

Monitoring Physical and Biological Response to Barrier Removal

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NOAA's Fish Passage Monitoring

■ “Tier 1”

- Was the project built as designed?
- Does the site meet fish passage criteria?
- Fish Presence/absence upstream before and after the project
- Did it remove a safety hazard?
- Did it change recreational opportunities?
- Did it change annual maintenance costs?

■ “Tier 1” worksheet for projects

NOAA's Fish Passage Monitoring

- “Tier 2” Monitoring
 - Biological, physical
 - Long-term
- “Tier 2” questions
 - Before and after barrier removal
 - Is there a spatial or temporal change in
 - spawner abundance
 - juvenile abundance
 - Juvenile and spawner distribution
 - Habitat

“Tier 2” methods

- Winter Spawner Surveys
- Juvenile abundance and distribution surveys
 - Summer and (sometimes) winter
 - E-fishing, go-pro underwater camera, snorkel, outmigrant trapping
- Habitat characterization (habitat typing)
 - Flow measurements
 - Spawning substrate characterization
 - Rearing habitat characterization

“Tier 2” Project Sites

■ Completed

- Glenbrook Gulch (Mendocino)
- Frykman Gulch (Mendocino)
- Ryan Creek (Mendocino)
- Willow Creek (Sonoma)
- Hostler Creek (Trinity)
- Little Browns Creek (Trinity)

■ Future

- Quarry Creek (Humboldt)
- Essex Gulch (Humboldt)
- Fish Creek (Humboldt)

“Tier 2” monitoring avenues

- Funds for monitoring built into project grant
- NOAA Restoration Center contract with Ross Taylor and Associates
- Project proponent monitoring
- Larger watershed monitoring
 - DFW
 - UC Cooperative Extension

Glenbrook Gulch Dam Removal

- Small Tributary to the Albion River in Mendocino County
- Earthen Dam owned by CA State Parks
- Total Barrier- no fish presence upstream prior to project
- Fish presence immediately downstream
- .66 miles of blocked habitat upstream
- Ross Taylor and Associates conducting channel response and fish re-colonization study



Glenbrook Gulch 12/9/10 Spawner Survey



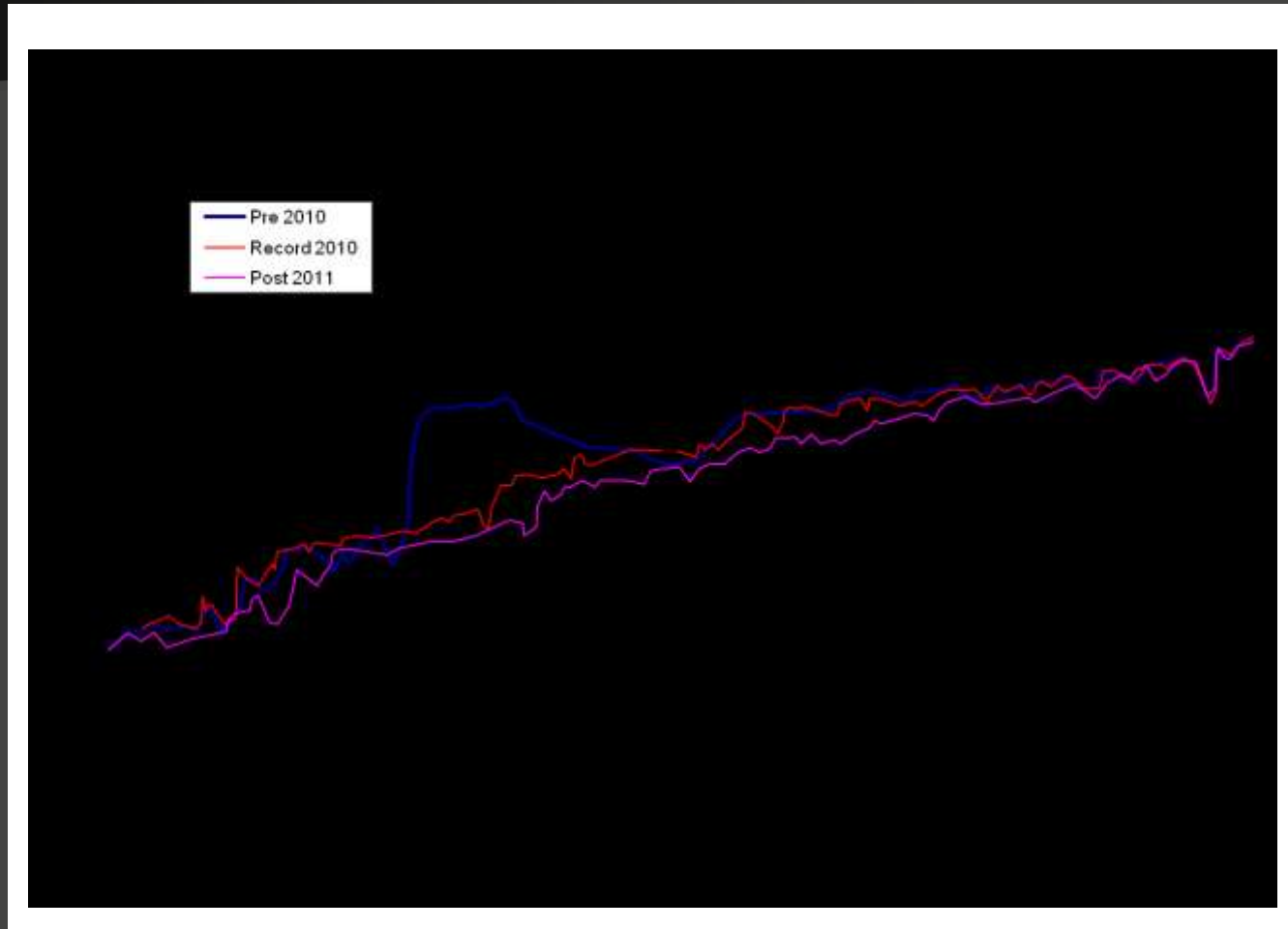
Photo: Ross Taylor

Glenbrook Gulch 3/22/12 Spawner Survey



Photo: Ross Taylor

Channel Monitoring



Graph courtesy of: Ross Taylor and Associates

Glenbrook Gulch Results

- Increase in Spawning substrate
- Coho juvenile re-colonization immediately after removal
- Increase in juvenile distribution upstream over first 3 years
 - Year 1- 800ft
 - Year 2- 950 ft
 - Year 3- 1250 ft
- 3rd winter spawners upstream

Coho Redd In Glenbrook Gulch



Photo: Ross Taylor

Ryan Creek Barrier Removals

- Mendocino County Culvert
- Tributary to the Eel River, Outlet Creek
- Longest Run of coho salmon in California
- Only one brood year of coho
- 440 coho juveniles relocated during county crossing construction 2011



Photo: Christine Jordan

Ryan Creek Barrier Removals



New bottomless arch culvert



Habitat in Ryan Creek

Chinook Salmon upstream of barrier 1 week after project completion



Ryan Creek Barrier Removals

- Chinook observed “passing” through bottomless arch immediately after removal
- Coho return in winter 2013-2014
 - 35 total redds in project reach
 - 6 redds upstream of barrier sites
- <https://www.youtube.com/watch?v=k80s0hjPYk8>

Hostler Creek Dam Removal

- Tributary to Trinity River
- Hoopa tribe project lead
- 2 miles blocked
- 14ft. dam removed in 2012
- only steelhead upstream pre-project



Hostler Creek Dam Removal

- Now steelhead, chinook, coho rearing upstream of barrier site
- Initial survey 32 juvenile coho in first 0.75 miles=> rough extrapolate to 1.5 miles = 128 juvenile coho
- Est. over 100 of chinook juveniles
- Est. 2000 steelhead outmigrants (from fyke trap above barrier)

Willow Creek Bridge Replacement

- Tributary to the Lower Russian River, Sonoma County
- Important for Russian River broodstock program and recovery of Russian River coho
- Road Crossing barrier
- Documented total barrier to fish passage
- Owned by CA State Parks
- Blocked ~6 miles habitat for coho and steelhead
- Removed and Replaced with a clearspan bridge in summer 2011



Willow Creek Crossing before replacement

Willow Creek Bridge



Willow Creek habitat



Willow Creek Barrier Removal

- Spawner Surveys conducted first winter after barrier removal(2012)
- 10 adult salmonids observed upstream of the barrier site in winter 2012-2013
 - 5 coho jacks with clipped adipose fins (Russian River Broodstock)
 - 5 wild male steelhead
 - 2 steelhead redds
- Juvenile coho released from broodstock observed throughout stream
- Continued monitoring by Russian River Broodstock program

Essex Gulch

pre-project monitoring

- Caltrans/County/private barrier complex
- Tributary to Mad River
- 4 miles of habitat blocked
- 2014 monitoring (Ross Taylor)
 - Documented ample flow even during drought
 - Habitat is high quality
 - 29 coho and 32 cutthroat in 3 pools downstream of barrier
 - Very low numbers of cutthroat upstream, 0 coho

Ideas for Discussion

Monitoring Fish Response

- Presence/Absence before and after barrier removal
 - Simple/Inexpensive
 - best for project sites that are total barriers to passage (no fish upstream)
 - Observations fish passing through previous barrier site
- Determining Re-colonization rates and distribution
 - Can be determined with winter spawner and summer juvenile surveys before and after project
 - Important to map distribution over time
 - Long-term (several years pre-and post project)
- Determining effects on the watershed population
 - Challenging, few opportunities
 - trapping and estimating fish abundance at multiple locations at a reach or site scale, and at a watershed scale to determine the proportion being contributed by newly available habitats.
 - Best in watersheds where there is large status and trend monitoring program
- Also important to monitor physical variables such as available habitat, habitat quality (e.g., pool number, frequency, LWD), channel slope and substrate type
- Common Restoration Technique, but few studies of fish response published in the scientific literature

NOAA Considerations for choosing barrier removal monitoring sites

- Choose sites that:
 - are total barriers, or that have multi-year datasets on fish numbers upstream and downstream
 - are likely to have flow during drought years
 - fit into ongoing population monitoring programs
- Choose sites with high quality habitat upstream (or improve habitat as part of barrier removal project)
- Choose sites with documented fish use just downstream
- Utilize qualified professionals so that data are defensible, and can be shared