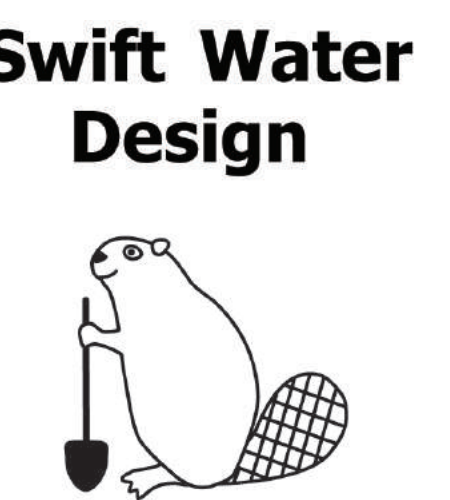




# BEAVER & CALTRANS



BEAVER DAMAGE MITIGATION USING COST EFFECTIVE SOLUTIONS THAT RETAIN HABITAT BENEFITS

## ECOSYSTEM SERVICES BEAVER DAMS CAN PROVIDE

The North American beaver (*Castor canadensis*) is an ecosystem engineer and quintessential keystone species (Jones et al. 1994, Pollock et al. 1994). By constructing millions of dams, beaver have historically altered low-gradient streams and floodplains in almost every North American ecoregion, thus profoundly affecting the continent's landscape (Pollock et al. 2003).

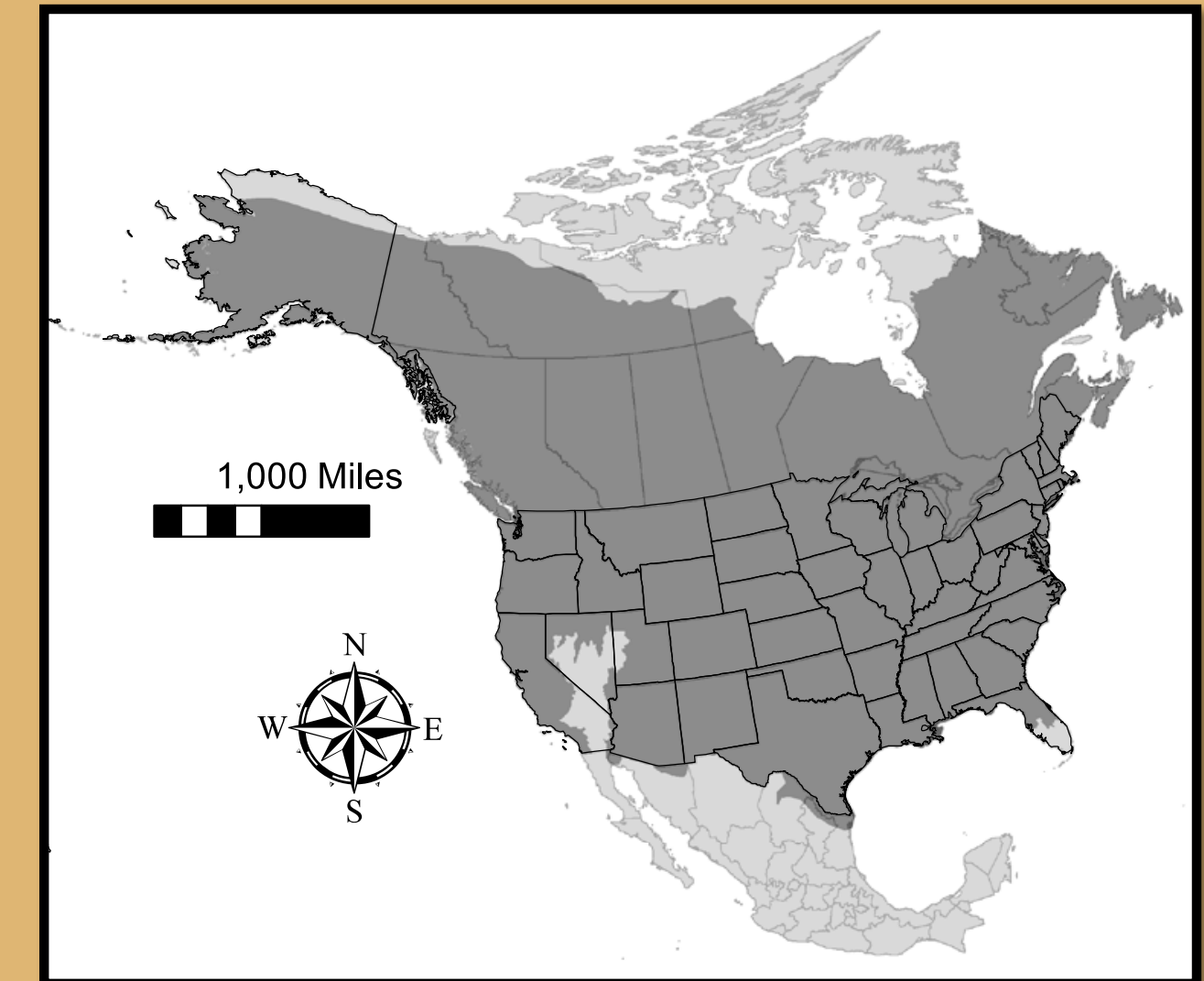
### BEAVER DAM EFFECTS ON BIOLOGICAL DIVERSITY:

- Improved habitat for invertebrates, fish, amphibians, birds and mammals, including Coho salmon and Red-legged frogs
- Increase in heterogeneity of habitat and water temperature
- Increase in species richness and diversity
- Increase in aquatic, transition and deadwood habitats
- Increase in open canopy riparian habitats and improved riparian understory
- Increased in-stream woody debris
- Improved riparian connectivity and resilience

### BEAVER DAM EFFECTS ON ECOSYSTEM FUNCTIONING:

- Regulation of stream flows and flood attenuation
- Increased water storage and raised water table
- Sediment retention & sorting, reduction in erosion & decreased turbidity
- Improved hydrological connectivity within and between surface and groundwaters
- Increased hydrological and morphological diversity
- Improved lateral connectivity between channel and floodplain
- Increased nutrient cycling and improved acid-neutralizing capacity
- Carbon retention, pollutant retention and water purification

### PROBABLE HISTORIC RANGE OF THE NORTH AMERICAN BEAVER



Excerpted from The Beaver Restoration Guidebook, Pollock et al. (2015). Map adapted from Pollock et al. (2003), as modified by Lanman et al. (2012, 2013) and James et al. (2012) for California, and Layne (1965) for peninsular Florida. Absence of historic beaver evidence in the Great Basin, interior southern California, and southern Florida streams, is not evidence of historic absence of beaver in these regions.

## NON-LETHALLY MANAGE BEAVER TO BENEFIT FROM THEIR DAMS

### PROTECT NEW AND EXISTING VEGETATION:

Wrap trunks with wire or paint bark with latex paint mixed with sand (5 oz. of mason sand to each qt. of paint).

- Inexpensive
- Low maintenance and easy to install
- Paint can be color matched
- Preserves mitigation plantings

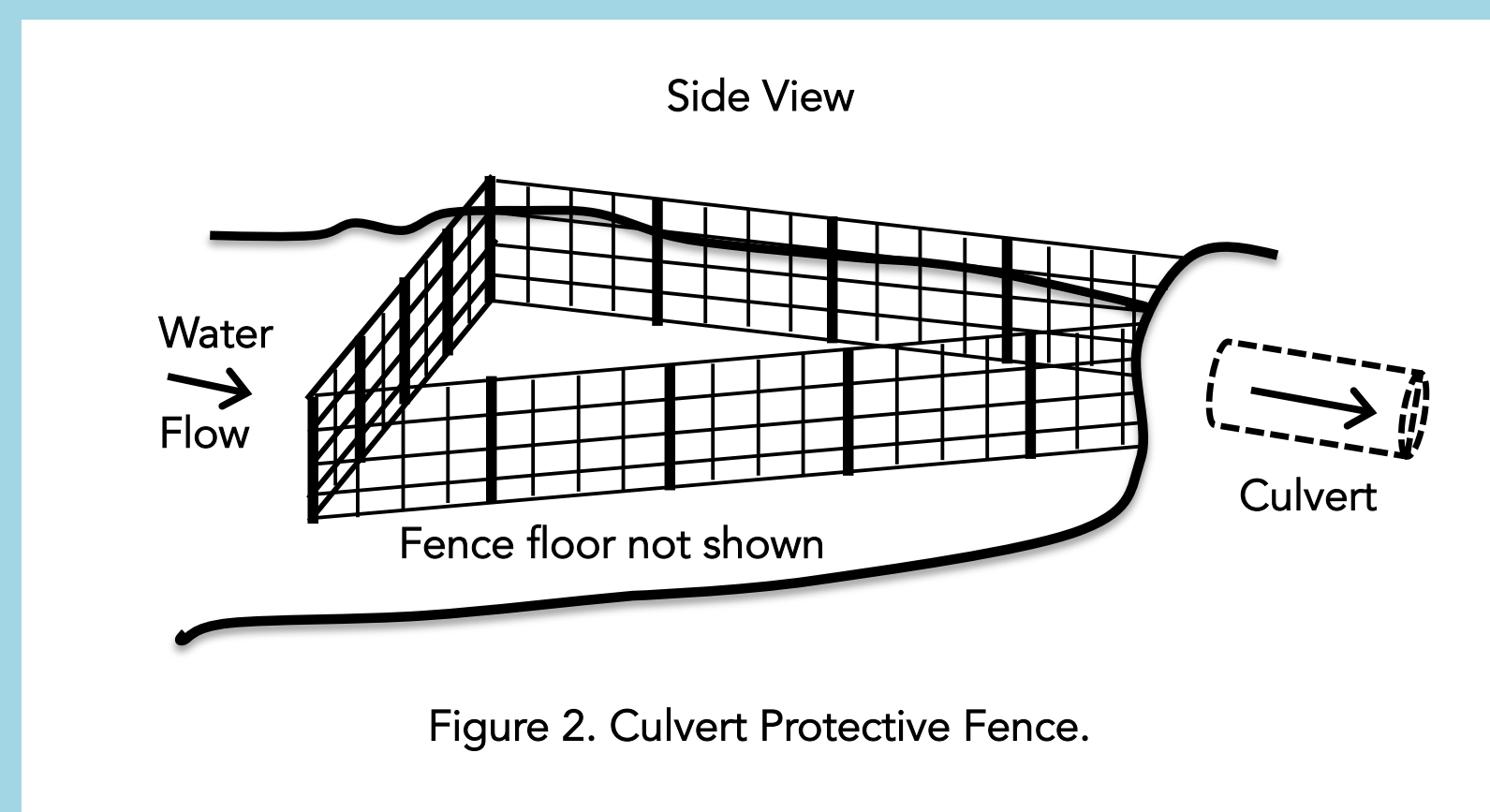
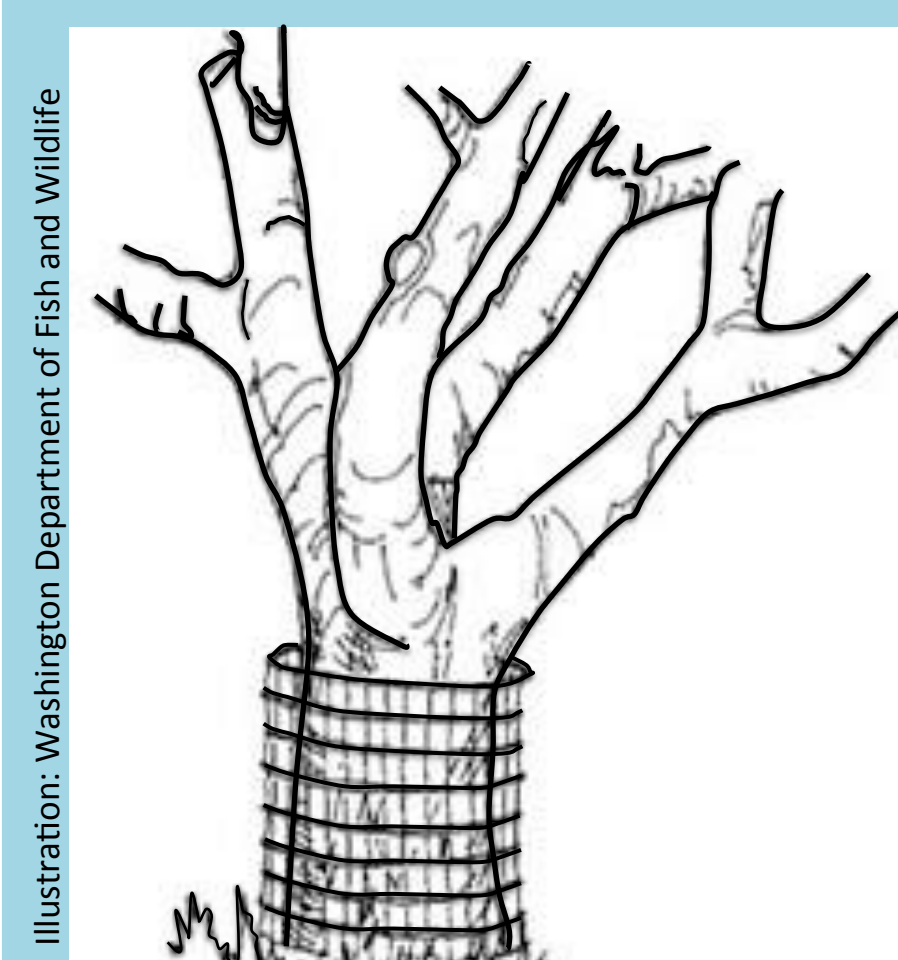


Figure 2. Culvert Protective Fence.

### KEEP CULVERTS CLEAR WITH TRAPEZOIDAL FENCING:

- Keeps beaver from blocking culvert
- Reduces dam building stimulus
- Inexpensive
- Low maintenance
- Can be combined with a pond leveler as needed
- Also functions as a trash rack

### PREVENT FLOODING: Install a flow control device to control the height of the water.

- Installer sets pond height
- Reduces dam building stimulus
- Inexpensive, low impact install
- Low maintenance

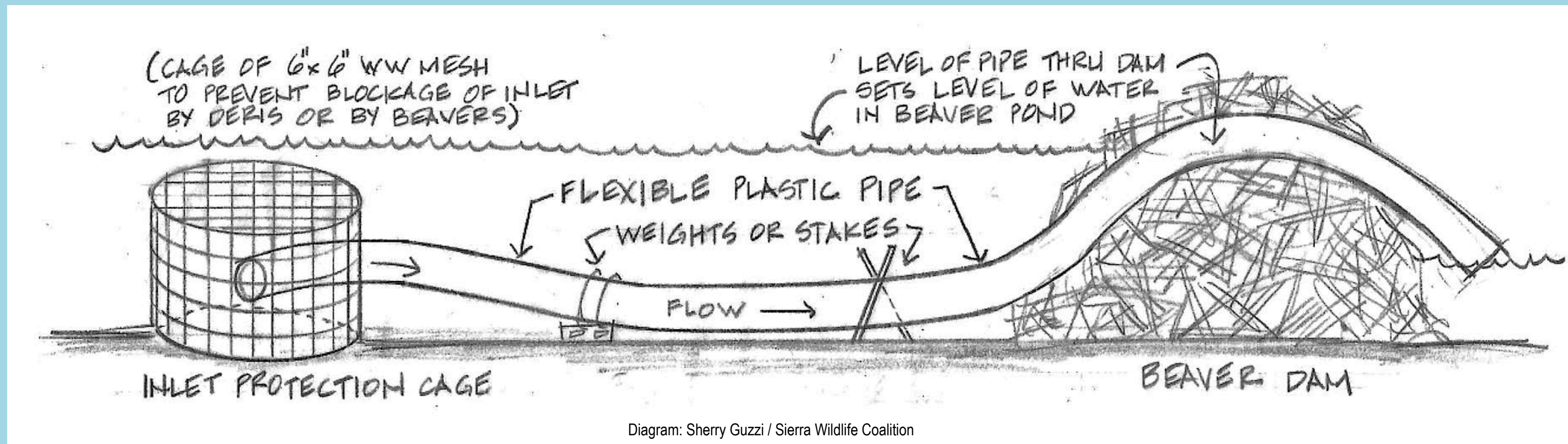


Diagram: Sherry Guzzi / Sierra Wildlife Coalition

### BEAVER MANAGEMENT SUCCESS RATE COMPARISON:

Beaver Management Study Overview (excerpted from Simon, 2006)						
Management Method	Total Sites	Total Successful	Total Failed	Failed <1 yr	Failed 1-2 Yrs	Failed >2 Yrs
Culvert Protector	227	220 (97%)	7 (3%)	5	2	0
Pond Levelers	156	135 (87%)	21 (13%)	21	0	0
Trapping Only	69	8 (16%)	43 (84%)	43	34	6
<b>Total</b>	<b>482</b>					

Note: follow-up data was not available for 18 of the 69 Trapping Only sites

## CASE STUDY: CALTRANS HIGHWAY 101 PROJECT – PRUNEDALE, CA

**ISSUE:** Beaver builds dam in newly restored channel which begins to saturate adjacent roadbed. Caltrans seeks solution to preserve aquatic habitat while preventing flooding.



Summer 2012 – Post construction, prior to beaver colonization | Fall 2014 – Post construction, after beaver colonization causes flooding

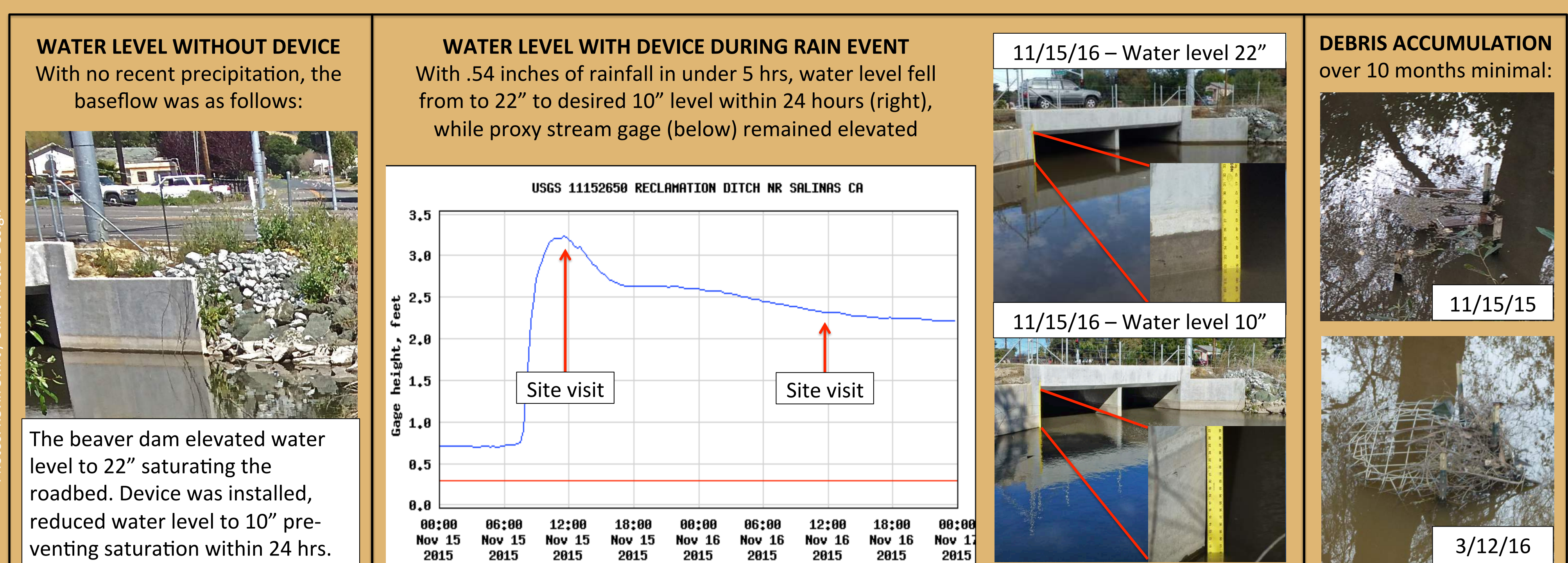
**SOLUTION:** In 2015, Caltrans invited OAC WATER Institute and Swift Water Design to give a presentation to District 5 staff about benefits of beaver and how to utilize non-lethal management strategies at sites where they were experiencing conflicts. In the summer of 2015, the three entities worked together to install a flow control device at a site in Prunedale.



Photo: Kate Lundquist / OAC WATER Institute

- Install pond leveler to lower water level, protect roadbed and retain beaver dam
- Pond leveler discourages additional dam height, reducing beaver harvest of mitigation plantings
- Beaver continues to maintain valuable habitat for sensitive species such as Western pond turtle and Red-legged frog
- Low impact installation done by two people, using only hand tools, with no vehicles in the wetted channel
- Installation was completed in one day

**RESULTS:** Device performed as expected, lowering and maintaining pond level at the 12" decrease needed to alleviate roadbed flooding. Device continues to perform well even during El Niño high flow events, supporting low anticipated maintenance requirements. Continued beaver presence on-site has been verified as of March 2016.



### BEAVER INFORMATION & MANAGEMENT RESOURCES

- *The Beaver Restoration Guidebook: Working with Beaver to Restore Streams, Wetlands, and Floodplains*, Pollock et al. (Editors) 2015: [www.fws.gov/oregonfwo/ToolsForLandowners/RiverScience/Beaver.asp](http://www.fws.gov/oregonfwo/ToolsForLandowners/RiverScience/Beaver.asp)
- *Caltrans Road Ecology Meeting Beaver & Caltrans Presentation*: [www.dot.ca.gov/hq/env/bio/rem/2015/presentations/pdfs/n\\_siepel\\_beavers\\_poster.pdf](http://www.dot.ca.gov/hq/env/bio/rem/2015/presentations/pdfs/n_siepel_beavers_poster.pdf)
- *Swift Water Design* (Beaver damage mitigation contractor based in CA): [www.swiftwaterdesign.com](http://www.swiftwaterdesign.com)
- *OAC WATER Institute Bring Back the Beaver to California Campaign* (with links to papers re-evaluating the historic range of beaver in CA): [www.oaec.org/beaver](http://www.oaec.org/beaver)

### POSTER CREDITS

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