

The Build-up to Canada's Policy for Conservation of Wild Pacific Salmon (1980-2000)

&

Introduction to Defining Conservation Units for Wild Pacific Salmon

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Outline of Build-up to the first draft of the WSP (March 2000)

1. A Convergence of People and Issues ... A chronology for change
2. The Value of diversity in Pacific salmon ... The original value
3. Managing Diversity in BC's salmon
 - a. Spatial organization of salmon by species



1. A Convergence of People and Issues ... A chronology for change

A period of accomplishments in science and new agreements, historic highs and lows in Canadian catches of Pacific salmon, and changes in resource management.

But ironically, in the context of Fraser River sockeye salmon, the effect of these changes were less than for other Pacific salmon populations in British Columbia and the Yukon.

Examples presented:

- Development of Conservation Biology and concern for Biodiversity
- Explosion of genetic research methods and analyses
- A period of introspection and change in fisheries (Attachment 1)
- Major new agreements and Pacific Salmon Treaty
- Key science papers in conservation and environmental events, and heightened environmentalism.

Figure 1 B.C. commercial catch and spawning escapement

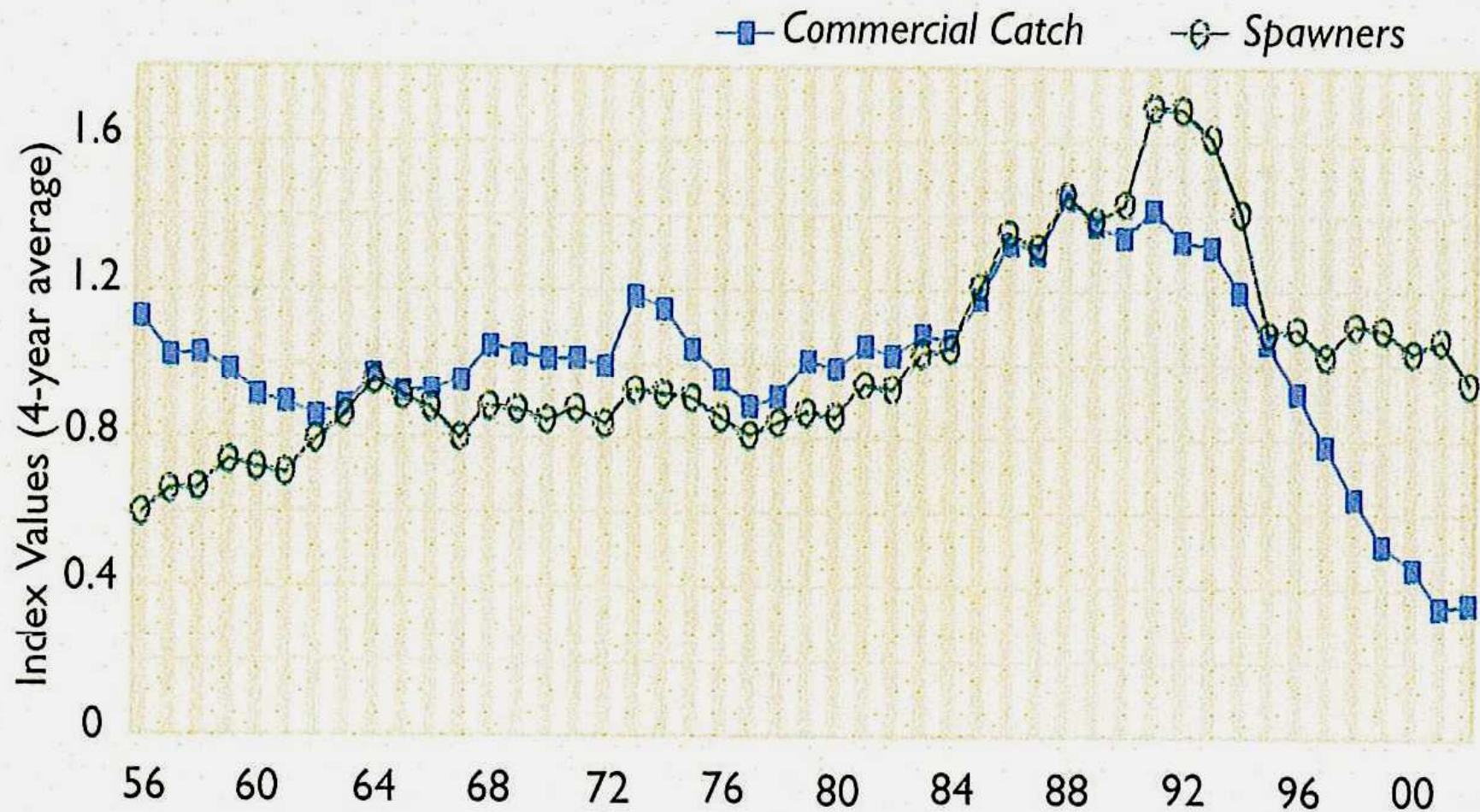


Figure 1 from Dec. 2004 draft of the Canadian WSP. Trends in commercial salmon catch and total salmon spawning numbers within same years (1956 to 2002).

2. The Value of diversity in Pacific salmon ... The original value

The Home Stream Theory & the Stock Concept

The ability of salmon to return to their natal stream is called HOMING.

Homing creates local spawning groups, affording opportunity for adaptation whereby inherited traits improve survival of these groups in their local environment (increasing their productivity) = POPULATIONS.

Such populations that are largely isolated from other groups form genetic lineages of salmon referred to as STOCKS. Managing to sustain stocks to maximize production of salmon throughout their habitats = Stock Concept.

The roots of the Stock Concept for Pacific salmon has been acknowledge for essentially 100 years, so why was it necessary to establish the Wild Salmon Policy?

Why wasn't the "Stock Concept" in Pacific salmon sufficient?

- 1) While the diversity amongst populations was acknowledged, the concept was misused and misunderstood. In practice, "stocks" had become identifiable management units and the composition within them not fully appreciated or protected.
- 2) How should "stocks" be delineated? Individual species/stream combinations ("stocks" in Slaney et al 1996) are NOT genetic lineages ... and the Department does not, and can not, manage each individually.
- 3) The Stock Concept emphasizes differences between populations identified by current adaptations ... but the underlying processes (adaptability) were not considered. (*P Larkin 1974*)
- 4) and as the value of biodiversity was recognized ... people questioned "how much do you really need?"

Three principles emerge from understanding the Stock Concept:

1. Adaptations that exist today reflect the past ... but evolution is a continuous process. Maintaining ADAPTABILITY in salmon is critical for their future. But, the genetic lineages of today are irreplaceable and *provide our current basis for production*.
2. Ecological and habitat diversity are the templates for genetic diversity. The tie between conservation units, habitats, and ecosystems within the WSP is simply natural *and required*.
3. Maximizing production and diversity of salmon are consistent objectives ... Not inconsistent. In management, the trade-off that people debate is about the *rate of use and not total production*. Rate of use is directly related to productivity.

Scientifically, there is no question that diversity in Pacific salmon is essential for their continuance and future sustainable benefits.

3. Managing Diversity in BC's salmon

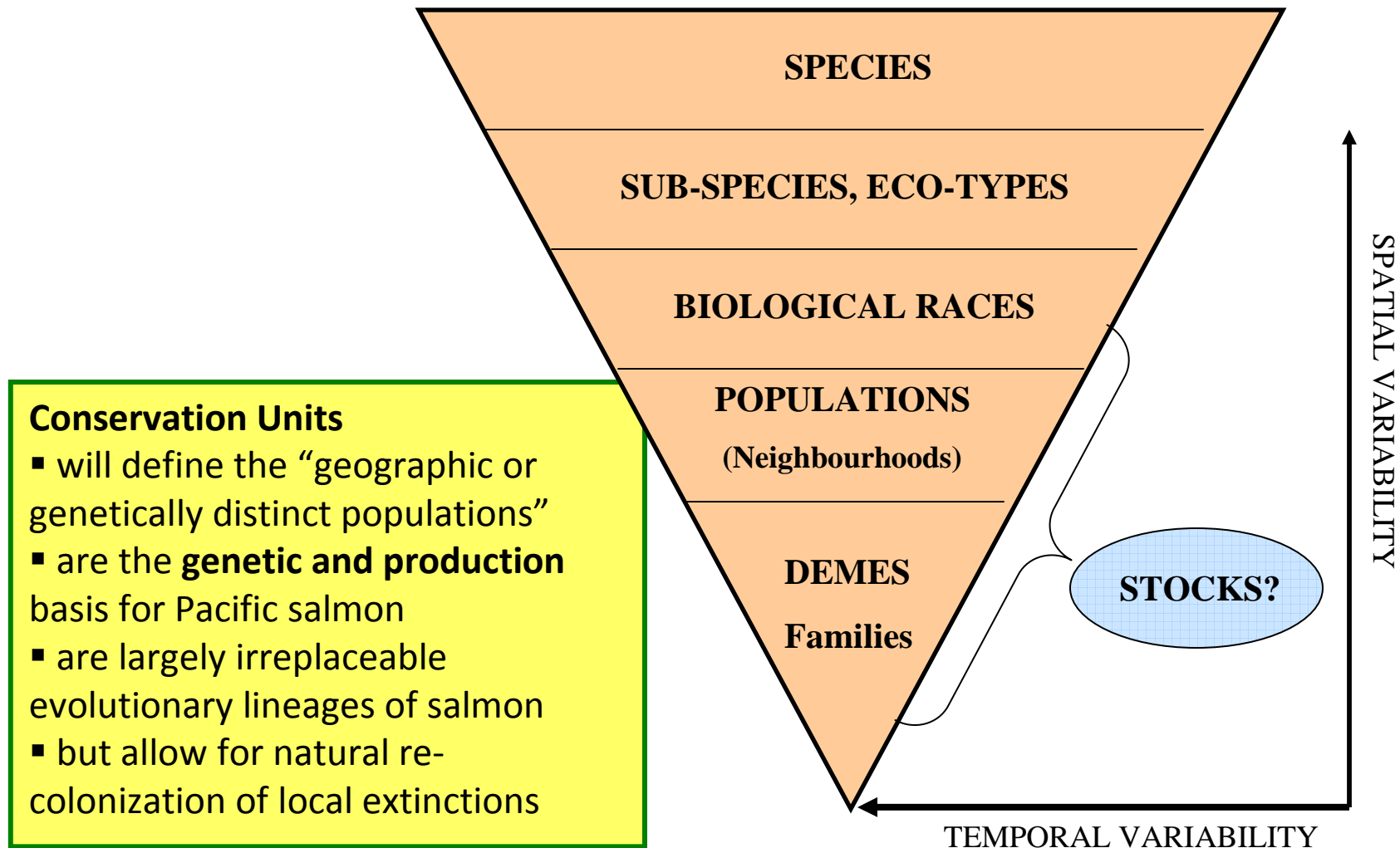
a. Spatial organization of salmon by species

Each combinations of species/streams are not “stocks” of salmon.

Species	# of "Stocks"	Status could be determined for % of "Stocks"	% Extinctions of Known "Stocks" (number of Stocks)
Chinook	866	47%	4.2% (17)
Chum	1,625	70%	1.9% (22)
Coho	2,594	50%	2.2% (22)
Pink	2,169	69%	1.1% (17)
Sockeye	917	60%	3.7% (20)
Total	8,171*	60%	2.1% (105)

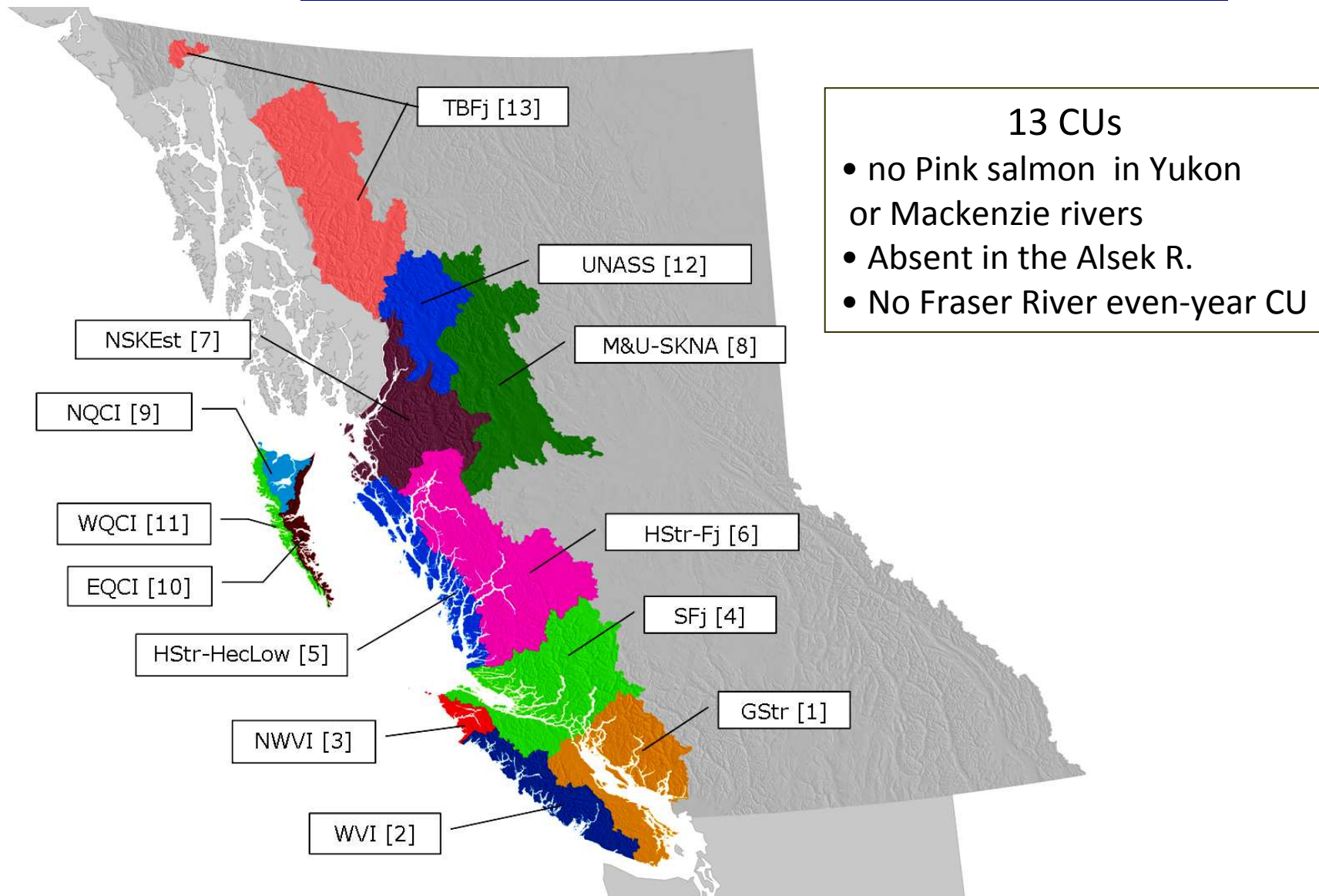
From Slaney et al. 1996. Fisheries 21(10), page 24. (provided to Commission)

Hierarchy of biological diversity within Pacific Salmonids (from Riddell 1993)



The spatial scale of CU's varies widely and is very different between species.

Even-year Pink CUs in Pacific/Yukon



What is a Conservation Unit of Pacific Salmon?

A Conservation Unit is defined as: *“Groups of wild salmon living in an area sufficiently isolated from other groups that, if extirpated, that area is very unlikely to be recolonized naturally within an acceptable time frame.”* pg. 38 WSP (June 2005)

See: Holtby, L.B. and Ciruna, K.A.. 2007. Conservation Units for Pacific salmon under the Wild Salmon Policy. CSAS Research Document 2007/070: 367p.

www.dfo-mpo.gc.ca/csas

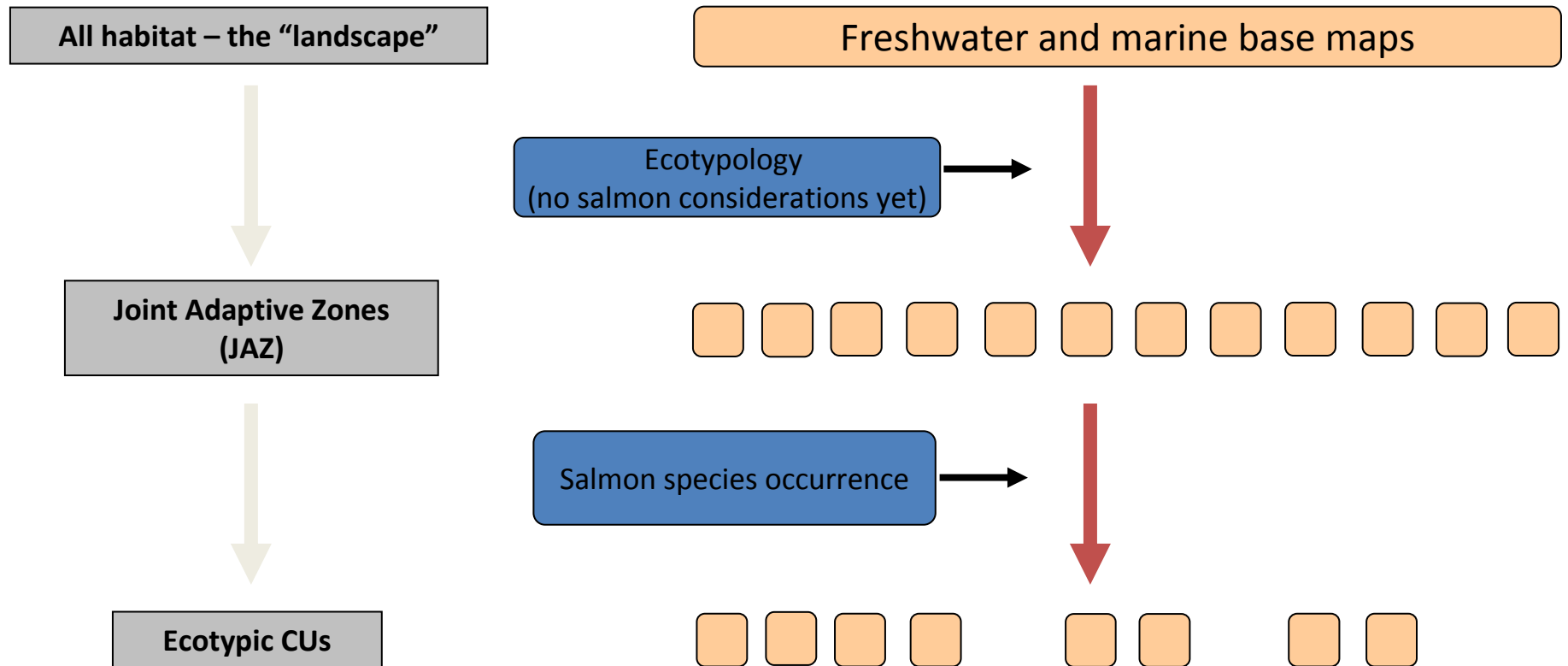
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The WSP and Conservation Units acknowledge:

- the natural spatial organization of salmon (**Networks** of populations across varying habitats = intra-specific diversity)
- the need to manage uncertainty (**precaution**) into the future due to
 - high uncertainty in data with related management limitations
 - significant environmental impacts with unpredictable interactions and outcomes
 - expectations of climate change (unpredictable rates and extent of change)
- the essential need to protect **adaptability** in salmon.
(allow for natural processes to function)

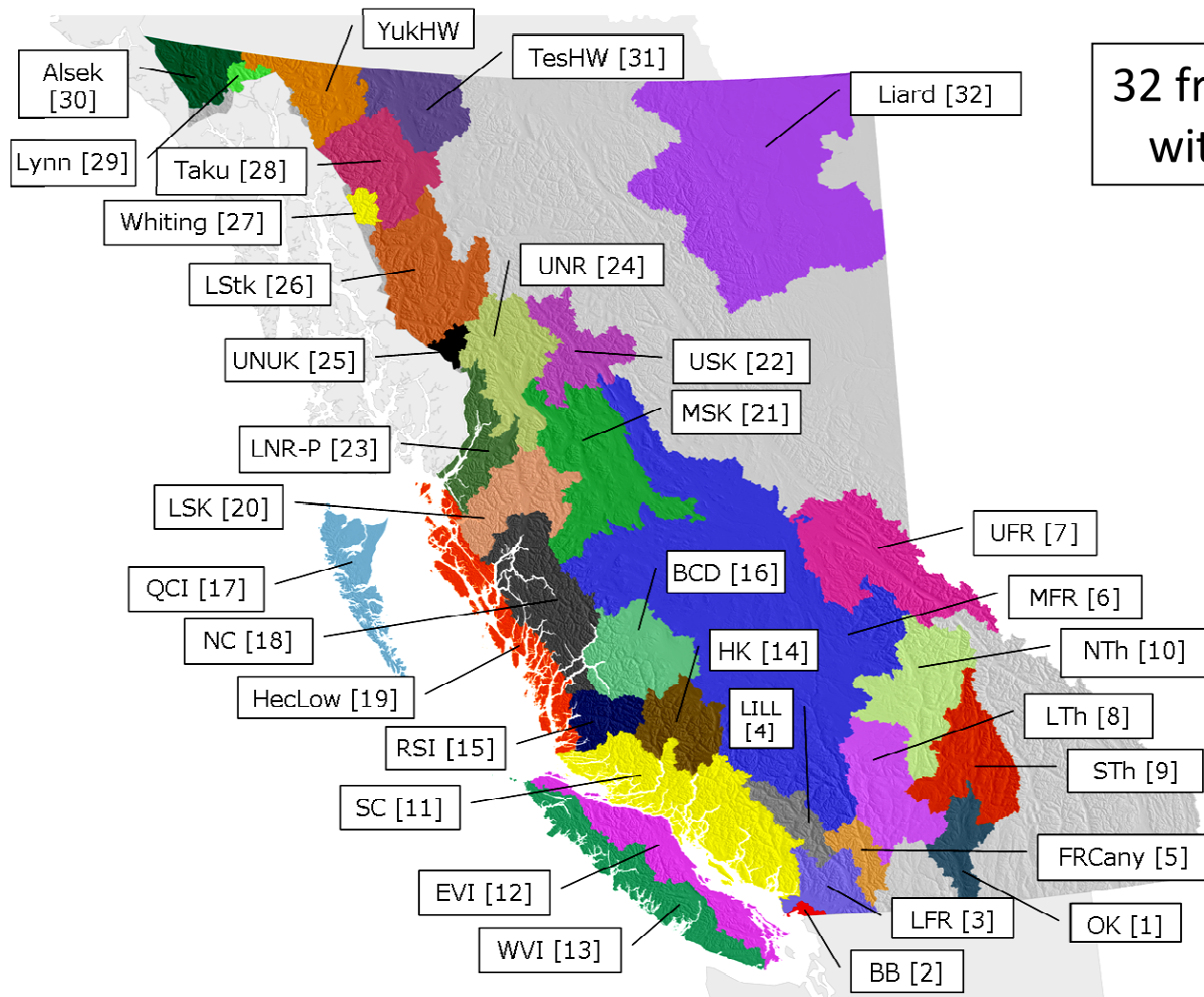
CU Methods diagram, step 1



Geographic distribution of species only.

(Biological attributes of local populations not yet considered)

BC's Freshwater Adaptive Zones (FAZ)

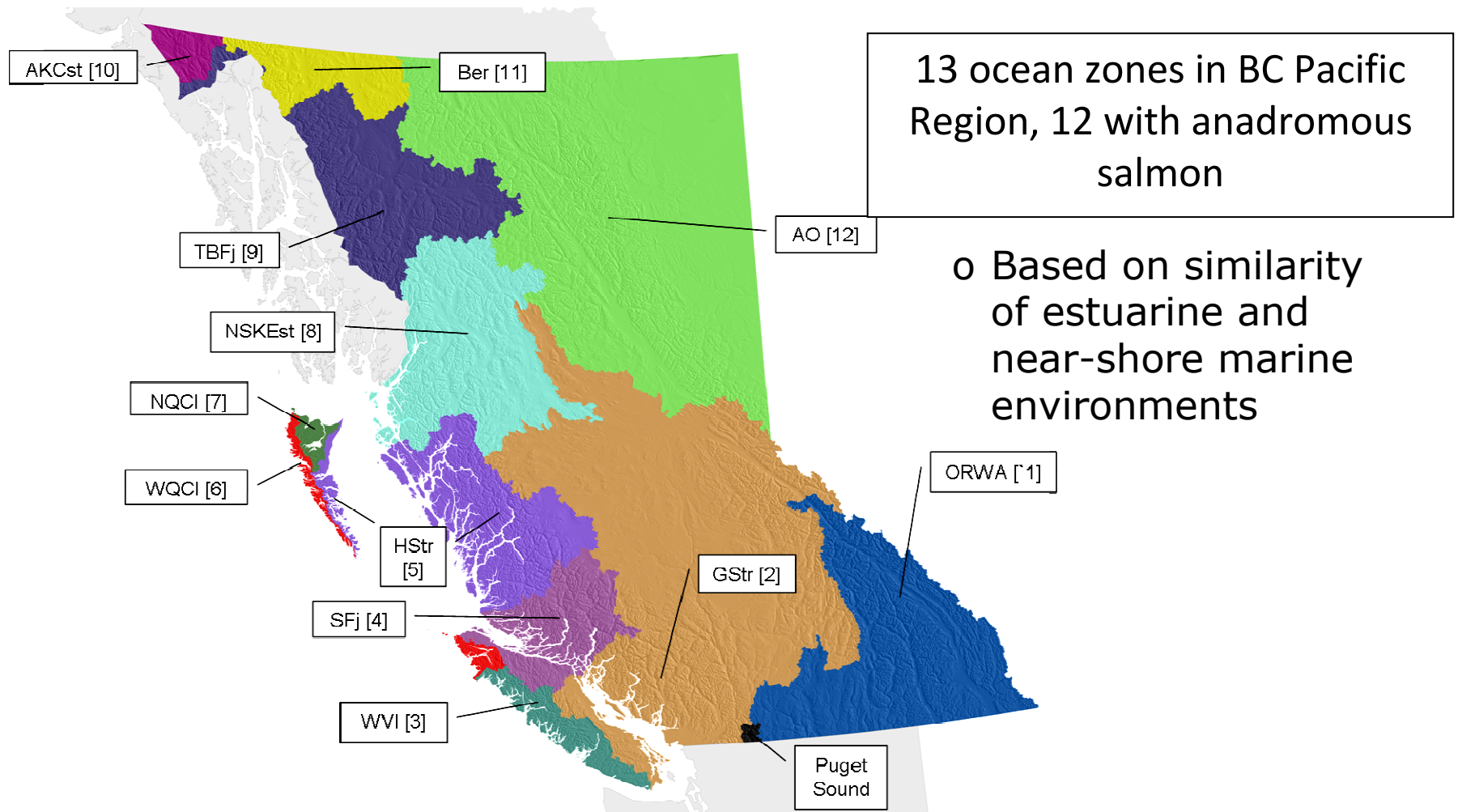


32 freshwater adaptive zones
with anadromous salmon

- o Similar climate, geography, hydrology & connectivity
- o Common zoogeographic history so distinct freshwater species assemblage
- o Salmon populations within each zone are more likely to be ecologically exchangeable than with populations in different zones

K.A. Ciruna, B. Butterfield, J.D. McPhail, and BC Ministry of Environment. 2007. *EAU BC: Ecological Aquatic Units of British Columbia*. Nature Conservancy of Canada, Toronto, Ontario. 200 pp. (www.science.natureconservancy.ca/resources/docs/)

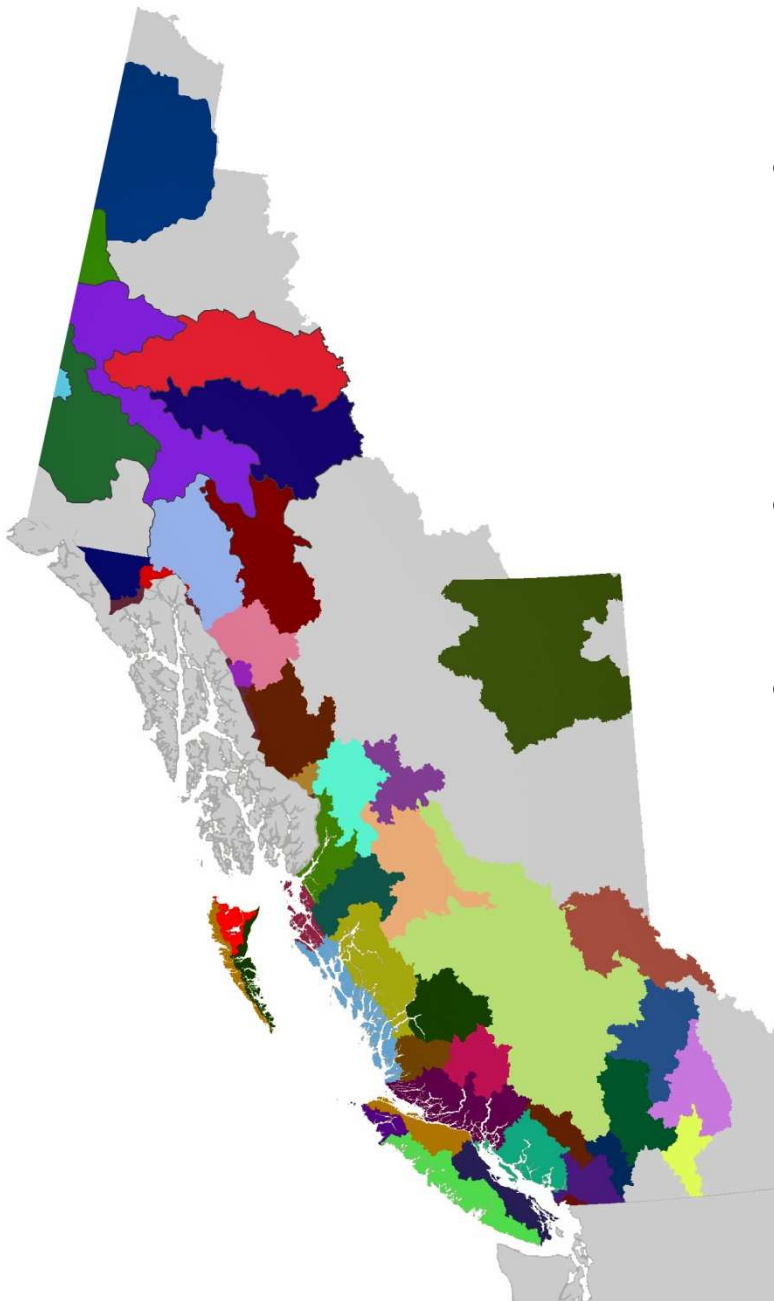
Ecotypology – Marine Adaptive Zones (MAZ)



The Marine Adaptive Zones were derived from the Ocean Eco-regional Classifications developed by the Wild Salmon Centre, Portland, OR.

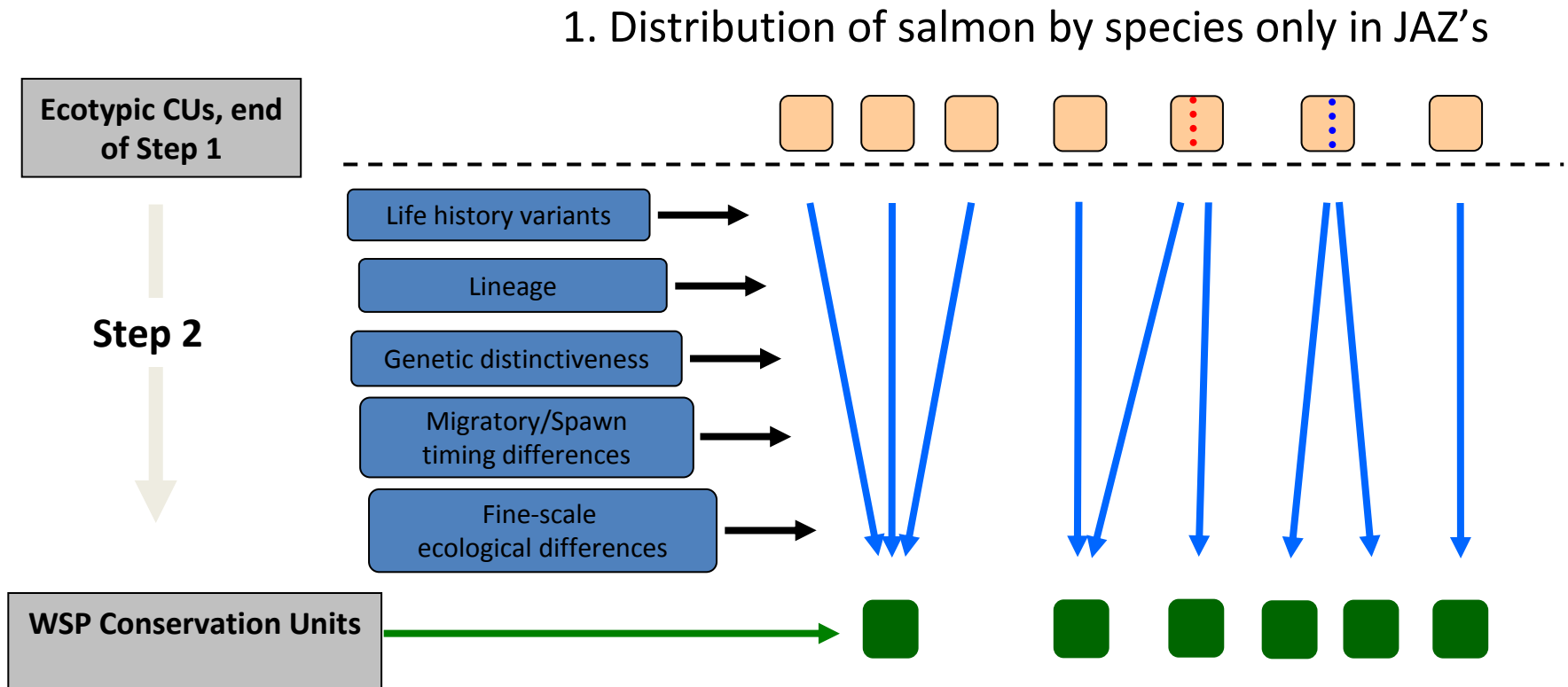
Maps at: www.stateofthesalmon.org/resources/maps

Joint Adaptive Zones (JAZ)



- Combination of modified Ecological Drainage Units (Ciruna et al 2007) & modified Ocean Eco-regional Units (WSC) create 38 JAZ
- But, all Pacific salmon species are NOT in all JAZ
- At a minimum, one salmon species in one JAZ would be a Conservation Unit.

Method diagram, Step 2, Biological Attributes by Ecotypic CU's



Conservation Units will differ by spatial scale and information content, to be periodically revised with new information and the delineations do NOT dependent on status.

Number of CUs by species in BC

species	number of CUs
pink-odd	19
pink-even	13
chum	38 [†]
coho	43
Chinook	68 [†]
sockeye-river	24
sockeye-lake	~230
Sub-total	435

+ Additional CUs will be described in the Yukon River. Although additional CUs are possible in the Mackenzie River, they would be outside of the geographic purview of the Wild Salmon Policy at this time.

WSP Implementation Steps

