More Fish Use Reconnected Side Channel near Elbow Coulee

Methow River, Washington

Bureau of Reclamation

Bonneville Power Administration

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This report is an update to Appendix D1 in the Methow Intensively Monitored Watershed 2012 Annual Report and can be found at:
http://www.usbr.gov/pn/fcrps/rme/methowimw/MethowIMW032013.pdf

Introduction

More than 50 years ago, a portion of the floodplain and side channel near Elbow Coulee was cut-off from the mainstem Twisp River by a levee (Figure 1). In September 2008, a project was initiated to re-establish connection to the river by breaching the levee. The Elbow Coulee Side Channel Restoration Project was implemented to meet the following objectives: 1) re-establish a side channel to the Twisp River at RM 6.6; 2) increase habitat complexity and large woody debris recruitment potential; 3) reduce stream energy to increase the potential for the accumulation of sediment and wood in the Twisp River; and 4) increase rearing habitat for native juvenile salmonids. A breach was excavated in the existing levee at the upstream entrance to the disconnected side channel (Photo 1). A sill constructed at the breach functions as a grade control structure and limits flow entering the side channel. The sill was designed to activate the side channel when flows in the Twisp River reached 200 to 400 cubic feet per second (cfs), representing a 1.5 to 2 year recurrence interval discharge (Photo 2). Monitoring results obtained since post-construction in 2008 and through 2011 indicate that all four objectives have been met and that the project provides habitat for spring Chinook salmon, steelhead, and potentially bull trout:

- High flows activated the side channel each year
- Young-of-the-year spring Chinook and steelhead observed each year using the side channel
- More fish are using the side channel than before
- Water temperatures conducive for fish rearing

This report summarizes the monitoring and evaluation of the project as presented by Crandall (2009, 2010, and 2011).

Project at a Glance

Formal Project Name: Elbow Coulee Floodplain Reconnection & Side Channel Restoration	
Project Type: Complexity – side channel reconnection	
Project Sponsor: Methow Salmon Recovery Foundation (MSRF), 509-422-0300	
Project Design: Bureau of Reclamation	
Landowner(s): Private, Washington Department of Fish and Wildlife, and US Forest Service	
Partners: U.S. Forest Service (Technical Assistance and Permitting), Washington Department of Fish and Wildlife (Project Development and Construction Oversight), and Bureau of Reclamation (Technical Assistance and Design)	**Reclamation Development Costs:** $281,220
Funding Source(s): Bonneville Power Administration	**Implementation Cost:** $9,251

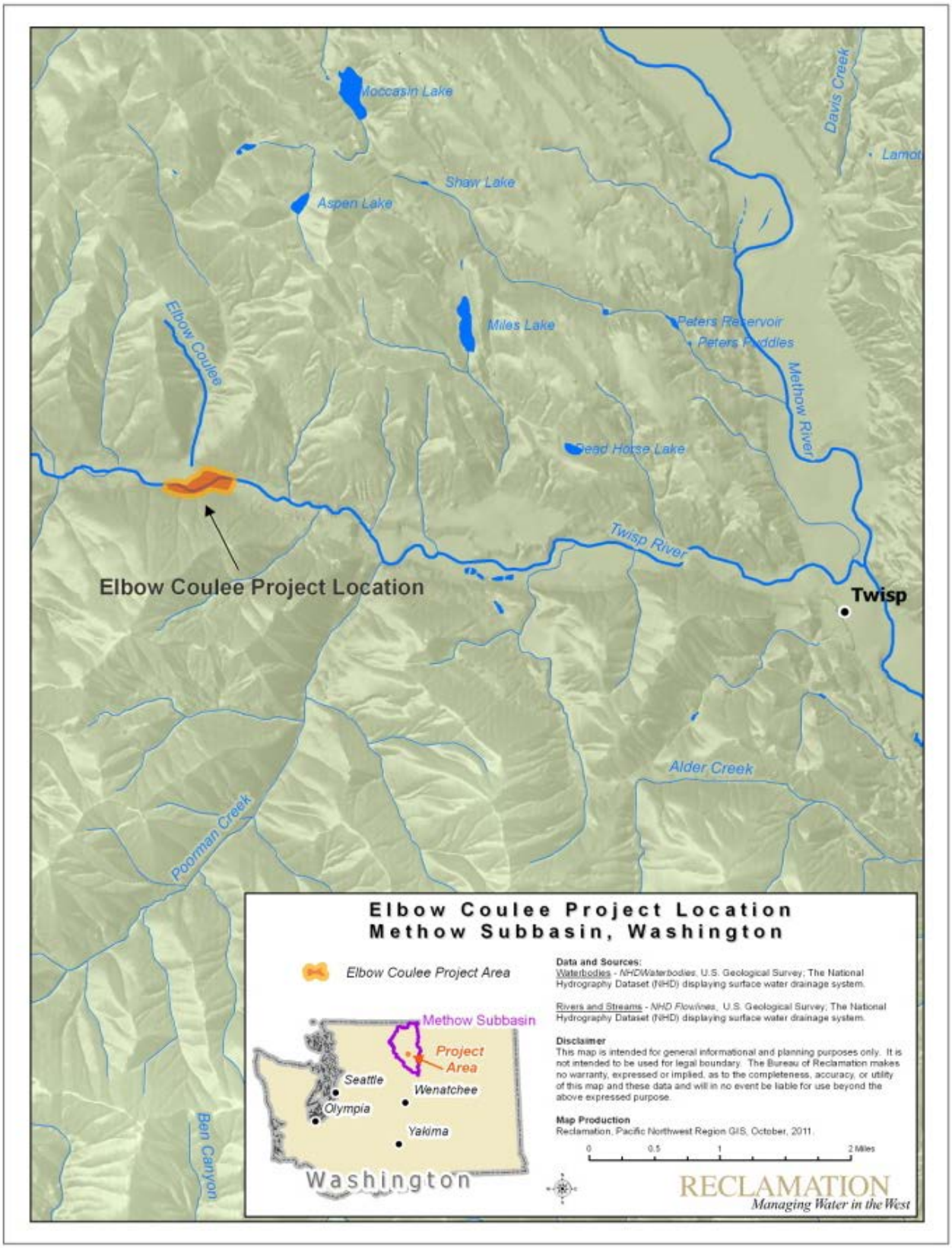

Figure 1. Location map for the Elbow Coulee Floodplain and Side Channel Reconnection Project.


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Photo 1. Levee at river left along Twisp River conceals the side channel with extensive floodplain rearing habitat. Photograph was taken in summer 2008 looking east.

Photo 2. Disconnected side channel showing numerous downed trees and woody vegetation. Photograph was taken in 2006 looking down-gradient viewing northeast.

Methods for Monitoring and Evaluation

Monitoring and evaluation of the reconnected side channel and associated floodplain is necessary to measure project success at meeting goals and forms the basis for adaptive management. Monitoring consists of both quantitative measurements and visual examinations of side channel form and function. Monitoring is being conducted to evaluate:

1) Response of the side channel geomorphic form and function.
2) Response of side channel discharge, water temperature, and biological community.
3) Identify steps needed (if any) to adaptively manage the project to maximize project success.

Prior to construction in 2008, monitoring goals in the side channel were focused initially around investigating the physical and biological aspects of the side channel. From this, a baseline dataset was developed to compare with future monitoring. These efforts are purposely aligned to the regional monitoring framework for the Upper Columbia River (Hillman, 2006).

Annual monitoring of the project is predominantly focused on flow, temperature, and fish.

- Flow – generally from late November through May including a combination of flow estimates, staff gauge readings, water level monitoring, and visual observations.
- Temperature – continuous year-round using accuracy-checked electronic submersible data loggers.
- Fish – population surveys via electrofishing, visual (snorkel and bank) surveys, and pit tagging.

Results, Interpretations, and Trends

A portion of the side channel at Elbow Coulee received perennial groundwater and maintained a downstream connection to the Twisp River prior to project implementation. The levee that blocked flow access to the side channel was breached at the upstream end and opened to the Twisp River in the fall of 2008. The side channel was activated by high flows for the first time in over 50 years. Three years of monitoring data and observation have documented that the side channel continues to activate each year during high water and has been functioning in close accordance to the goals of this project. Since construction, juvenile spring Chinook salmon and steelhead have been observed in the side channel following nine activation events from the Twisp River spanning 284 days over a three-year period.

The perennial nature of groundwater inputs provide at least 700 linear feet of rearing habitat for fish including spring Chinook salmon and steelhead, along the entire length of the baseflow wetted channel (Crandall, 2009) (Photo 3). The perennial groundwater provides year-round downstream connectivity to the Twisp River and monitoring results indicate juvenile fish are using the side channel for rearing.

Physical and geomorphic form was measured in November 2008 using Forest Service stream habitat survey protocols focusing upon channel type, substrate, large wood, and longitudinal profile. The side channel is primarily dominated by shallow riffles at about 60 percent and pools at 12 percent that provide deeper habitat. Further, eleven channel cross-sections were surveyed in November 2008 and photographs taken at each point. Plans are to repeat these surveys in 5 years or as significant flow events occur (e.g., greater than 10-year flood events).

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Photo 3. Before the project, this previously groundwater fed side channel had a terminal connection to the Twisp River. A levee was breached at the upstream end of the Elbow Coulee side channel along the left bank of the Twisp River in Fall 2008. A monitoring program was soon initiated in the side channel, which received its first flows from the Twisp River in 2009 during the spring freshet. The photograph was taken in summer 2008 looking northeast down gradient.

Flow

The snowmelt runoff in the Twisp River in 2011 was the highest since the project was completed. Peak discharge in the Twisp River exceeded 2,400 cfs, which represents an approximately 2.5-year recurrence interval flood. During these peak flows, greater than 20 cfs was recorded flowing through the side channel (Crandall, 2011; unpublished data). Due to the high-, and extended, runoff, the side channel was activated by Twisp River flows for over 115 continual days in 2011.

Twisp River flows greater than approximately 580 cfs are sufficient to crest the rock sill in the breach and fish would have uninhibited passage into the upstream end of the side channel (Crandall, 2009) (Photos 4 – 5). Once in the side channel, fish would have the ability to move downstream within the side channel and also back into the Twisp River at the terminus of the side channel. Thus, flows in excess of 600 cfs are sufficient to allow passage for all life stages of fish. Due to the extended length of activation this last year, fine sediment and smaller particles were flushed out of the breach and it is expected to activate at a lower discharge (Crandall, 2011, unpublished communication). This will be confirmed in 2012 during the winter/spring flows. This adjustment is a natural outcome of a system allowed to freely adjust and settle out.

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Photo 4. View looking west and upstream of the side channel confluence with the Twisp River and the reconstructed inlet of the side channel. The view shows side channel activation during high water May 2010.

Photo 5. The same event as Photo 4, downstream view of the activated side channel looking northeast during high water spring 2010.

Temperature

Juvenile salmonids generally enter the side channel during high flow associated with spring runoff, yet can remain for extended periods of time due to perennial groundwater feeding the side channel. The water temperatures in the side channel are both warmer in winter and cooler in summer compared to the adjacent Twisp River (Crandall 2009 and unpublished data) which may provide rearing fish with a thermally beneficial location for growth and survival.

Fish

In late 2008, 42 fish representing three species were captured and identified during an electrofishing survey (Figure 2). Fish were captured along the entire length of the wetted channel and were most commonly observed in the deeper portions of the channel in pools (Crandall, 2009) (Photo 6). A subsequent electrofishing survey in late 2011 recorded an almost three-fold increase from 2008 in fish abundance and a greater diversity of fish species present in the side channel.

While rearing-sized fish were observed in the side channel prior to reconnection, the presence of young-of-the-year fish, including ESA listed salmonids, in the uppermost pool in the side channel is strong evidence that these fish gained access to the side channel through the newly constructed breach (Photos 7 – 8). Although it is plausible that 40 mm salmonids could have gained access to and entered the side channel from the bottom, the presence of larval sculpin (less than 20mm) that lack the swimming ability to move upstream through the side channel, is evidence that fish are entering the side channel through the newly created breach. Thus, it was concluded that fish gained access to the side channel during the first activation event post-emergence and resided in the channel (Crandall, 2009). Based on observations, the period of fish residency is estimated at several weeks to months and possibly longer for fish that select to remain in the groundwater influenced portion of the channel. Future monitoring will focus on determining whether undesired stranding is occurring and whether the channel may begin to prematurely fill in with fine sediment and detritus.

In 2011, beaver constructed two dams just downstream of the flow monitoring site in the side channel (Photos 9 – 10). While the ponds that resulted from this activity disrupted the continuous flow monitoring instrumentation by flooding the area, listed fish species were observed using the ponds almost immediately (Molesworth, USBR, pers. comm.). This change in habitat type has increased habitat complexity within the channel through increased pool habitat, wetted width and large woody debris.

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Photo 6. Endangered spring Chinook salmon, *Oncorhynchus tshawytscha*, in the Elbow Coulee side channel during the first post-construction spring channel activation event, June 2009.

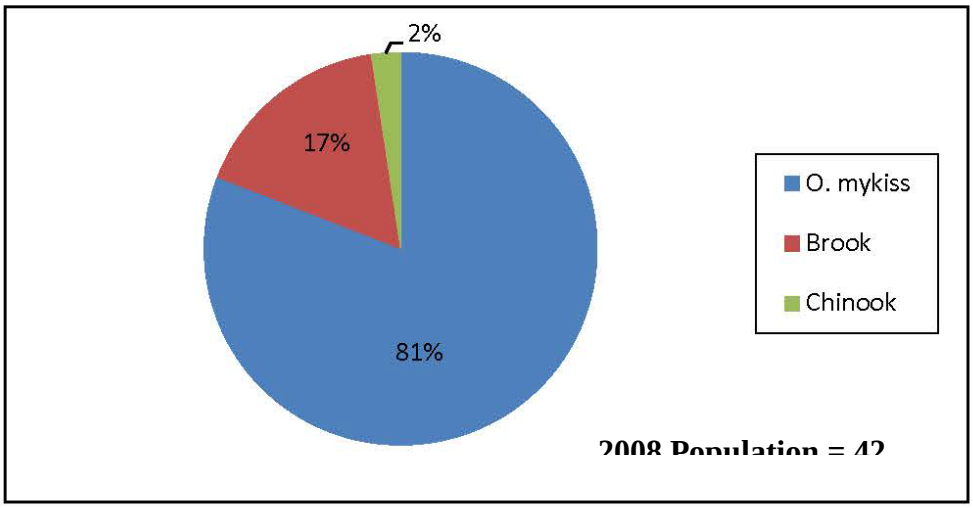

Figure 2.a. Elbow Coulee side channel fish species composition data for **2008**. Forty-two fish representing three species were sampled. Rainbow trout/steelhead dominated the catch representing 81 percent of the total. While present, ESA-listed spring Chinook were represented by only one individual. Non-native brook trout comprised 17 percent of the catch.

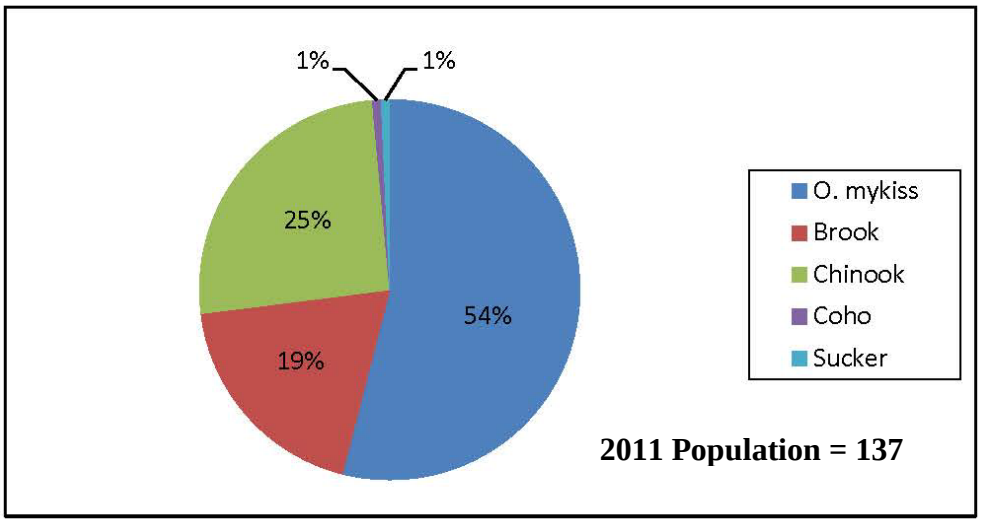

Figure 2.b. Elbow Coulee side channel fish species composition data for **2011**. There was a three-fold increase in fish abundance in the side channel after three years of flow activation via the Twisp River when compared to 2008. Species richness also increased with the addition of coho salmon and bridgelip sucker. ESA-listed abundance increased noticeably. Spring Chinook salmon abundance increased from 1 to 48 and rainbow trout/steelhead increased from 34 to 74.

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Photo 7. A rearing wild young-of-the-year rainbow/steelhead trout collected from the side channel during May 2010.

Photo 8. A rearing wild spring Chinook parr, obtained from the side channel during May 2010.

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Photo 9. Pond habitat in July 2011 on the activated side channel created by a beaver dam construction just downstream of the flow monitoring site established in early 2009. Note that photo location is identical to Photo 3.

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Photo 10. Beaver dams built in 2010 resulted in two ponds within the side channel that were subsequently inhabited and used for rearing by listed fish species.

References Cited

Crandall, John D.* 2009. Elbow Coulee Floodplain Reconnection and Side Channel Restoration Project, 2008-2009 Post-Project Assessment. 22 pp.

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*** John Crandall is a biologist with the Wild Fish Conservancy Northwest**