Steelhead Paper
Public Review Draft

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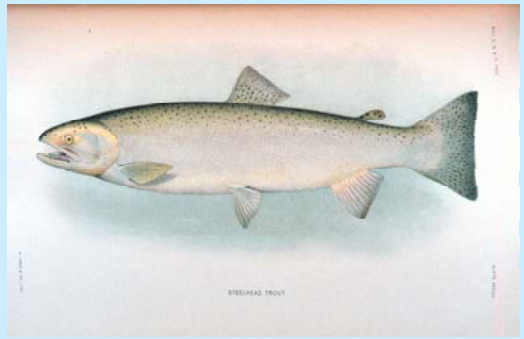
Chief Fish Scientist, Fish Program

July 20, 2006



Draft for
Public Review and Comment

Oncorhynchus mykiss:

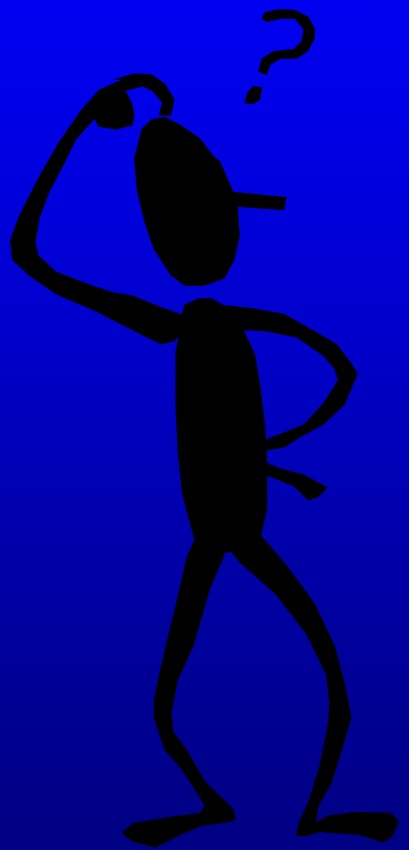
Assessment of Washington State's Anadromous Populations and Programs

Edited by
James B. Scott, Jr.
William T. Gill

Washington Department of Fish and Wildlife
Olympia, Washington

July 21, 2006

Motivation



- Director Koenings: Provide a scientific foundation for the subsequent development of steelhead management plan:
  - Compile recent research
  - Collate and analyze current data
  - Develop tools and evaluate alternative fishery and hatchery management strategies

Approach

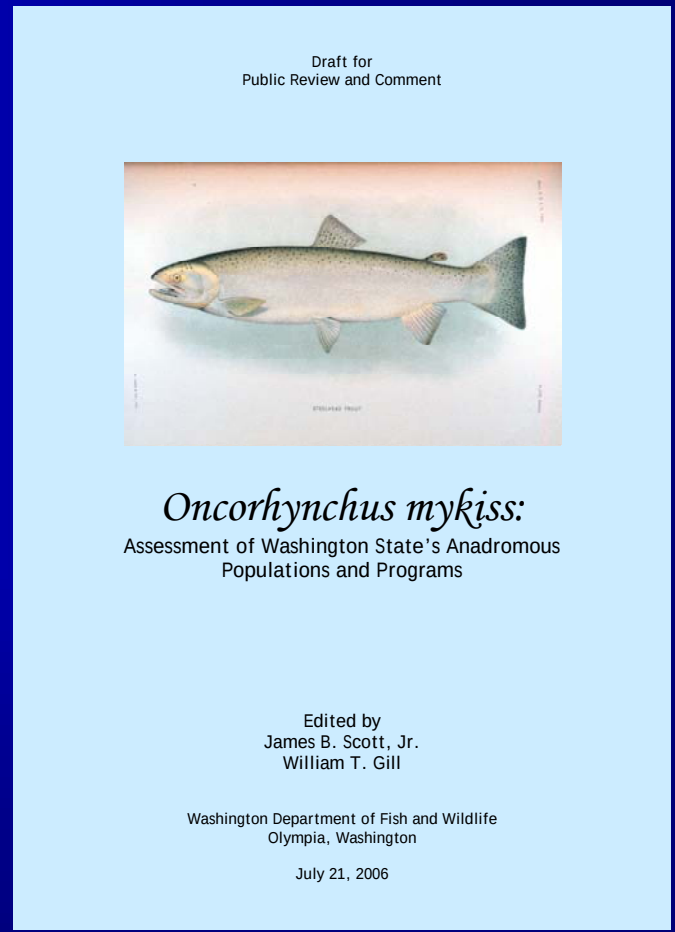
- Frame paper around a series of key questions currently facing steelhead managers:
  - "What management complexities result from the unique biological characteristics of steelhead?"
  - "What is the fitness of naturally-spawning steelhead of hatchery-origin relative to the indigenous population?"
  - "How has the range of steelhead changed from the historical distribution?"
  - "What is the status of steelhead populations?"

Development Process
External Review of Framework

- Hatchery Scientific Review Group (May 2004)
- Western Washington Tribes (June 2004)
  - Assure that appropriate topics are addressed
  - Provide data
  - Review draft document
- Stakeholders
  - Steelhead and Cutthroat Advisory Group (September 2004)
  - Steelhead Summit V (November 2004)
  - Hatchery Reform Coalition (December 2004)

Science Paper Chapters

- Introduction
- Biology
- Artificial Production
- Management
- Population Structure
- Diversity and Spatial Structure
- Abundance and Productivity



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Development Process
Content Review

1st Draft (December 2004)	Internal Review
2nd Draft (September 2005)	Western Washington Tribes Steelhead & Cutthroat Advisory Group
3rd Draft (January 2006)	Internal Review Western Washington Tribes Columbia Basin Tribes Steelhead & Cutthroat Advisory Group
Public Review Draft	July 2006 Stakeholders Steelhead and Cutthroat Advisory Group Other Agencies & Tribes Independent Scientists (e.g., HSRG)

What Will You See?

Chapter 2

Biology

Key Questions:

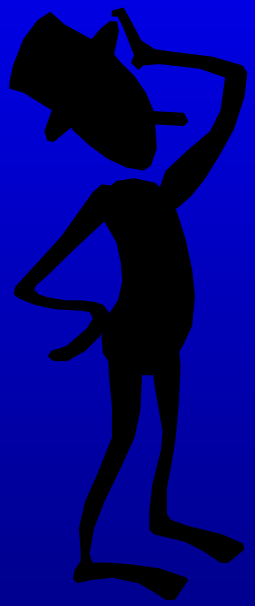
a) *What are the defining biological characteristics of O. mykiss?*
b) *What are the habitat, harvest, and hatchery management implications of these biological characteristics?*
c) *What management complexities result from these biological characteristics?*

2.1 Introduction

Steelhead are considered by many fisheries biologists to be the most difficult Pacific salmonid species to protect and manage because of the diversity in life history patterns that exist both within and between populations. This diversity includes multiple times for the return of adults to natal streams, varying periods of freshwater and ocean residency, and plasticity of life history between generations. The life history of steelhead also differs from many *Oncorhynchus* species in several fundamental ways. These include the frequent presence of resident forms of *O. mykiss* and iteroparity, or the ability to complete more than one cycle of spawning. This diversity introduces management complexity – but also enables the species to persist in highly variable environments.

> *"The steelhead are a paradox and only their return is viewed with absolute certainty. They are composed of exceptions—every "fact" about their upstream migration will almost contain an opposite number somewhere else."*
>
> *Trey Combs, The Steelhead Trout*

What Will You See?



2.6 Findings and Recommendations

Finding 2-1. *O. mykiss* **displays a wide range of life history diversity that enables the species to persist in highly variable environments.** The diversity of life history characteristics expressed by *O. mykiss* include the presence of resident (rainbow or redband trout) and anadromous (steelhead) forms , varying periods of freshwater and ocean residency, summer and winter adult return timing to freshwater, and plasticity of life history between generations. The emphasis on life history diversity as a strategy for persistence contrasts with some other species of anadromous *Oncorhynchus*, such as pink salmon (*Oncorhynchus gorbuscha*), which exhibit relatively small variation in life history characteristics.

Recommendation 2-1. Pursue opportunities to preserve and restore population structure, spatial structure, and within-population diversity through careful review of harvest, hatchery, and habitat management and implementation of improved strategies.

Recommendation 2-2. Develop improved tools that relate environmental factors (e.g., climate, water temperature, stream flow) and the physiological status (e.g., length, growth rate) of juvenile *O. mykiss* to the diversity, spatial structure, abundance, and productivity of steelhead populations.

What Will You See?

- **Introduction**
  - "**Promote progress in the continued evolution of fisheries management."** The underlying paradigm of fishery management is rapidly shifting from an approach that focused simply on the abundance of a single species to one that considers multi-attribute population assessments and community ecology."

You have to understand that for some people this is *the* Northwest fish. Period. Status quo management is not an option.

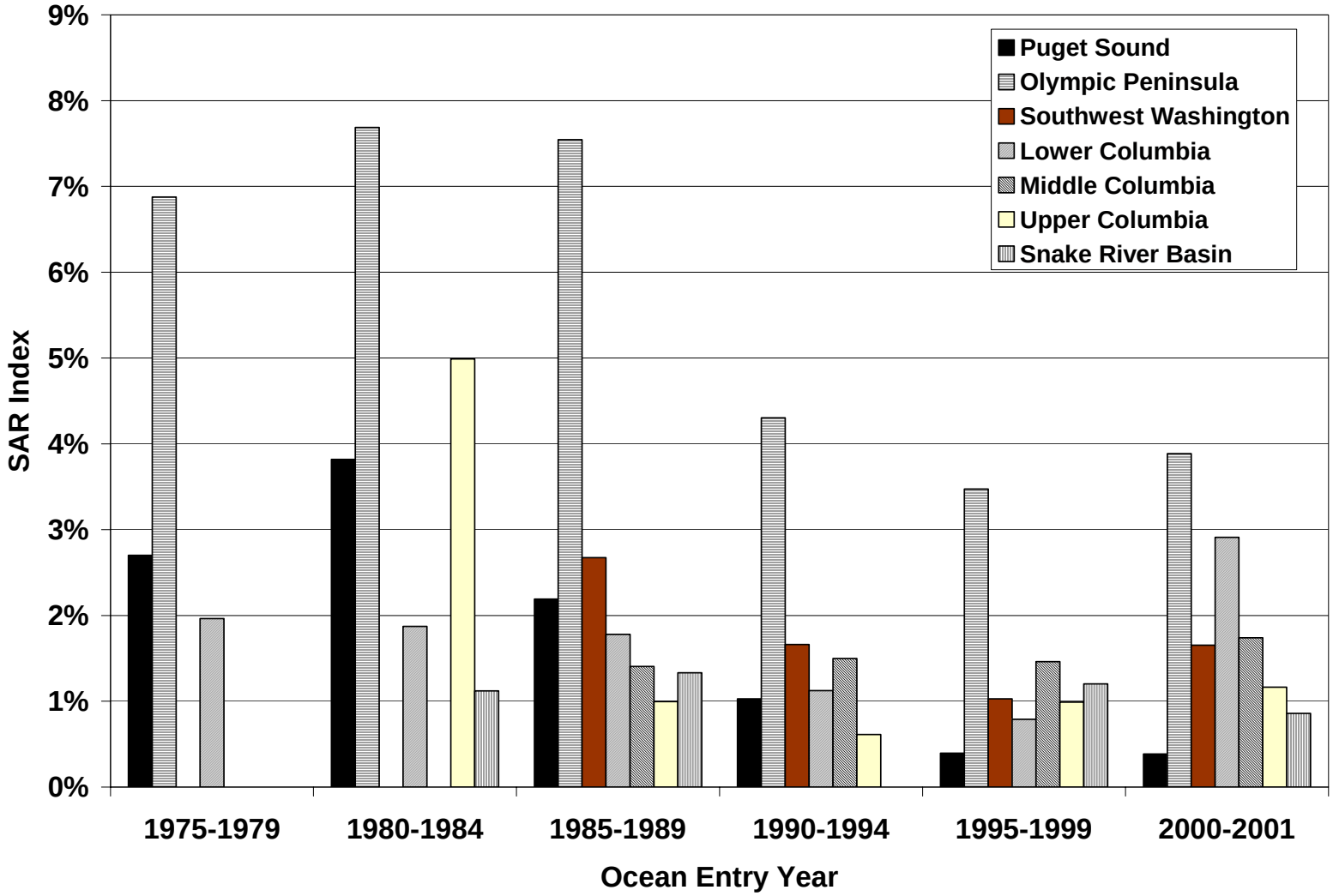
Director Koenings

What Will You See?

- **Biology**
  - **Finding 2-1.** *O. mykiss* **displays a wide range of life history diversity that enables the species to persist in highly variable environments.**
  - **Finding 2-3. The complex reproductive and ecological interactions between anadromous and resident forms of O. mykiss may necessitate a holistic assessment of management actions.**

What Will You See?

- **Artificial Production**



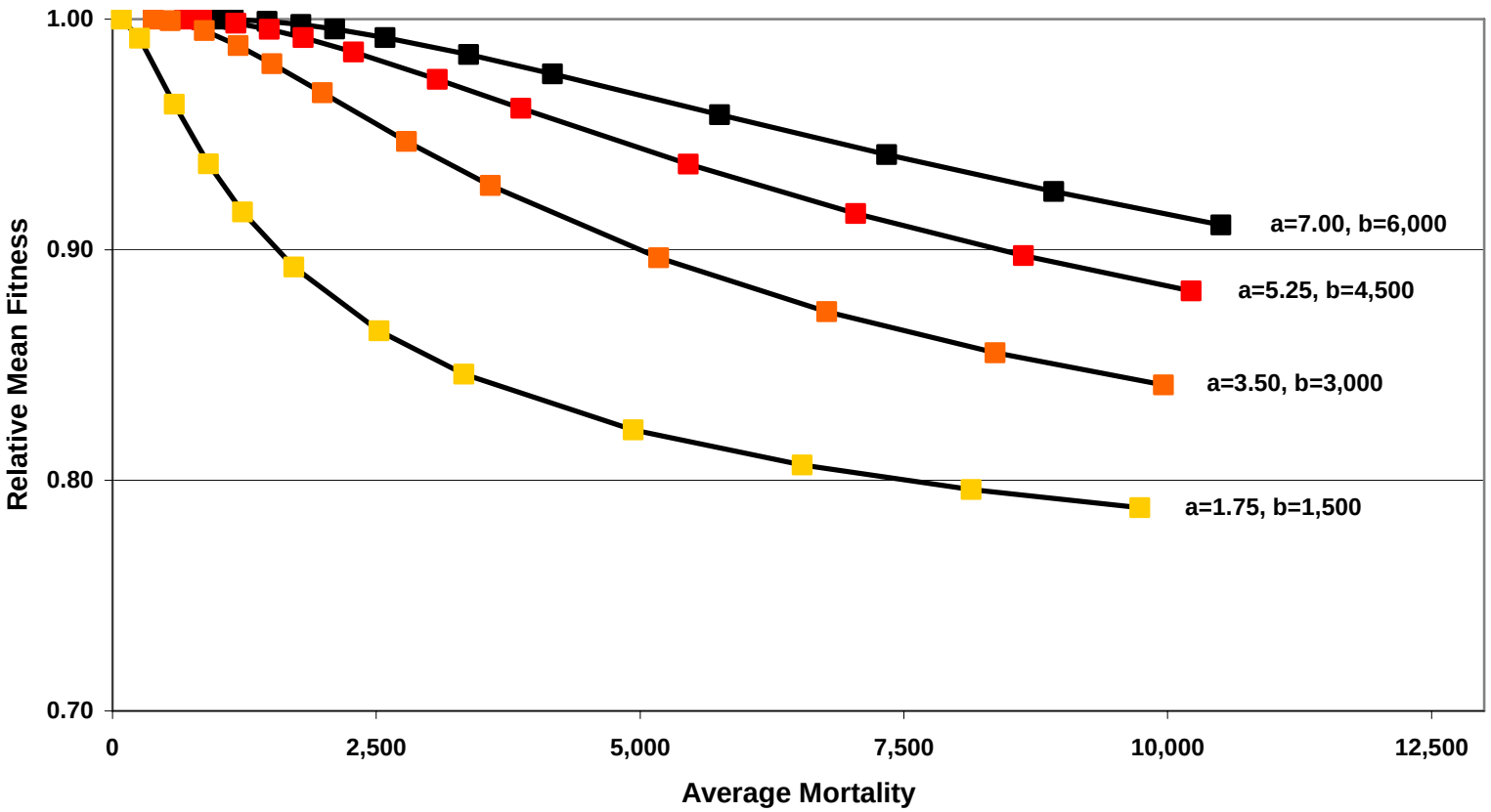
What Will You See?

- **Management**

> *"…the central objective of modern fisheries science should be to clearly expose trade-offs among conflicting objectives, and the central objective of fisheries management should be to develop effective ways to decide where to operate along the trade-offs, and how to operate successfully."*
>
> *Carl J. Walters & Steven J.D. Martell*
> *Fisheries Ecology and Management*

What Will You See?

- **Management**



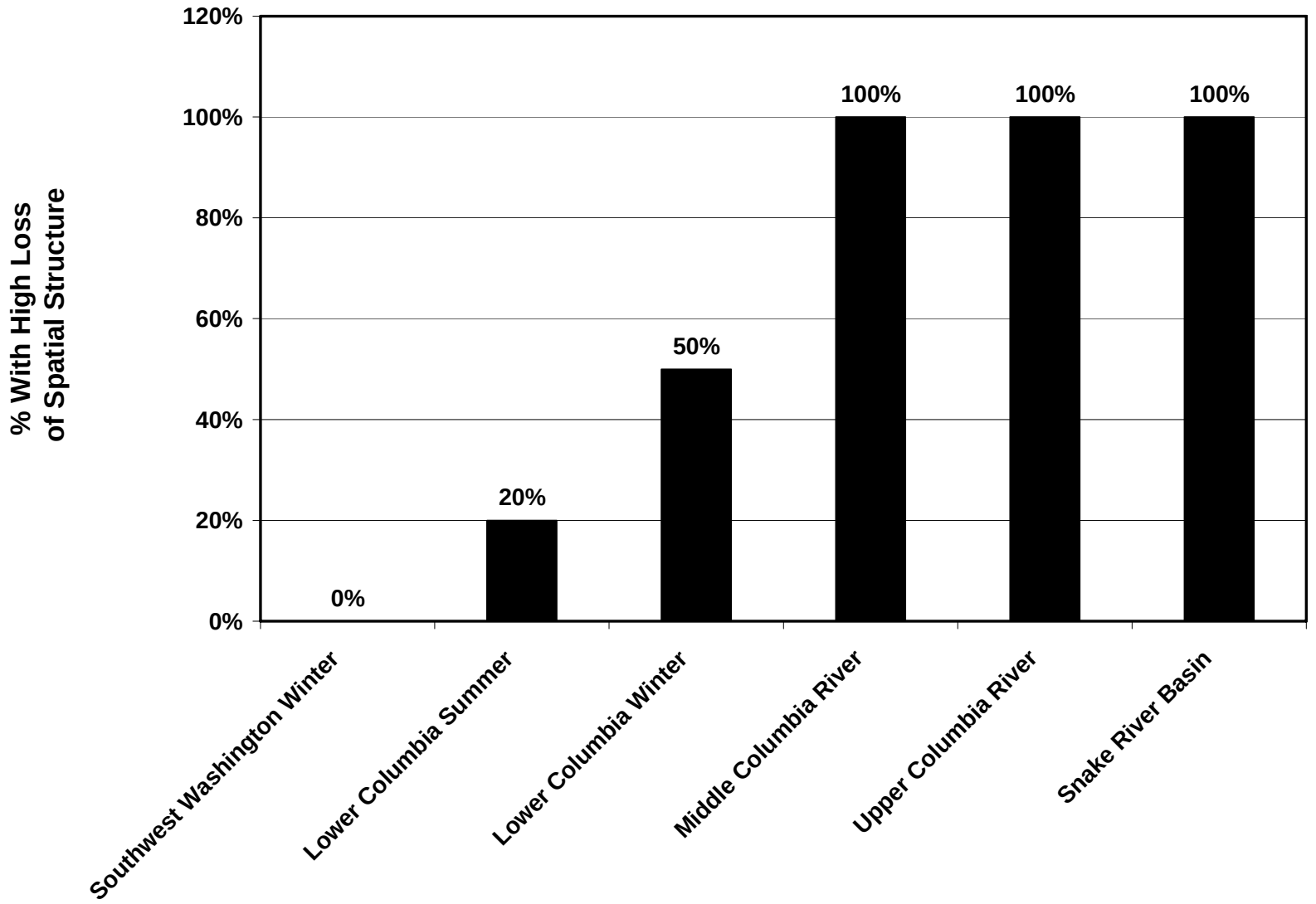
What Will You See?

- **Population Identification**
  - **Finding 5-1. Short-term abundance and longterm persistence of the steelhead resource requires viable, locally-adapted, diverse populations, but a substantial loss of population structure has occurred in some, but not all regions.**

ESU	Number of Historical Populations	Number of Historical Populations Remaining	% of Historical Populations Remaining
Puget Sound	51	49	96%
Olympic Peninsula	31	31	100%
Southwest Washington	19	19	100%
Lower Columbia River [1]			
Within Washington	19	14 [2]	74%
Total ESU	28	23	82%
Middle Columbia River [3]			
Within Washington	9	8	89%
Total ESU	20	18	90%
Upper Columbia River [3]	11	5	45%
Snake River Basin [3]			
Within Washington	4	4	100%
Total ESU	40	25	62%
All			
Within Washington	144	130	90%
Total ESU	200	170	85%

What Will You See?

- **Spatial Structure and Diversity**



What Will You See?

- **Abundance and Productivity**
  - **Finding 7-1. The inability to monitor the escapement of populations introduces significant uncertainty and risk into the management of steelhead in Washington.**
  - **Finding 7-2. Degradation of riverine, estuarine, and nearshore habitat has resulted in the loss of an average of 83% of the potential production of the 42 steelhead populations assessed in Washington.**

Region	Mean loss in potential production (# populations assessed)	% Populations Healthy (# populations assessed)
Upper Columbia River	98% (4)	0% (2)
Middle Columbia River	87% (6)	0% (2)
Snake River Basin	84% (4)	0% (2)
Lower Columbia River	69% (16)	11% (9)
Puget Sound	[1] (1)	20% (25)
Southwest Washington	68% (11)	65% (16)
Olympic Peninsula	NA (0)	92% (13)

Next Steps & Opportunities

- Steelhead Paper Comments
- Management Plan Development
- 07-09 Budget Proposal
- Collaboration
  - Kelt reconditioning
  - Collection of genetic samples