An Experimental Study of Beaver and Beaver Dam Analogue Restoration Techniques in Childs Meadow

Center for Watershed Sciences, UC Davis The Nature Conservancy USFS Pacific Southwest Research Station Point Blue Conservancy

Childs Meadow Project Partners



UC Davis - Sarah Yarnell (hydrology, geomorphology, restoration)



The Nature Conservancy – Kristen Willson, Rodd Kelsey, Andrea Craig, (restoration and grazing management, geomorphology)



UC Davis – Evan Wolf (carbon, restoration)



Point Blue – Ryan Burnett (birds, restoration)



USFS PSW – Karen Pope (amphibians, restoration)



Childs Meadow Project Partners



U.S. Fish & Wildlife Service, Partnership Program - Jacob Byers and Sheli Wingo



Plumas CorporationScott RiverLeslie MinkWatershed Council(Permitting)Charna, Leslie, Peter
(BDA Construction)



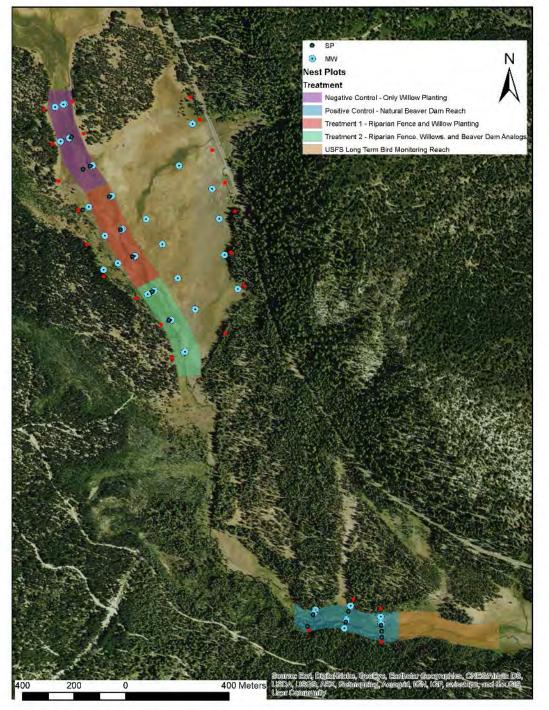
Study Design

BACI Design:

- 2 treatments
- 2 controls

Monitoring:

- Above and below-ground carbon
- Hydrogeomorphic conditions
- Response of targeted wildlife species:
 - Willow flycatcher
 - Cascades frog





May 2015-Today

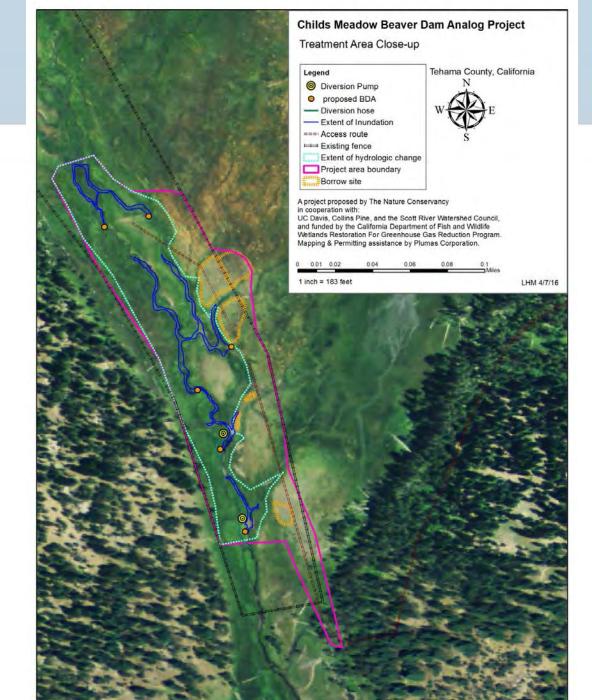
Collect data

Fall 2015

- Cattle exclosure fence
- Planted willow stakes

Fall 2016

Installed 6 BDAs





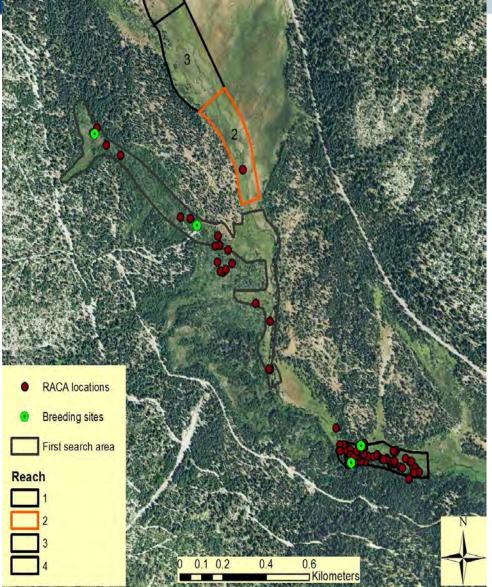
Pre-treatment Reaches

Natural Beaver Reach



- 100+ years of grazing
- Removal of timber from 1941-1974
- Ditching on edges of meadow by 1974
- Channel incised on average 1.6 ft, lacks woody vegetation
- Historic removal of beaver?

Images flown same day, Oct. 2014

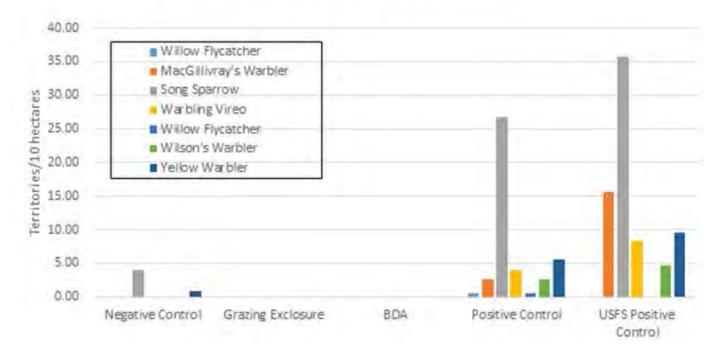




Critical species: Cascades frog (Karen Pope's research)



Meadow Focal Bird Species Densities

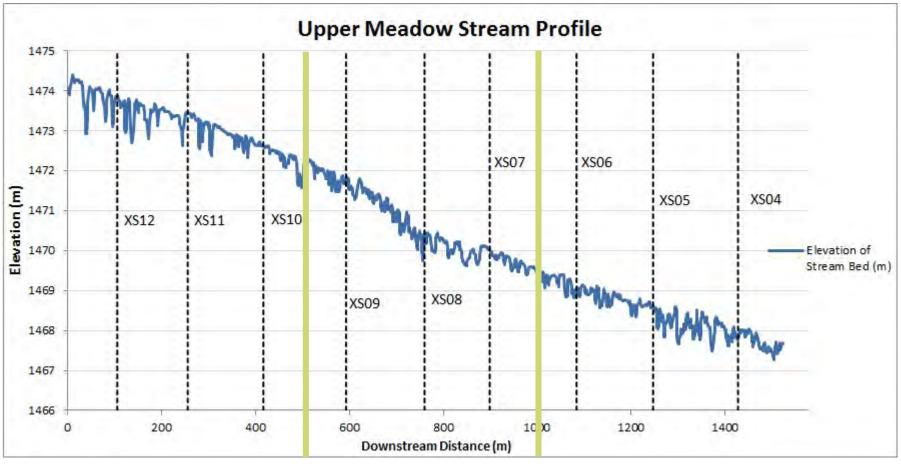




Critical species: Willow flycatcher (Ryan Burnett's research)



Pre-treatment Reaches



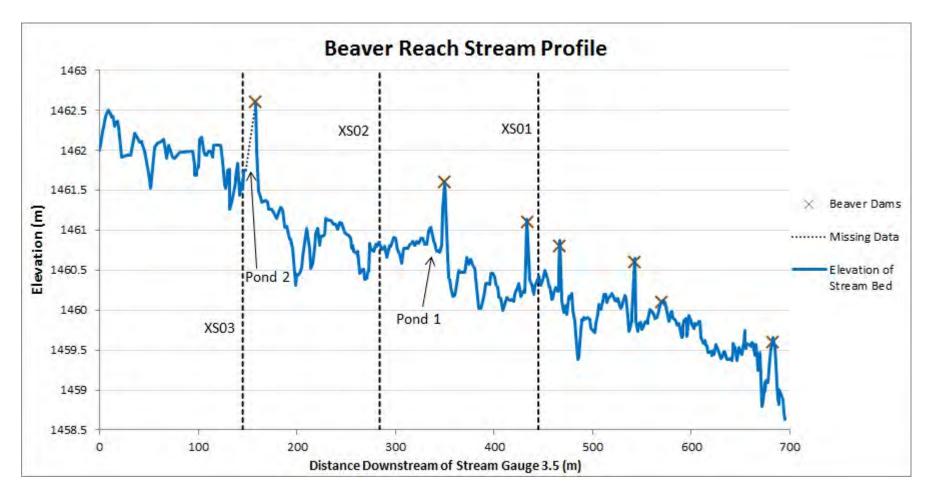
Negative Control

BDA

Fence Only



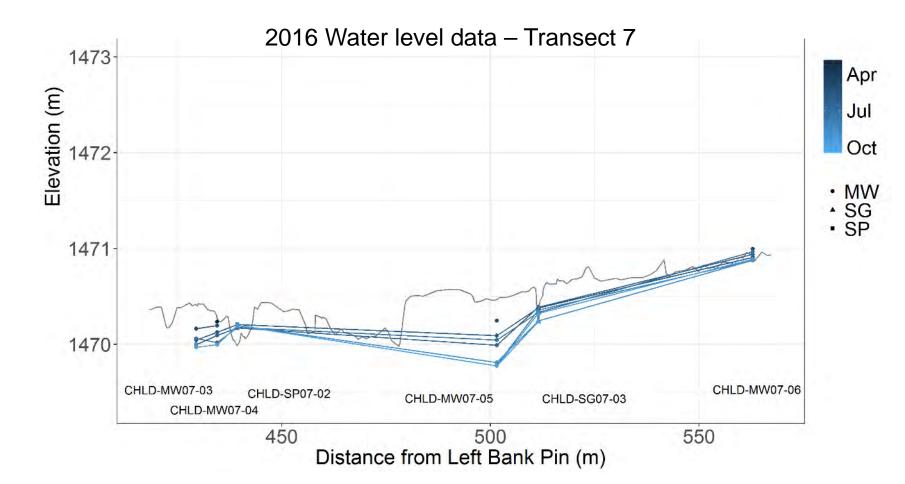
Natural Beaver Reach

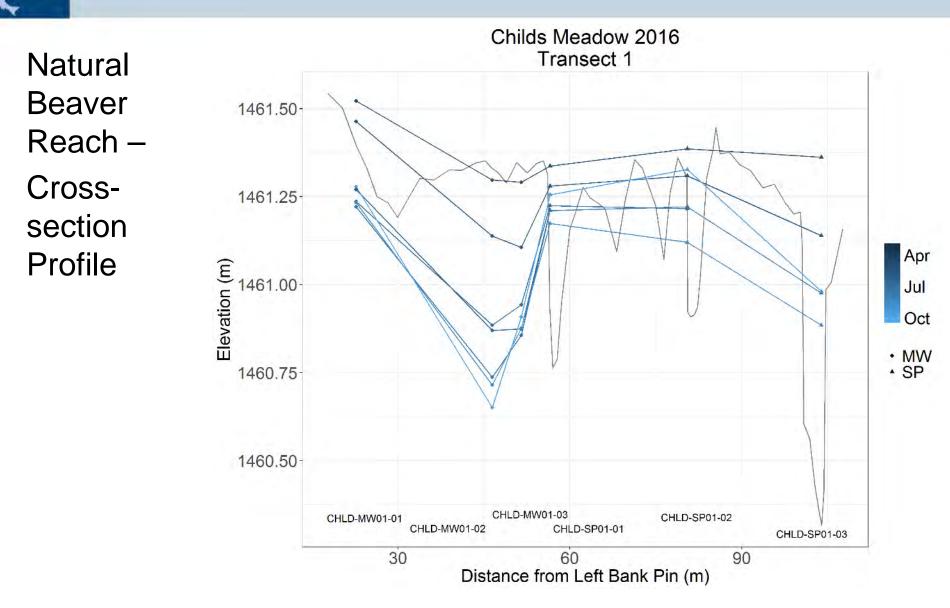


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Pre-restoration Meadow Conditions

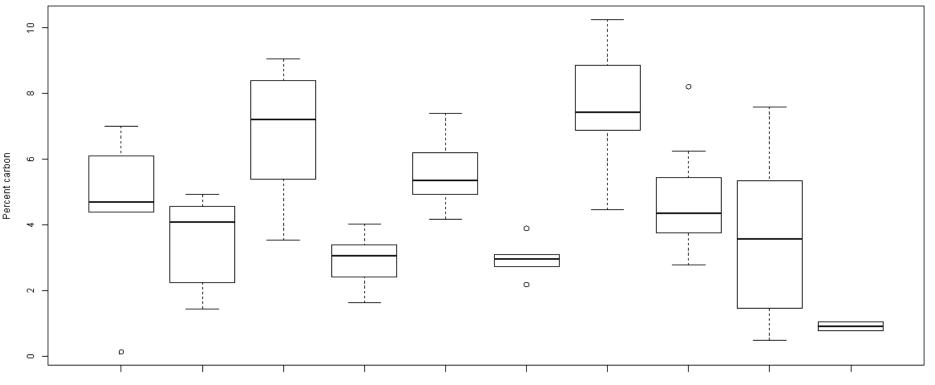
Pre-treatment Reaches – Cross-sectional profile





Carbon Sequestration – Effect of fencing

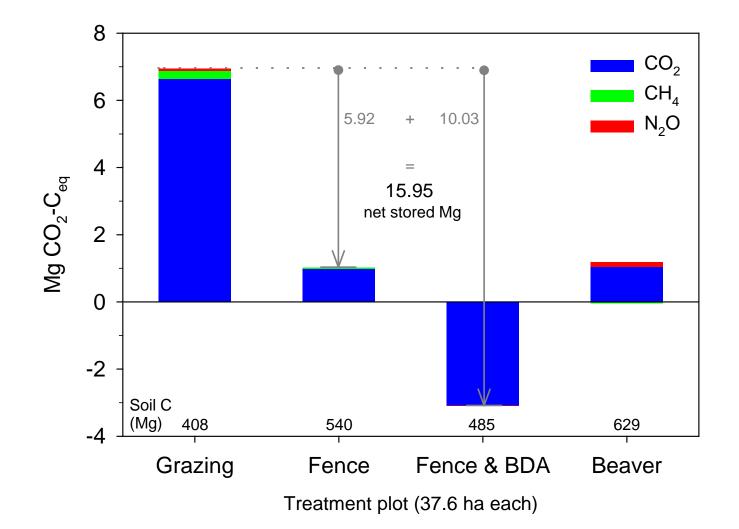




0-10cm 10-20cm 0-10cm 10-20cm 0-10cm^{te} 10-20cm 0-10cm 10-20cm Beaver Stream Neg Cntrl Neg Cntrl Fence Fence BDA BDA Beaver Beaver Ponds Channel Only Only

Carbon Sequestration – Effect of fencing

2016 growing-season GHG balance



BDA installation – Oct 2016





BDA Installation – Oct 2016







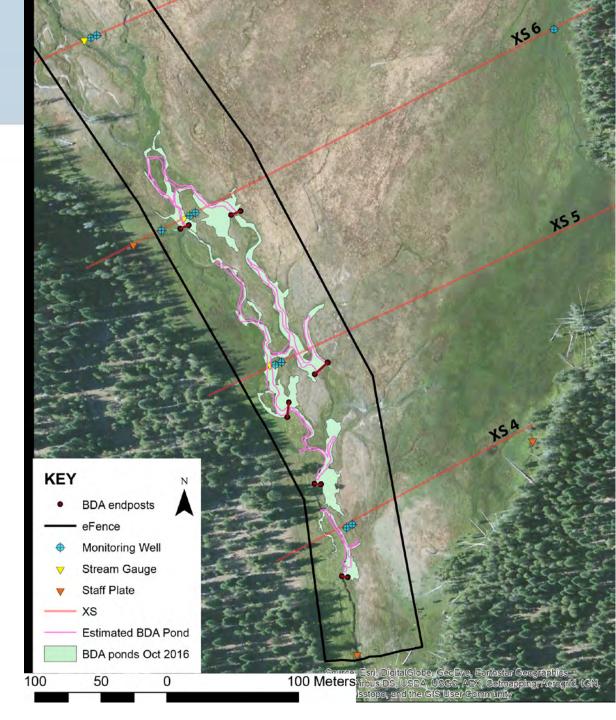






BDA Inundation

- Full inundation in less than 24 hours
- Mapped surface water extent from aerial drone flight approximately 2 weeks after install
 roughly 3-4x predicted extent





Post-Treatment Monitoring

- 3 seasons: 2017-2019
- Continued hydrogeomorphology, GHG monitoring, and amphibian and avian ecology
- BDA maintenance as needed





Dec 15 2016 Flood



WY 2017 - Wettest Winter on Record



Jan 30 2017 Snow and Ice on BDAs

May 2017 – Wet Spring Conditions



BDAs withstood high winter flows

May 2017 – Wet Spring Conditions



Natural beaver dams did not withstand high flows



Aug 31 2017 – Summer Conditions



Leaky dams - BDA maintenance required

September 2017 – Summer Conditions



BDA maintenance - repacked dams from meadow materials

October 10 2017 – Fall Conditions



Questions?