2006 (fig. 1). Both the IS (containing an island) and BC (containing a back channel) sites shifted from net aggradation in 2006 to net degradation in 2007. The average change in cross-sectional area at the BC site (10 cross sections) was 1.15 m^2 in 2006 and -0.05 m^2 in 2007. The average change in cross-sectional area at the IS site (10 cross sections) was 4.40 m^2 in 2006 and -1.05 m^2 in 2007. Change at the IS site was dominated by degradation associated with caving and retreat of the bank lip of a steep cut bank on a single cross section (fig. 2).

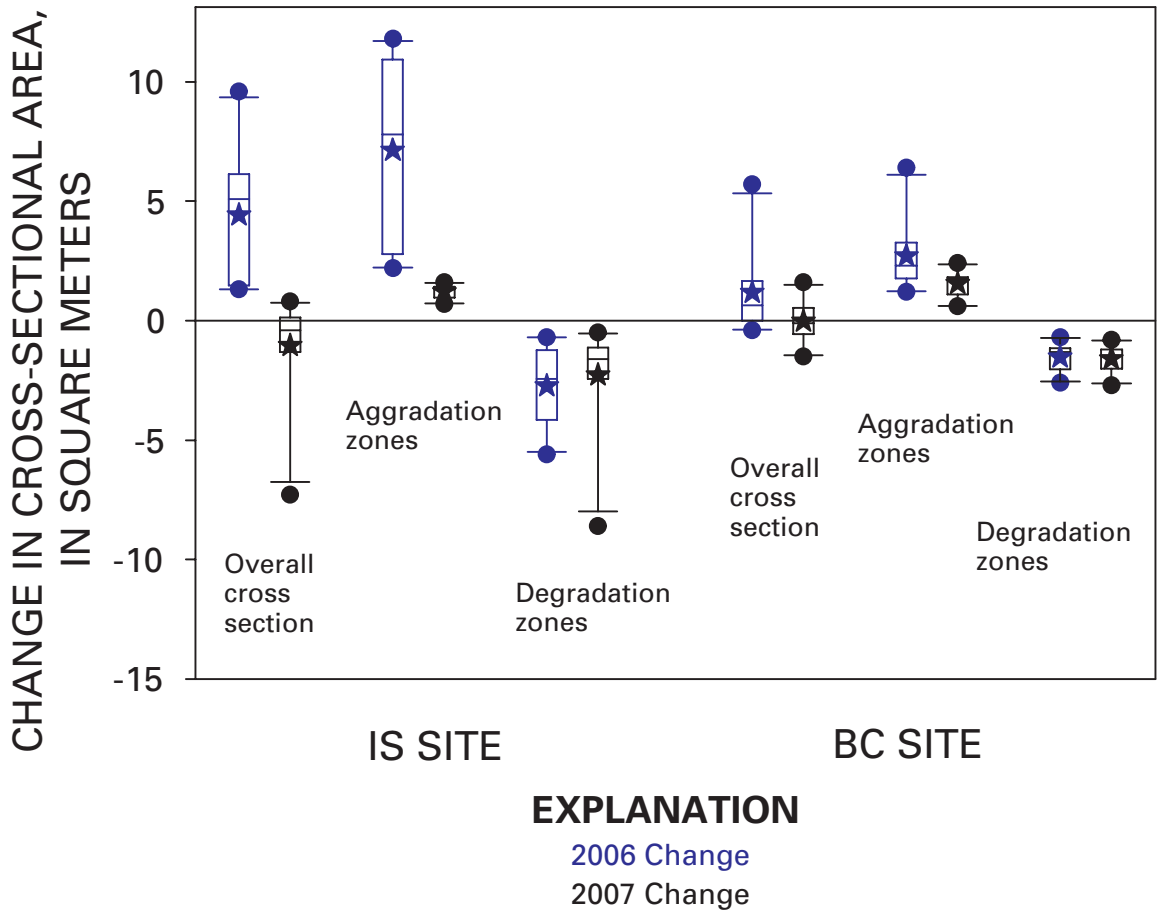

Figure 1. Box plots of changes in cross-sectional area. All values represent net change over interval. Data for 2006 change are from Auble and Bowen (2008). Cross-sectional values are the total for each cross section of zones of aggradation and degradation within each cross section. The horizontal line within each box is the median of 10 cross sections at each site; the star indicates the mean; the tops and bottoms of the box are the 75th and 25th percentiles, respectively; the vertical whiskers capped with a horizontal line are the 90th and 10th percentiles; and individual observations beyond the 90th and 10th percentiles are represented by closed circles.

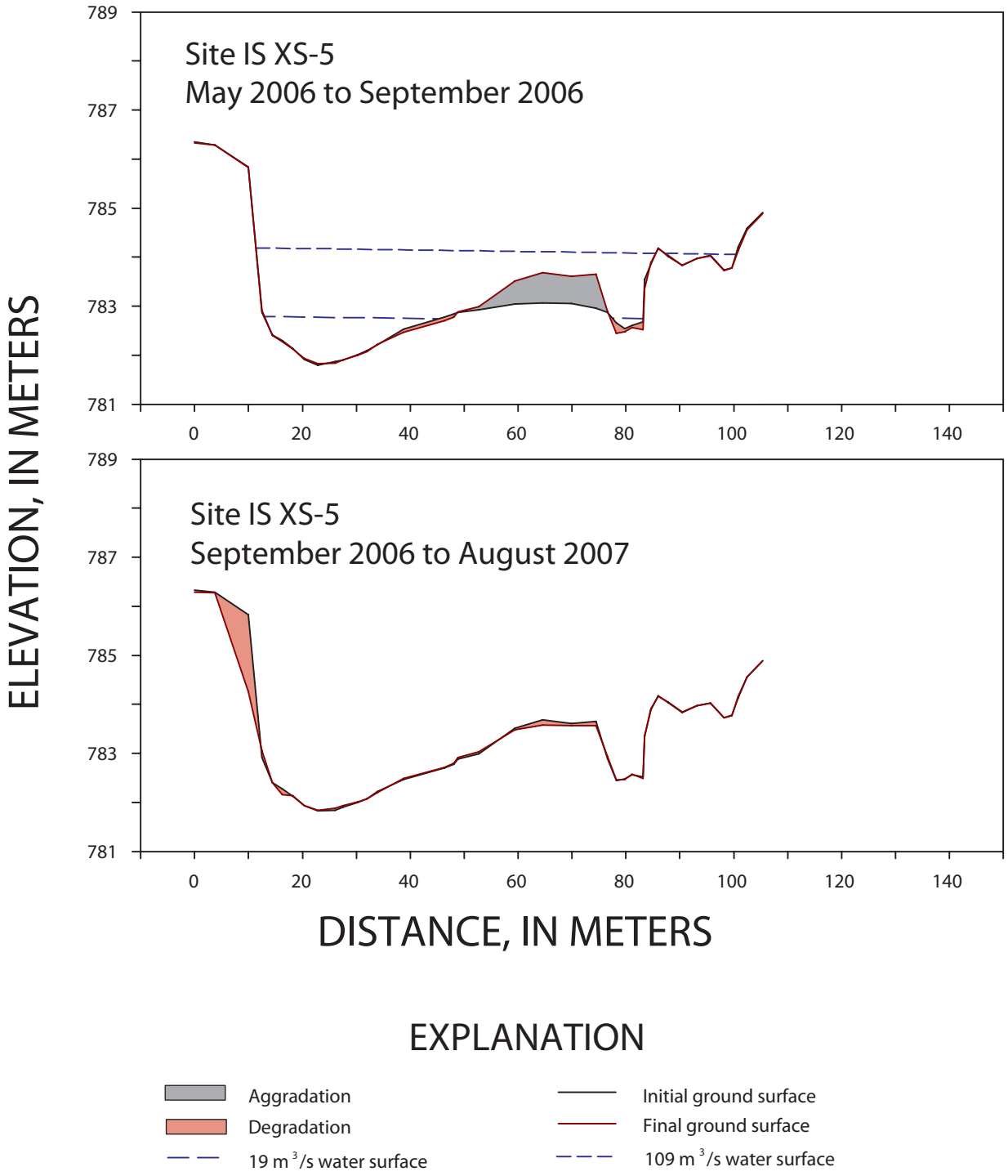

Figure 2. Cross section 5 at Site IS. Distance along cross section is from left (facing downstream) to right head pins. Data for 2006 are from Auble and Bowen (2008).

Files of horizontal and vertical coordinate data from the 2006 surveys are available at *http://pubs.usgs.gov/of/2008/1234/* (Auble and Bowen, 2008). A file of horizontal and vertical coordinate data from the 2007 resurvey is available at *http://pubs.usgs.gov/ds/410/downloads/MR_XS_Coord_07.xls*. These geospatial coordinates are reported as projected in UTM Zone 12 North to two decimal places.

References Cited

Auble, G.T., and Bowen, Z.H., 2008, Effects of a 2006 high-flow release from Tiber Dam on channel morphology at selected sites on the Marias River, Montana: U.S. Geological Survey Open File Report 2008–1234, 39 p., *http://pubs.usgs.gov/of/2008/1234/*.

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