Photomonitoring at Trinity River Restoration Sites

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INTRODUCTION

Monitoring changes of river morphology may be accomplished in various ways. The Trinity River is rapidly changing due to implementation of a large scale restoration program that is altering the morphology of the Trinity River in many ways. Changes in the Trinity River are being documented by a variety of multidisciplinary assessments that focus on fish, wildlife, geomorphology and vegetation. Images from ground-based photographic monitoring are worth a thousand words making it an inexpensive technique to qualitatively document changes caused by restoration projects in the Trinity River and supplement the results of other monitoring efforts (Gerstein and Kocher 2005; Flosi et al. 1998). The objectives of this photographic monitoring project are to document changes resulting from bank rehabilitation, riparian establishment and evolution from restoration actions.

MATERIALS AND METHODS

1) Photomonitoring is scheduled at winter base flow for pre-construction, as-built, post-construction and occasionally during flow events. As-built is defined as the time period after construction and before a major flow event. Post-construction is defined as the time period after construction and after a major flow event.
2) Photo-points are selected based on vantage points that will capture broad effects caused by bank rehabilitation projects and site specific features.
3) Photo-point locations and attributes are georeferenced in ArcPad (ESRI) using a Trimble Pro-XH GPS and tablet PC.
4) New photo-points are framed from left to right according to area of interest and taken in panoramic form when applicable. When revisiting a photo-point, photographs are framed using previous photographs to obtain identical scale and magnitude.
5) Attributes collected at each photo-point include site, photo-point, date, photo number, construction phase, flow, location description, photo-point comments, photographer's name and photograph comments.
6) Field data is stored in an office environment using a Microsoft Access database and Excel spreadsheet that facilitates archiving, easy access to photographs and links attribute data and photographs to georeferenced locations (Figure 1).

RESULTS

The USFWS photomonitoring project was initiated in 2007 and to date has collected over 1,300 photographs at 159 photo-point locations. Photo-points are located at the following bank rehabilitation sites that are organized from upstream to downstream of Lewiston Reservoir; Sven Olbertson, Deadwood Creek, Cableway, Hoadley Gulch, Rush Creek, Dark Gulch- Upper, Dark Gulch- Lower, Bucktail, Vitzhum Gulch, Indian Creek, Reading Creek and Hocker Flat (Table 1, Figure 2). Georeferenced photo-points within bank rehabilitation sites are easily identified in the field by utilizing aerial photographs, such as LDG9 and Bt4 (Figure 3). The history and evolution of photo-points can be accessed and viewed according to site location, year, flow and/ or construction phase (Table 2, Figure 4 and Figure 5).

DISCUSSION

This photomonitoring project is a stand alone product that can be used to evaluate how restoration is changing the Trinity River. Photomonitoring will also aide more quantitative projects in the description of changes occurring on the Trinity River and may be used to support the adaptive management framework of the Trinity River Restoration Program. In the future, the Trinity River Restoration Program may consider expanding this project to include areas outside of bank rehabilitation sites, as well as, including quantitative components in the data collection such as classification schemes, presence/ absence, increase/ decrease, volume estimates and more (Rosgen 1994).

REFERENCES

Gerstein, J.M. and S.D. Kocher. 2005. Photographic Monitoring of Salmonid Habitat Restoration Projects. University of California, Center for Forestry, Berkeley, CA: 21.

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey and B. Collins. 1998. California Salmonid Stream Habitat Restoration Manual, Third Edition. State of California, The Resources Agency, California Department of Fish and Game, Inland Fisheries Division. Sacramento, CA: 273.

Rosgen, D. L. 1994. A classification of natural rivers, Catena 22: 169–199.

SITE
Sven Olbertson

PHOTO-POINT ID
SO4

YEAR
2009

PHASE
As-Built

FLOW
4,370 cfs

FLOW GAGE STATION
Trinity R A Lewiston CA

LAT/LONG
40.724N, 122.815W

LOCATION DESCRIPTION
RB of MC above road on cliff.

PHOTO-POINT COMMENTS
N/A

PHOTO-POINT
SO4

PHOTOGRAPHER
Matthew Smith-Caggiano

DATE
5/5/2009

PHOTO COMMENTS
Zoomed from panoramic photo #'s 3833-3838

PHOTO #
3839

Figure 1. Microsoft Access database example at Sven Olbertson (SO4).

Pre-Construction 8/12/2008

As-Built 1/26/2009 (314 cfs)

As-Built 5/5/2009 (4,558 cfs)

Figure 4. Lower Dark Gulch (LDG9) pre-construction and as-built photographs.

Table 1. Site locations and number of photo-points by year

Site	2007	2008	2009
Sven Olbertson (SO)	0	4	14
Deadwood Creek (Dw)	0	3	6
Cableway (Cw)	0	13	17
Hoadley Gulch (Hy)	0	11	17
Rush Creek (RC)	0	3	0
Dark Gulch-Upper (DG)	0	8	11
Dark Gulch-Lower (LDG)	0	14	13
Bucktail (Bt)	0	4	4
Vitzhum Gulch (Vz)	9	4	4
Indian Creek (IC)	19	35	2
Reading Creek (Rdg)	0	0	4
Hocker Flat (HF)	0	0	5

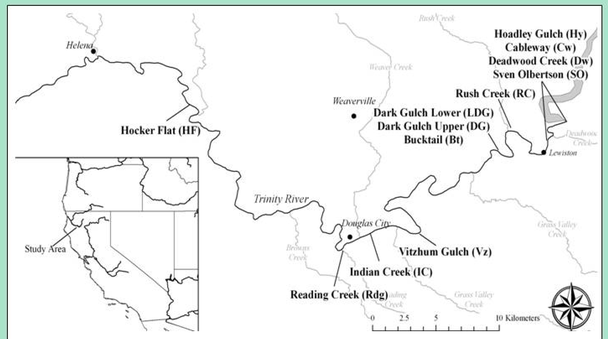

Figure 2. Overview map of site locations from 2007-2009.

Table 2. Examples of photo-point ID's by year and flow (cfs)

Photo-point ID	2008	2009
Sven Olbertson (SO4)	6,120	321
		881
		1,590
		2,660
		4,370
Dark Gulch-Lower (LDG9)	455	314
		4,558
Bucktail (Bt4)	452	314
		1,626
		2,690
		4,558

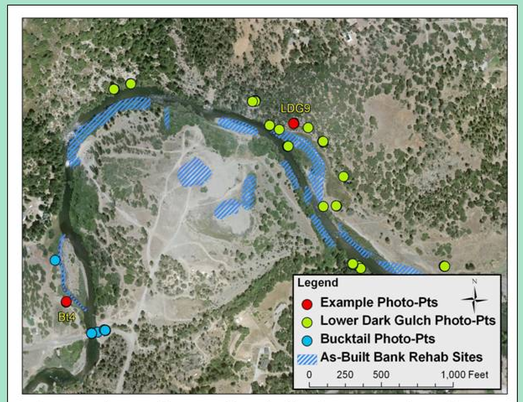

Figure 3. Photo-point ID's of Bucktail and Lower Dark Gulch from 2008-2009.

Figure 5. Bucktail (Bt4) as-built photographs at four stream flows of constructed side-channel. The red arrow shows large wood transport that is impinged on a restoration wood structure.