



California Fish Passage Forum - Fish Passage Monitoring Methods

Ross Taylor and Associates (RTA)

Monitoring Methods – Task List

- **Task #1** - Summarize the Current Extent of Fish Passage Monitoring in California.
- **Task #2** - Investigate and summarize fish passage monitoring methodologies in use.
- **Task #3** - Develop or recommend methods for adoption by the Fish Passage Forum
- **Task #4** - Complete a final report that includes the three previously mentioned tasks.

Task #1 – Current Monitoring in CA.

- 1) Developed questionnaire in Adobe FormsCentral.**
- 2) Distributed via email.**
- 3) Six week response time.**
- 4) Collected information on 36 passage projects.**

Section 1: Fish Passage Project Information

- Project PAD ID#.
- Project latitude and longitude in decimal degrees.
- Project location – county, watershed, sub-watershed, stream name.
- Project ownership.
- Target fish species and life stages.
- If applicable, watershed or recovery plan(s) that project addresses.
- Type of fish passage project – stream crossing (retrofit, replacement with bridge, stream simulation, hydraulic design, or road removal); channel grade change (roughened riffle, weirs, or designed fishway); dam removal, or modification of natural barrier.
- If a retrofit, describe type what was done.
- Project contact – name, organization, phone number, and email address.
- Completion date of fish passage project.

Section 2: Fish Passage Monitoring Information

- Monitoring contact – name, organization, phone number and email.
- Funding source(s) to conduct project monitoring.
- Location information (select one choice) – at project site only, within adjacent channel reach only, or at both project site and within adjacent channel.
- Location information – in applicable, length of channel reach.
- Location information – latitude and longitude in decimal degrees of the channel reach start and end points.
- Was pre-project monitoring conducted – yes or no?
- If “yes”, what types of pre-project monitoring were conducted?
Select from: photo point documentation, channel survey (longitudinal profiles, cross sections, pebble counts); biological (juvenile distribution, presence/absence, out-migrant trapping, or adult spawner surveys); other (respondent could then describe “other”).

Section 2: Fish Passage Monitoring Information

- Describe types of post-project monitoring conducted – same choices as previously listed.
- Status of project monitoring? Select from: completed, on-going, planned).
- If completed, what were the start and end dates of monitoring?
- What methods or protocols were used to conduct project monitoring?
- Are monitoring results available? If “yes”, please provide PDFs of results or Internet links.

Task #1 – Survey Results

By County, respondents were monitoring fish passage projects completed in:

Humboldt (4 projects)

Trinity (1 project)

Mendocino (9 projects)

Marin (3 projects)

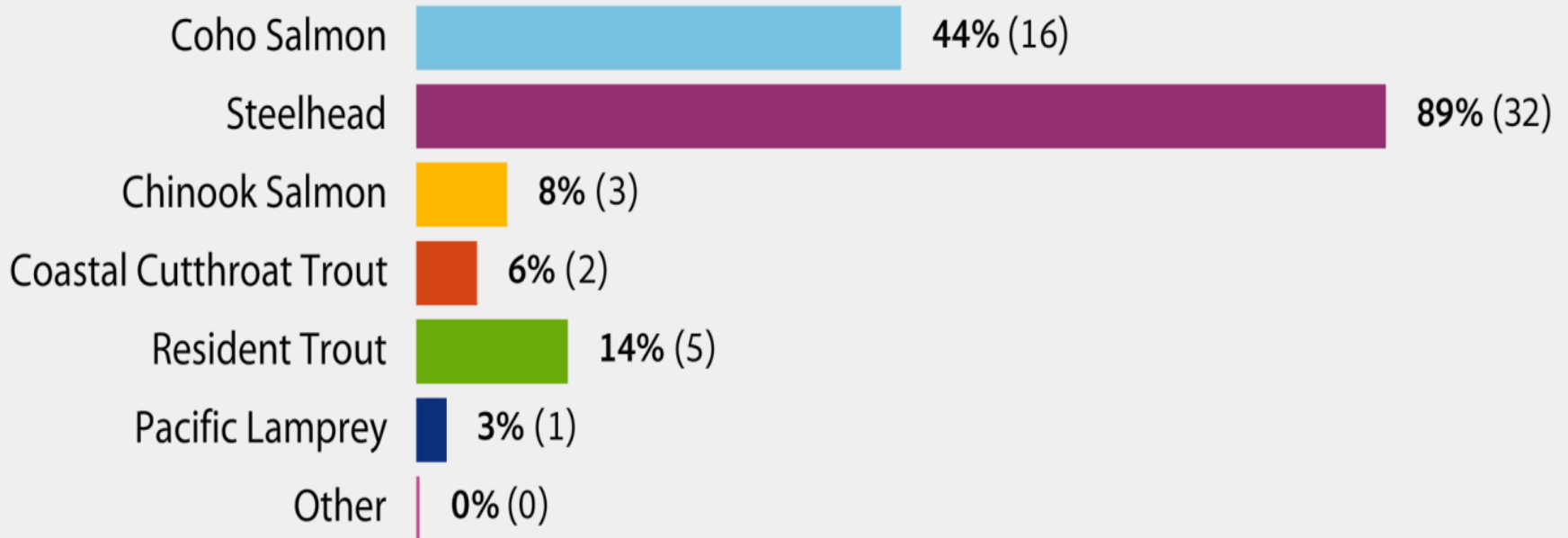
Santa Cruz (9 projects)

San Luis Obispo (1 project)

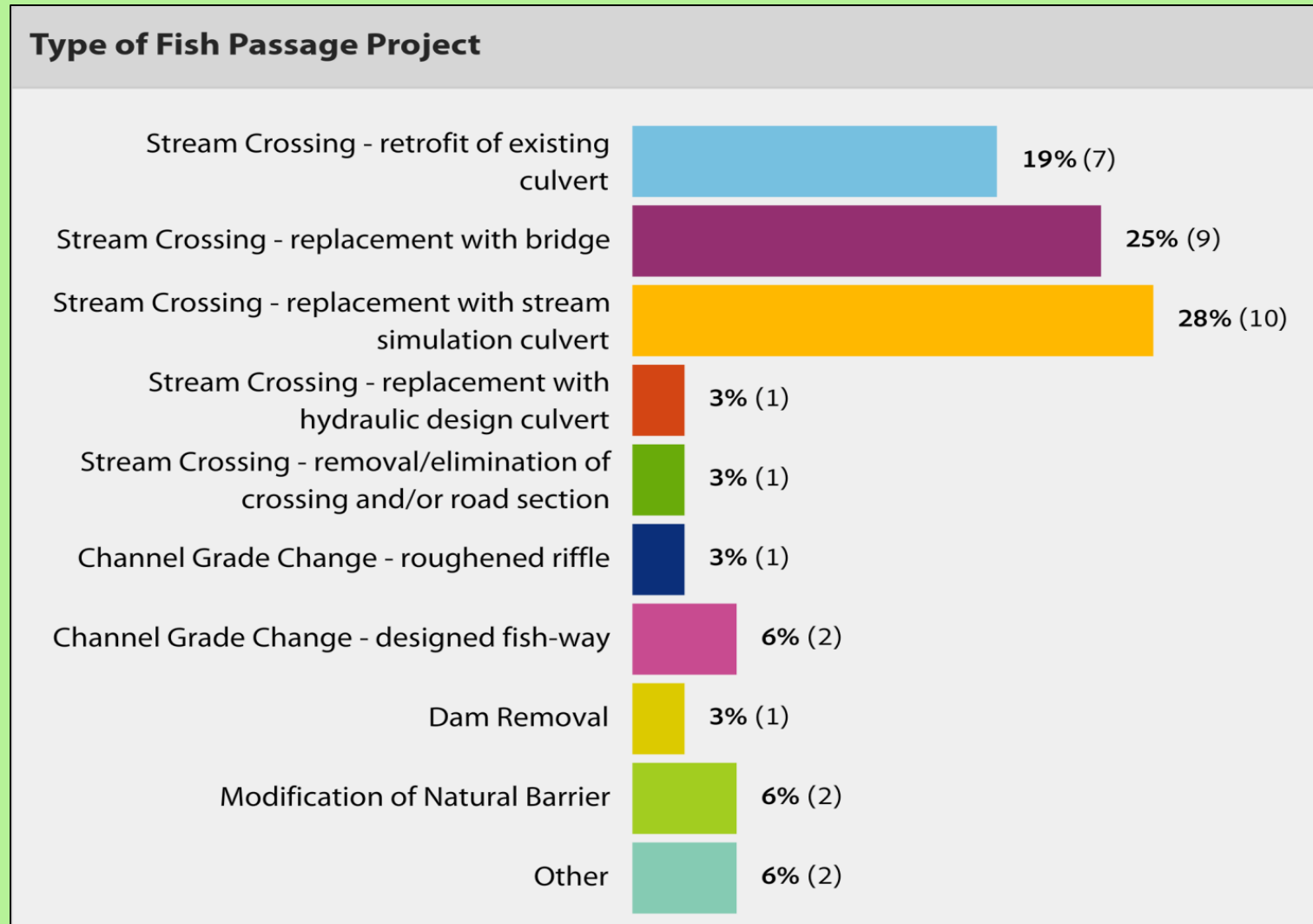
Santa Barbara (9 projects)

Task #1 – Survey Results

Project's Target Fish Species



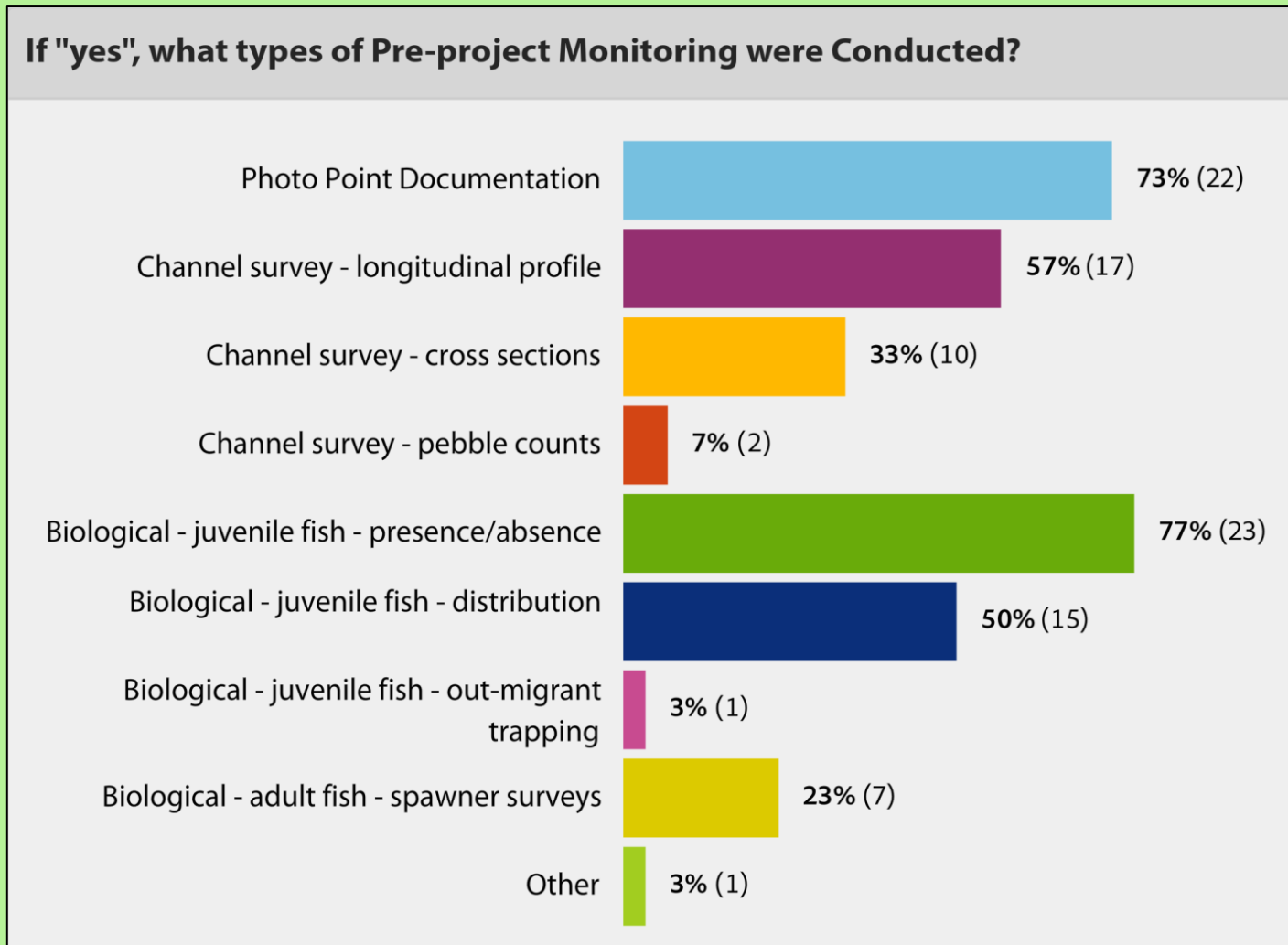
Task #1 – Survey Results



The two projects in the “other” category = modifications of a streamflow gauging station and removal of a sewer line and its concrete encasement .

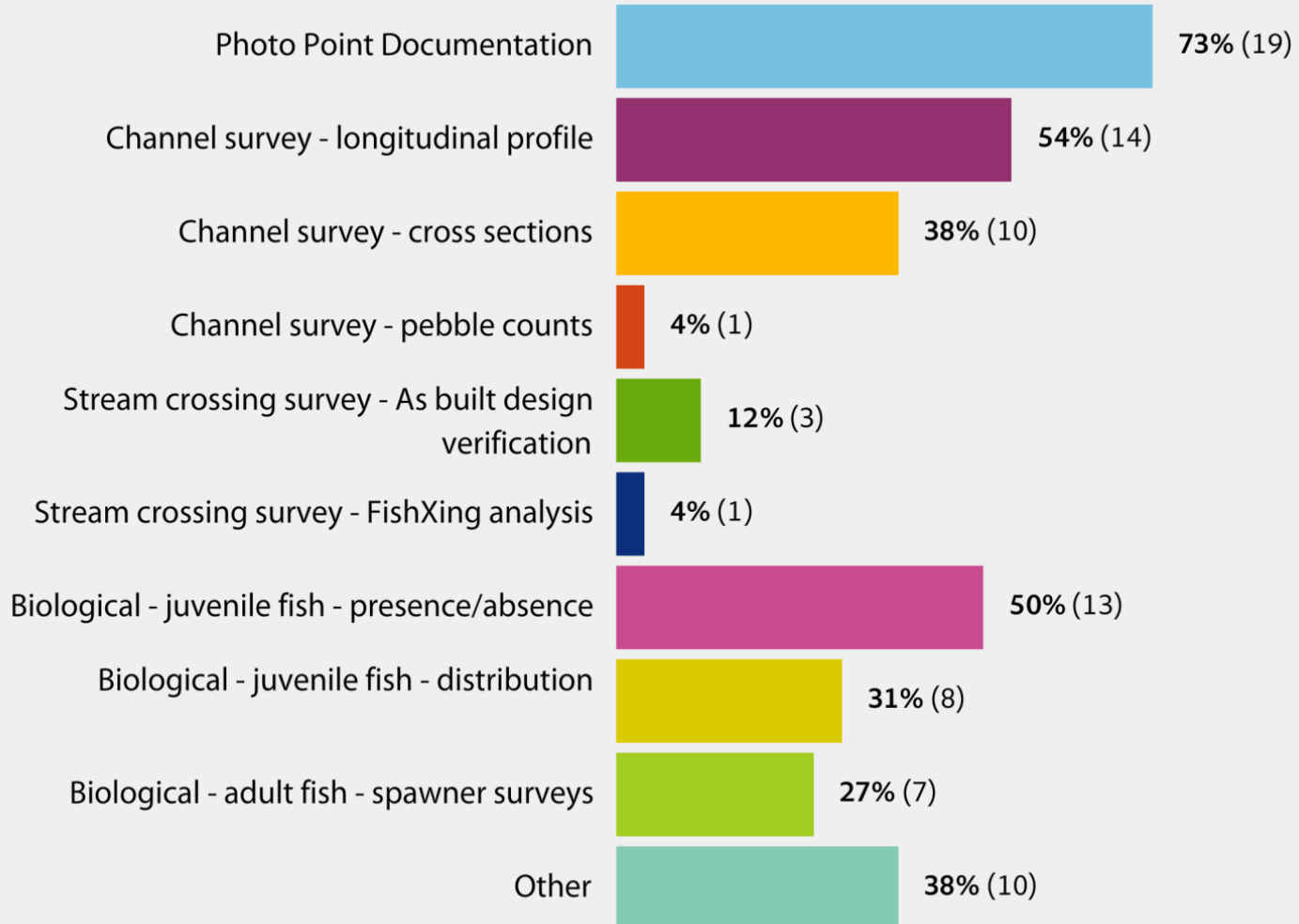
Task #1 – Survey Results

Pre-project and post-project monitoring was conducted for 28 of the 36 projects; for the remaining eight projects only post-project monitoring was conducted.



Task #1 – Survey Results

What types of Post-Project Monitoring were Conducted?



Task #1 – Survey Results

Respondents to the questionnaire employed a range of methods to conduct their fish passage monitoring; with several methods or protocols cited frequently.

Channel/cross section surveys and pebble counts:

Harrelson, C.C.; C.L. Rawlins, and J.P. Potyondy. 1994. Stream channel reference sites: an illustrated guide to field techniques. USFS General Technical Report RM-245. 61 pp.

Harris, R.R. 2005. Monitoring the effectiveness of culvert fish passage restoration. CDFG Salmon and Steelhead Restoration Account Agreement # P0210566: 28 pp.

Kocher, S.D. and Harris, R.R. 2005. Qualitative monitoring of fisheries habitat restoration. University of California, Center for Forestry, Berkeley, CA. 166 pp.

Task #1 – Survey Results

Streamflow Measurements:

Woodward, M.E. 2013. Standard operating procedure for discharge measurements in wadeable Streams in California, CDFW-IFP-002. 24 pp.

Adult Salmonid Spawner Surveys:

Duffy, W.G. 2006. Protocols for monitoring the response of anadromous salmon and steelhead to watershed restoration in California. CDFG, Salmon and Steelhead Trout Restoration Account, Agreement #P0210565. 92 pp.

Flosi, G., S. Downie, M. Bird, R. Coey and B. Collins. 2002. California salmonid stream habitat restoration manual, Volume II. Native Anadromous Fish and Watershed Branch, CDFG, Sacramento, California. Part IV: Fish Sampling Methods.

Task #1 – Survey Results

Juvenile Salmonid Surveys:

Duffy, W.G. 2006. Protocols for monitoring the response of anadromous salmon and steelhead to watershed restoration in California. CDFG, Salmon and Steelhead Trout Restoration Account, Agreement #P0210565. 92 pp.

Flosi, G., S. Downie, M. Bird, R. Coey and B. Collins. 2002. California salmonid stream habitat restoration manual, Volume II. Native Anadromous Fish and Watershed Branch, CDFG, Sacramento, California. Part IV: Fish Sampling Methods.

Lockwood, Roger N. and J. C. Schneider. 2000. Stream fish population estimates by mark-and-recapture and depletion methods. Chapter 7 in Schneider, James C. (ed.) 2000. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.

Zippin, C. 1956. The removal method of population estimation. Journal of Wildlife Management 22:82-90.

Task #2 – Investigation of Fish Passage Monitoring Methods and Protocols

To complete this task, a literature search was conducted to gather published fish passage monitoring methods and protocols.

The literature review also focused on peer reviewed journal articles regarding the monitoring of barrier removals, specifically the methods and results sections.

Task #2 – Investigation of Fish Passage Monitoring

Methods and Protocols

Allibone, R. 2000. Fish population and fish passage monitoring for Orokonui Creek, Otago. *Conservation Advisory Science Notes #304*, Department of Conservation, Wellington, New Zealand. 8 pp.

Armstrong, G.S., M.W. Aprahamian, G.A. Fewings, P.J. Gough, N.A. Reader and P.V. Varallo. 2010. Environment Agency fish pass manual: guidance on the legislation, selection and approval of fish passes in England and Wales. Almondsbury, Bristol, UK. 369 pp.

Collins, M., K. Lucey, B. Lambert, J. Kachmar, J. Turek, E. Hutchins, T. Purinton and D. Wells. 2007. Stream barrier removal monitoring guide. Gulf of Maine Council on the Marine Environment. 85 pp.

Crawford, B.A. 2011. Protocol for monitoring effectiveness of fish passage projects (culverts, bridges, fishways, logjams, dam removal, debris removal). Washington Salmon Recovery Funding Board, MC-1. 36 pp.

Task #2 – Investigation of Fish Passage Monitoring

Methods and Protocols

Duffy, W.G. 2006. Protocols for monitoring the response of anadromous salmon and steelhead to watershed restoration in California. CDFG, Salmon and Steelhead Trout Restoration Account, Agreement #P0210565. 92 pp.

Harris, R.R. 2005. Monitoring the effectiveness of culvert fish passage restoration. CDFG Salmon and Steelhead Restoration Account Agreement # P0210566: 28 pp.

Kocher, S.D. and Harris, R.R. 2005. Qualitative monitoring of fisheries habitat restoration. University of California, Center for Forestry, Berkeley, CA. 166 pp.

O’Neal, J. and R. Scranton. 2014. BPA-MBACI protocol for monitoring the effectiveness of partial barrier projects. Bonneville Power Administration. 54 pp.

Pess, G., J. Drake, P. Roni and T. Beechie. 2011. Characterizing stream morphology and habitat characteristics using a modified thalweg profile for full barrier removal projects. NOAA Fisheries, Northwest Fisheries Science Center. 8 pp.

Task #2 – Investigation of Fish Passage Monitoring

Methods and Protocols

- Regionally, there was general recognition that fish passage project monitoring is important to the success of future projects. Pre-project information was also widely acknowledged as vital to a comprehensive monitoring program.
- Regionally, the varying types of migration barriers and target fish species influenced both treatments and monitoring parameters.
- Most of the existing methods have overlaps and similarities in their approaches to monitoring performance of fish passage projects. For example, nearly all of the approaches to measuring channel thalweg profiles default back to Harrelson et al (1994).
- Many peer-reviewed papers were focused on fish passage successes and documented failures were less common. However, several papers described failures as well as unintended consequences as a result of implementing fish passage projects. Case studies, such as those presented on the FishXing website, that include “lessons learned” sections are valuable in presenting project challenges and failures.

Task #3 – Development of Methods and Protocols

Tier #1 Monitoring Methods:

Tier #1 methods should entail the use of checklists and photo points to quickly and inexpensively monitor the status of recently completed fish passage projects.

RTA recommends that the Fish Passage Forum adopt CDFW's FRGP project checklist (for fish passage) found in Kocher and Harris (2005).

NOAA Restoration Center's Fish Passage Barrier Removal Performance Measures and Monitoring Worksheet.

Task #3 – Development of Methods and Protocols

Tier #2 Monitoring Methods:

Tier #2 methods require resources and expertise beyond the Tier #1 checklists.

These methods should allow for evaluation of the project, the adjacent stream channel, and the biological response of target fish species and age classes.

RTA recommends that the Fish Passage Forum consider use of the following methods which were selected from methods presented earlier in this report.

Channel profile and Cross Sections:

Performance of New Crossing:

Biological – Juvenile Fish Distribution

Biological – Juvenile Fish Abundance

Biological – Adult Spawner Distribution

