Chapter 7: The Aquatic Conservation Strategy of the NWFP—Review of the Relevant Science After 23 Years

Speaker: Gordon Reeves, Emeritus Scientist, PNW Research Station
Chapter Authors

Dede Olson, PNW
Steve Wondzell, PNW
Pete Bisson, PNW (emeritus)
Sean Gordon, Portland State Univ.
Stephanie Miller, BLM
Jonathan Long, PSW
Michael Furniss, US Forest Service (retired)
From: Naiman et al. 1992

Dynamic
Regional

Restore and maintain ecological processes that create and maintain suitable conditions in aquatic ecosystems in the NWFP area through time
Augusta Cr. Designs

Riparian reserves
80-year regen. harvest

Headwater reserves
Longer rotations & thinning

Thinning

Headwater and riparian reserves

Default Plan Scenario

Year 400

Long-rotation blocks

AquaBlock Scenario

Year 400

Cissel et al. 1998
Salmon Returns to Bristol Bay, AK

From: D. Schindler
Aquatic and Riparian Ecosystems

Riparian Function versus Distance

Cumulative effectiveness of ecological processes (percent)

- Soil moisture
- Radiation
- Soil temp
- Air temp
- Wind speed
- Relative humidity

Distance from stand edge into forest (tree-heights)

Relative humidity, adjusted
Relative humidity, from above
Riparian Reserves

- Fish-bearing streams
  - Second site-potential tree-height not supported by recent science
Riparian Reserves

- Fish-bearing
  - Second site-potential tree-height not supported by recent science
- May need active management
Riparian Reserves

- Fish-bearing
  - Second site-potential tree-height not supported by recent science
- May need active management
Riparian Reserves

- Non-fish-bearing
- Ecologically important
- May need active management
LWD Input

0.2-0.5 m diameter pieces/mile/yr

RIPARIAN_1
- 1
- 2
- 4
- >4

DEBRIS_F_1
- 1
- 2
- 4
- >4
Time Since the Previous Debris Flow

- 0 to 30 yrs
- 30 to 60 yrs
- 60 to 90 yrs
- > 90 yrs
Option B Riparian Management Area Widths

<table>
<thead>
<tr>
<th>Fish-bearing</th>
<th>Non-fish-bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Most ecologically sensitive</strong></td>
<td><strong>Most ecologically sensitive</strong></td>
</tr>
<tr>
<td>One tree-height</td>
<td>One tree-height</td>
</tr>
<tr>
<td>One tree-height</td>
<td>One tree-height</td>
</tr>
<tr>
<td>One tree-height</td>
<td>One tree-height</td>
</tr>
<tr>
<td>One tree-height</td>
<td>One tree-height</td>
</tr>
<tr>
<td>One tree-height</td>
<td>One tree-height</td>
</tr>
</tbody>
</table>

**Outer Zone**

**Inner Zone**

From: Reeves et al. 2016
Water Contribution

A Lot

Small-
Moderate

Percentage of flow contributed

National forest boundary
Waterbody

Mean annual flow (km$^3$/y)
- 0.15 to 1
- 1 to 2
- 2 to 5
- 0.06 to 5
- 5 to 10
- 10 to 14
Key Watersheds

• Improvement in condition
  • Most improvement compared to non-Key Watersheds in 10- & 15-year assessments
  • Same level of improvement as non-Key Watersheds in 20-year assessment

• Have less capacity to support recovery of ESA-listed fish than originally assumed
High-priority fish-bearing streams located on:

- Federal lands
- Non-federal lands

Source: Pickard et al. (2013)
Climate Change

1993 - 2011

2040
Priority Riparian Areas for Water Temperature

Legend
SolDifMax
- <= 0
- 0.01 - 1500.00
- > 1500

High priority
From: Luce et al. 2012
<table>
<thead>
<tr>
<th>Winning strategies</th>
<th>Losing strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitat generalist</td>
<td>Habitat specialist</td>
</tr>
<tr>
<td>Shorter time in fresh water</td>
<td>Long freshwater rearing</td>
</tr>
<tr>
<td>High stray rate</td>
<td>Low stray rate</td>
</tr>
<tr>
<td>Spring spawning</td>
<td>Fall spawning</td>
</tr>
<tr>
<td>Brief exposure or high tolerance to high temperatures</td>
<td>Extended exposure to high temperatures</td>
</tr>
</tbody>
</table>

Lower risk

- native minnows
- native suckers
- many non-natives

Higher risk

- chum salmon
- pink salmon
- fall Chinook salmon
- winter steelhead
- westslope cutthroat trout
- coastal cutthroat trout
- sockeye salmon
- coho salmon
- spring Chinook salmon
- summer steelhead
- bull trout
- mountain whitefish
Life-History Variation

Juvenile Chinook Salmon Moving Past Humphrey Trap, Elk River, Oregon

Source: G. Reeves, unpublished data
Monitoring (AREMP)

10- & 15-Year Reports

20-Year Report

Number of Watersheds

Change in Condition Score

Density

Upslope/riparian score

Physical habitat score

Density

Macroinvertebrate index (observed / expected)

Water temperature (T-DADMax)
Summary

• Aquatic ecosystems in the NWFP area are likely improving as expected, albeit slowly
Summary

• Aquatic ecosystems in the NWFP area are likely improving as expected, albeit slowly.

• The fundamental tenets and ecological framework of the ACS are sound
Summary

• Aquatic ecosystems in the NWFP area are likely improving as expected, albeit slowly.

• The fundamental tenets and ecological framework of the ACS are sound

• Opportunities exist for implementing parts of the ACS differently while continuing to achieve its goals.
Go big, or go home!
Summary

• Aquatic ecosystems in the NWFP area are likely improving as expected, albeit slowly.

• The fundamental tenets and ecological framework of the ACS are sound

• Opportunities exist for implementing parts of the ACS differently while continuing to achieve its goals.

• Need active management in Riparian Reserves in some situations
Summary

• Aquatic ecosystems in the NWFP area are likely improving as expected, albeit slowly.

• The fundamental tenets and ecological framework of the ACS are sound

• Opportunities exist for implementing parts of the ACS differently while continuing to achieve its goals.

• Need active management in Riparian Reserves in some situations

• Need to examine AREMP analytical process
Summary

• Aquatic ecosystems in the NWFP area are likely improving as expected, albeit slowly.
• The fundamental tenets and ecological framework of the ACS are sound.
• Opportunities exist for implementing parts of the ACS differently while continuing to achieve its goals.
• Need active management in Riparian Reserves in some situations.
• Need to examine AREMP analytical process.
• Are potential options of meeting challenges of climate change.