

Stage Zero Stream Restoration in California

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Introduction

Project Description

The U.S. Fish and Wildlife Service (Service) in partnership with Placer Land Trust (PLT) started a stream and floodplain restoration project along Doty Ravine Creek in 2014. The goals of the project involved shifting the reach from an incised single thread reach with threshold/erosional instream processes to a Stage 0 reach with active depositional processes instream and across the floodplain (Cluer and Thorne 2013).

The 1-mile reach and 50 acre floodplain is part of the habitat preserve and rangeland owned and managed by PLT. Doty Creek is in the Feather River watershed and is critical habitat for steelhead.

Design

Design Criteria

Site design was guided by newly developed and broadly applicable general criteria based on existing ecological standards and process based principles for fluvial restoration (Beechie et al., 2010; Palmer et al., 2005). These criteria assure restoration actions and design are ongoing, adaptive, aimed at increasing space for fluvial action and restoring sediment and stream (dis)connectivity (Ward et al., 2002; Wohl et al., 2018). These criteria are presented and discussed as general tools for any fluvial restoration project that seeks to pursue process-based ecological restoration at a landscape scale and in a cost and time effective way.

Implementation

Adapting Management and Infrastructure

While the project area remains in active grazing for 2 months a year, limiting livestock access allowed for the development of a robust riparian area throughout the floodplain. Levee removal increased floodplain connectivity and increased instream deposition. Cessation of lethal beaver removal encouraged instream deposition and accelerated floodplain connectivity.

Instream Actions

Instream restoration investments by the Service for Doty Ravine are relatively low (less than \$10,000) and include hand placed wood jams, beaver dam support structures, and beaver dam analogues (Pollock et al., 2014).

Conclusion

Results

In three years, approximately 30 acres of floodplain evolved from a single thread channel dominated by oak and grassland to a permanently flooded Stage 0 condition with highly complex stream and wetland morphology. Cost of habitat restoration through bio-geomorphic process was an order of magnitude lower when compared to a traditional construction-based stream restoration. The result is a fully connected floodplain with multiple flowpaths, heterogeneous water depth and velocities, and dynamic full gradient wetland throughout the year providing multi-species benefits and ecosystem services.

Tracking the habitat creation by bio-geomorphic process with the help of streamflow estimates and site surveys helps guide adaptive management and design and communicate actions, costs and outcomes to stakeholders (Figure 1).

Bio-geomorphic Recovery Hydrograph

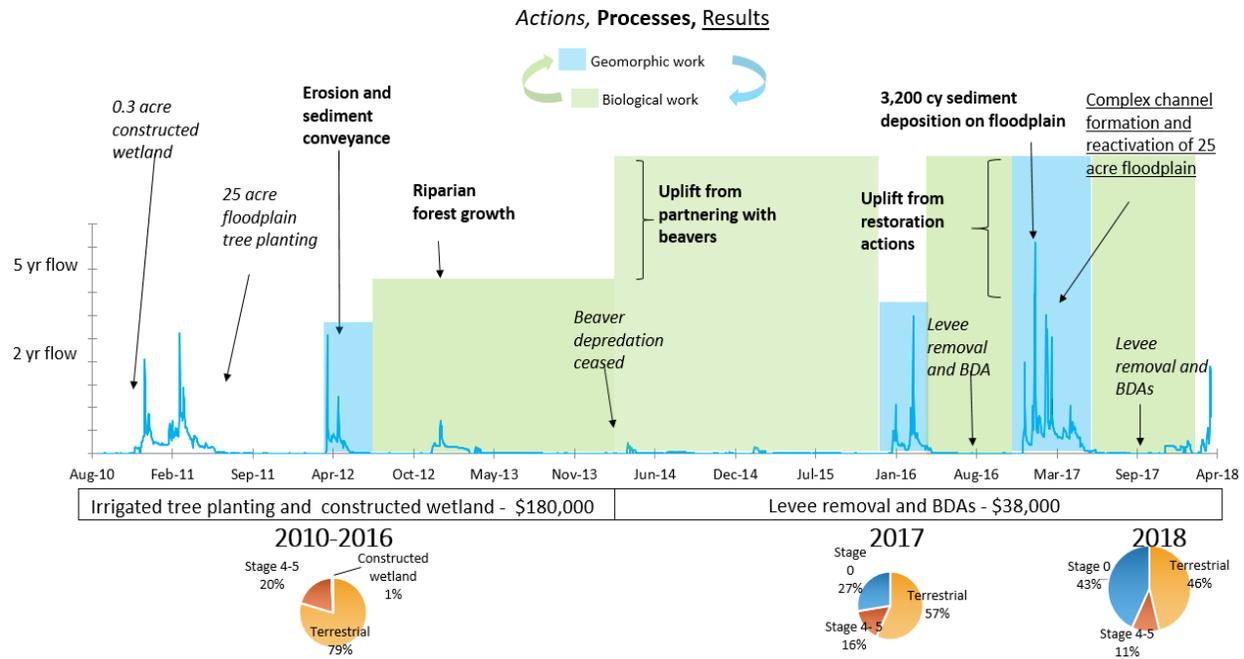


Figure 1. Bio-geomorphic process based recovery tracking with hydrograph

Discussion

The project provides the Service and PLT with an ideal demonstration of maximum stream restoration with minimum intervention. Basic habitat indicators such as channel length increased by a magnitude. The project does not involve stream channel reconstruction beyond the use of hand placed wood jams intended to nudge inherent process to create more beneficial habitat and satisfy stream and floodplain form objectives. The livestock continue to access the project for an average of 2 months a year with no apparent deleterious effects on habitat.

References

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