Developing an Interagency Roadmap For Research on Large Wood in River Restoration

Jock Conyngham, Research Ecologist
Environmental Laboratory, ERDC
Jock.N.Conyngham@usace.army.mil

Jennifer Bountry, Hydraulic Engineer
Technical Service Center, Reclamation
JBountry@usbr.gov

Provenance—USACE, Reclamation River Restoration Cooperation Initiative

May, 2011—Thirty-six managers, scientists, and engineers met in Sacramento to discuss best practices and coordinated integration of science and engineering, prioritization of information gaps, and leveraging of individual agency expertise in riparian, stream, and river restoration.

Initial Outcomes

Broad agreement on the potential for:

- Interagency working groups
- Joint discussion and review of R&D needs
- Cooperative technology transfer
- Project-scale coordination

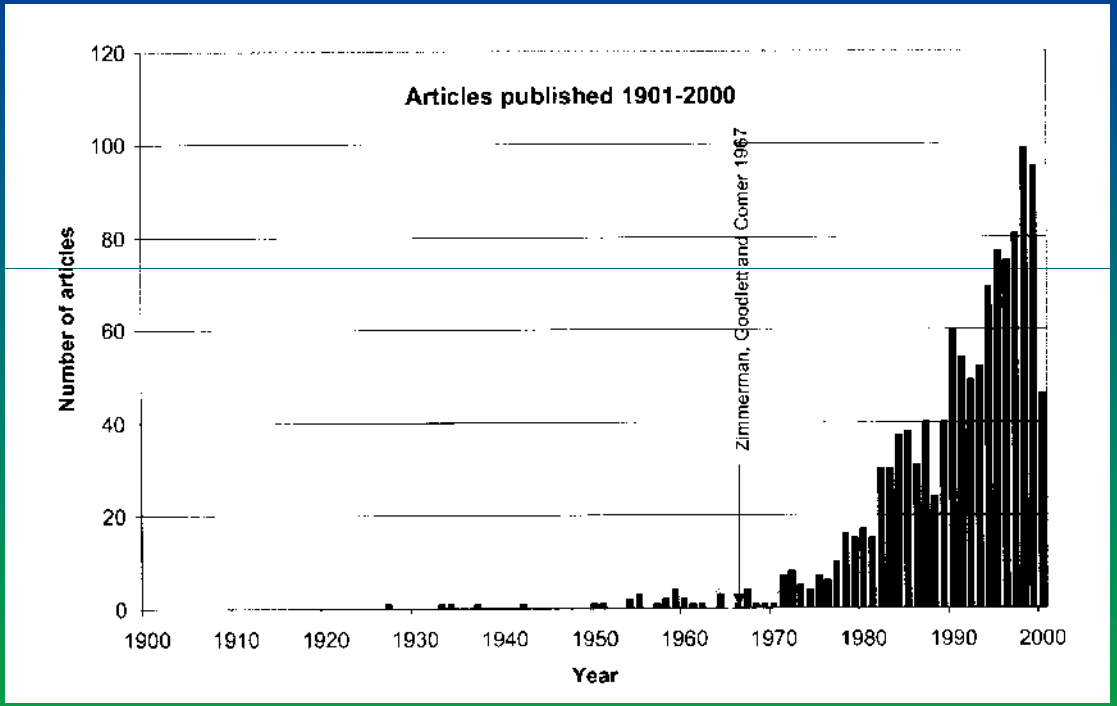
First task:

Execute a workshop to develop a research roadmap for roles and utilization of large wood in river restoration.

Major roles of woody material in streams and rivers

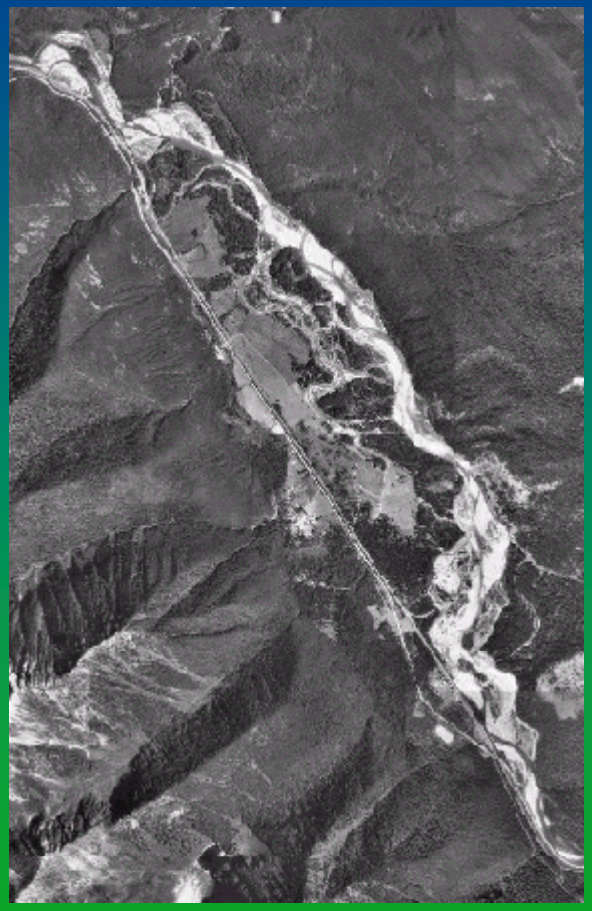
- Physical
- Hydrologic
- Thermal
- Chemical
- Processual
- Biological
- Recreational

State of Science (n = 1172)



Gregory et al., 2000. Bibliography: world literature on wood in streams, rivers, estuaries, and riparian areas. International Conference on Wood in World Rivers. Oregon State University, Corvallis.

Mechanisms of local recruitment: incremental or avulsive?



Incremental, but pulsed

Central elements in wood recruitment, transport, and storage in channels (including floodplains)

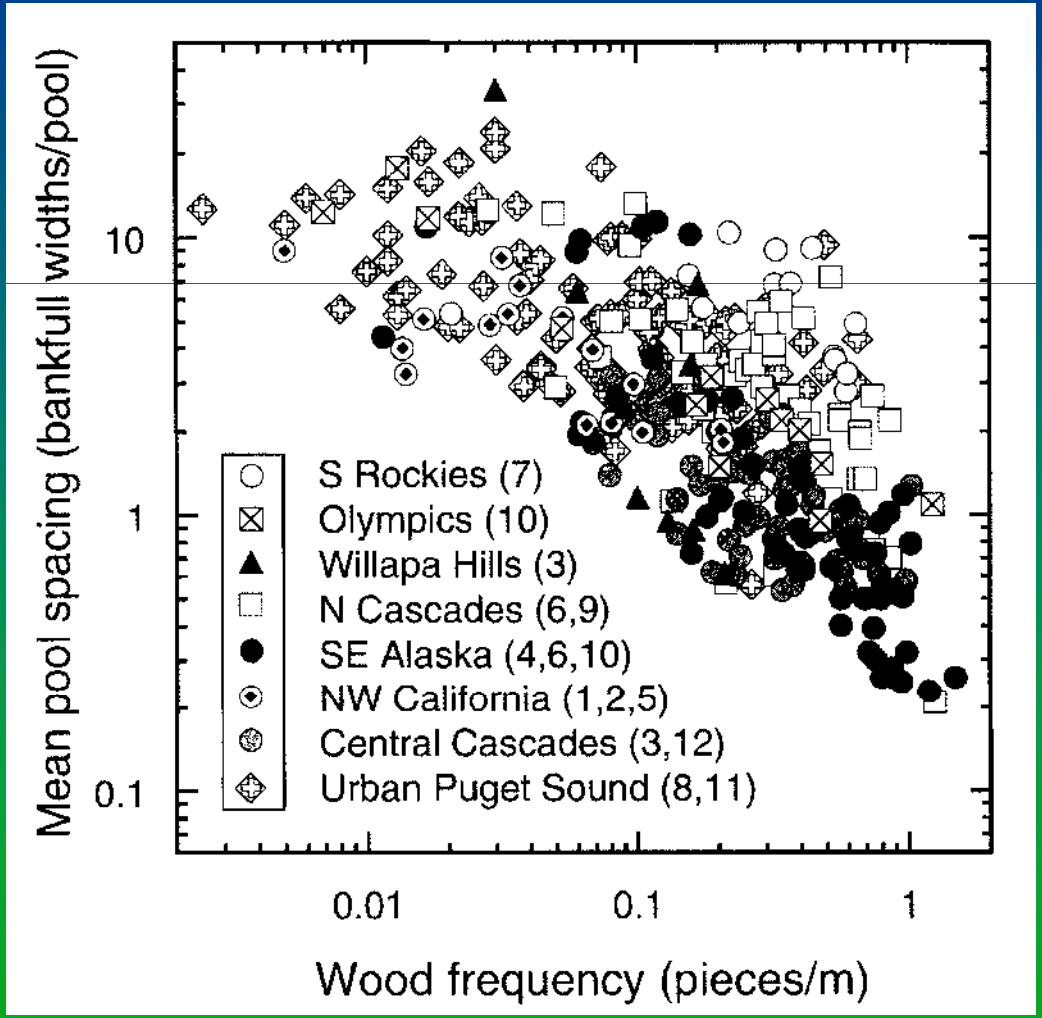
- Recruitment mechanism—channel continuum, incremental, pulsed, stochastic
- Wood particle size relative to width and depth of bankfull and higher discharges
- Wood particle roughness (crown type, rootwad type)
- Channel forms and roughness elements
- Crossing design, reservoir operations and LWD management
- Volume
- Wood particle density/buoyancy
- Wood particle decay rate

Longitudinal grain size sorting (and fish passage and spawning)

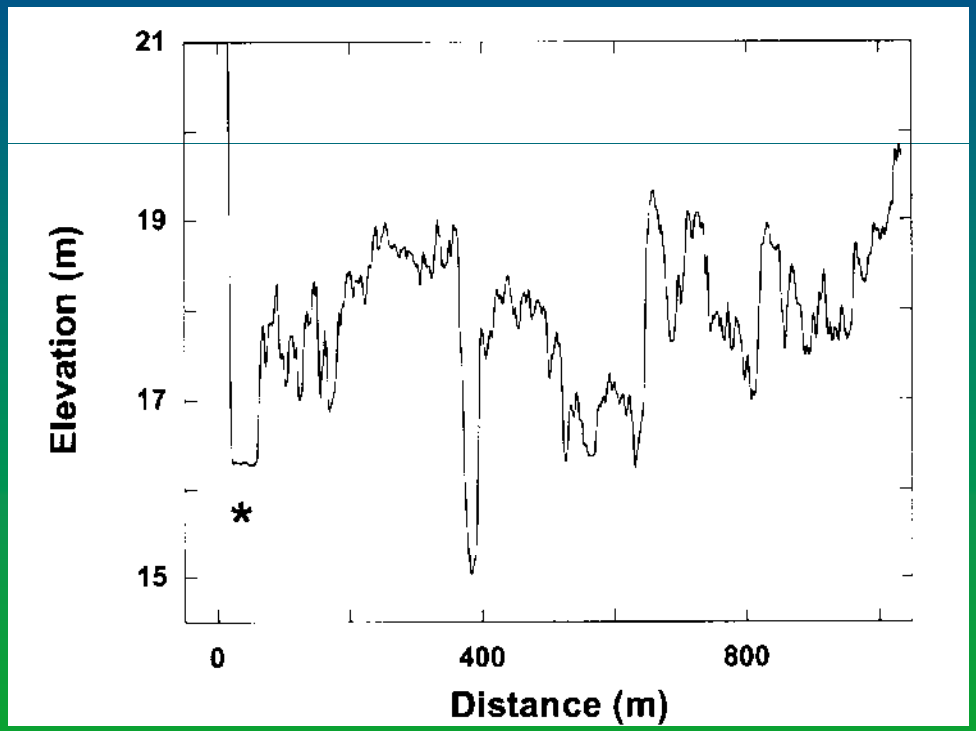
Racked deposition and effects on lateral stability

Wood in estuarine systems

Wood and channel morphology (Montgomery et al., 2003)



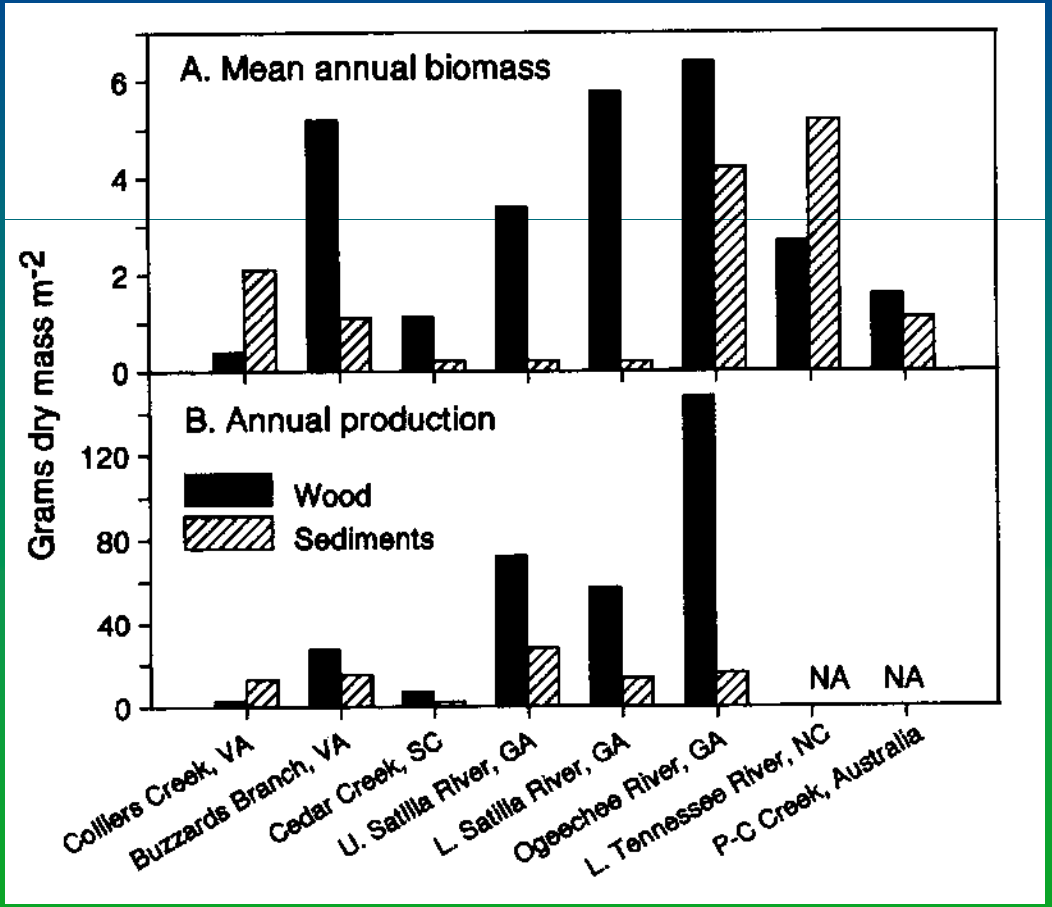
Logjams, debris, and floodplain topography on the Nisqually (Montgomery et al., 2003)



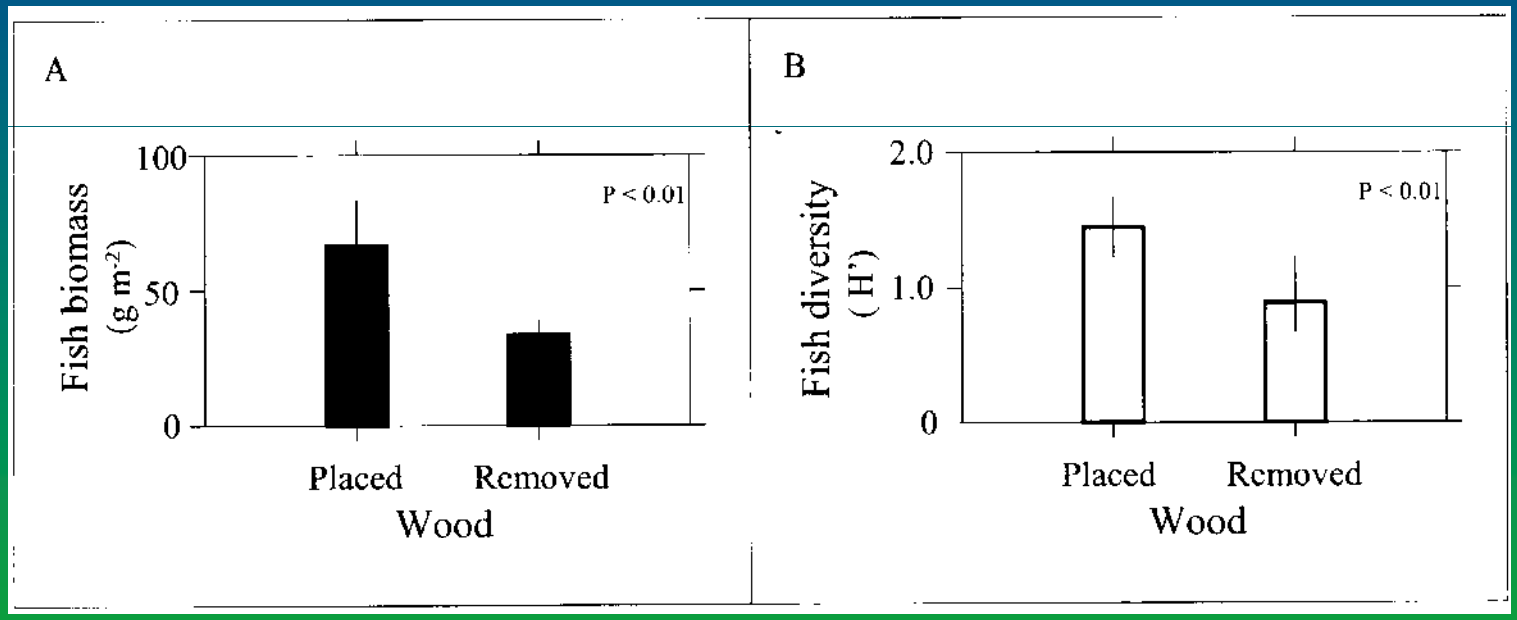
The roles of wood in fish communities

- Nutrient inputs
- Roles in primary and secondary productivity
- Predation avoidance
- Creation and maintenance of spawning, nursery, feeding, spawning, resting, and refuge habitats
- Maintenance of larger scale dynamism and habitat mosaics
- Attenuation of thermal extremes
- NW salmonids—wood increases fish numbers 2-8x

Wood and lotic macroinvertebrates (Benke and Wallace, 2003)

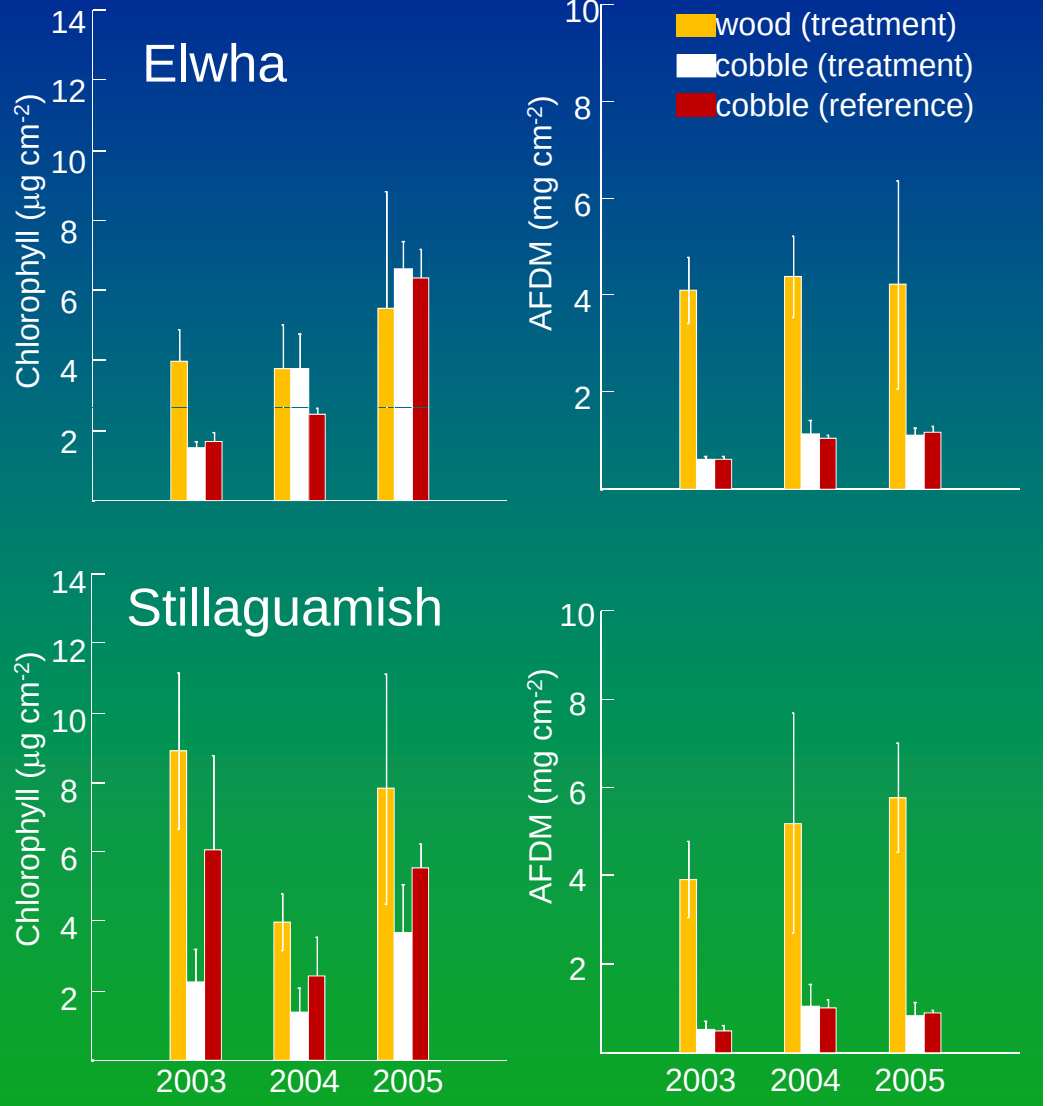


Experimental placement and removal of wood—effects on biomass and diversity (Zalewski et al., 2003 from Lapinska, 1996 and Lapinska et al., 2002)



Periphyton Results

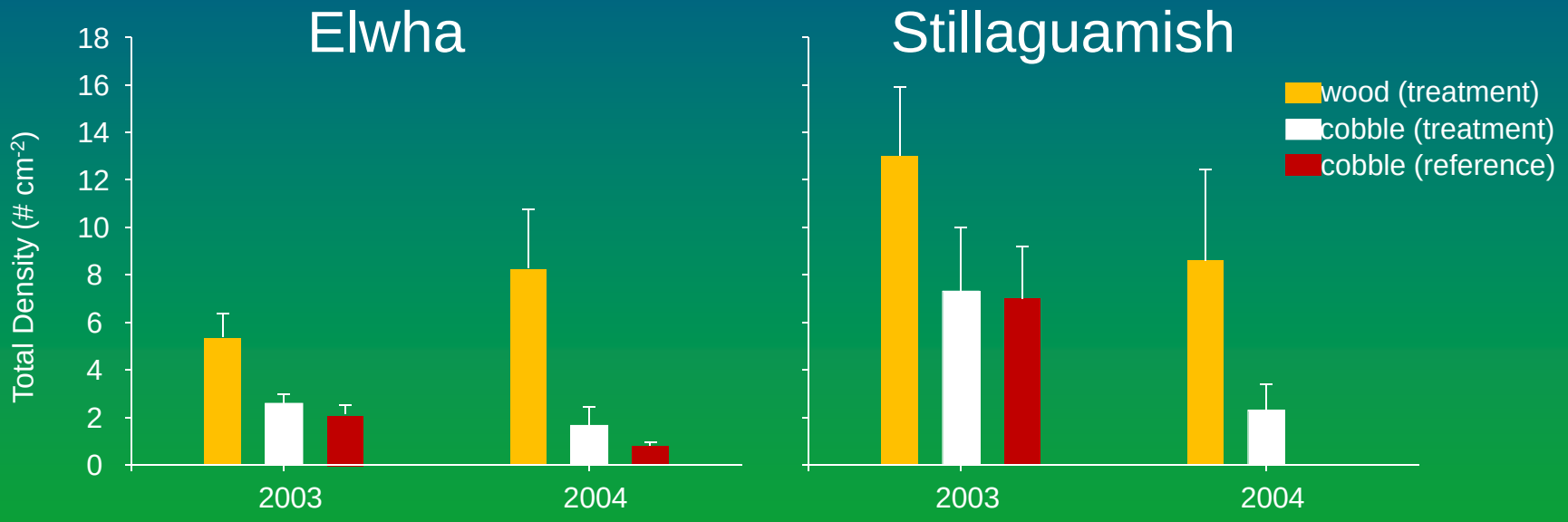
- Chlorophyll *a*
  - Greater on wood in 1 of 3 years
- Periphyton biomass and AFDM
  - Consistently greater on wood than cobble
  - No apparent reach affect



Coe et al. 2009, River Res. App.

Invertebrate Results

- Invertebrate densities greater on wood than cobble
- No apparent reach affect

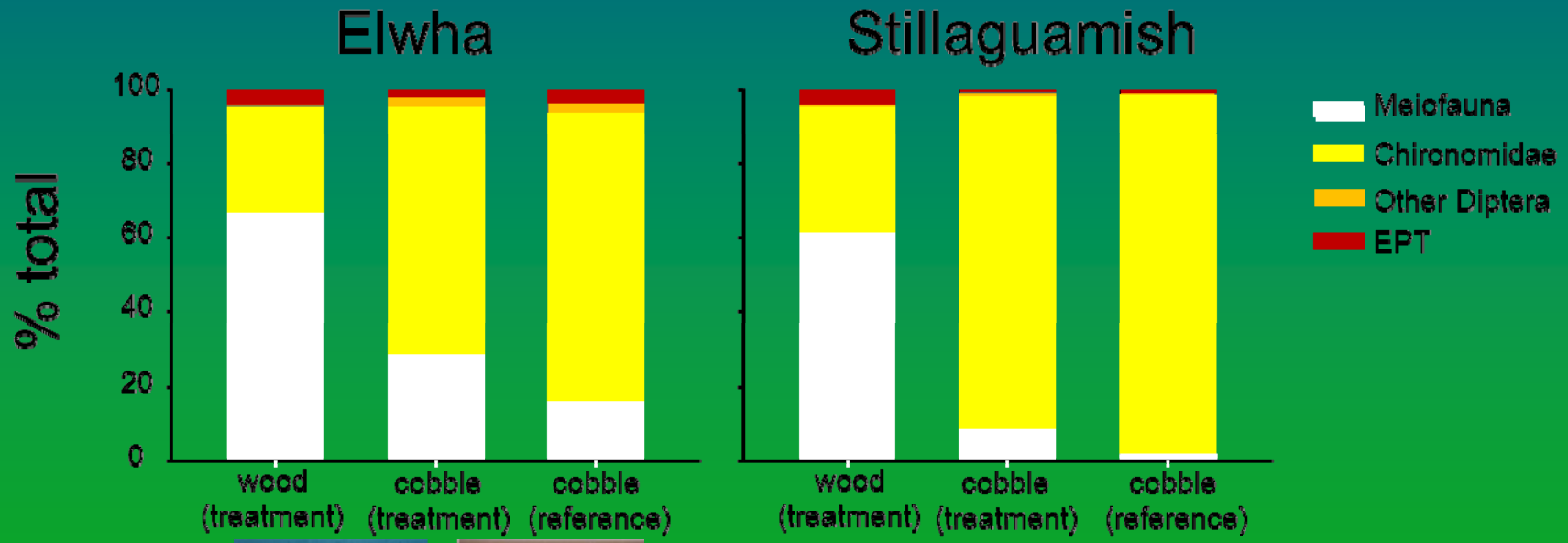


Coe et al. 2009, River Res. App.

Photo by John McMillan

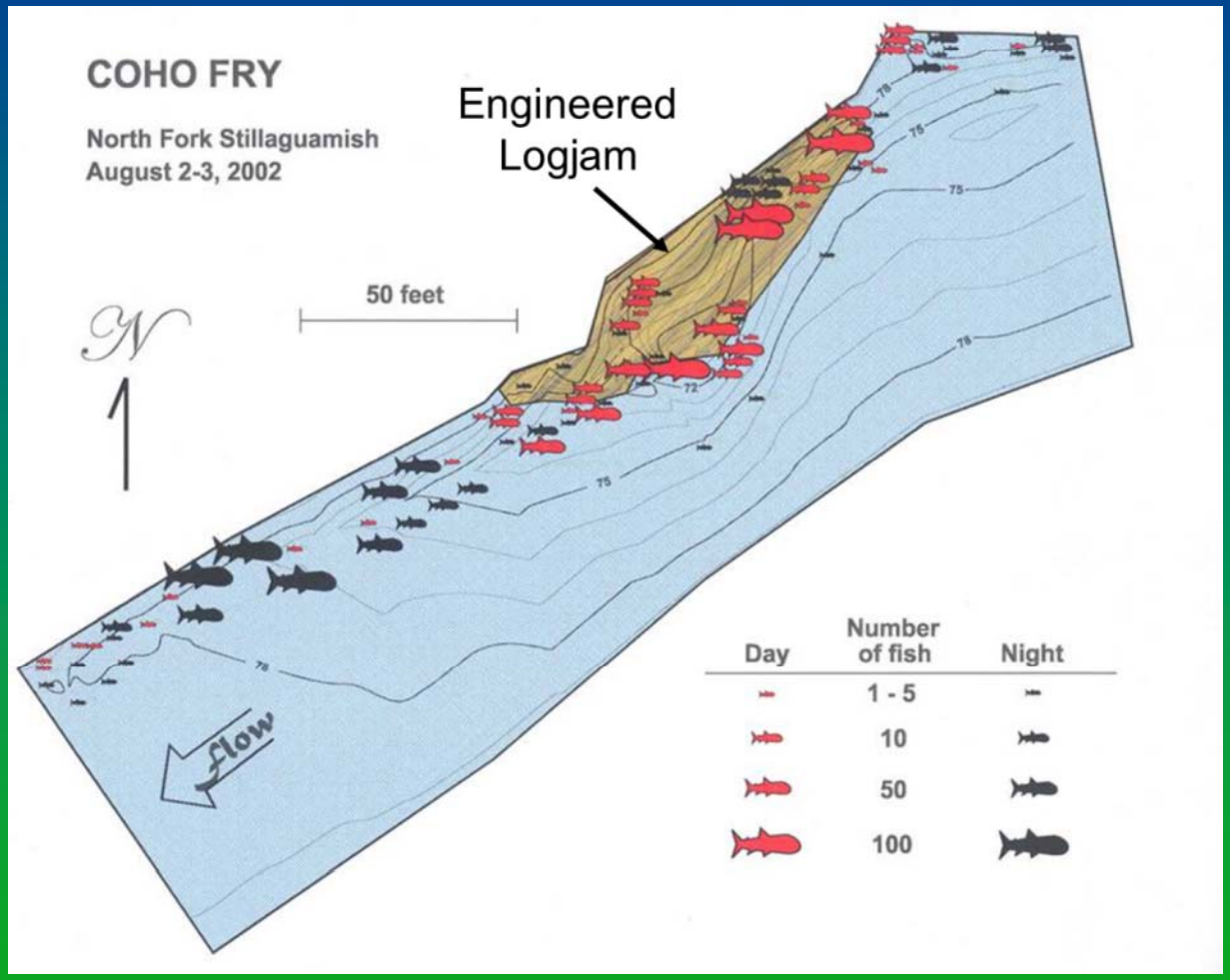
Invertebrate Results

- Meiofauna (<500 μm) represented 60% of the invertebrate community on wood, ≤ 30% on cobble
  - Cyclopoid and harpacticoid copepods, ostracods, mites, oligochaetes, nematodes, and tardigrades



Coe et al. 2009, River Res. App.

Diel Effects



History repeats itself: is this restoration?

The LWD Research Workshop—Seattle, February 14-16, 2012

Goals

- Task a geographically diverse and highly experienced interdisciplinary group with developing a research road map for large wood that can be used to help guide future research proposal ideas and collaborations
  - Identify current tools
  - Identify gaps and needs
  - Capture presentation and discussion group products and synthesize into report

42 representatives from federal, local, state government, tribes, academia, AE firms

Workshop Overview

- Day 1: Kick-Off Risk Talk and Field Trip
- Day 2 and 3: Mix of Presentations and Facilitated Discussions on Key LWD Research Topics
  - System & reach scale wood analysis
  - Designing at the local scale
  - Implementation & monitoring

Field Tour--Wood-based Restoration by Seattle District and Partners

- Provide participants an opportunity to view installed large wood projects in both urban and remote settings
- Engage in discussions about lessons learned and data gaps in existing design and implementation tools

Workshop Highlights

- Dealing with Inherent Risk of Wood Projects
  - Legal perspective presented on how to assist project sponsors with public perception, liability, and risk in large wood projects
  - Quality design and construction team
  - Use standard or best practice approaches
  - Planning for health and safety risks
  - Warning signs and public education

Workshop Highlights

- System and Reach Scale Example Research Ideas
  - Numerical fish habitat modeling (with linked large wood processes)
  - Better assessment tools for effects quantification
  - How wood loads affect structures
  - Multi-tiered framework for national application with regional tools

Workshop Highlights

- Designing at a Local Scale Example Research Ideas
  - Guidelines, principles and standards for design, implementation, and risk
  - Cost/benefit analysis
  - Interactions between multiple wood structures
  - Need for field demonstrations
  - Stability and failure mechanisms
  - Improved understanding of scour and porosity prediction

Workshop Highlights

- Implementation and Monitoring Example Research Ideas
  - Need for field demonstrations and pilot projects
  - Manual of wood properties for construction design
  - Use of artificial wood elements
  - Compilation of lessons learned
  - Training manuals for construction
  - Core set of metrics to measure project success and habitat & river response

Next Steps

- Web site for presentations and agenda: www.usbr.gov/research/science-and-tech/conference/large-wood/index.html
- Workshop results synthesized in technical report by planning team, followed by participant review. Final draft June 2012.

Funding applications for:

- Peer-reviewed publication on states of science and practice
- Design guide (scope in prep.)