Effectiveness of experimental riparian buffers on perennial non-fish-bearing streams on competent lithologies in western Washington

Cooperative Monitoring, Evaluation and Research Committee (CMER)

Landscape and Wildlife Advisory Group (LWAG)

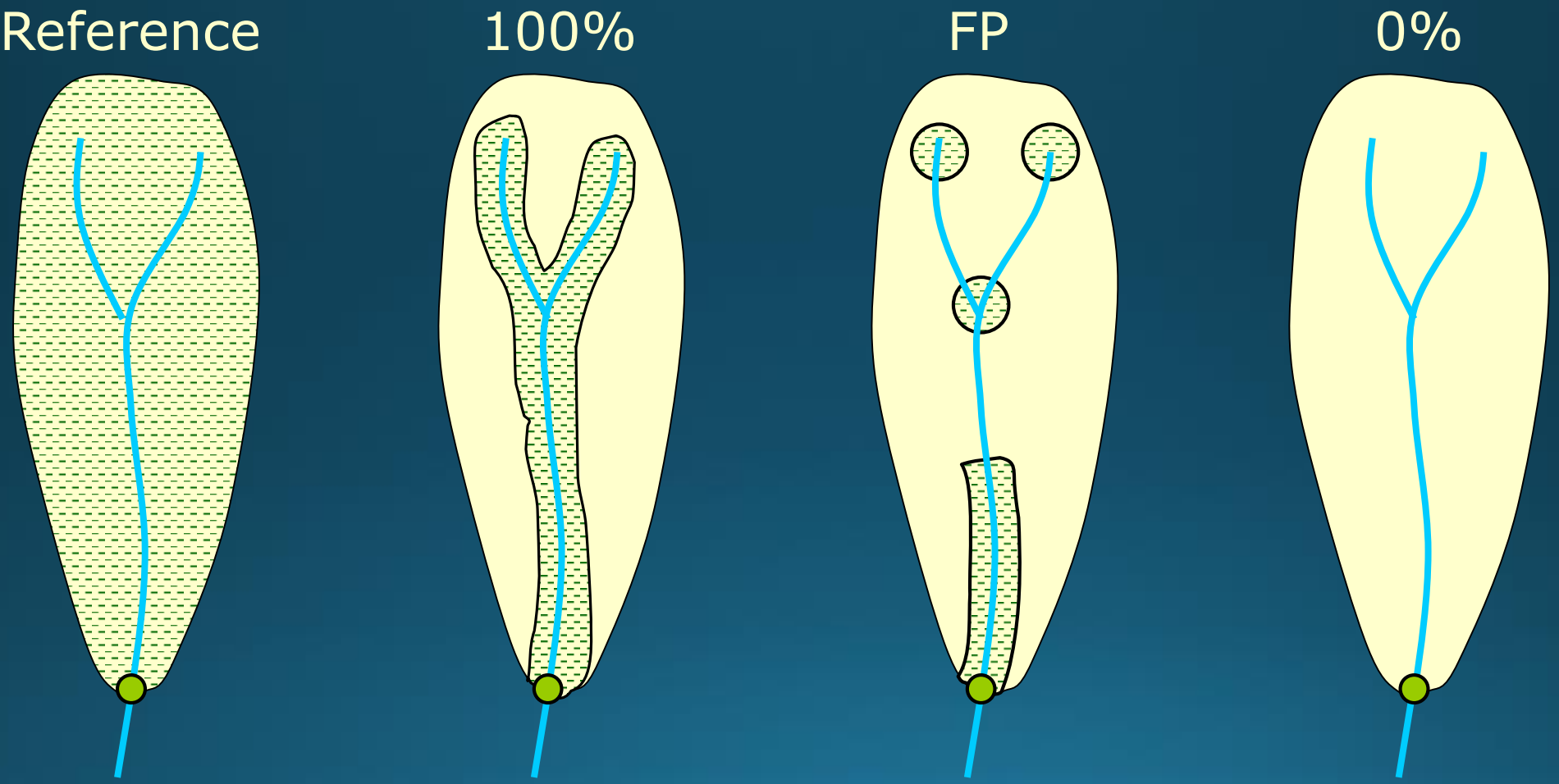
Riparian Scientific Advisory Group (RSAG)

Study Purpose

- Evaluate effectiveness of riparian buffer prescription for Type Np streams
- Compare to alternatives more and less restrictive

Before-After/Control-Impact Study Design

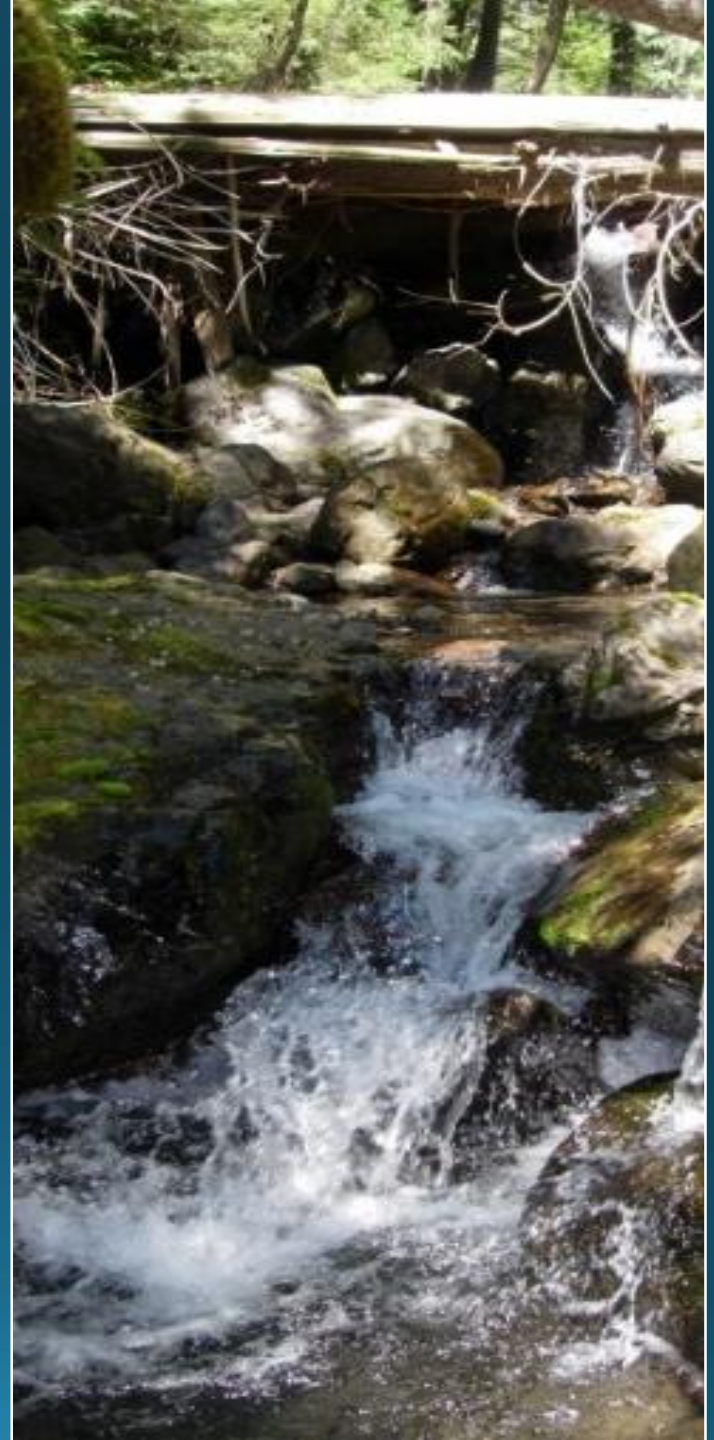
- Four experimental treatments
- Response relative to unharvested condition



Site selection

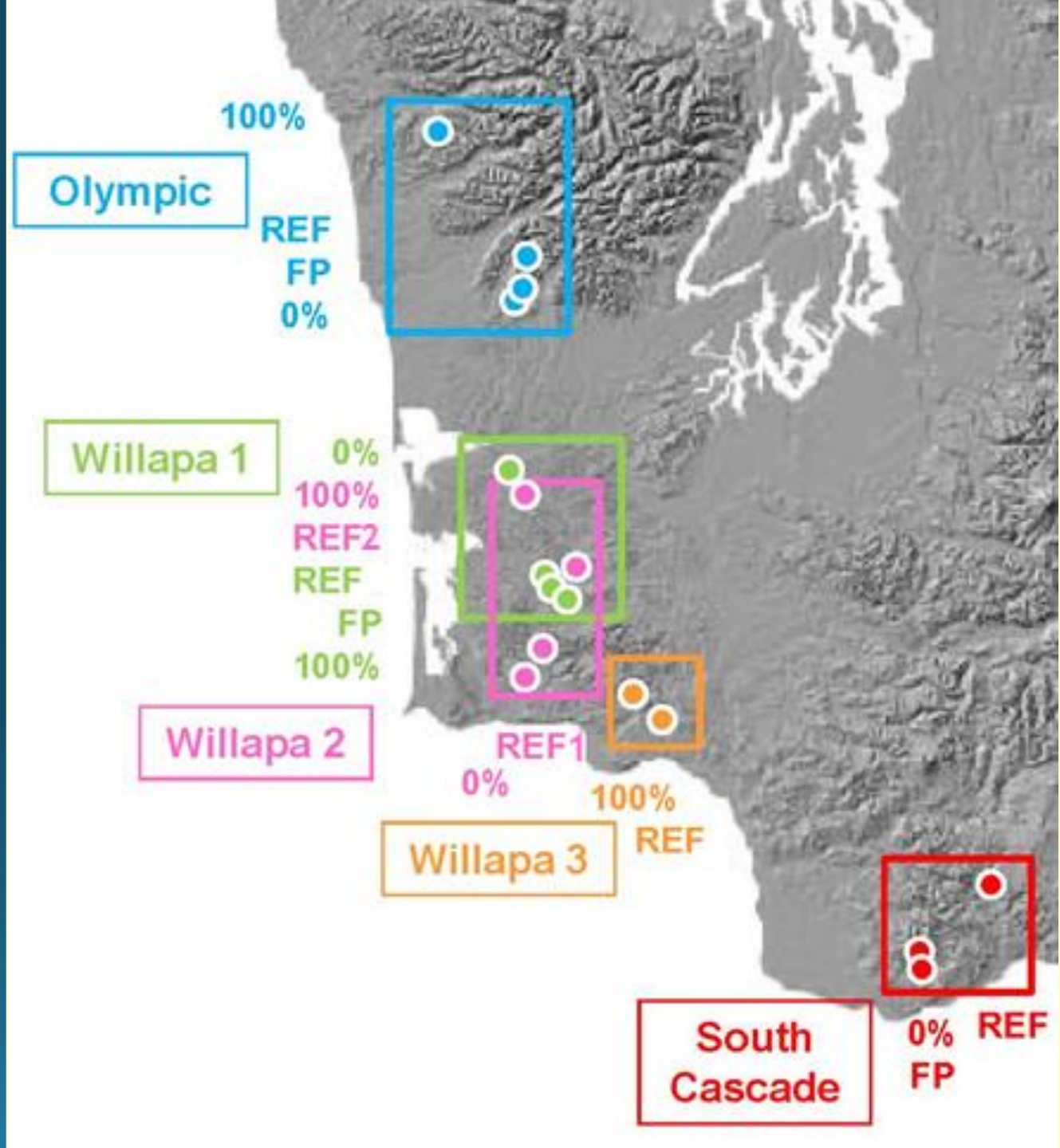
All Type Np basins (N ~36,000)

- Amphibian presence
  - Driven by stream substrate size
  - Related to underlying lithology
- 6,125 potential sites ID'd via GIS
- 11 landowners provided stand age and harvest info (N >4,480)
- ~500 meet age and harvest timing
- ~350 sites surveyed
- 48 sites met GIS, age, harvest & amphibian presence criteria



Study Sites (n = 17)

- Two year process to identify sites and secure permission
- Sites are:
  - Perennial, Type N streams
  - ~30-130 acre basins
  - Managed 2nd-growth forests
  - 30-80 year old stands
  - Private/state/federal



Timeline

2004 - 2006	Site selection
2006 - 2008	Pre-harvest data collection
2008 - 2009	Harvest
2009 - 2011	Post-harvest data collection

Collaborators – Study Principle Investigators

- NWIFC (D. Schuett-Hames, G. Stewart)
- WDFW (M. Hayes, A. McIntyre, R. Ojala-Barbour, T. Quinn)
- WA Ecology (W. Ehinger, S. Estrella)
- WSU/The Wilds (S. Spear, A. Storfer)
- Weyerhaeuser (R. Bilby, J. Jones, A.J. Kroll, J. Walter)




Landowners

Fruit Growers Supply Co.
Gifford Pinchot National Forest
Green Crow
Hancock Forest Management
Longview Timber
Olympic National Forest
Rayonier
The Nature Conservancy
WA Department of Natural Resources
Weyerhaeuser Company

Forests and Fish

- ✓ Key aquatic conditions and processes affected by forest practices were identified
- ✓ Resource objectives were developed for
  - Large Wood/Organic Inputs
  - Heat/Water Temperature
  - Sediment
  - Hydrology
  - In-/Near-stream Habitat (Type N)
  - Chemical Inputs
  - Stream Typing
  - Fish Passage
  - Stream-associated Amphibians

Large Wood / Organic Inputs Objective

Responses:

- Riparian tree mortality
- In-channel wood recruitment
- In-channel wood load
- Organic input/export (litterfall/detritus)

Riparian tree mortality

Tree mortality in RMZ buffers: REF = 100% < FP

Tree mortality in PIP buffers: REF < 100% = FP

However, there was a lot of variability in the 100% and FP treatments.

Large Wood Recruitment

Recruitment in RMZ buffers: REF = 100% = FP

Recruitment in PIP buffers: REF < 100% = FP

Most trees were suspended above the active channel.

Wood Loading

- Total Wood loading increased in all buffer treatments
- Small Wood: >75% of all pieces
- Small Wood loading increased in all buffer treatments
  - Greatest in 0%

Organic Input - Litterfall

No change in 100% and FP treatments.

Decreased total and deciduous litterfall in the 0% treatment

Organic Matter Export

Detritus

- No change in 100% and FP.
- Decreased export in the 0% treatment

Macroinvertebrates

- No change for total macroinvertebrates or major shifts in most functional feeding groups

Heat/Water Temperature

Responses:

- Shade
- Stream temperature

Shade

Reductions in shade in all buffer treatments

- 5-10% reduction in 100%
- 20-30% in FP
- 70-80% in 0%

Stream Temperature – 7-day average daily max

Temperature increased:

- 1.2°C in 100%
- 1.2°C in FP
- 3.2°C in 0%

Remained above pre-harvest levels in downstream reaches

Hydrology/Sediment/Nutrient export

Response:

- Stream discharge
- Suspended sediment
- Nitrogen export
- Phosphorus export

Stream Discharge – Water Yield

Net increase in all buffer treatments

Roughly proportional to buffer length and the proportion of the basin harvested

Suspended Sediment Export

No change across treatments.

Streams appear to be sediment supply-limited.

Nitrogen Export

Increased in all buffer treatments

- Greatest change in 0%, least in 100%.

Phosphorus Export

Slight increase in all buffer treatments with no difference among treatments.

Likely a result of higher flows.

Stream-associated Amphibians

Response:

- Amphibian density

Coastal Tailed Frog
(*Ascaphus truei*)

Torrent Salamanders
(3 *Rhyacotriton* species)

Giant Salamanders
(2 *Dicamptodon* species)

Amphibians Density: Tailed Frog

Increase in larval density in the 100% and FP treatments. No change in 0%.

Increase in post-metamorph density in 0% treatment

Amphibian Density: Torrent and Giant Salamander

No change in Torrent salamanders.

No change in Giant salamanders except in lower portion of FP treatment streams.

Summary

- ✓**100% treatment most effectively maintained pre-harvest conditions**
- ✓**Collectively, greatest effects in 0% treatment**

Next Steps

- Phase 2 report (extends through 2017).

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