

# WILDLIFE ENHANCEMENT PROJECTS



## COHO & STEELHEAD

**Eric Ettliger**

Aquatic Ecologist, Marin Municipal Water District



## COHO & STEELHEAD

**Carolyn Shoulders**

Natural Resource Specialist, Golden Gate National Recreation Area



## CALIFORNIA RED-LEGGED FROG

**Lisa Michl**

Resource Specialist, Marin County Parks

# Enhancing Winter Habitat for Lagunitas Creek Coho



Eric Ettlinger  
Aquatic Ecologist  
Marin Municipal Water District  
[eettlinger@marinwater.org](mailto:eettlinger@marinwater.org)

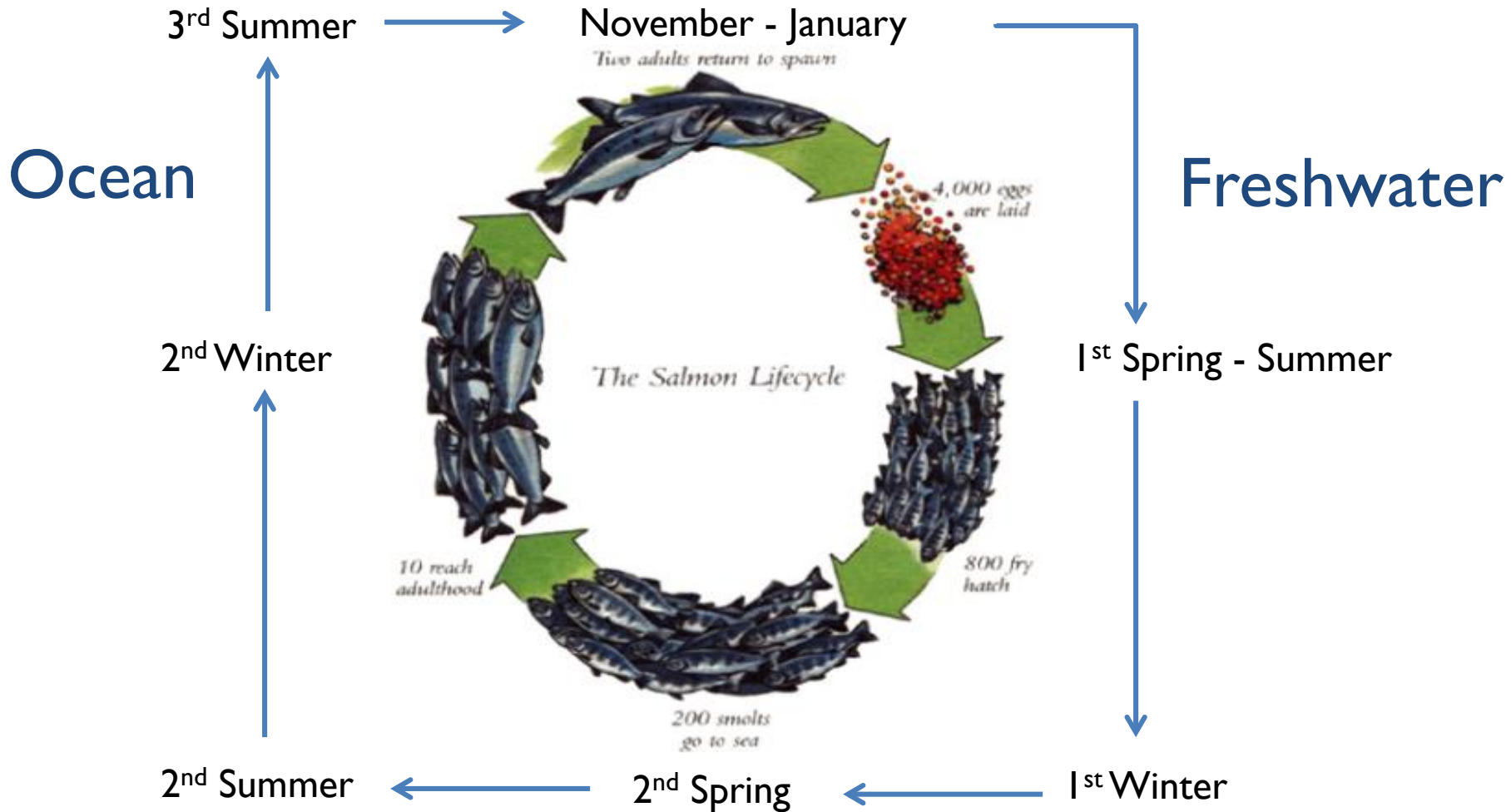
October 26, 2017



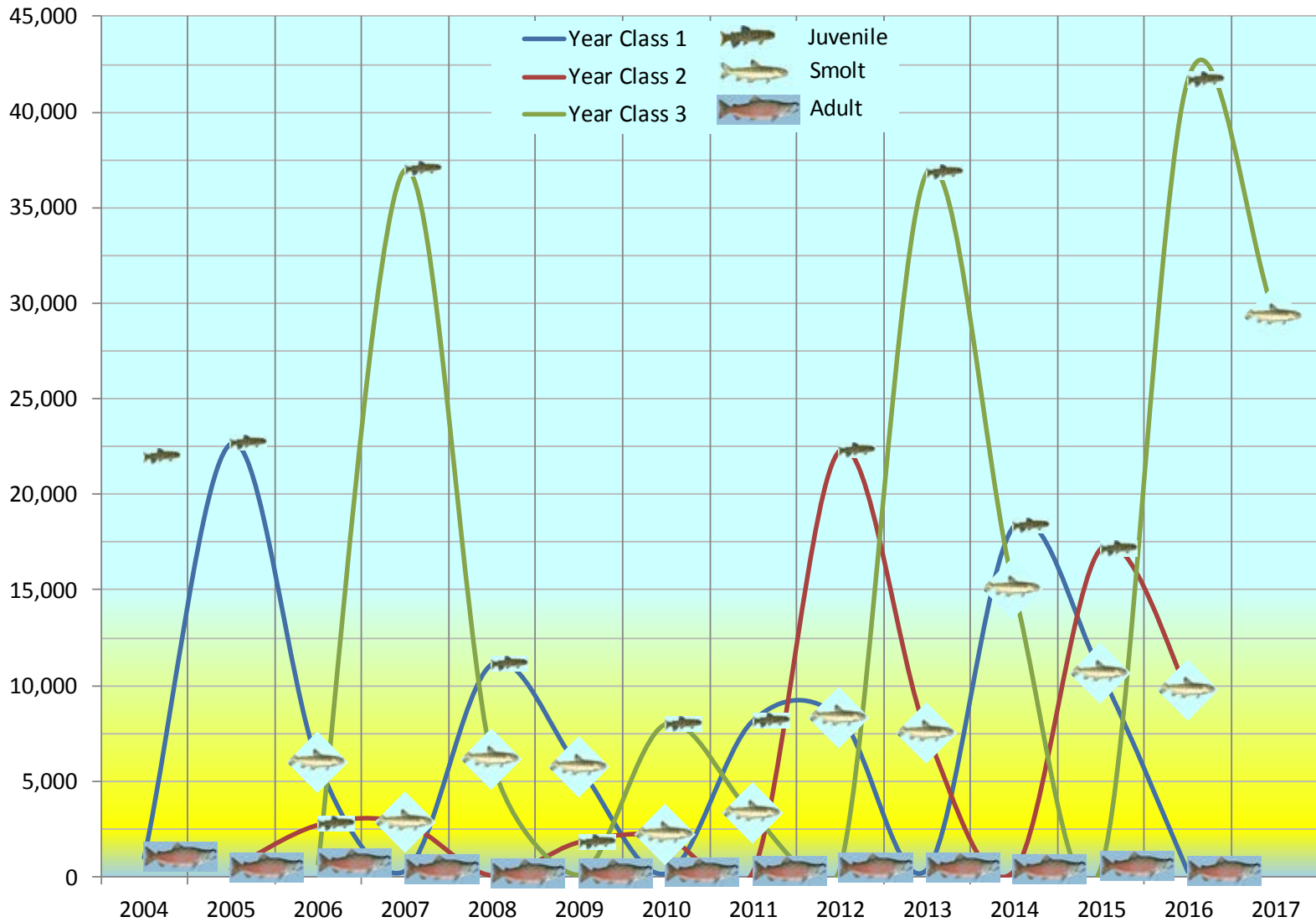
# Presentation Outline

- Coho Salmon Life Cycle
- Habitat Degradation and Winter Survival
- Project Concept and Scope
- Phase I Construction Video

# Coho Salmon Life Cycle

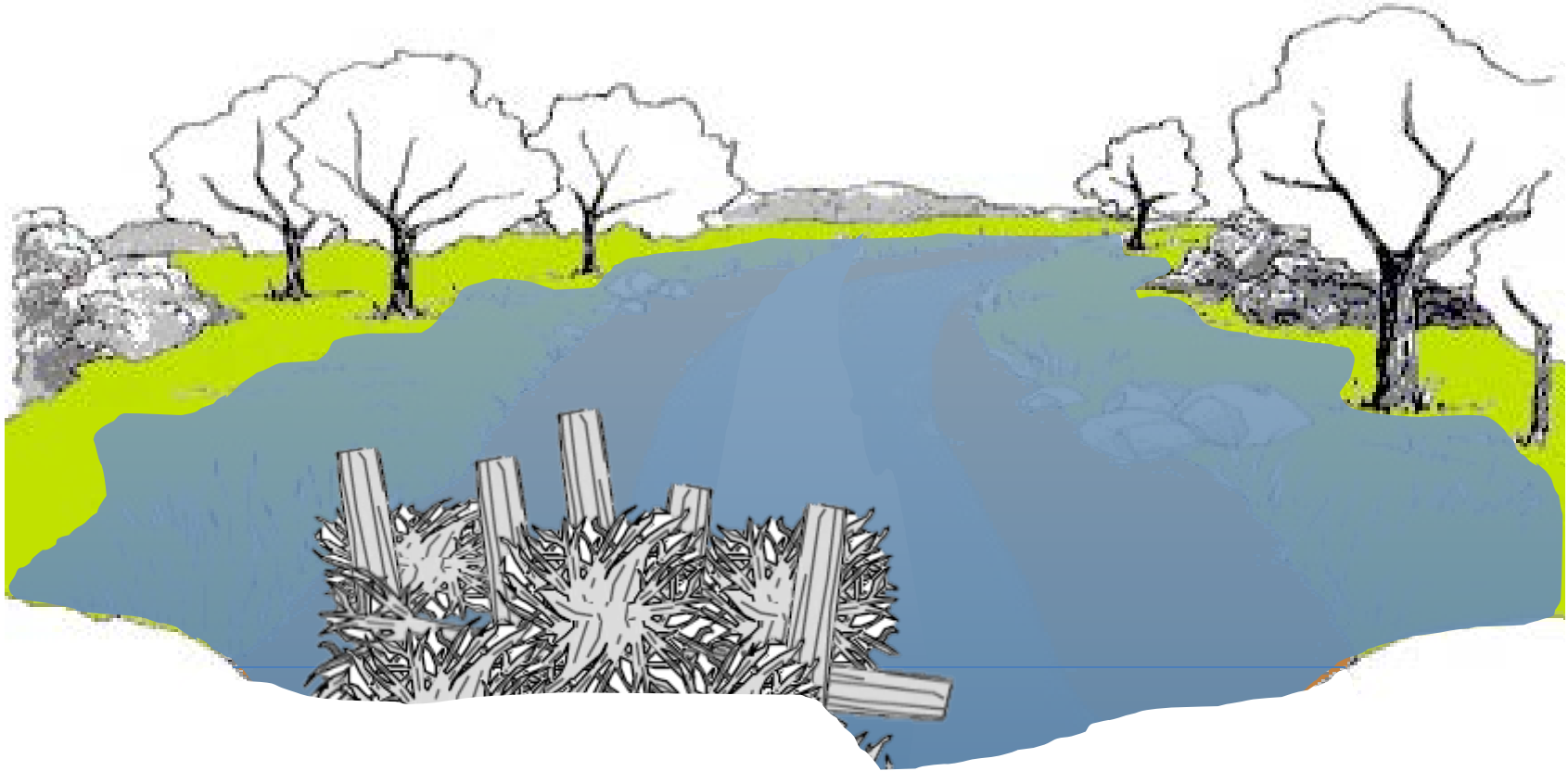


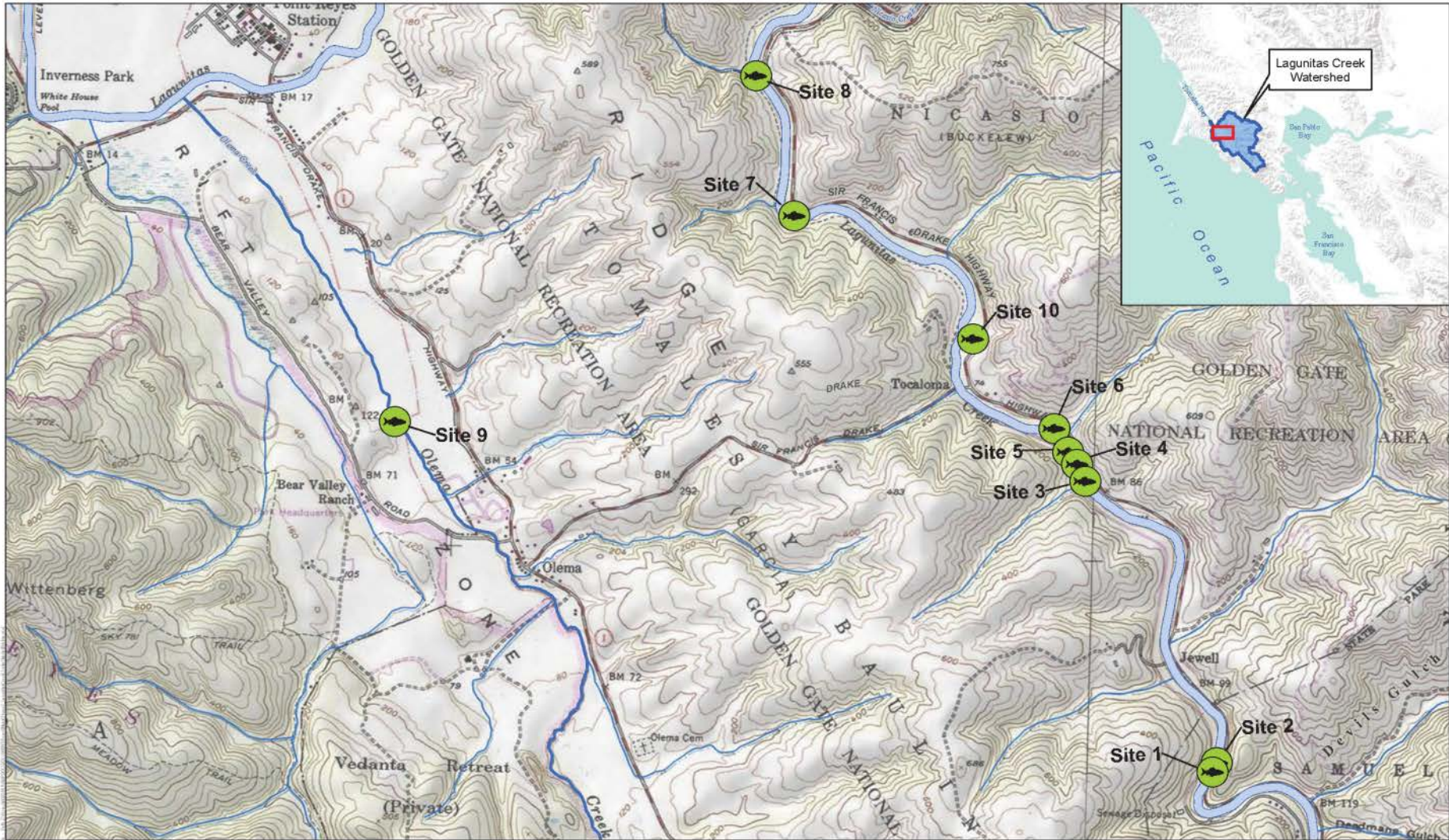






# Stream Flows and Winter Survival





SOURCE: USGS, 2016, Kaman Engineers

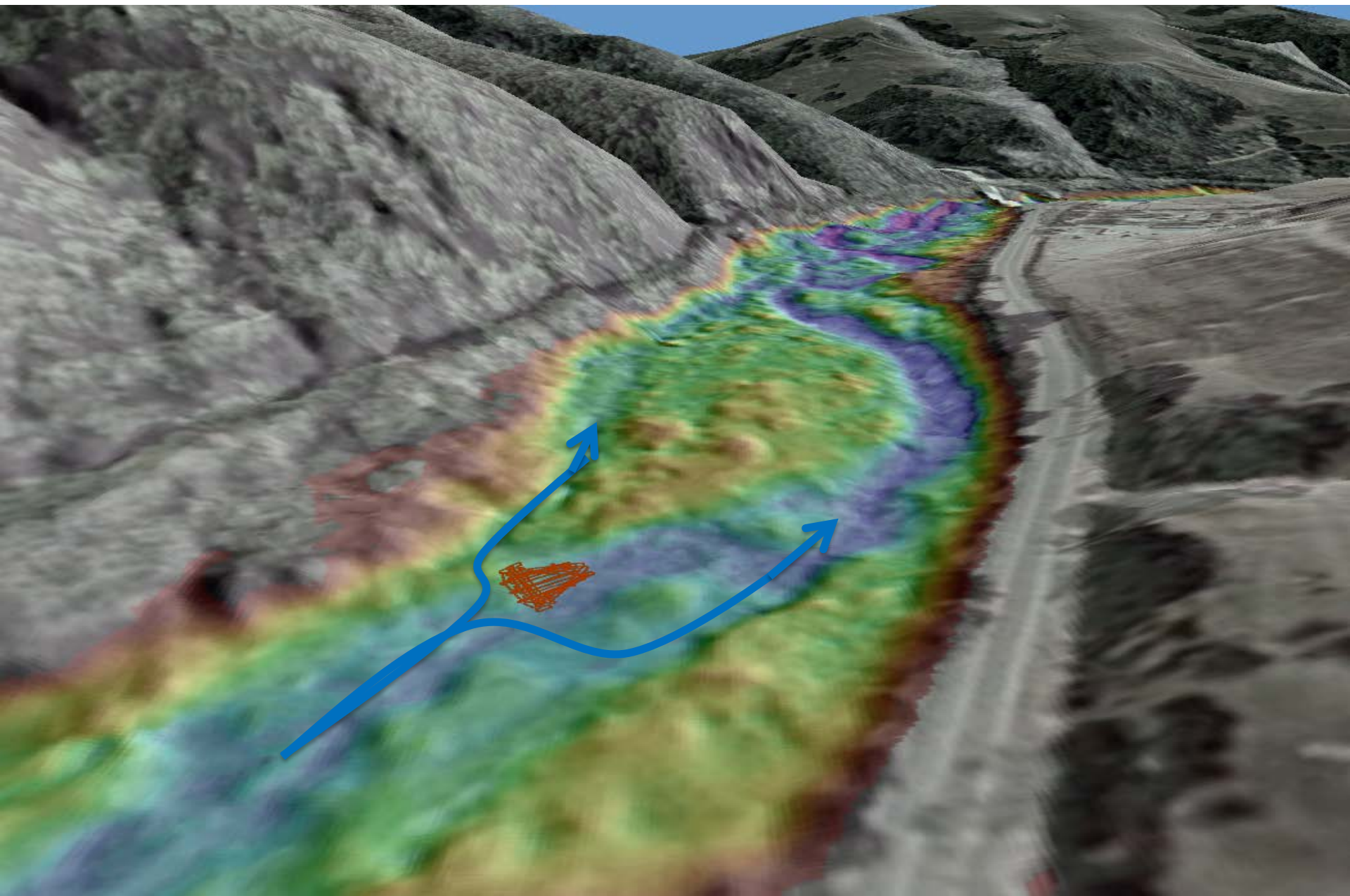
DUDEK

Lagunitas Creek Winter Habitat and Floodplain Enhancement

FIGURE 2

Lagunitas Creek Winter Habitat Enhancement Implementation











# Conclusions

- Juvenile coho salmon suffer high mortality in most winters as a likely result of:
  - Incised streams that are disconnected from floodplains.
  - A lack of complex shelter in the channel.
- Strategically placed wood structures are intended to:
  - Inundate floodplains more frequently and for longer durations.
  - Cause sediment deposition, further reconnecting floodplains.
  - Provide refuge from predators and flows.



# WILDLIFE ENHANCEMENT PROJECTS



## COHO & STEELHEAD

**Eric Ettliger**

Aquatic Ecologist, Marin Municipal Water District



## COHO & STEELHEAD

**Carolyn Shoulders**

Natural Resource Specialist, Golden Gate National Recreation Area



## CALIFORNIA RED-LEGGED FROG

**Lisa Michl**

Resource Specialist, Marin County Parks

# Salmon Habitat Restoration at Muir Woods National Monument



Carolyn Shoulders  
Natural Resources GGNRA  
[Carolyn\\_Shoulders@nps.gov](mailto:Carolyn_Shoulders@nps.gov)

October 26, 2017

















© Aldo Leopold Foundation

“To keep every cog  
and wheel is the  
first precaution of  
intelligent  
tinkering”

-Aldo Leopold, 1949. A  
Sand County Almanac





The reach of Redwood Creek through Muir Woods has a low rate of juveniles, even though a high rate of spawning occurs there

Spawners, 1994-2015



Photo- NOAA

Juveniles, 1994-2015

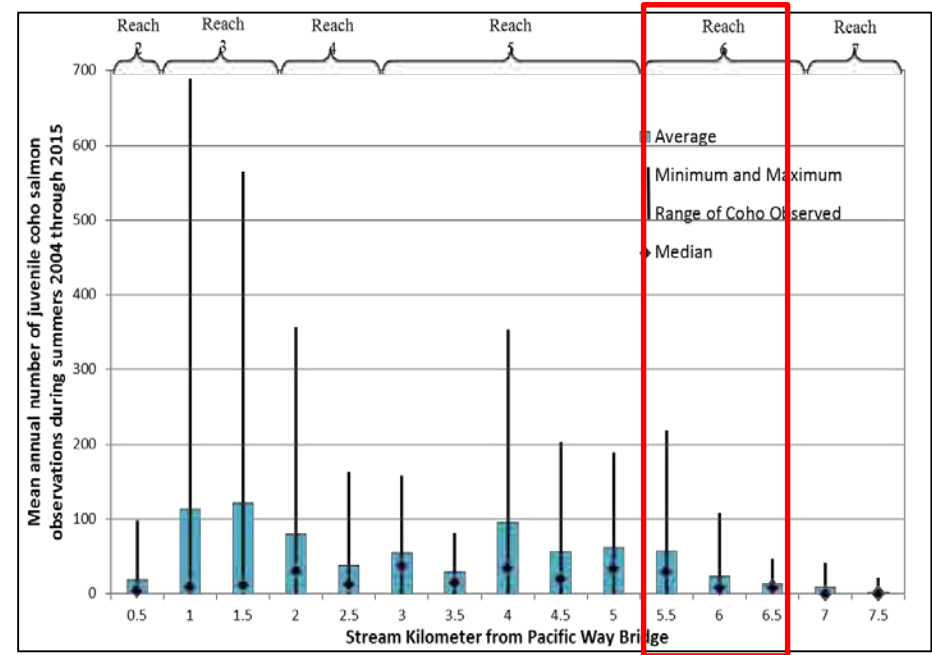
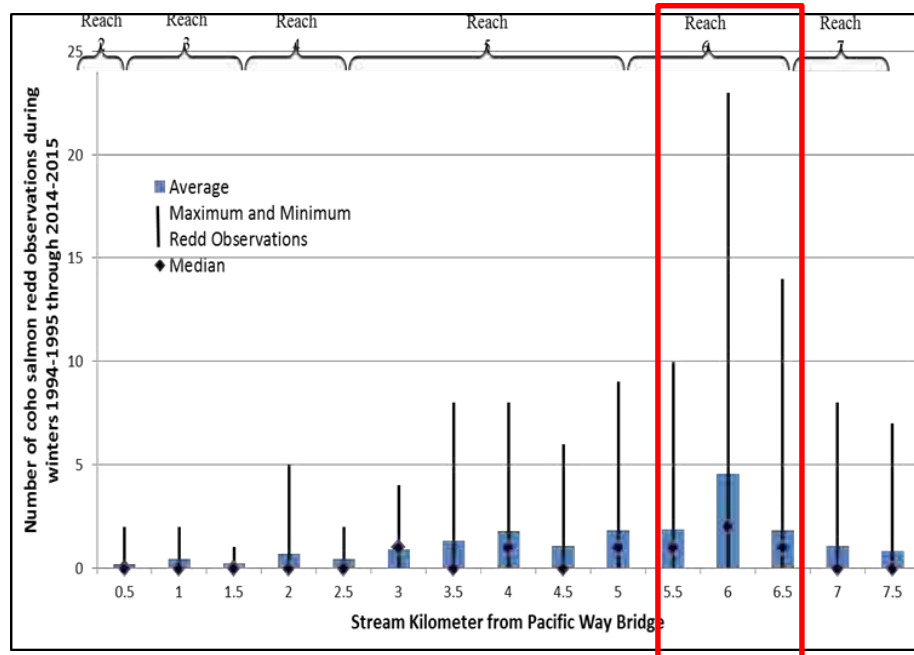


Data – Fong, Reichmuth, 2016

# A long-term record of poor juvenile numbers at Muir Woods

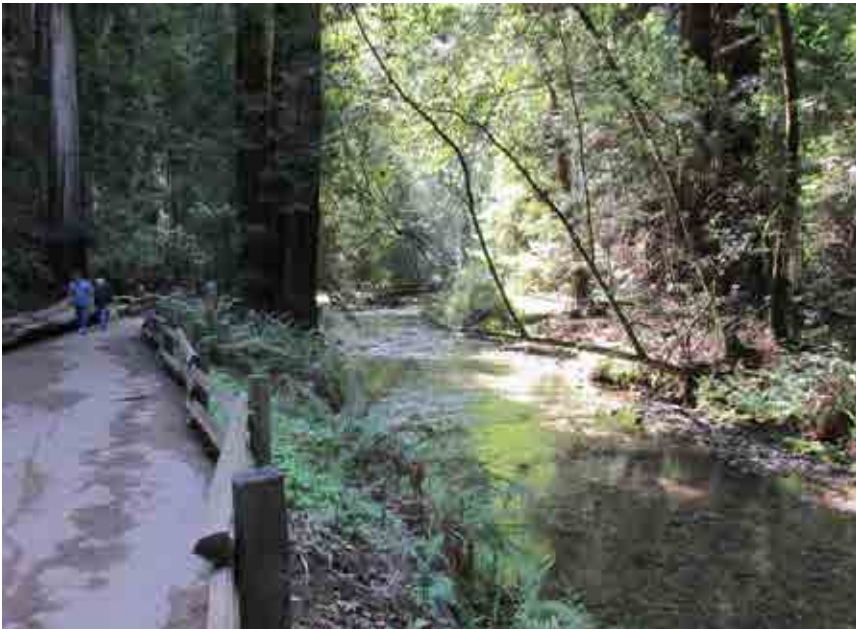
## Spawners, 1994-2015

## Juveniles, 1994-2015

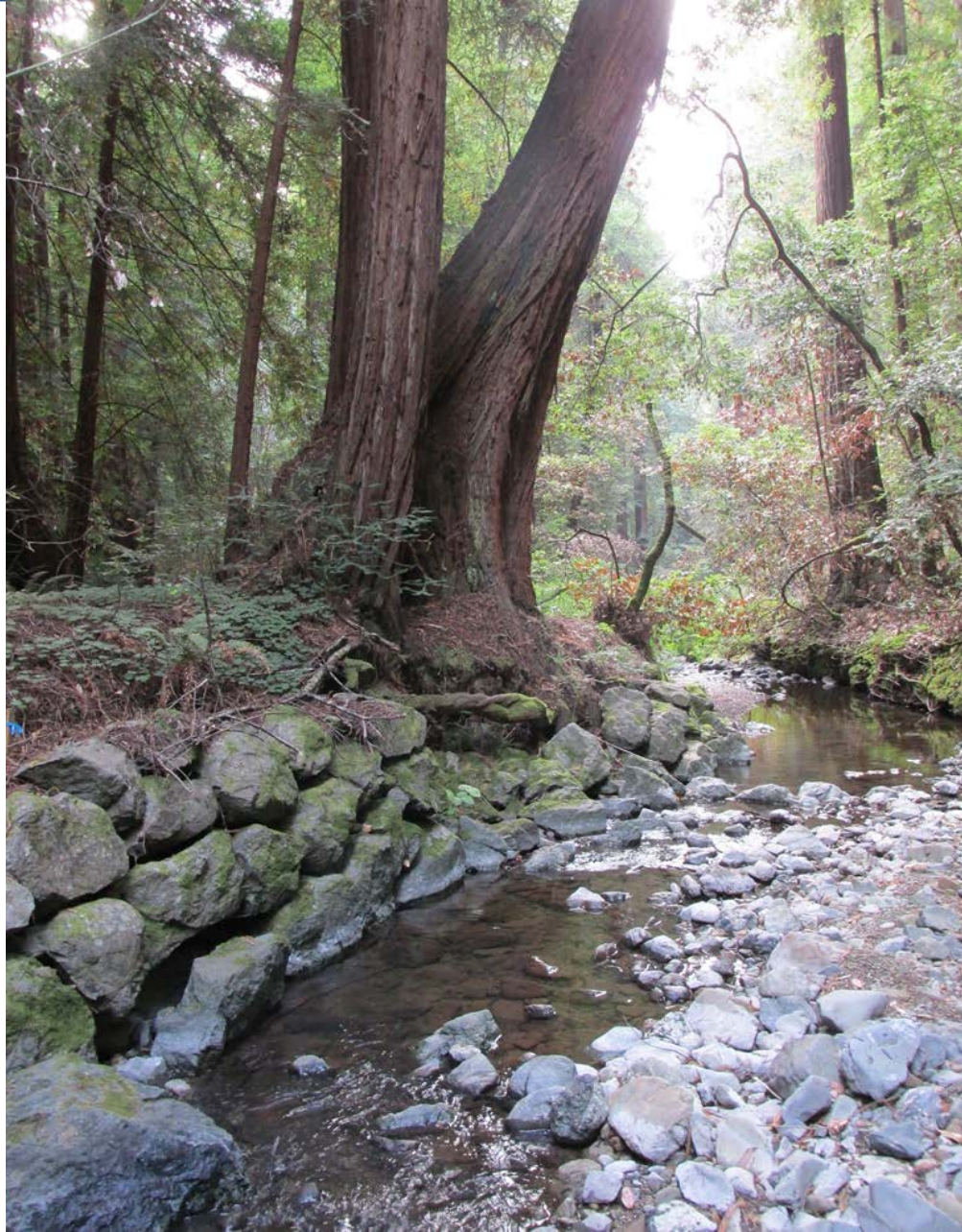


Data – Fong, Reichmuth, 2016







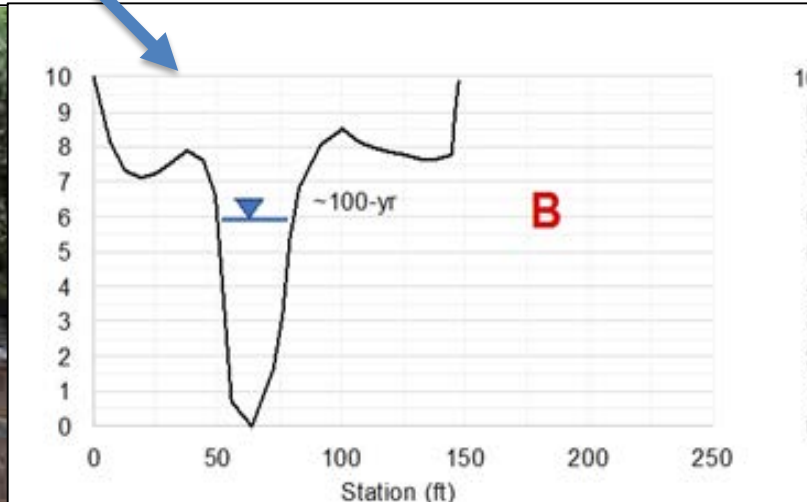
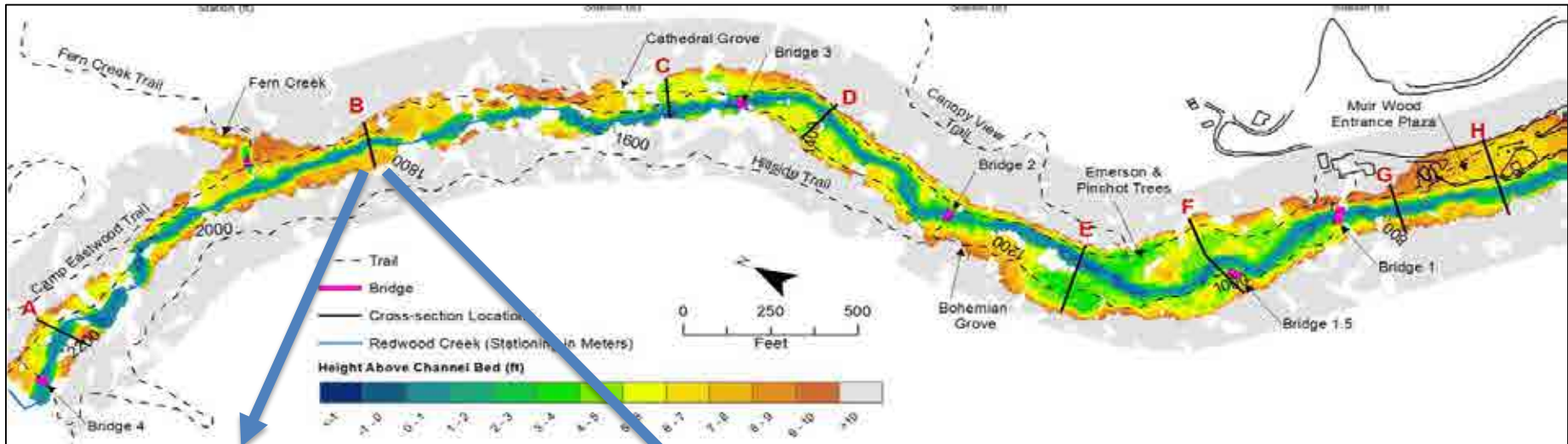




# Rock Riprap on 3,500 LF, or 60% of Banks, on One Mile of Channel



# Floodplain Disconnected Due to Channel Incision



Sediment  
Needs to be  
Trapped to  
Rebuild Channel

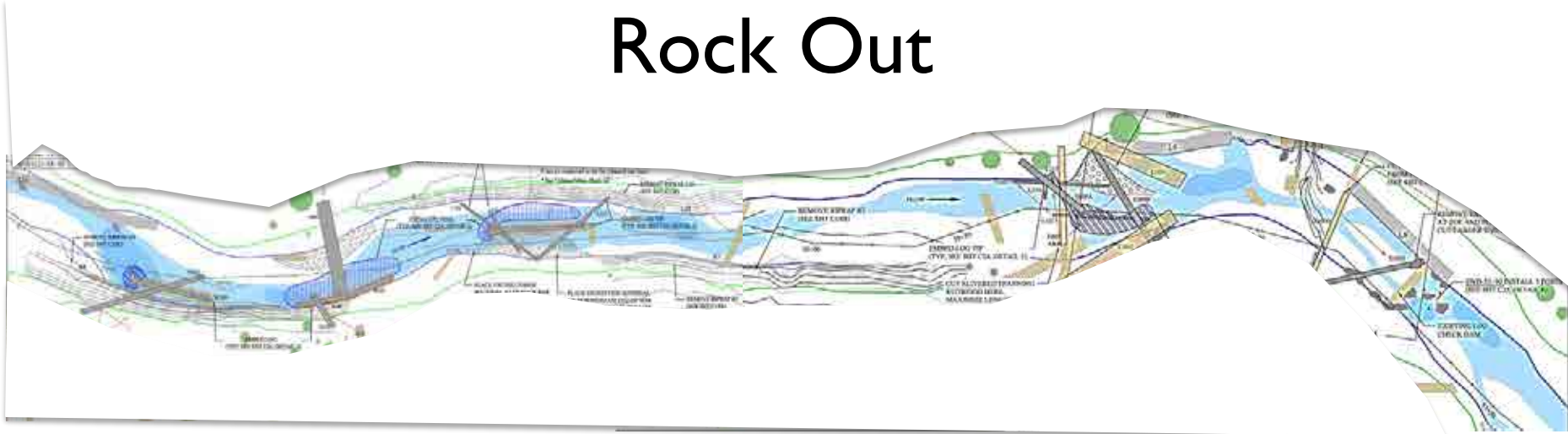


# Rock Installed by Civilian Conservation Corps (CCC's) in 1930's



- Historic Feature at Muir Woods
- Consultation with SHPO
- Protection of Cultural Landscape at Muir Woods

# Rock Out



- Remove 1,627 LF of Riprap (48 %)
- Relocate 40-50 Fallen Trees into Creek
  - Excavate Pools before Placing Trees
  - Regrade some banks; or where roots suggest stability, leave as-is and revegetate



# Redwood Tree Response?



**2017- Slid from Hillslope**



**Buttress Roots**



**2015 – Fell from Terrace**



# Winter Habitat from Exposed Roots





# Remove or Realign Three Trail Segments at the Top of Bank



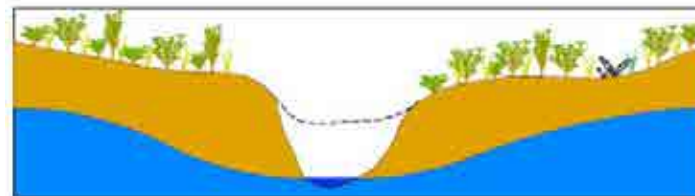
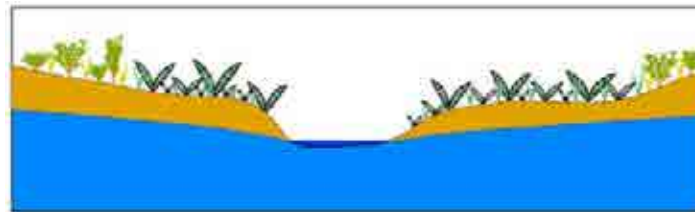
- Remove One Leg of Split Trail at Cathedral Grove (300 LF)
- Realign segment of Main Trail on West Side of Creek (440 LF)
- Realign Segment of Main Trail Near Fern Creek (115 LF)





# Add Rock Grade Control to Incised Tributary

- Store More Groundwater
- Increase Flow to Creek in Dry Season
- Support Vegetation



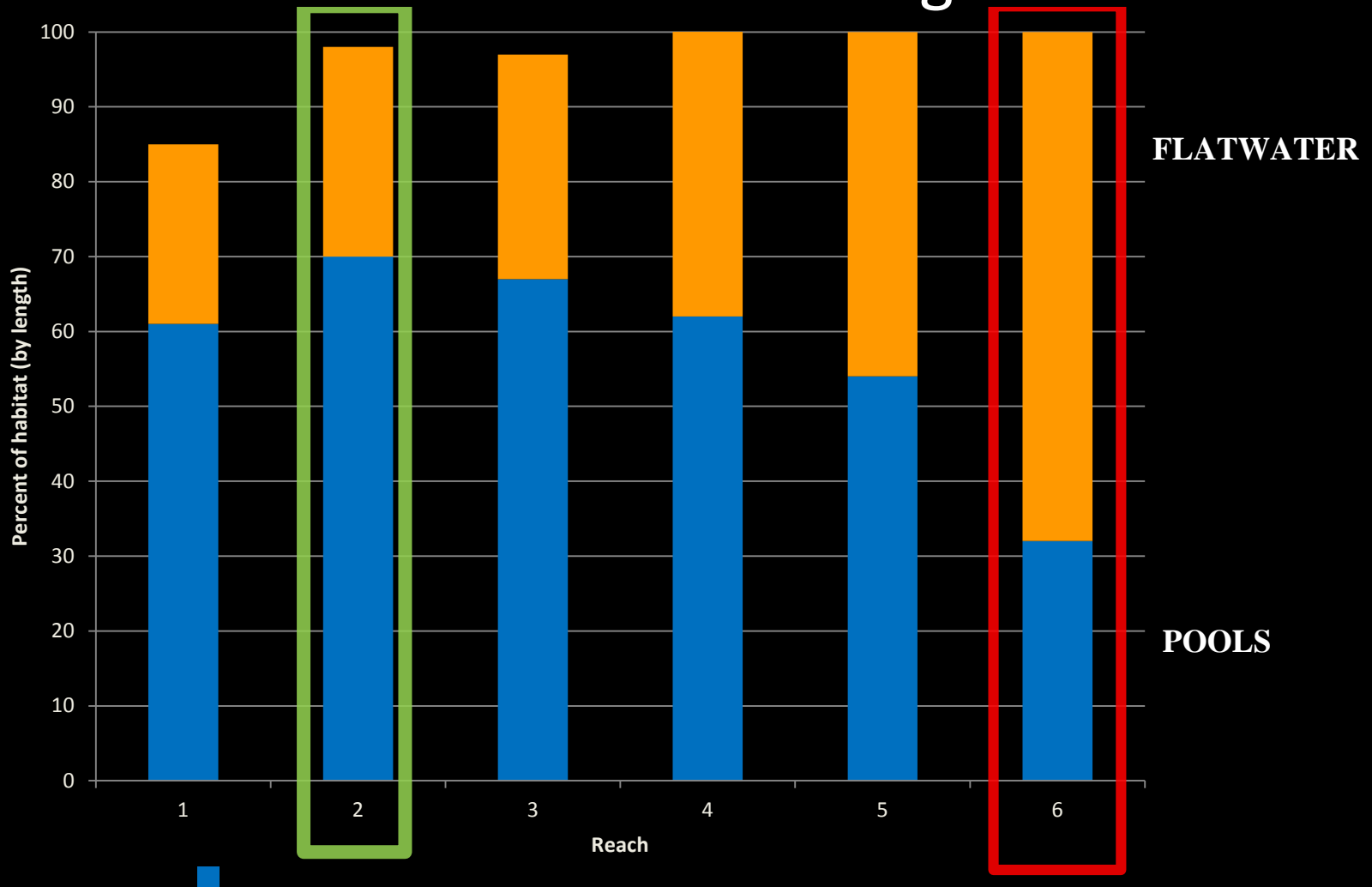
# Trap Sediment by Beaver Dam Analogs



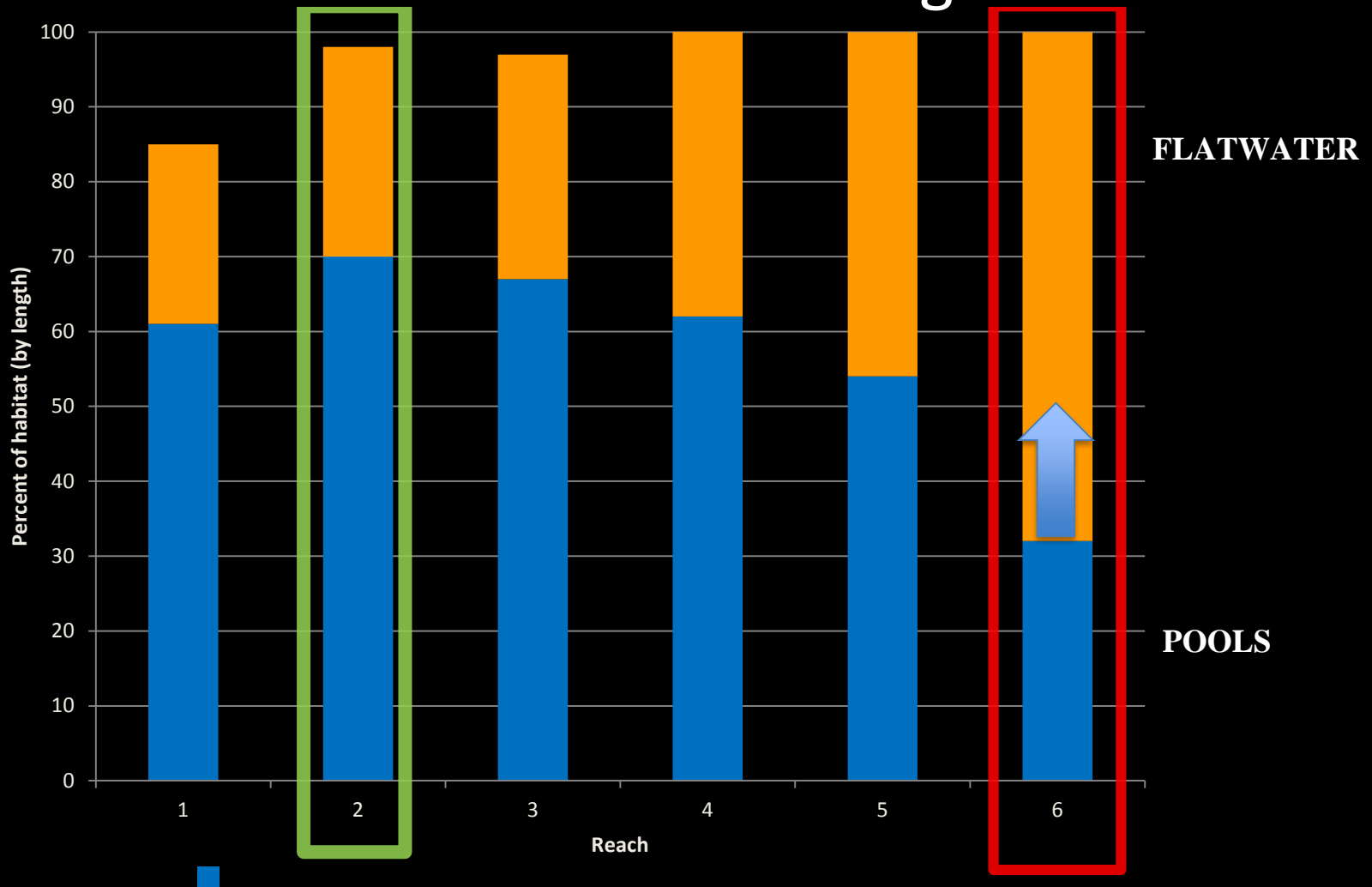
- Trap Sediment
- Create roughness/complexity
- 24 locations; only 2 span the channel
- Stewardship Activity
- Supplements Large Wood Structures (Longer lasting)



# Muir Woods Has Lowest Rate of Pools in 15 Years Of Monitoring



# Muir Woods Has Lowest Rate of Pools in 15 Years Of Monitoring





# Better Habitat & Better Coho Survival, Channel Recovery & Wilder Old Growth Redwood Forest



Carolyn Shoulders  
Natural Resource Specialist  
Golden Gate National Recreation Area  
[Carolyn\\_Shoulders@nps.gov](mailto:Carolyn_Shoulders@nps.gov)

October 26, 2017

# WILDLIFE ENHANCEMENT PROJECTS



## COHO & STEELHEAD

**Eric Ettliger**

Aquatic Ecologist, Marin Municipal Water District



## COHO & STEELHEAD

**Carolyn Shoulders**

Natural Resource Specialist, Golden Gate National Recreation Area



## CALIFORNIA RED-LEGGED FROG

**Lisa Michl**

Resource Specialist, Marin County Parks



# Frog Pond at Mount Burdell Open Space Preserve

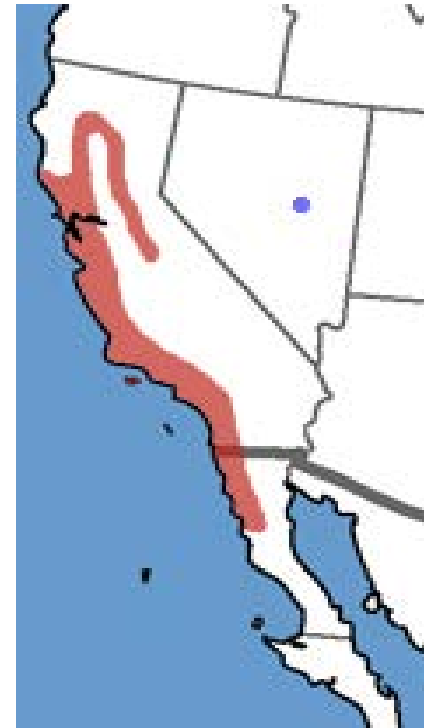


Lisa Michl  
Wildlife Biologist  
Marin County Parks  
[Lmichl@marincounty.org](mailto:Lmichl@marincounty.org)  
415-473-2128

October 26, 2017

# California Red-Legged Frog

- Federal Threatened Species (1996)
- CA species of special concern
- Extirpated from ~70% of former range

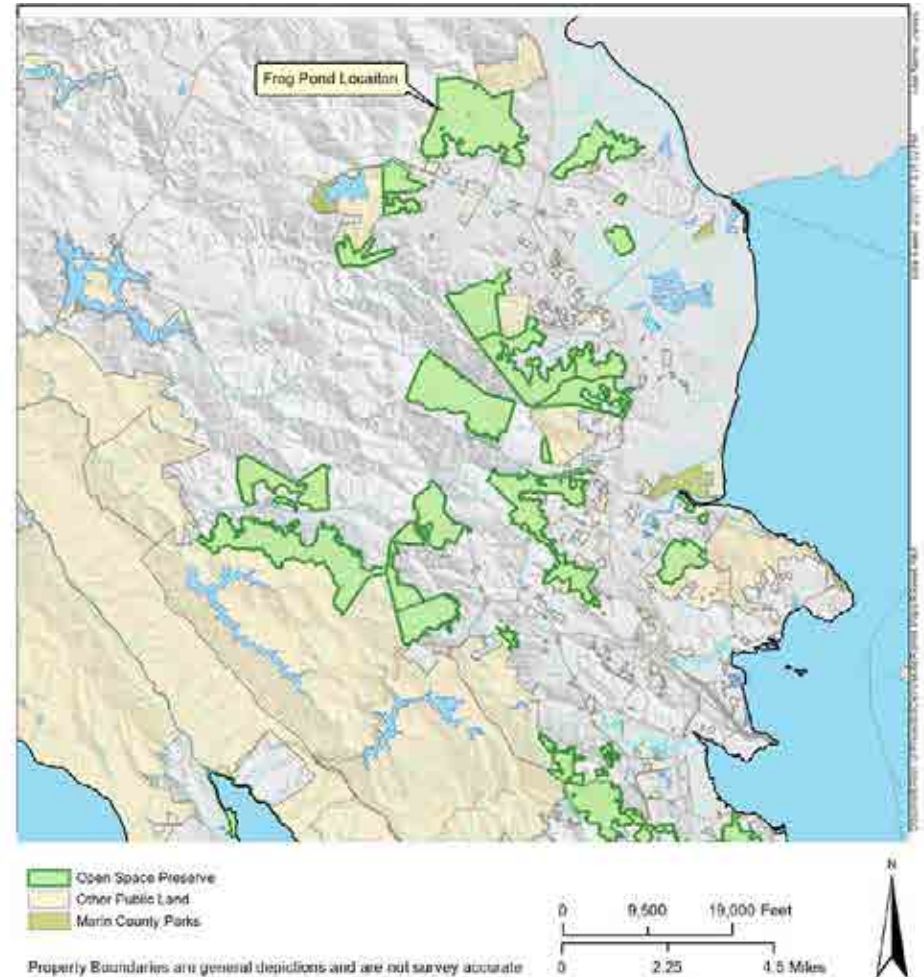


- Approximate historical range of CRLF
- Introduced population



# Location

- Only location of California red-legged frogs in our 34 preserves is Mt. Burdell
- Nearby breeding pond on private land

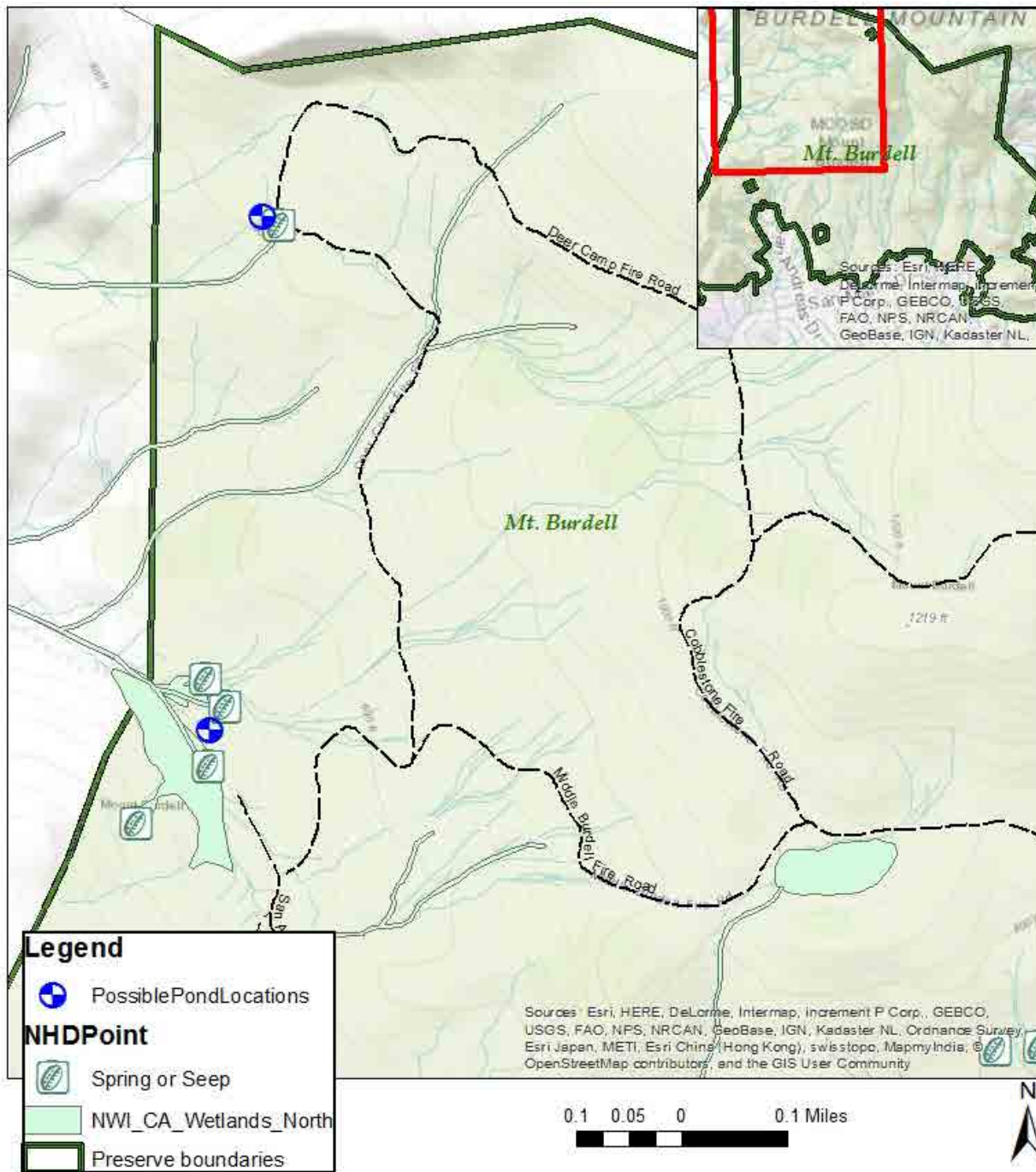


# Goal

Create California red-legged frog breeding habitat on Mt. Burdell







# Specifications

- Need:
  - Sufficient water to maintain pond depths
    - Near natural springs
    - High water table
  - Soil type
    - Pond construction
    - Water retention





# Examples

La Honda Creek OSP – Midpeninsula Regional Open Space



Sears Po



Mori Point – GGNRA

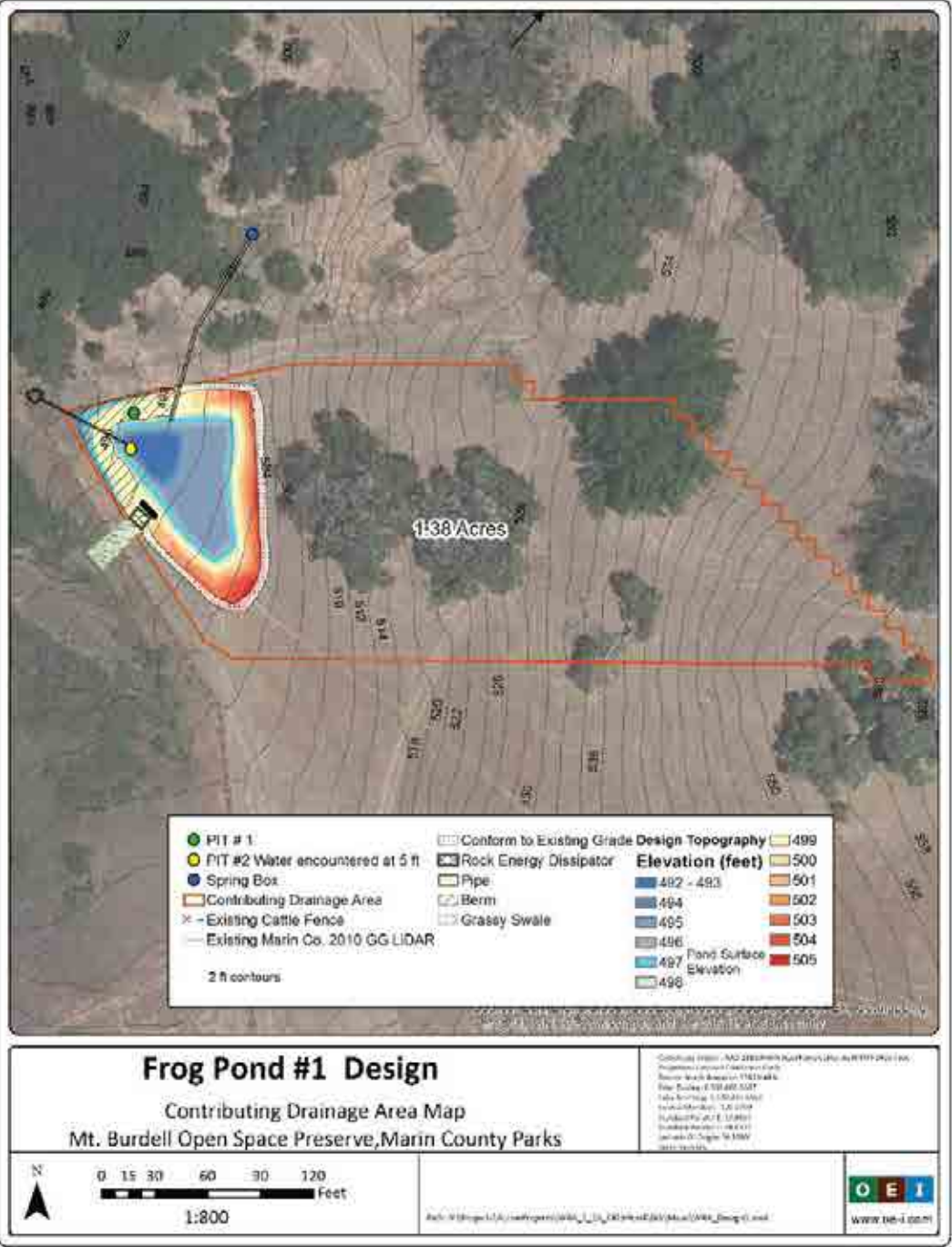
# Stakeholders

- Rancher
- Marin/Sonoma Mosquito and Vector Control
- Local Community

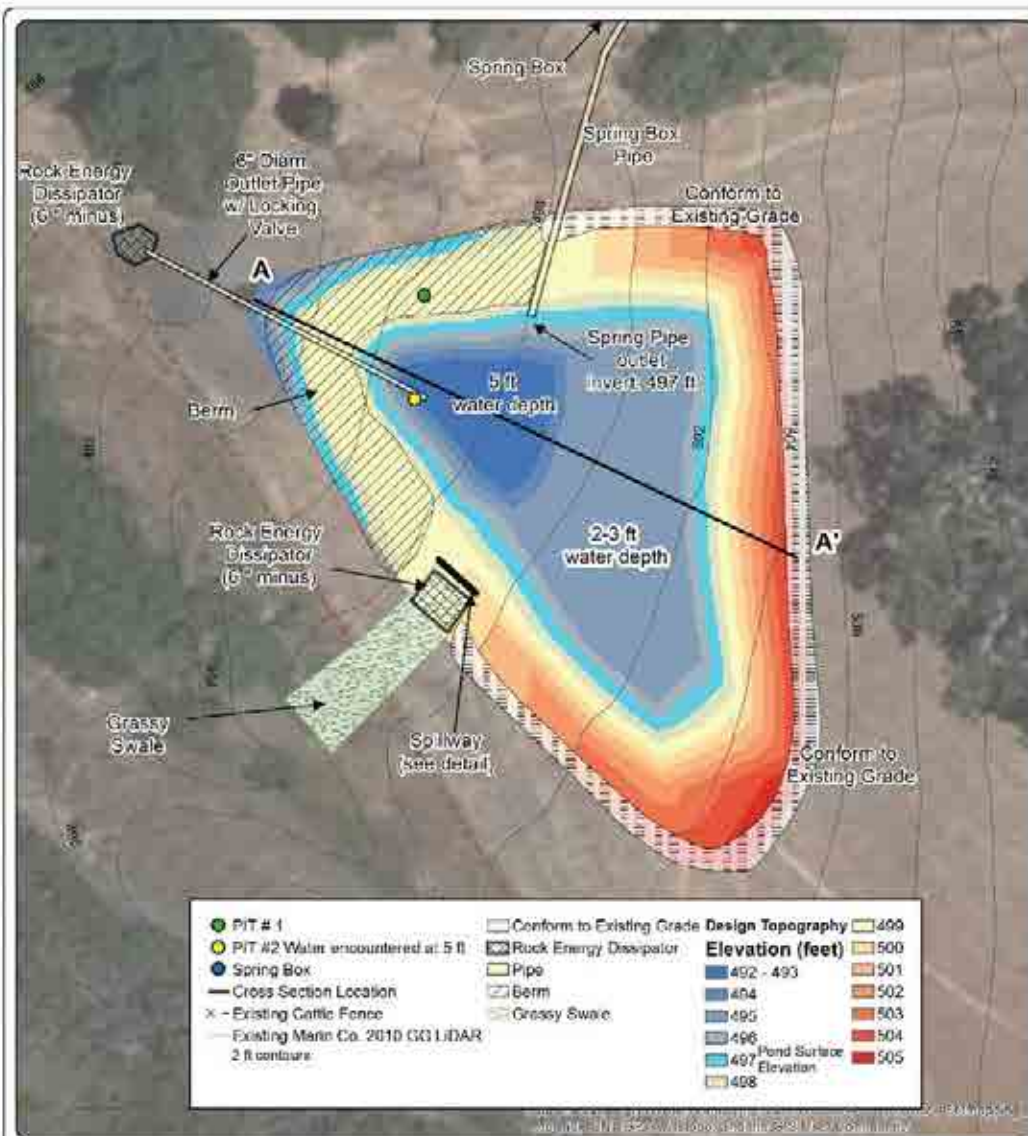




# Design



# Design



## Frog Pond #1 Design

Mt. Burdell Open Space Preserve, Marin County Parks



Path: \\S:\Projects\1016\Projects\1016\RA\_L1E\_CAD\Plan\2016Mar\1016\_Frog\_Pond\_Design.mxd





# Permits



California Department of  
Fish and Wildlife



# Construction Plan

- Biological monitor
  - Frog surveys prior to work
    - Potentially have exclusion fencing
  - Bird surveys
- What about extra soil?
  - Use on-site to cover invasive star-thistle
  - Use in Stafford Lake bike park





# Monitoring Plan

- Monitor for:
  - Egg masses
  - Native vegetation
  - Invasive species
- Opening up to cattle (work with rancher)



**Point Blue**<sup>™</sup> Conservation science  
for a healthy planet.<sup>™</sup>



# Next Steps

- Acquiring permits
- Constructing outside of rainy season (road was a creek during winter)
- Outside of cattle grazing (Jan – May/June)
- Planning on constructing in June 2018





ONE  
TAM

**TAM'S WILD SIDE**  
MT. TAM WILDLIFE SYMPOSIUM

OCTOBER 26, 2017