Northwest Power and Conservation Council

September 4, 2013

MEMORANDUM

TO: Full Council

FROM: Nancy Leonard

SUBJECT: What we know and do not know about salmon habitat restoration

Dr. Phil Roni is the Research Biologist/Watershed Program Manager at the Northwest Fisheries Science Center with NOAA Fisheries. His research team consists of about 20 scientists working on habitat science and watershed ecology, who for the last 18 years, have concentrated on evaluating various habitat restoration techniques and providing guidance on restoration prioritization and implementation. His work and expertise in the field of aquatic fish habitat restoration is recognized nationally and globally. The United Nations Food and Agriculture Organization (FAO) Fisheries Department sought out Dr. Roni to produce an FAO Fisheries Technical Paper in 2005 about the effectiveness and guidance for rehabilitation of freshwater ecosystems. The American Fisheries Society and the U.S. President also recognized him for his contributions to restoration science. He has published numerous papers on restoration including the books "Stream and Watershed Restoration: a guide to restoring riverine processes and habitat" (2013 Wiley-Blackwell) and "Monitoring Stream and Watershed Restoration" (2005 American Fisheries Society).

Jason Sweet is the manager of the Policy and Planning group within the Bonneville Power Administration's (BPA) Fish and Wildlife Division. He supervises a staff of professional biologists, engineers, and policy analysts whose work includes preparing biological assessments related to the operation of the Federal Columbia River Power System; analyzing and reporting on BPA's implementation of biological opinions for Endangered Species Act-listed salmonids; and helping implement BPA's broader fish and wildlife mitigation responsibilities under the Northwest Power Act, which covers non-ESA-listed fish and wildlife species in addition to listed species. In previous positions with BPA, Mr. Sweet worked on research, monitoring, and evaluation programs related to habitat restoration efforts. He was also BPA's technical lead for fish passage improvement to improve the survival of ESA-listed salmonids as they pass Columbia and Snake river dams. Prior to joining BPA, he worked in a variety of field-based jobs performing survival studies of fish passing Northwest dams and hydro-acoustic evaluations of a

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wide variety of fish species throughout the Pacific Northwest and Alaska. He recently presented to the Council and the ISRP about Bonneville's programmatic approach to monitoring habitat actions and how the CHaMP, ISEMP, IMWs, and project level action effectiveness work integrate together (see January 8th FW Committee agenda for more details).

Dr. Roni will lead us in a discussion about the current state of knowledge about the effectiveness of salmon habitat restoration actions.

Dr. Roni and Jason Sweet will also briefly address the current efforts to refine action effectiveness monitoring under the Program.

Effectiveness of Common Habitat Restoration Techniques

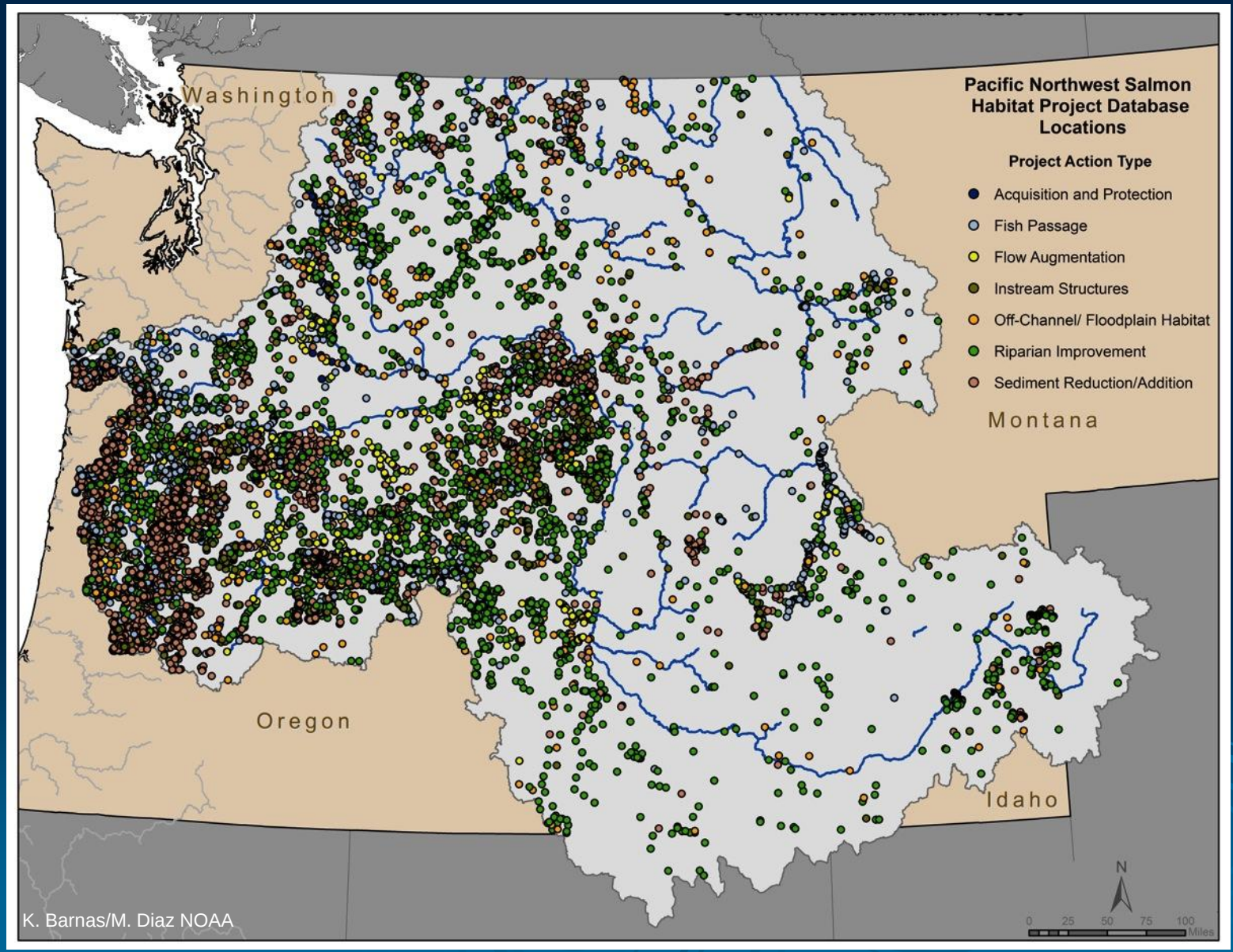

J McMillan photo


J McMillan photo

Phil Roni
Watershed Program
Northwest Fisheries Science Center
Seattle, Washington

NOAA FISHERIES

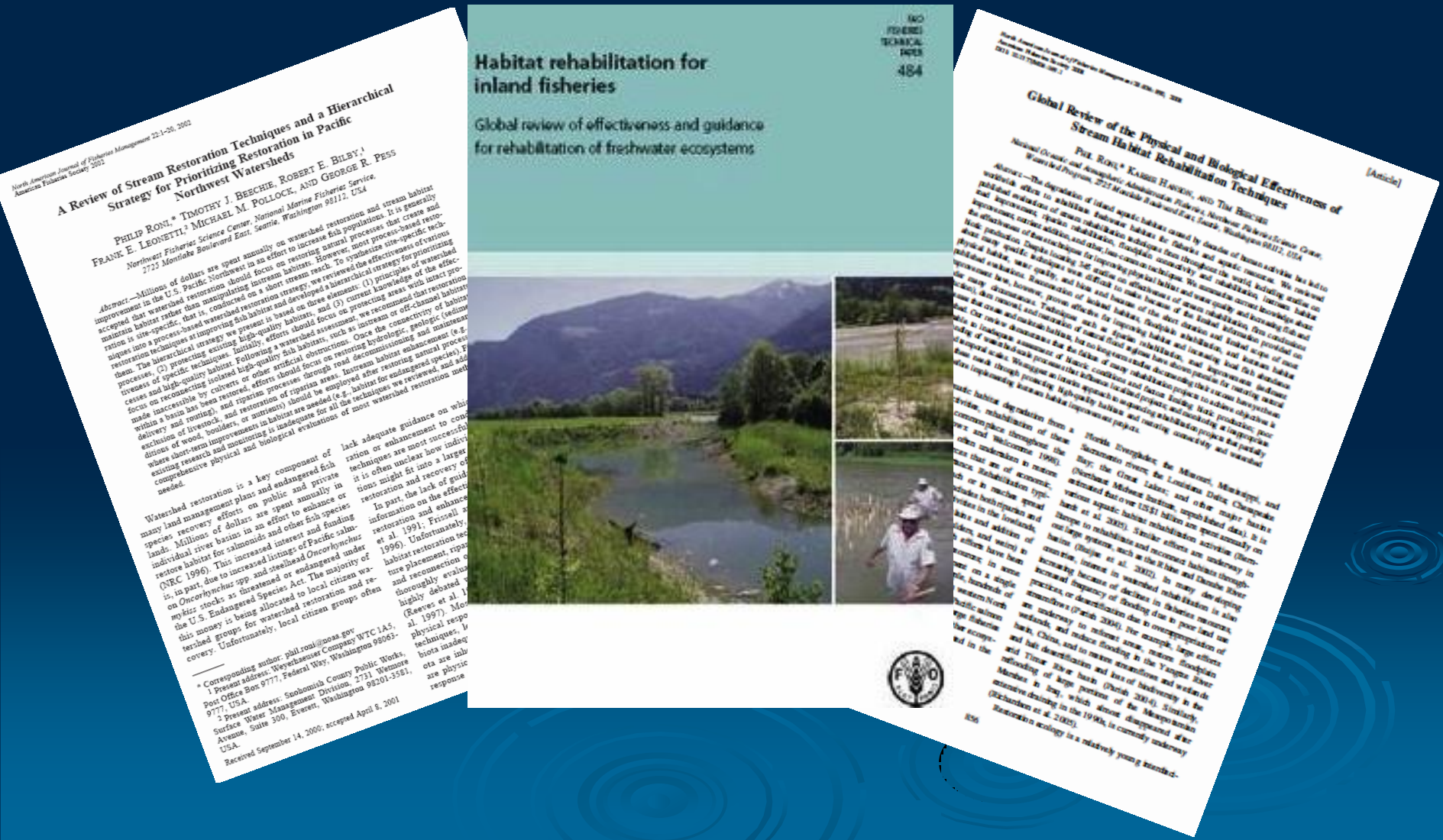
1,000s of Projects Implemented



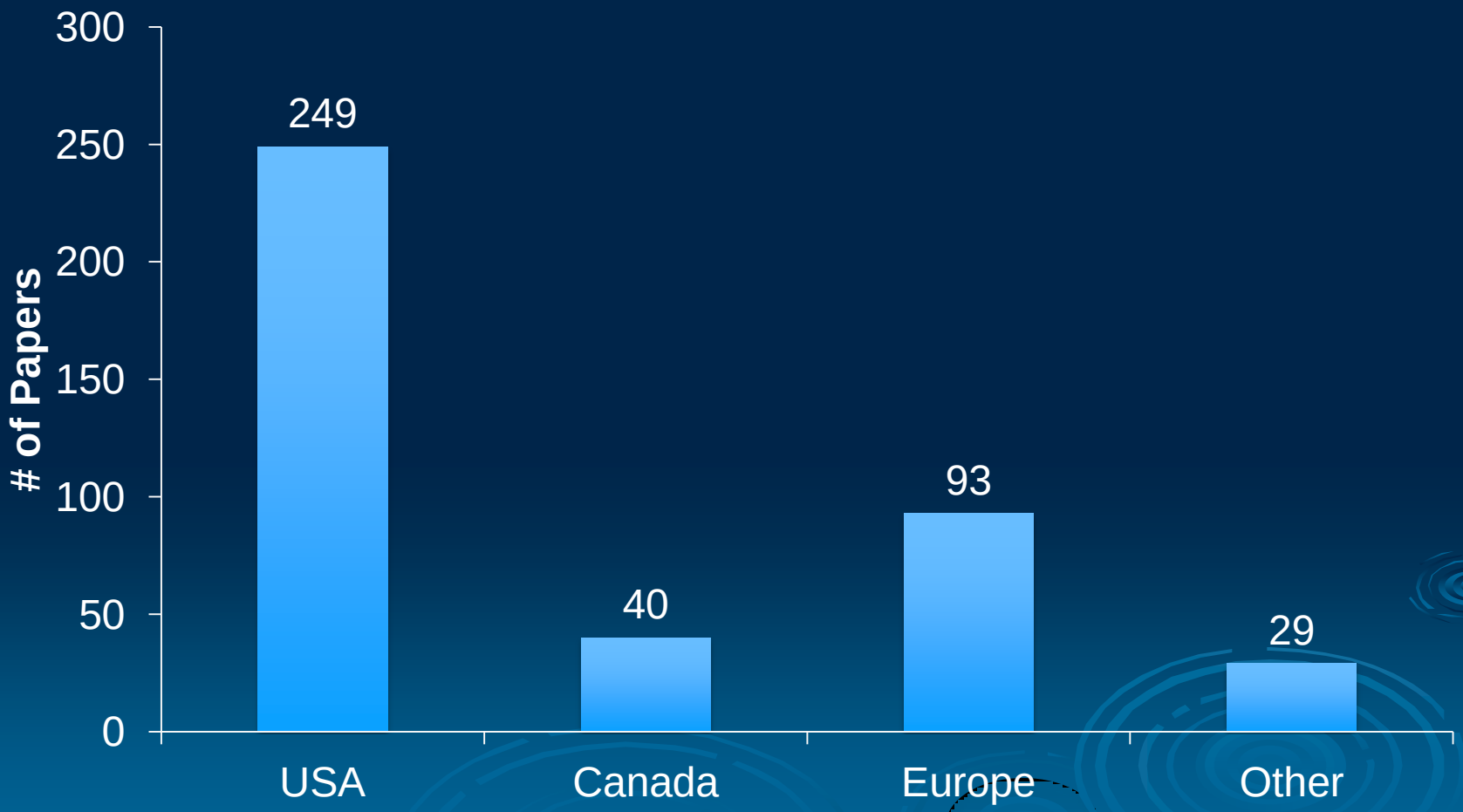
Considerable Debate

- Physical response?
- Biological response (fish)?
- How much is needed?
- Where is it effective?

Review of Literature

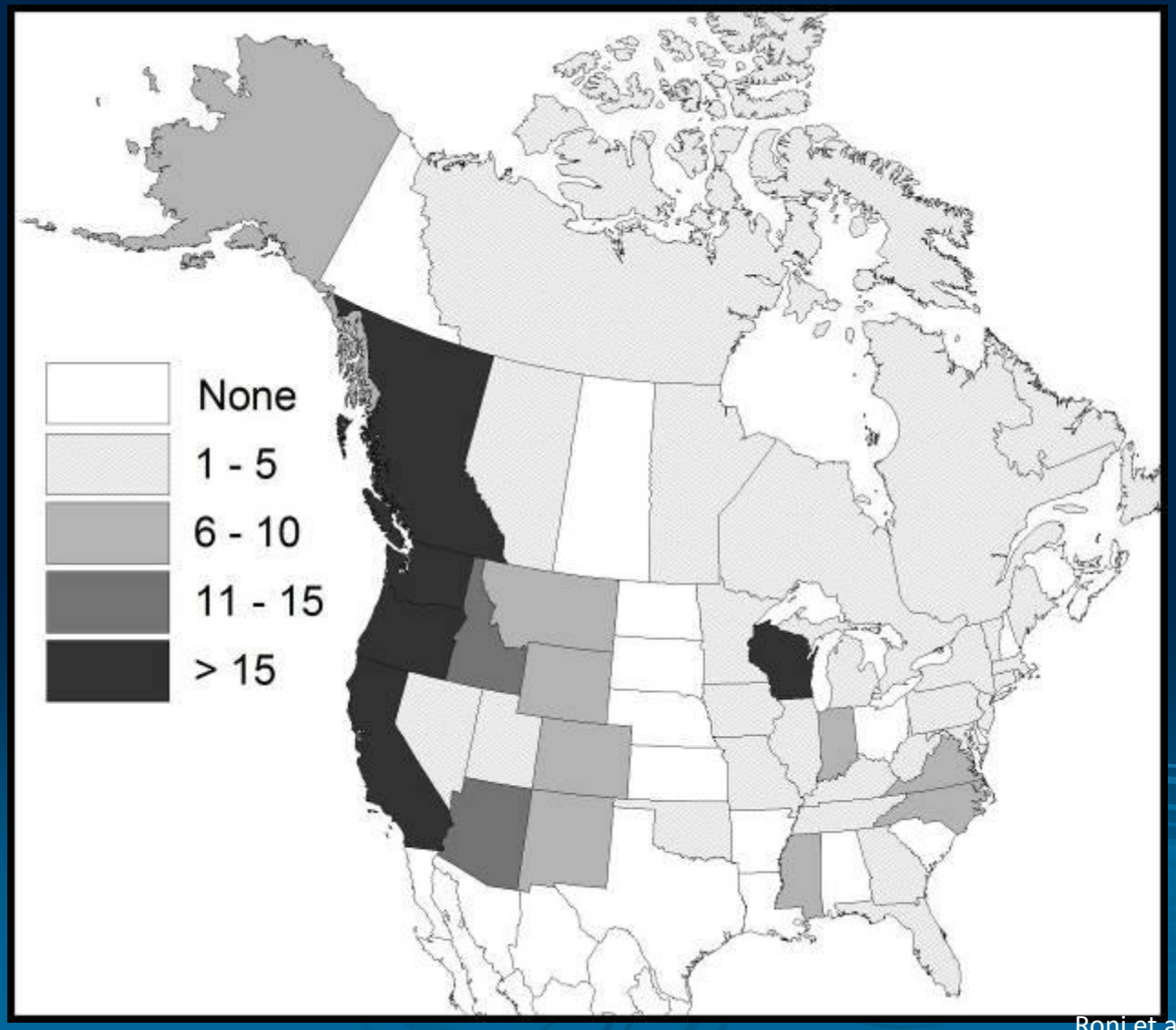


Total Published Evaluations of Stream and Watershed Restoration



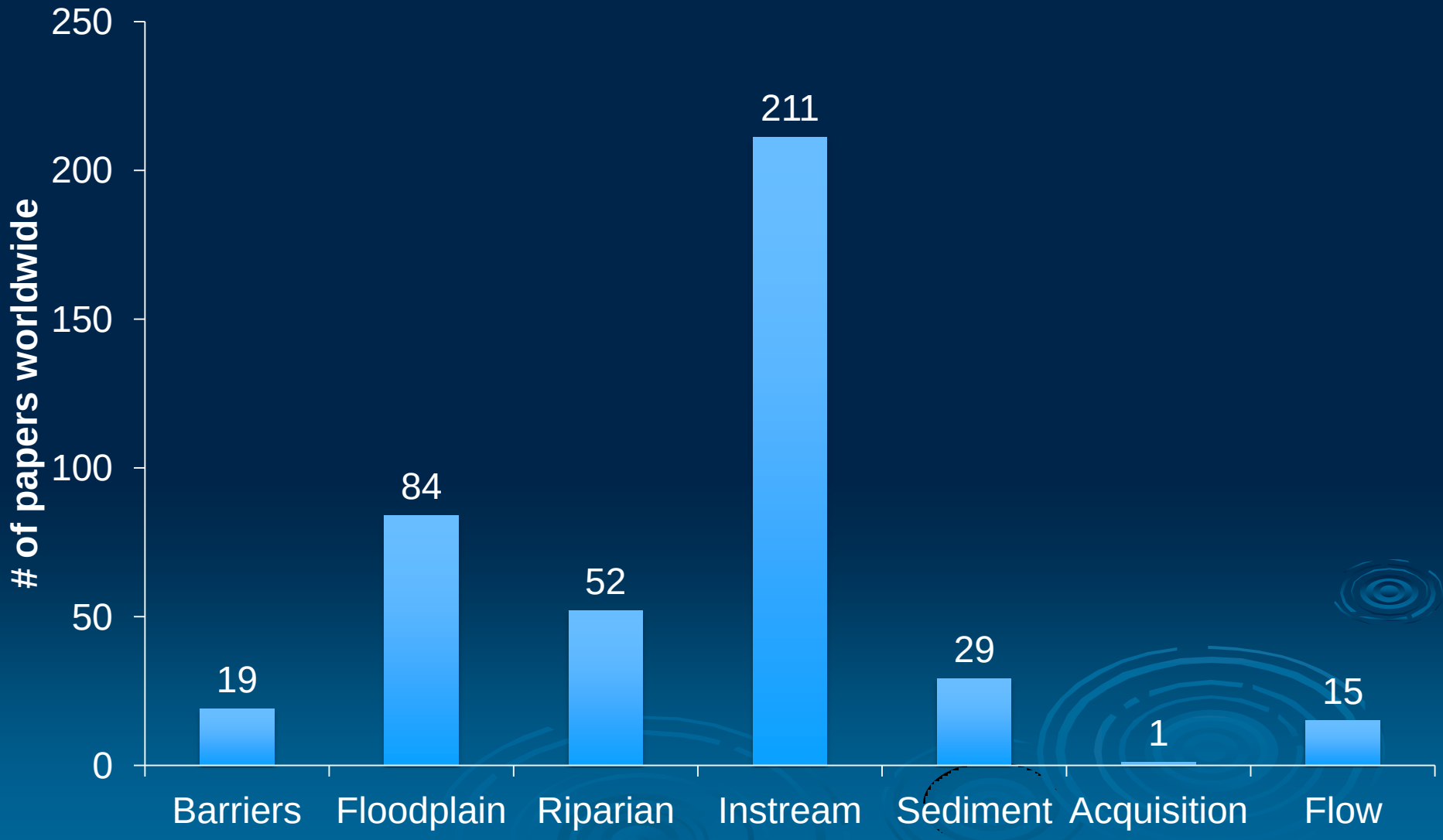
Roni et al. 2005, 2008

Published Studies Evaluating Restoration



Roni et al. 2008

Major Categories of Actions

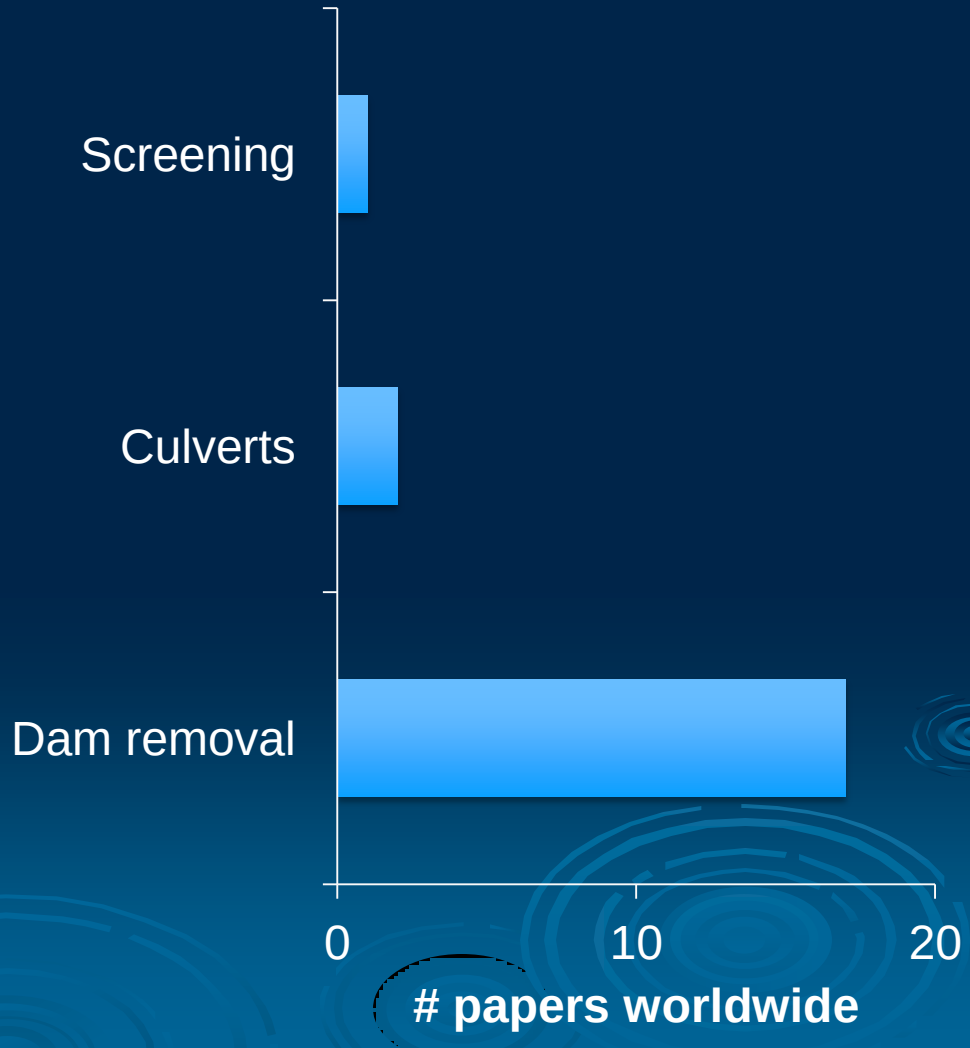


Goals for Today

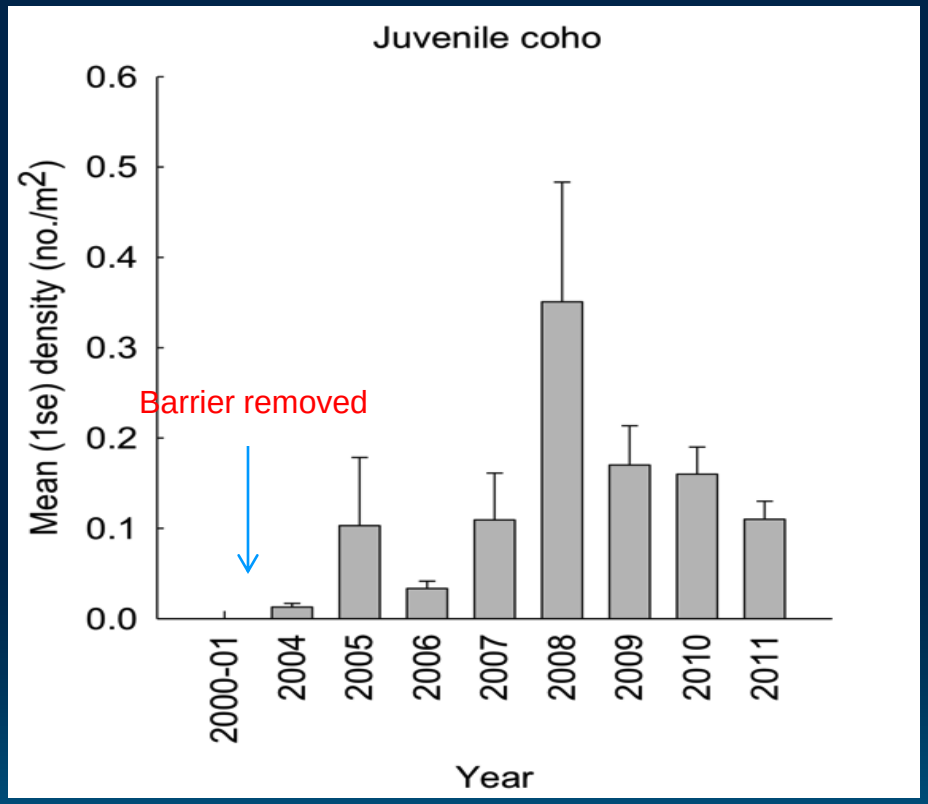
- Summary of
  - What we know
  - What we still need to know
  - What affects success
- Recommendations for Council's F&W Prgm.
- BPAs Programmatic Approach

Barriers to Fish Passage


T. Bennett NOAA photo



Summary Barrier Removal



Barrier removed on Cedar River
Kiffney et al. 2008; Kiffney et al. in prep

What we know

- Rapid recolonization
- Some don't meet passage success criteria
- Surprisingly few studies on fish response to culverts

Success depends upon

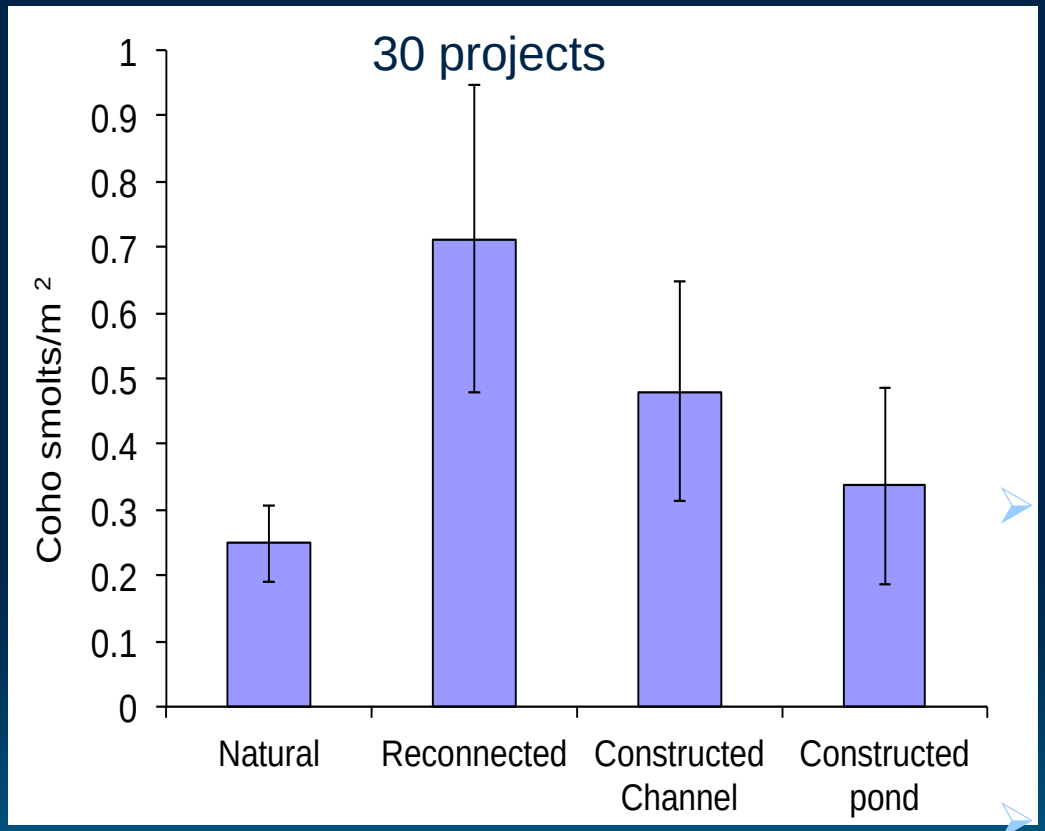
- Nearby fish populations size
- Design and maintenance

What we need to know

- Fish response

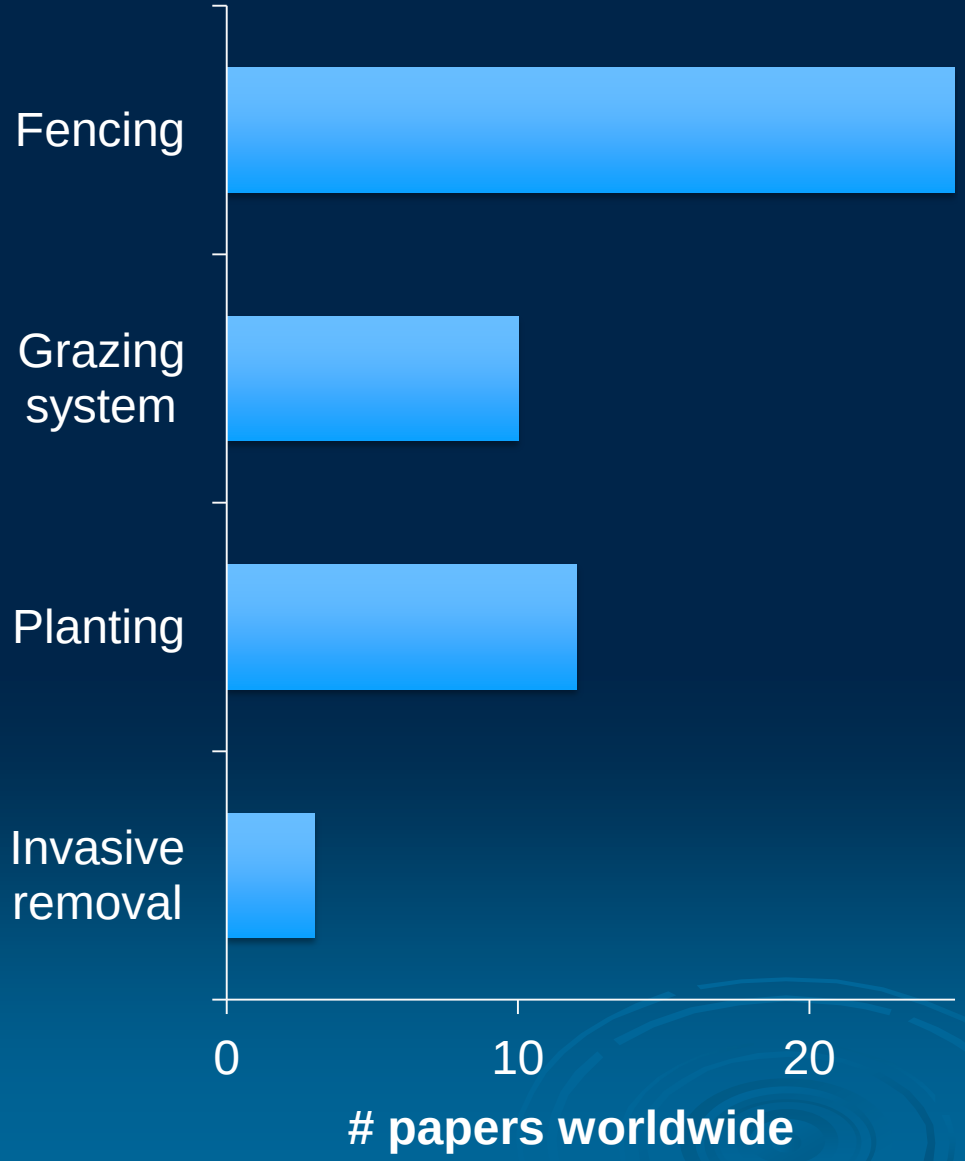
Floodplain Restoration

Summary of Floodplain Effectiveness



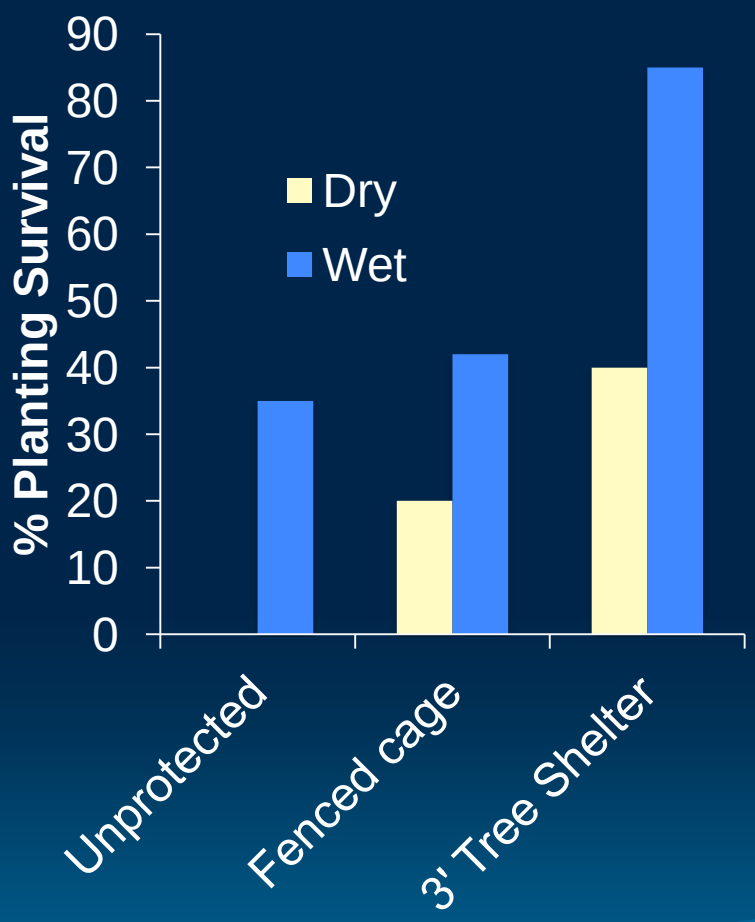
- What we know
  - Reconnecting existing habitats highly successful
  - Other techniques show variable success rates
  - Little long-term monitoring
  - Good data for coho
- Success depends on
  - Access, WQ, sediment
  - Design issues
- What we need to know
  - Response of Chinook & steelhead

Riparian - Planting



J. Hall NOAA photos

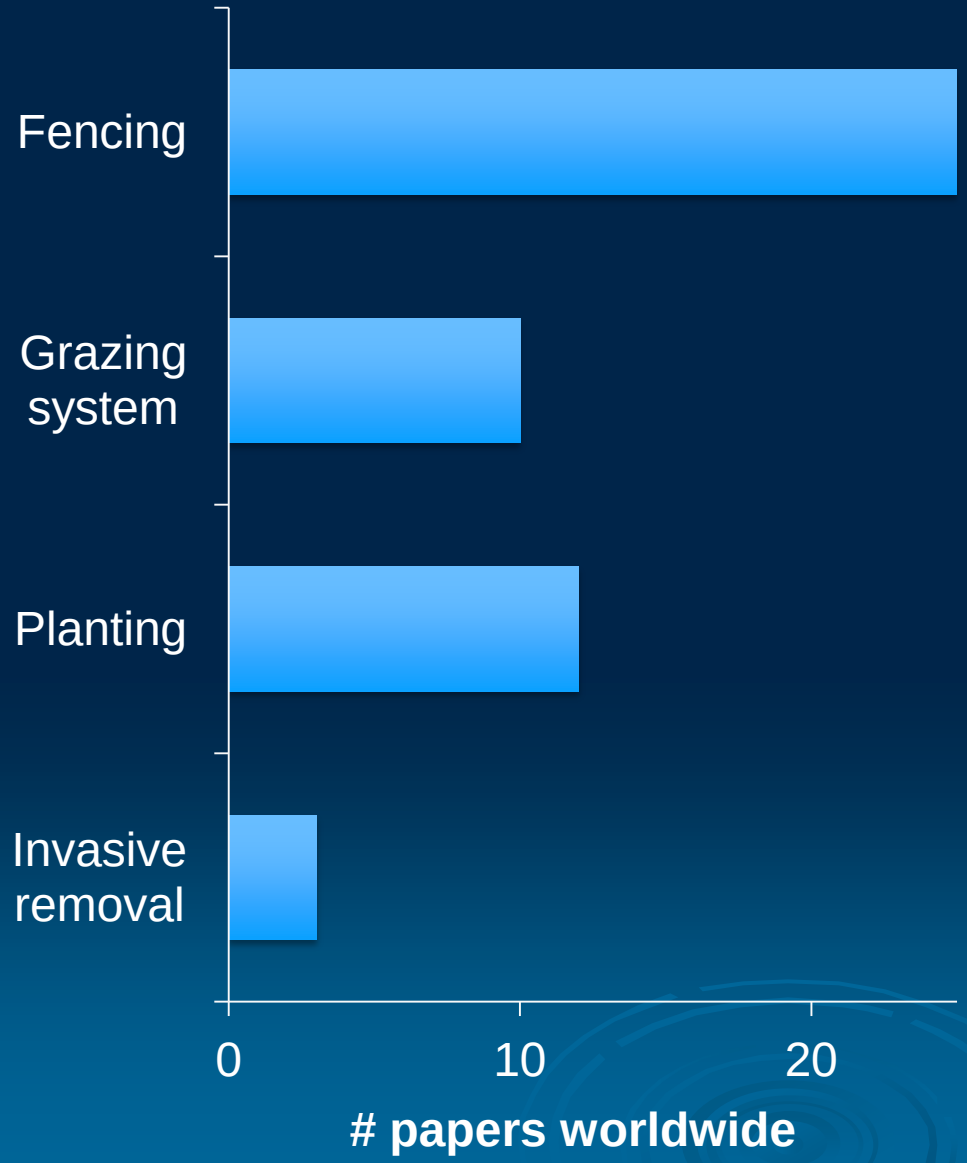
Riparian - Planting

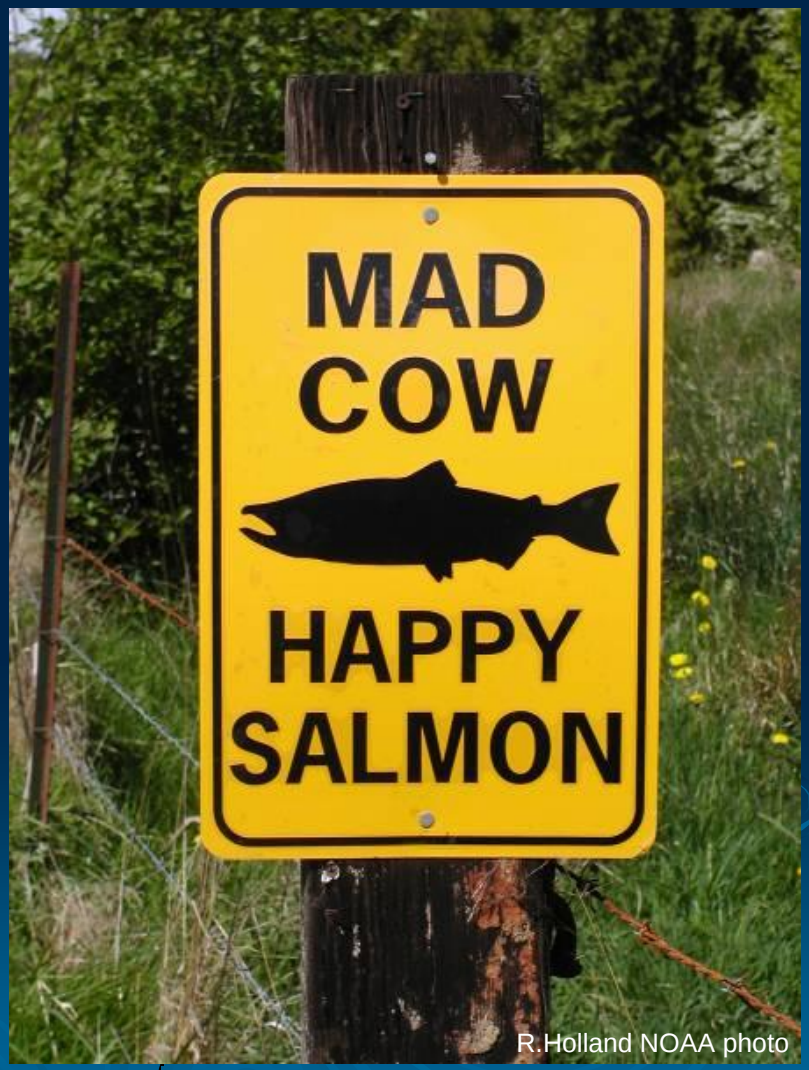


- What we know
  - shade and bank stability increase relatively rapidly
- Success depends on
  - technique
  - site prep & conditions
  - protection from herbivores
  - competition with other plants
  - planting depth
- What we need to know
  - time needed to restore LWD.
  - effects on stream habitat/biota
  - long-term response (10+ yrs)

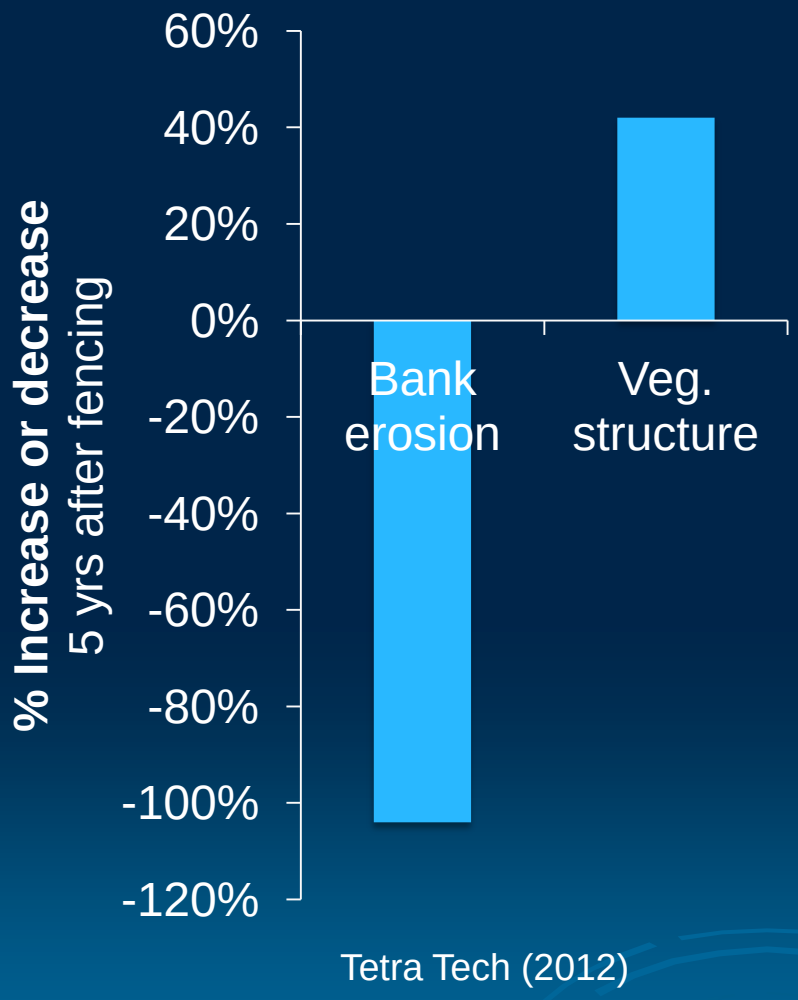
Hall et al. 2011

Riparian - Grazing





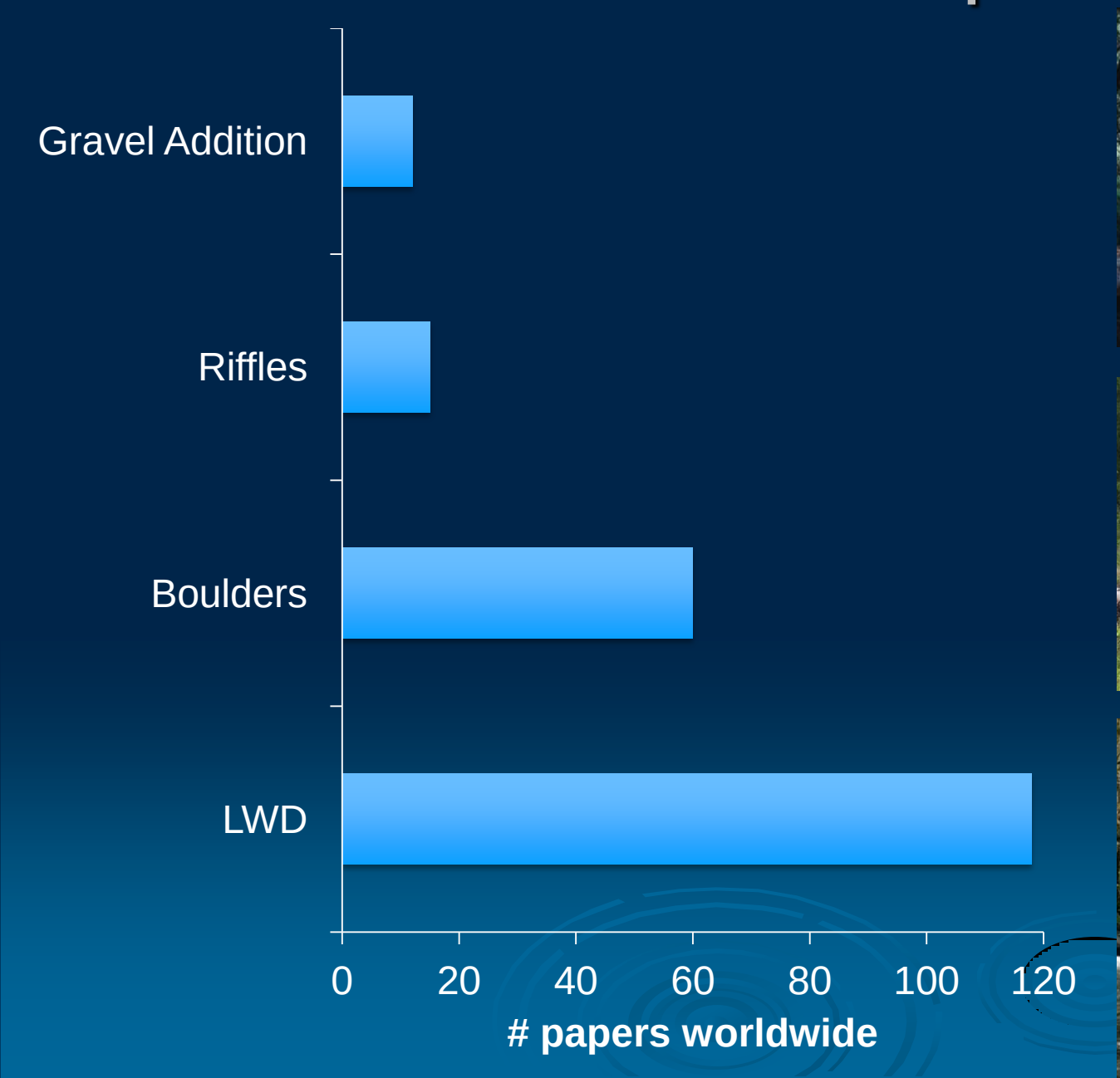
Summary – Grazing Reduction



Tetra Tech (2012)

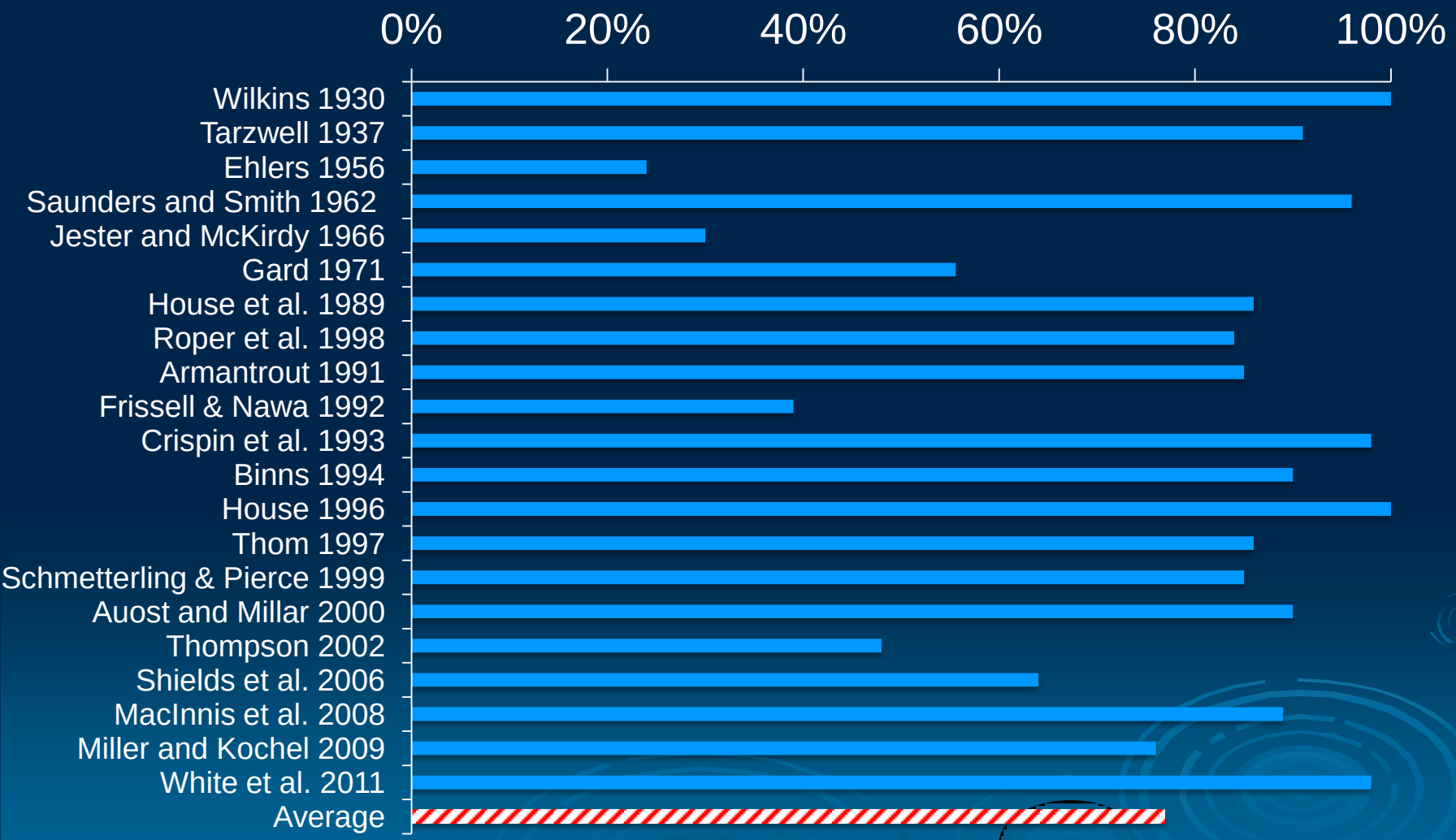
- What we know
  - Livestock removal consistently effective
  - Quick recovery of veg., sediment, channel width, shade
- Success depends on
  - Upstream conditions
  - Grazing duration
  - Invasive species
  - Rest. of flooding & processes
  - Scale of project
- What we need to know
  - Fish & instream response?

Instream Habitat Improvement



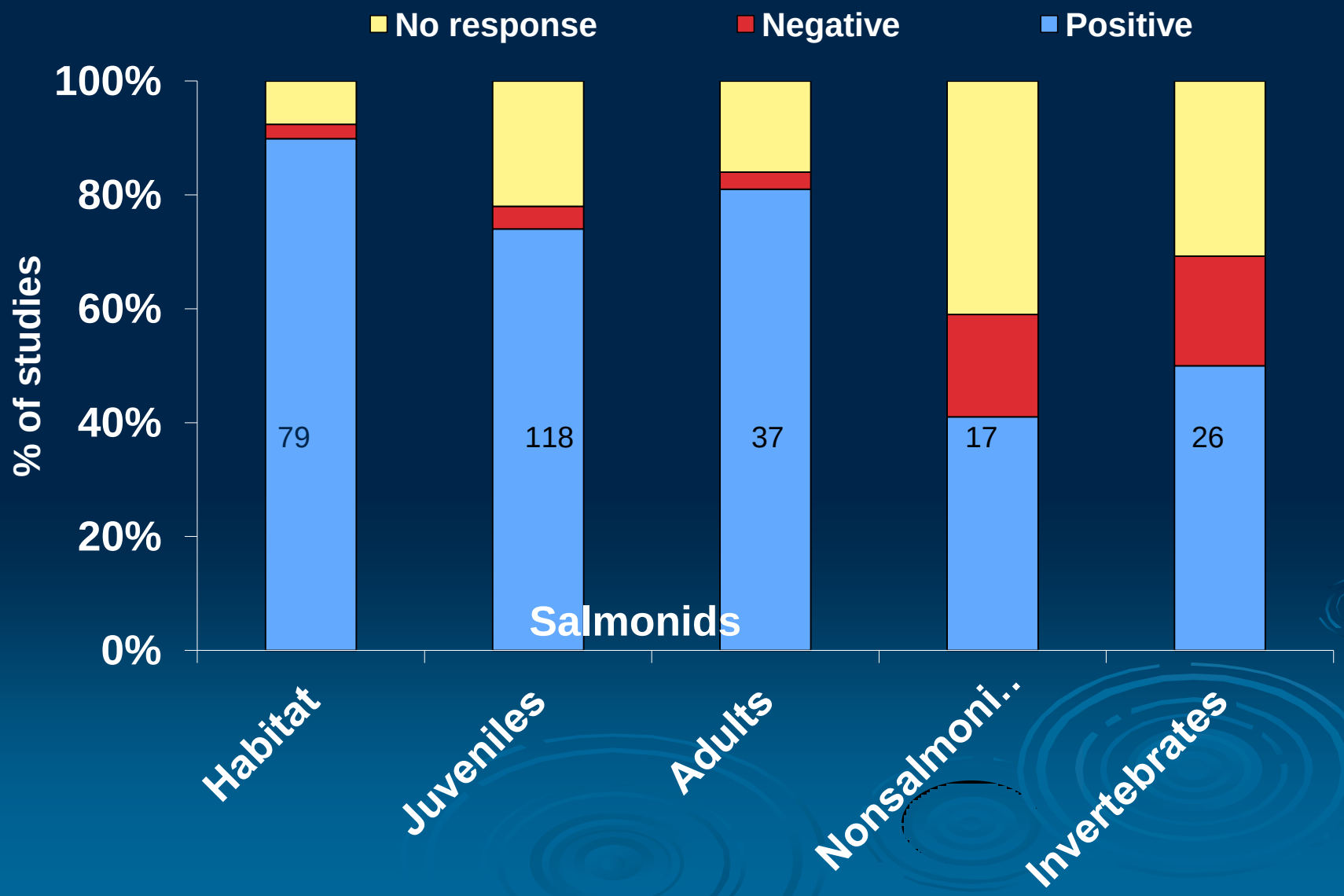
Instream Structure Durability

Averages 77% across 21 studies



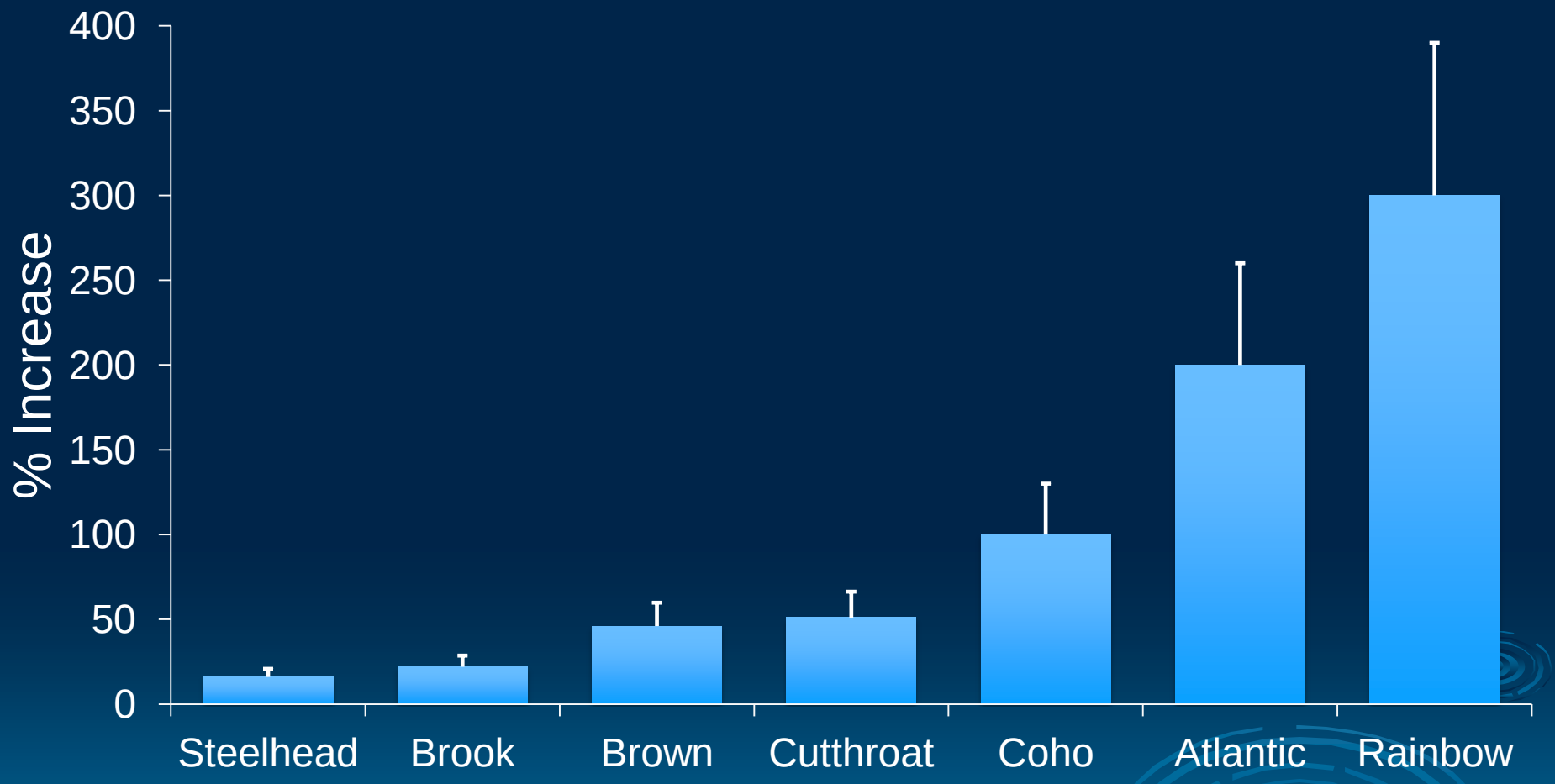
Instream Habitat Improvement

Physical and Biological Response



Meta-Analysis – Whiteway et al. 2010

Examined 211 Projects



Summary of Instream

- What we know
  - Physical response and durability well documented
  - Response well documented for coho, Atlantic salmon, resident trout
  - Fish response varies among species, regions, watersheds

- Success depends upon
  - Addressing WQ, sediment, riparian and other processes
  - Intensity and amount of restoration***
  - Design

- What we still need to know
  - Little to no data on Chinook or interior steelhead
  - Response in larger rivers (>20 meters wide)
  - Watershed-scale response

Overall Summary

What we know

- Many techniques show promising results
  - particularly for physical response
- Effectiveness often depends upon
  - Addressing underlying problems & processes
  - Intensity and amount of restoration**
  - Varies by region and restoration program

What we still need to know

- Biological monitoring lacking for many
  - Techniques
    - Culverts, riparian, floodplain, instream
  - Species
    - Chinook and steelhead
  - Regions
    - Interior Columbia

But…..

- Data for many of these techniques can be collected rather quickly
  - Because of large number of projects (e.g., culverts, LWD, riparian planting)
  - By leveraging other monitoring programs
- Several long-term intensively monitored watershed studies underway to determine population level responses

Action Effectiveness Monitoring of Tributary Habitat Improvement: a programmatic approach for the Columbia Basin Fish & Wildlife Program

Phil Roni
Northwest Fisheries Science Center
NOAA Fisheries

Russell Scranton & Jason Sweet
Bonneville Power Administration
Fish and Wildlife Program

Jennifer O'Neal
Tetra Tech
Mount Vernon, WA

Three Components

- Improve/refine current action effectiveness monitoring
- Sample a subset of previously completed projects
- Sample a subset of proposed projects

Current Development of AEM Program

Preliminary Projects Associated with Each Category						
Sample number	1	2	3	4	5	6-30
Extensive Post Treatment (EPT) Projects:						
Full Barrier	1992-026-01	1993-066-00	1994-015-00	1996-077-02	1996-077-05	…
Large Woody Debris	13+ SRFB	1992-026-01	1992-061-02	1994-018-06	1995-004-00	…
Engineered Log Jams	1 SRFB	1984-025-00	1992-026-01	1994-018-06	1995-004-00	…
Riparian Planting	1984-021-00	1990-018-00	1990-018-00	1990-044-00	1991-019-03	…
Invasive removals	1984-021-00	1987-100-01	1987-100-02	1988-120-25	1991-019-01	…
Multiple Before-After Control Impact (MBACI) Projects						
Partial Barrier	1993-040-00	1994-042-00	1994-042-00	2007-396-00	2007-397-00	…
Bank Stabilization	1984-021-00	1992-026-01	1994-018-05	2000-015-00	1984-025-00	…
Levee set-back removal	10-1765	11-1565	12-1307	1987-100-01	1992-026-01	…
Channel Reconnection	14 SRFB	2008-301-00	1994-042-00	1998-028-00	1998-028-00	…
Acquisition, Lease, Easement	00-1669	01-1353	02-1650	2007-224-00	2007-397-00	…
Fencing	02-1498	05-1547	205-060	205-060	206-357	…
Case Studies						
Road Decommissioning	TBD					
TBD						
TBD						

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Fencing	02-1498	05-1547	205-060	205-060	206-357	…
Case Studies						
Road Decommissioning	TBD					
TBD						
TBD						

EPT – Full Barrier Removal

- 115 Projects have been identified that were completed between 2004-2013
- 30 Projects will be sampled in this category
- Reconnaissance is occurring now
  - Geographic Diversity
  - Logistic Feasibility
- Field Surveys will occur in 2014 and 2015
- No monitoring for new full barrier projects will be planned

Preliminary Schedule for EPT Monitoring

2013	2014	2015	2016	2017	2018
Full Barriers		Large Wood/Log Jams		Riparian Planting	

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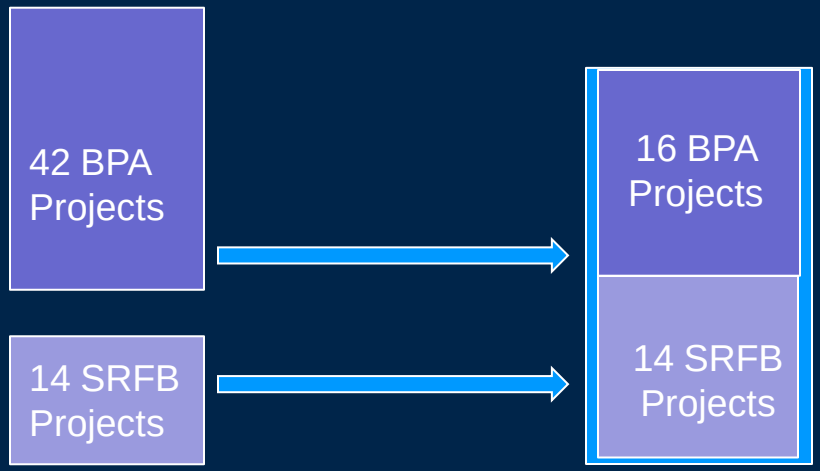
Case Studies						
Road Decommissioning	TBD					
TBD						
TBD						

MBACI- Channel Reconnection

- Currently, 42 projects were proposed in the Geographic Review
- 30 Projects will be sampled in this category
- 14 projects are currently being monitored in the Columbia Basin under the WA SRFB Program

MBACI- Channel Reconnection



30 projects needed in this category

- Currently, 42 projects were proposed in the Geographic Review
- 30 Projects will be sampled in this category
- 14 projects are currently being monitored in the Columbia Basin under the WA SRFB Program

MBACI- Channel Reconnection

- Mill Creek Channel Reconnection Update

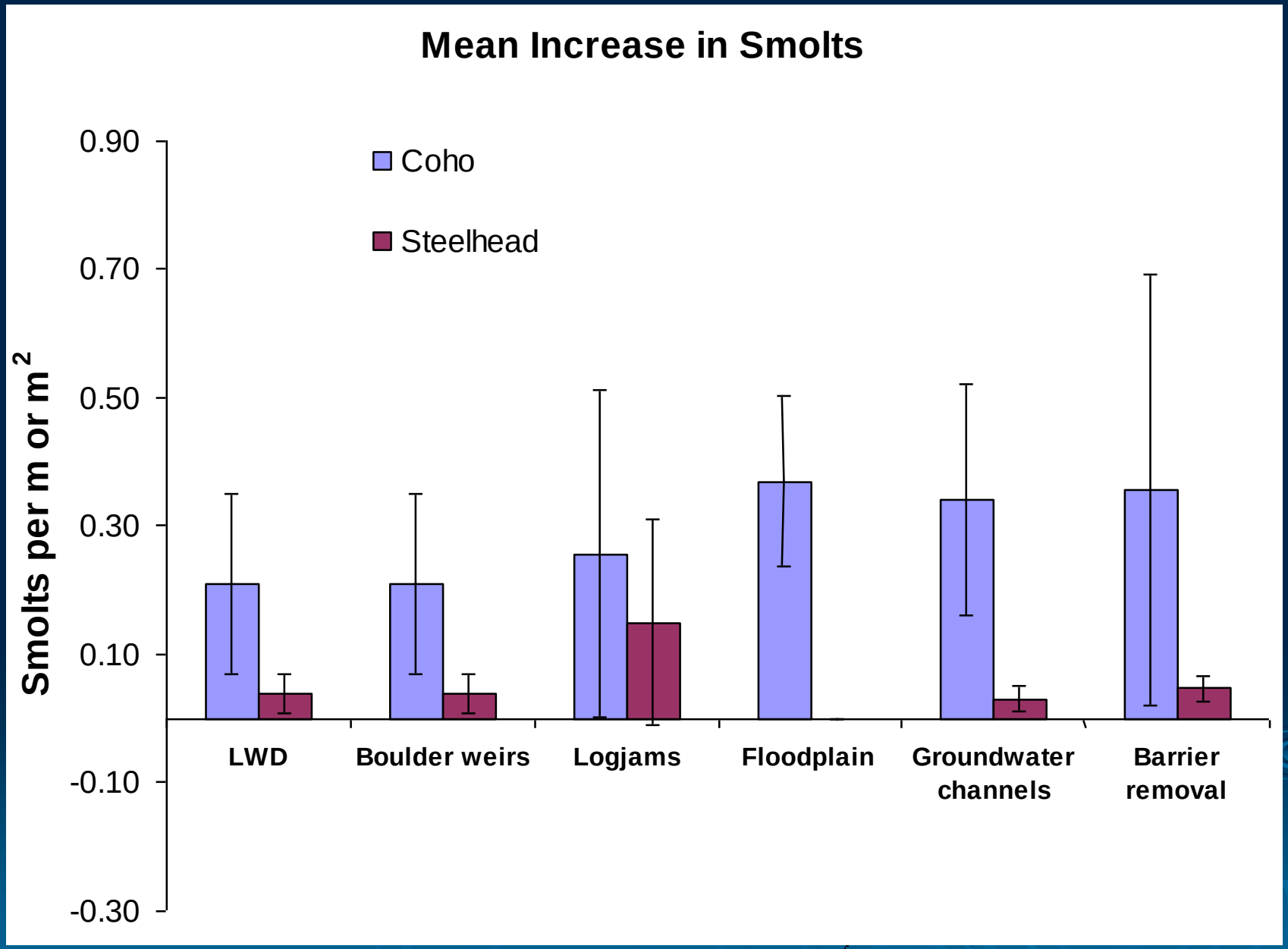
- Work is Scheduled to occur next summer
  - Existing fish surveys were leveraged at no additional cost
  - Habitat surveys will occur in two weeks

- Monitoring Schedule for Mill Creek

project	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22
Mill Creek	pre-1	implement	post-1	post-2			post-5			

AEM – Next Steps

- For both EPT and MBACI Projects:
  - BPA is contacting project sponsors to gather additional information on proposed projects:
    - Scheduled year of implementation
    - Identification of control site location
    - Confirm whether sponsor or 3rd party will perform initial monitoring
  - Multi-year Work plan to be developed and reviewed by Council by December 2013



Roni et al. 2010. NAJFM

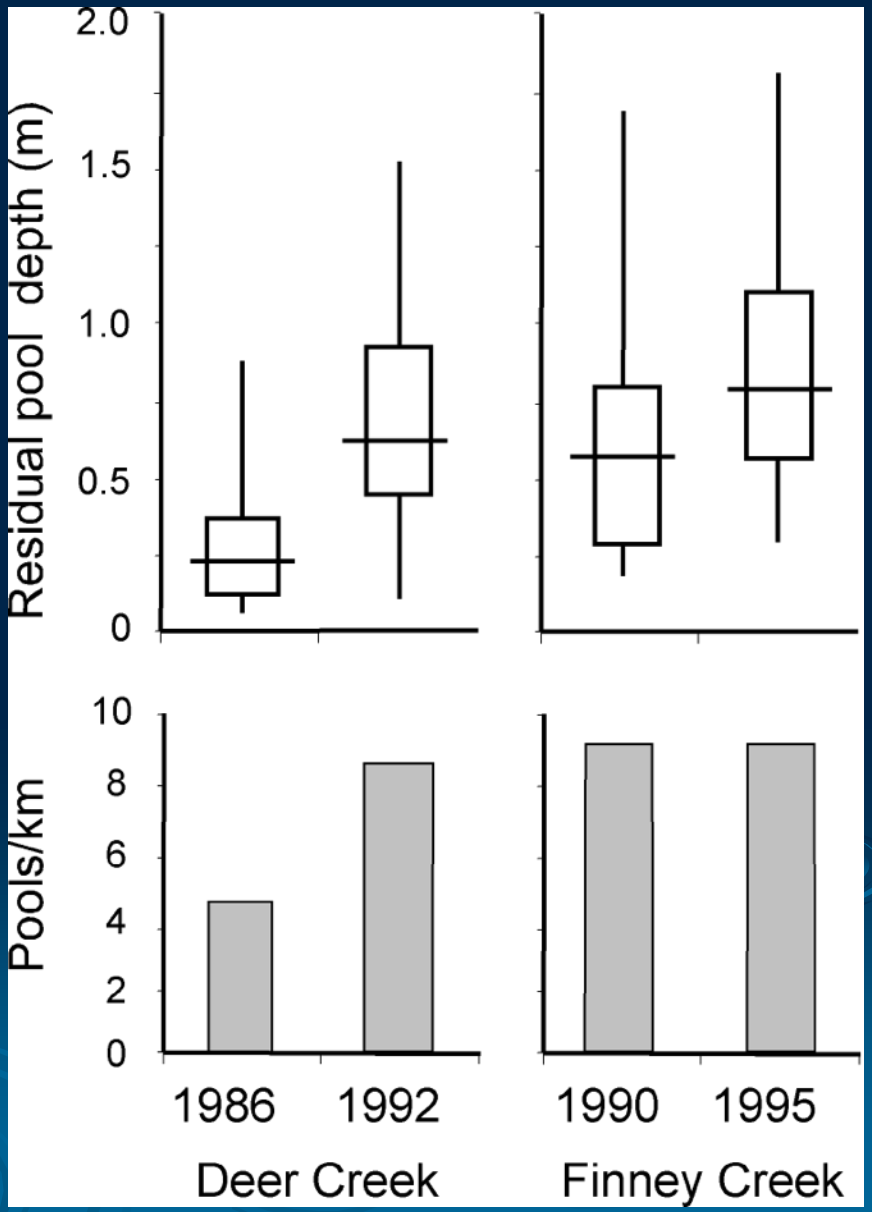
Additional RM&E Information

- 2013 - Benefits of Tributary Habitat Improvement Paper
  - Discussion based on results from F&W Program in addition to peer reviewed sources
  - Covers multiple aspects of Tributary Habitat RM&E
    - Action Effectiveness Monitoring
    - Status and Trend Monitoring (CHaMP and PIBO)
    - Watershed level effectiveness monitoring (ISEMP and IMWs)
  - Available on www.salmonrecovery.gov

Questions?

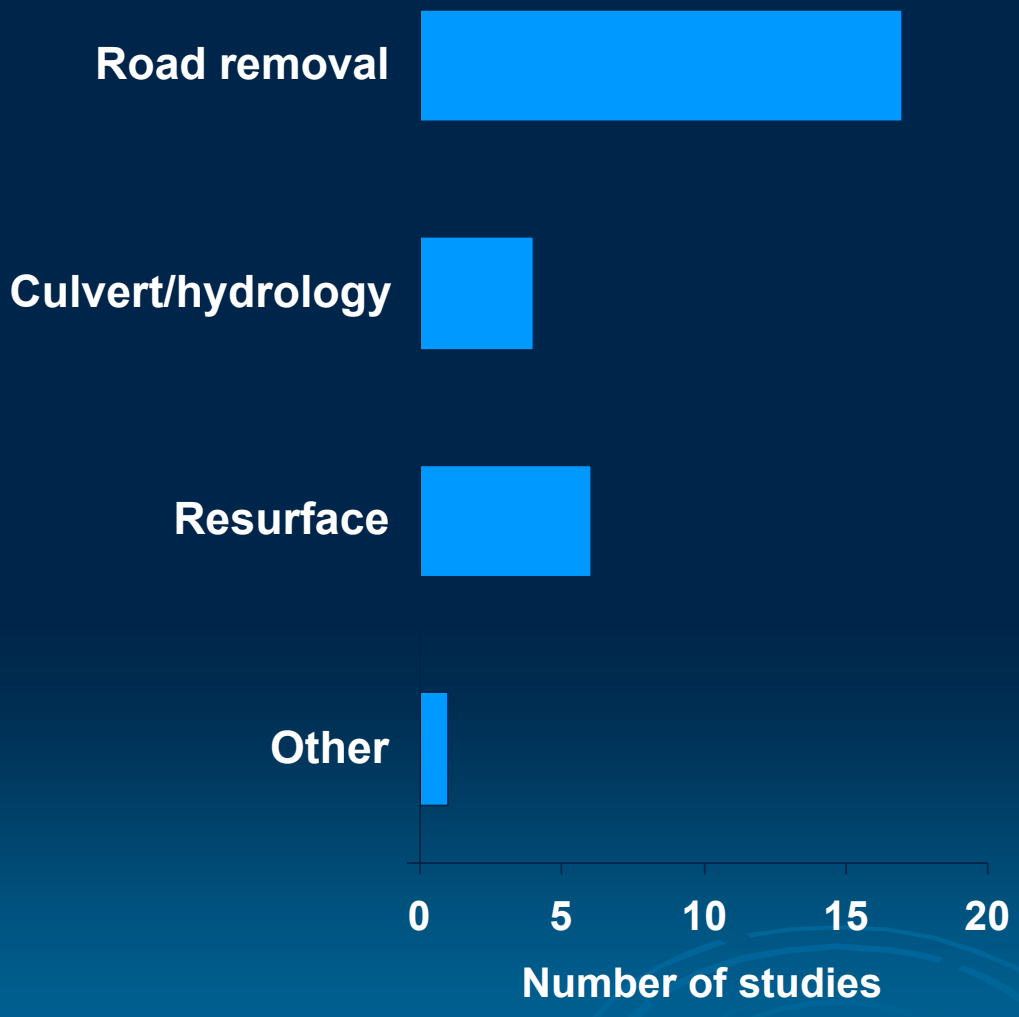
Extra slides

Sediment Reduction – Road Treatments



Beechie et al. 2005

Summary of Road Improvements



- **What we know**
  - **Many techniques reduce sediment but**
  - **little or no in channel or biological**
- **Success depends on**
  - Technique used
  - Number of stream crossings
  - Replanting/site prep
  - Area treated, WQ
- What we need to know
  - Watershed-scale response
  - Fish or biological response
  - Improved spawning success