Between the Gravel and the Sea:
Vital Role of the Willamette River for Chinook Salmon

"The Willamette River from a Mountain"
Paul Kane, 1847

Willamette Riverkeepers

Kirk Schroeder
Luke Whitman
Brian Cannon
Paul Olmsted
Oregon Department of Fish and Wildlife

USFWS – Sport Fish Restoration Funds
Army Corps of Engineers

Willamette Basin:

Largest watershed in Oregon

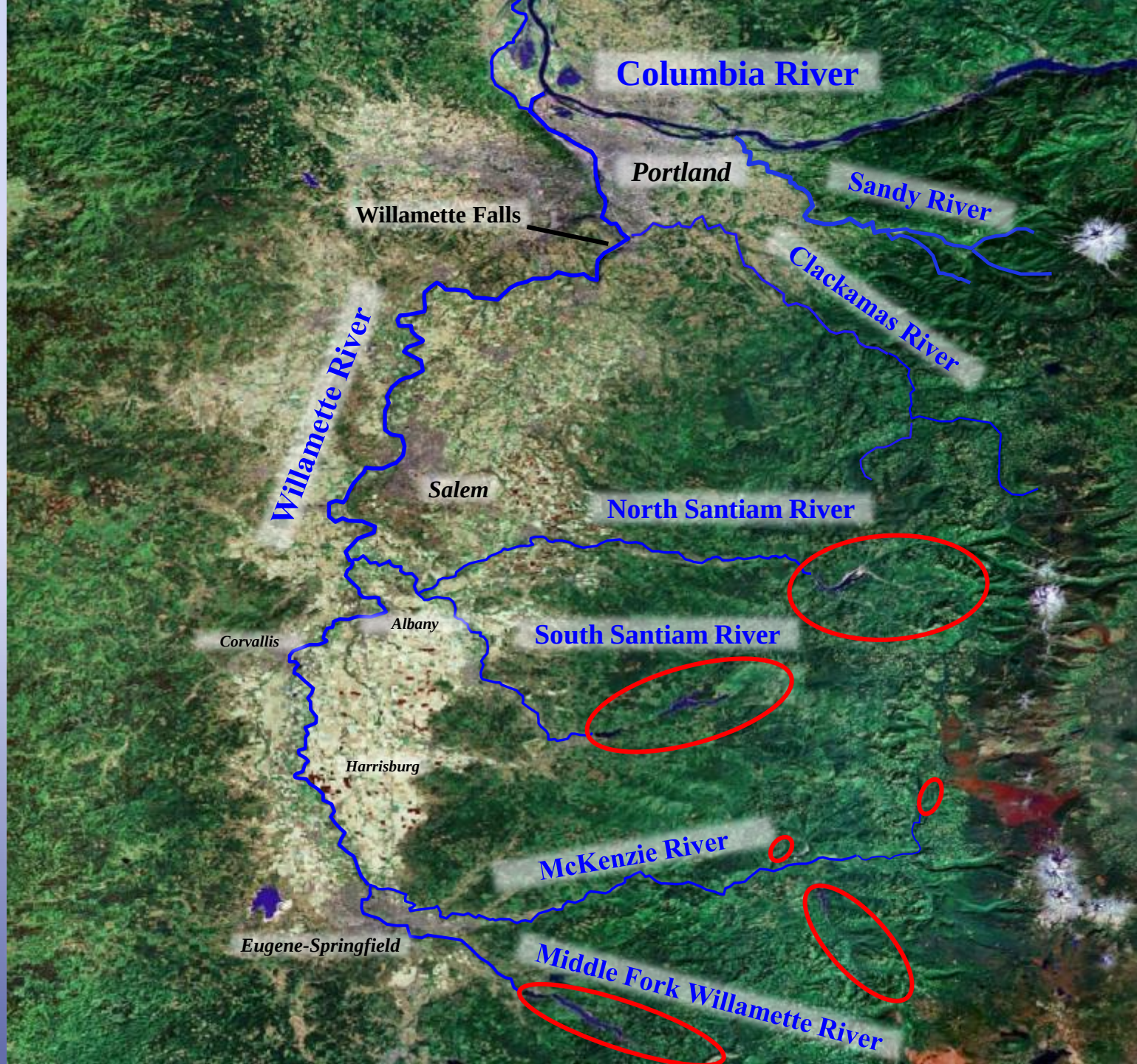
70% of Oregon population

Largest urban areas in Oregon

Dams block access to upper reaches of Spring Chinook rivers

Spring Chinook 'threatened" species 1999

Recovery Plan 2011



Between the Gravel and the Sea

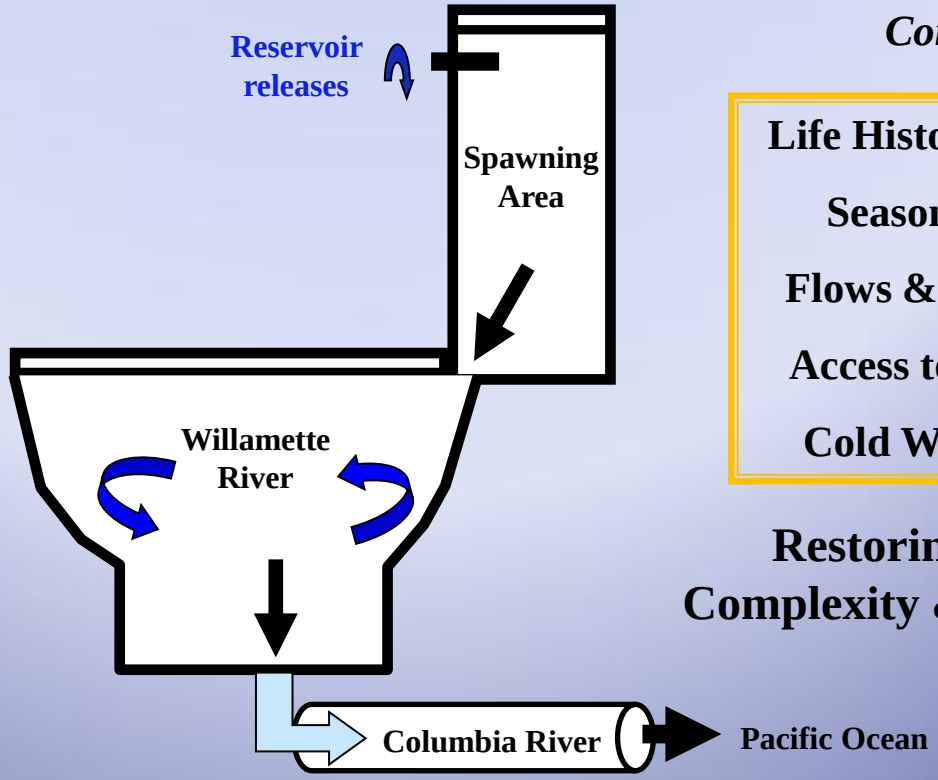
Building Your Conceptual Model

I. Willamette as Migration Corridor

Reductionist

- Dams control River
- Hatcheries control Fish Production
- Single Life History
- Legacy of Pollution
- River = Bad Neighborhood

Flow Management = Flushing Flows



II. Willamette River within Connected Landscape

Complexity

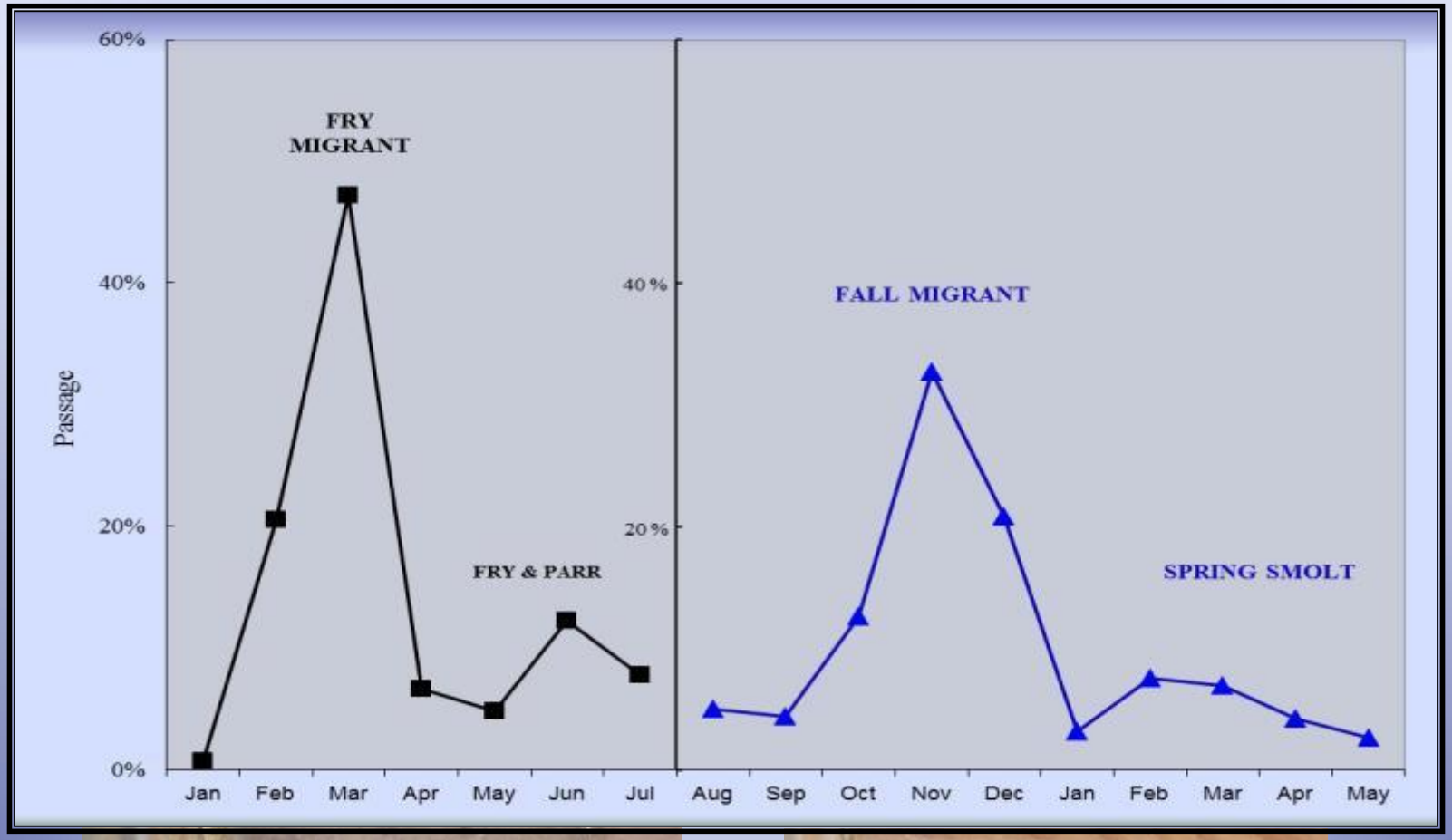
- Life History Expression
- Seasonal habitats
- Flows & Temperature
- Access to Floodplains
- Cold Water Refugia

Restoring Channel Complexity & Connectivity

Life History Diversity

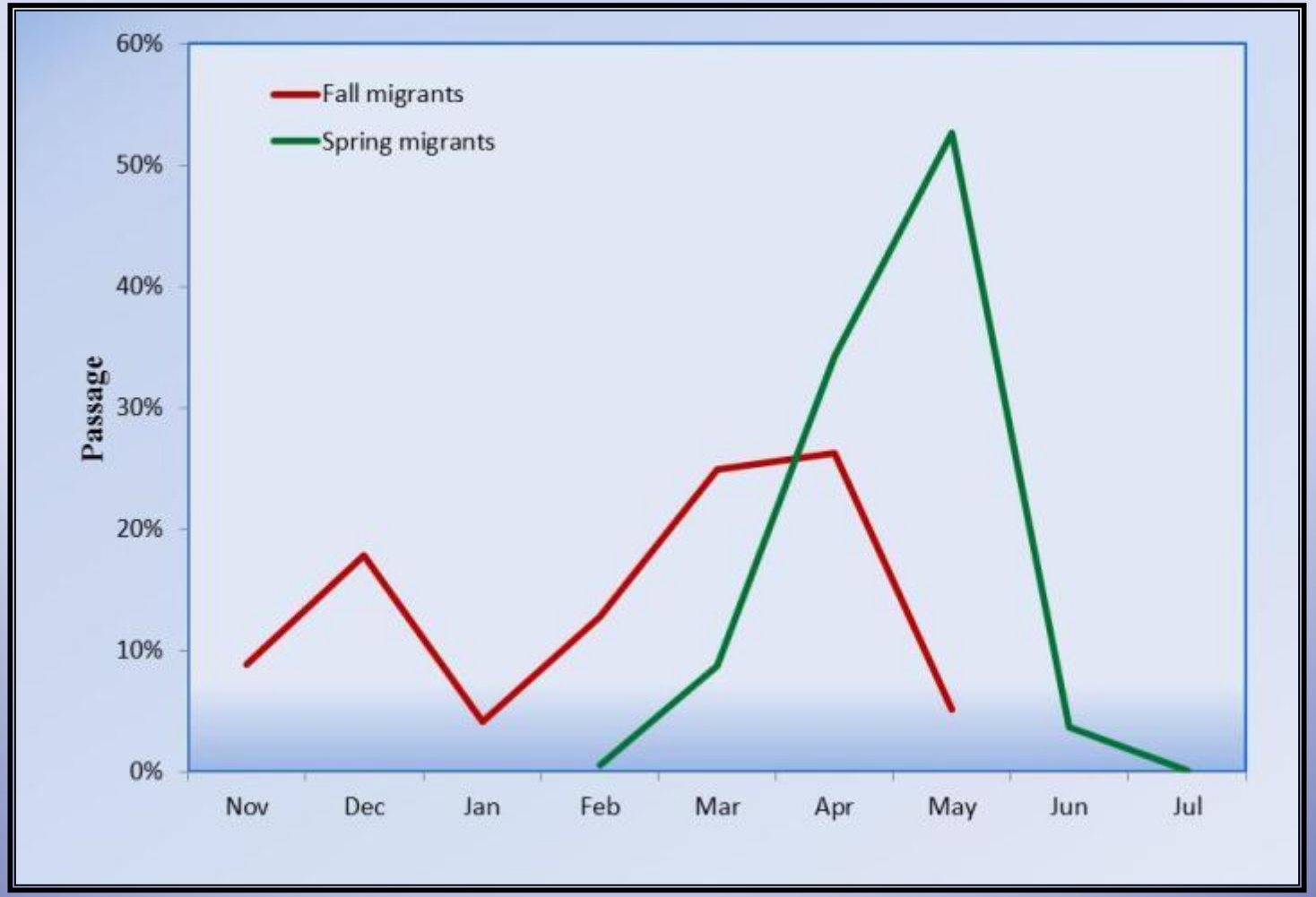
Wild Juvenile Chinook in McKenzie at Leaburg Dam

Migration from Spawning Areas



Migration of Wild Juvenile Chinook past Willamette Falls

Tagged at Leaburg Dam in fall or spring



Most Fall migrants overwinter in Willamette

Spring migrants spend < 1 month – 3 months in Willamette

Fry Dispersal & Rearing

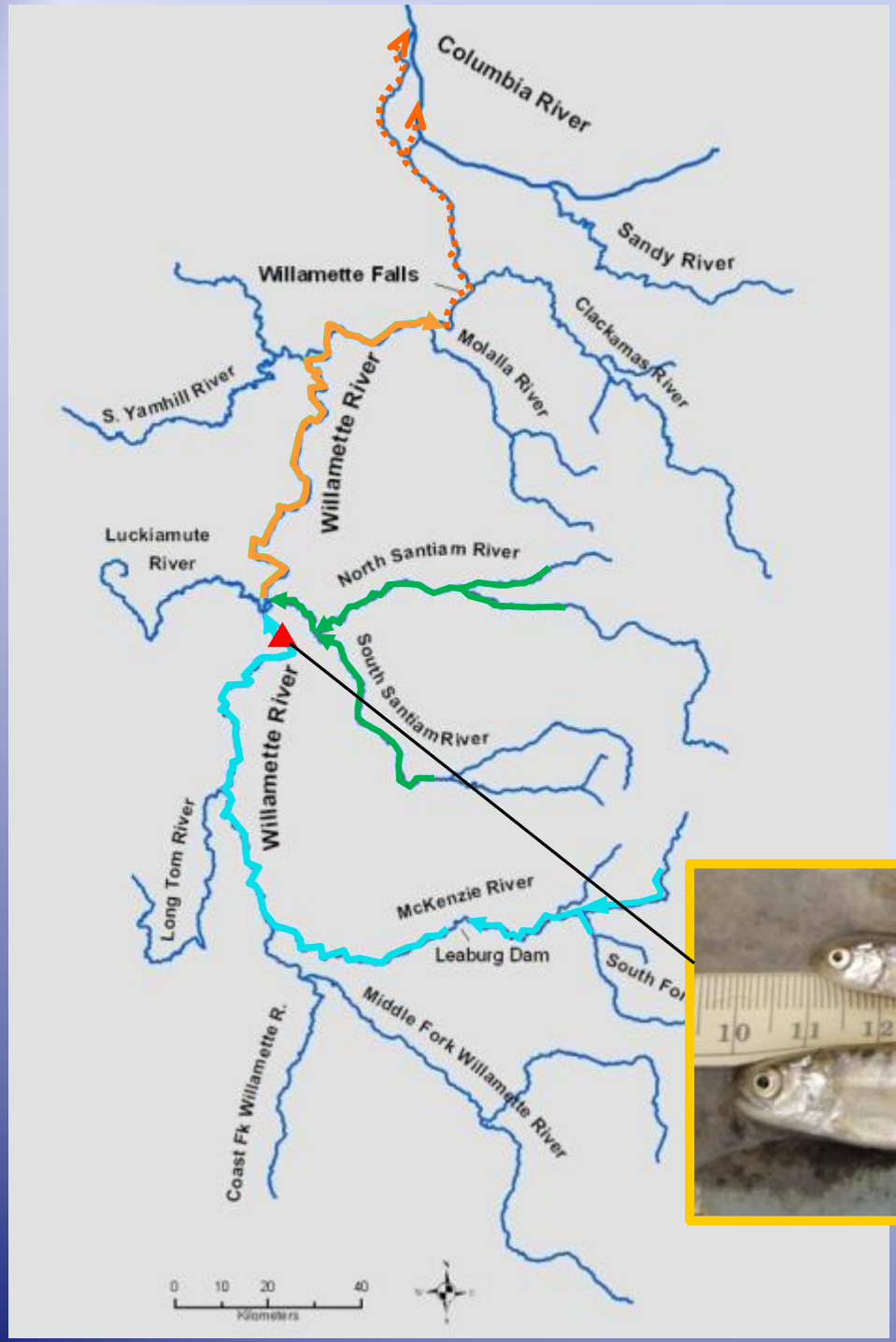
Santiam basin – early migration
Influence of dams

McKenzie – later migration
Colder water

Migration to lower Willamette & Columbia

Fry dispersed throughout Willamette by late February to early March

Most migrate as smolts in June & July

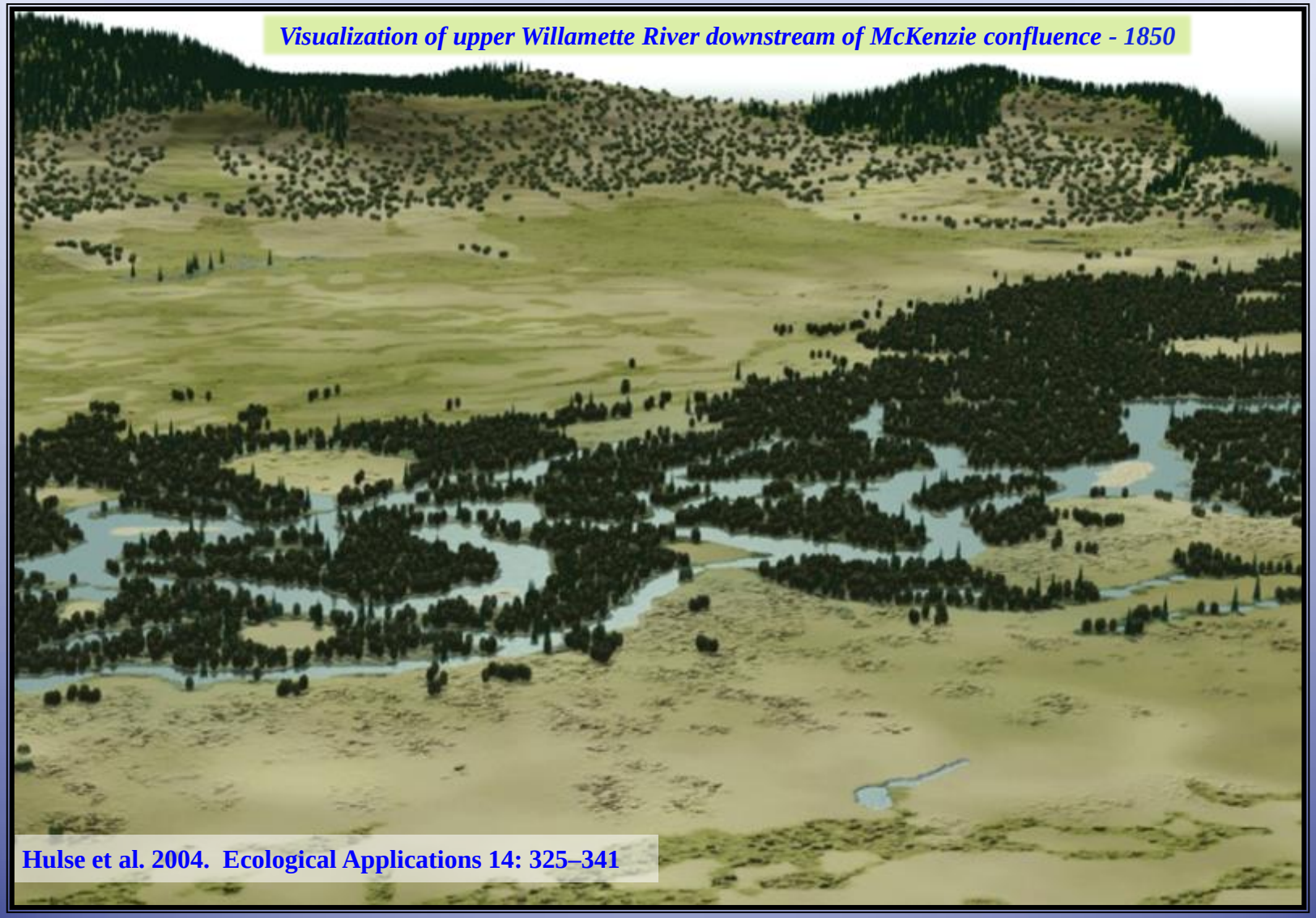


March 2011 (37 – 72 mm)

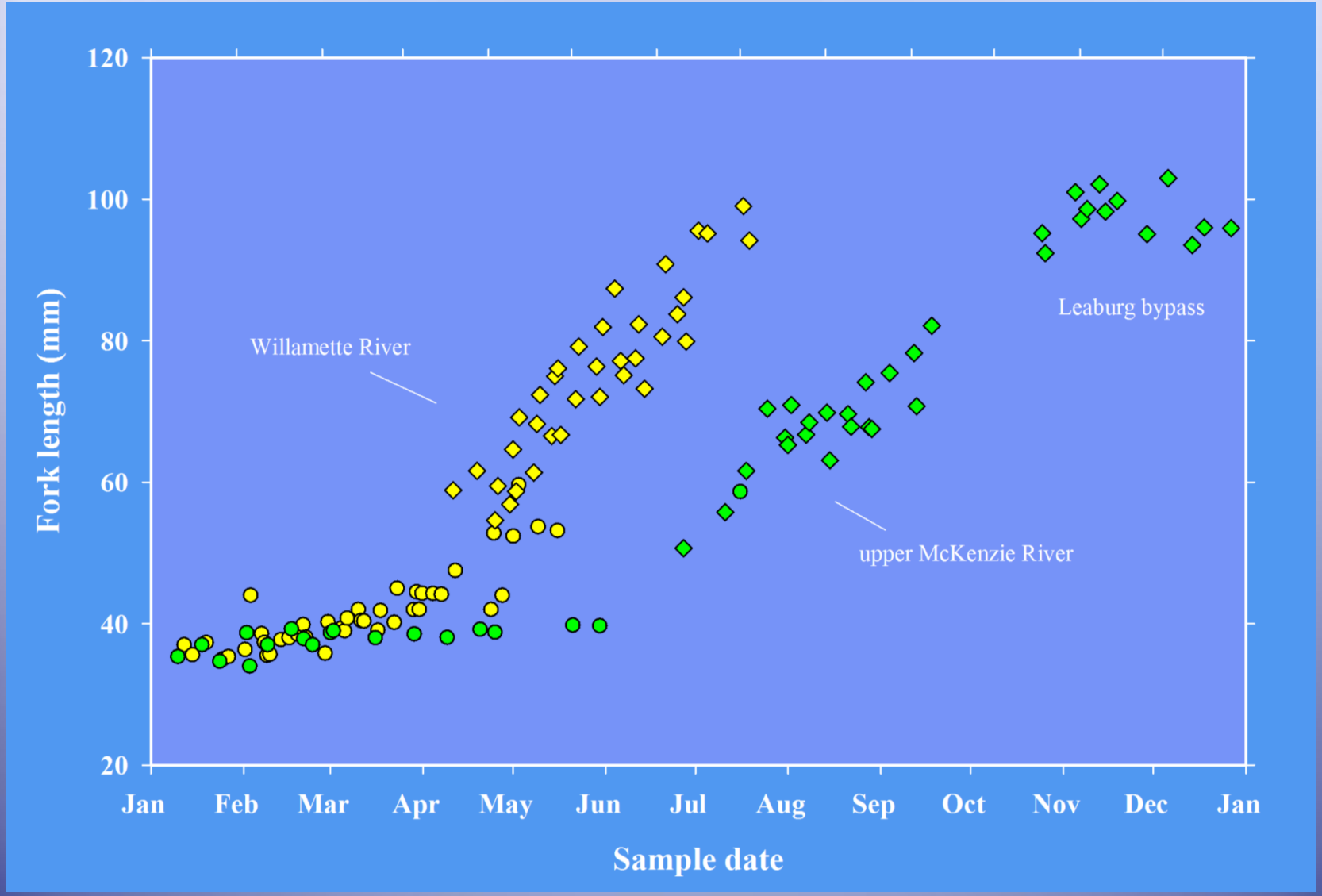
Long Distance Fry Dispersal – What's up with that?

Hypothesis: Adaptation to access productive rearing habitat in Willamette

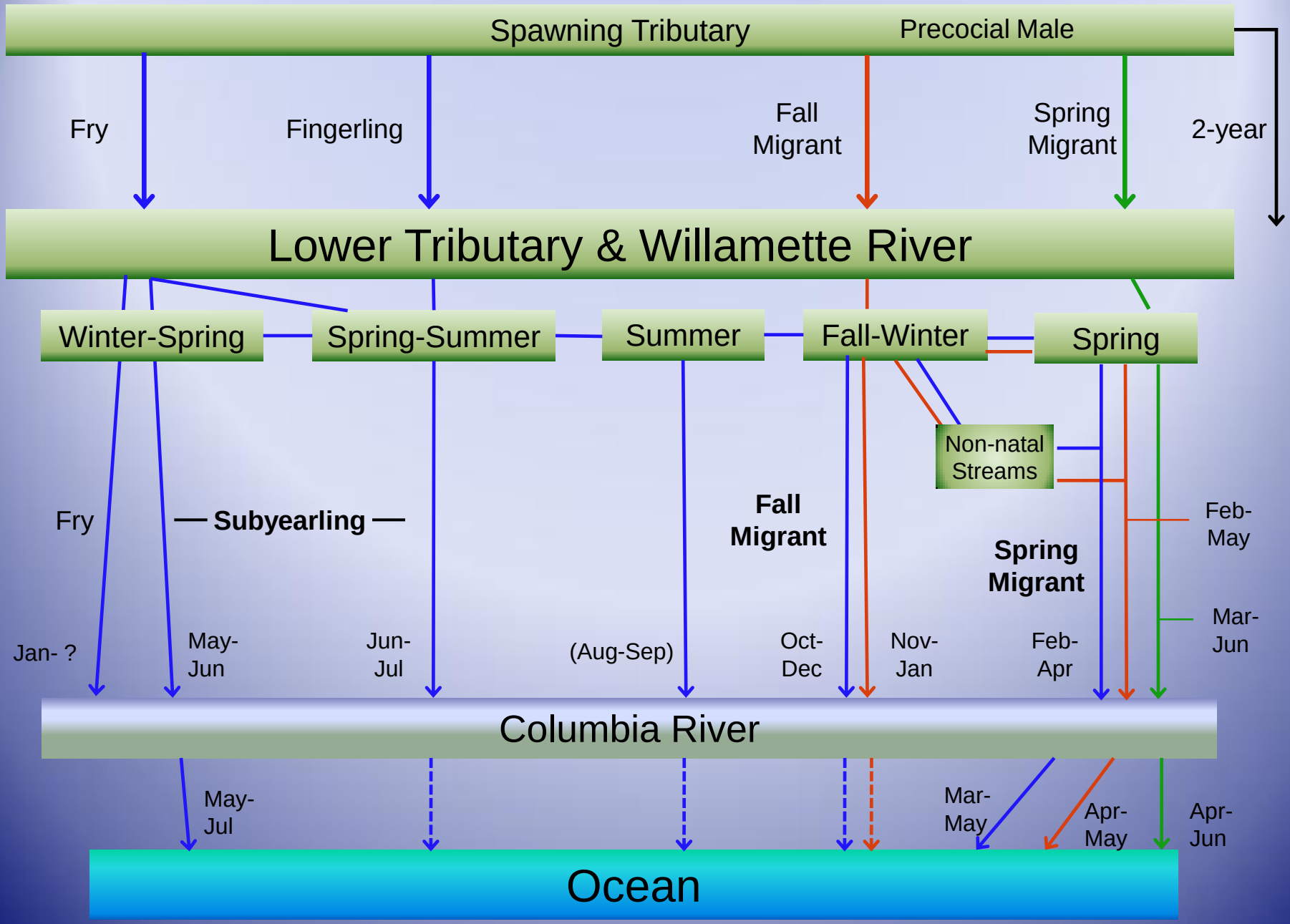
Fall Chinook absent upstream of Willamette Falls



Length of spring Chinook salmon captured as fry (○) or juveniles (◇)
Willamette and upper McKenzie rivers 2012



Willamette Juvenile Chinook Diversity (Bet-Hedging)

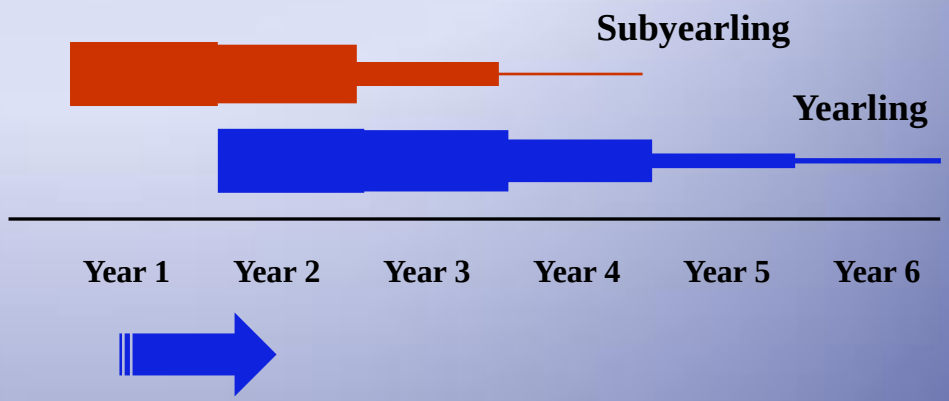


Life History Diversity – Spreading the Risks

Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun

Poor freshwater conditions

Brian Franklin

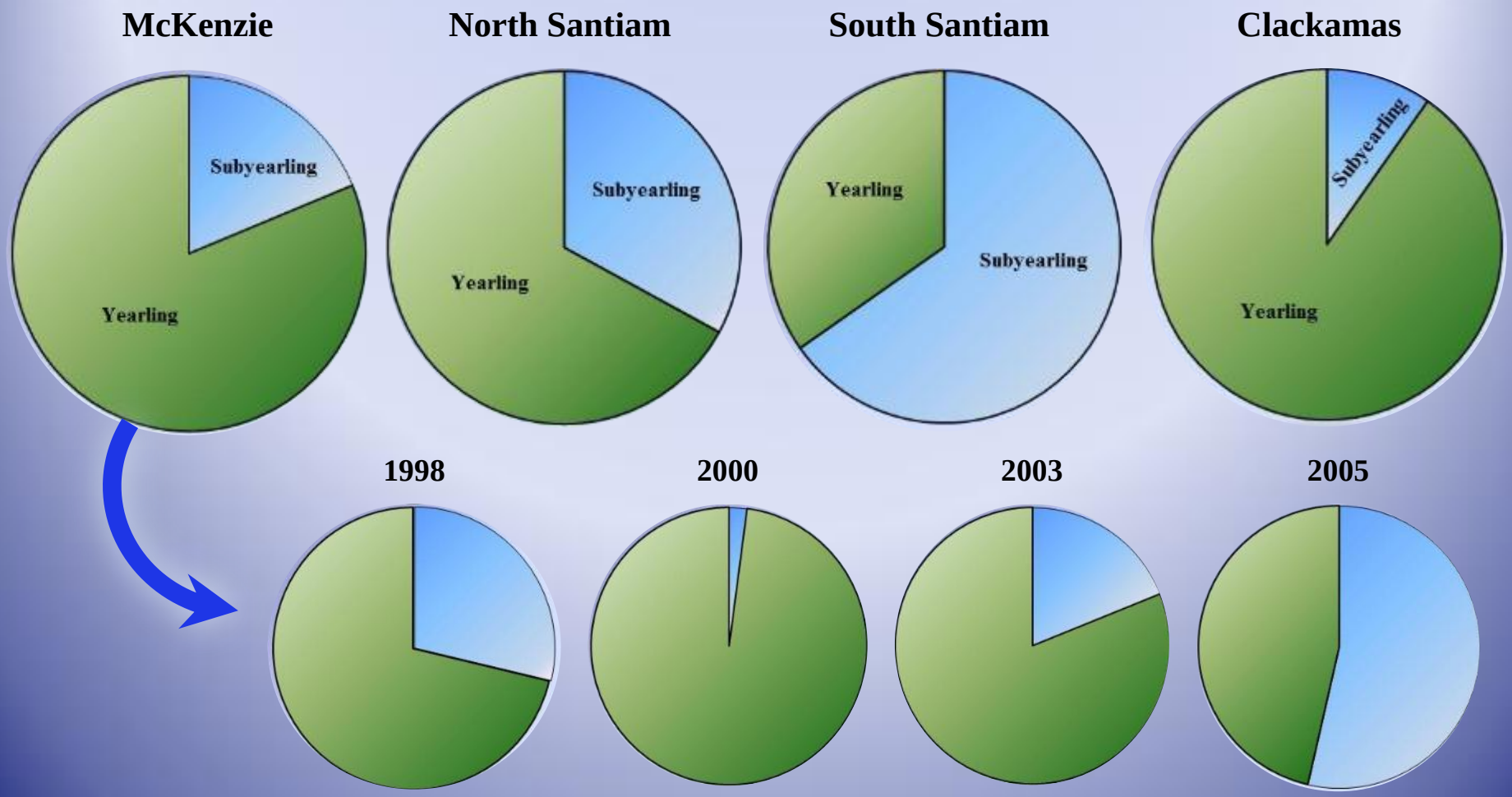


Poor ocean conditions

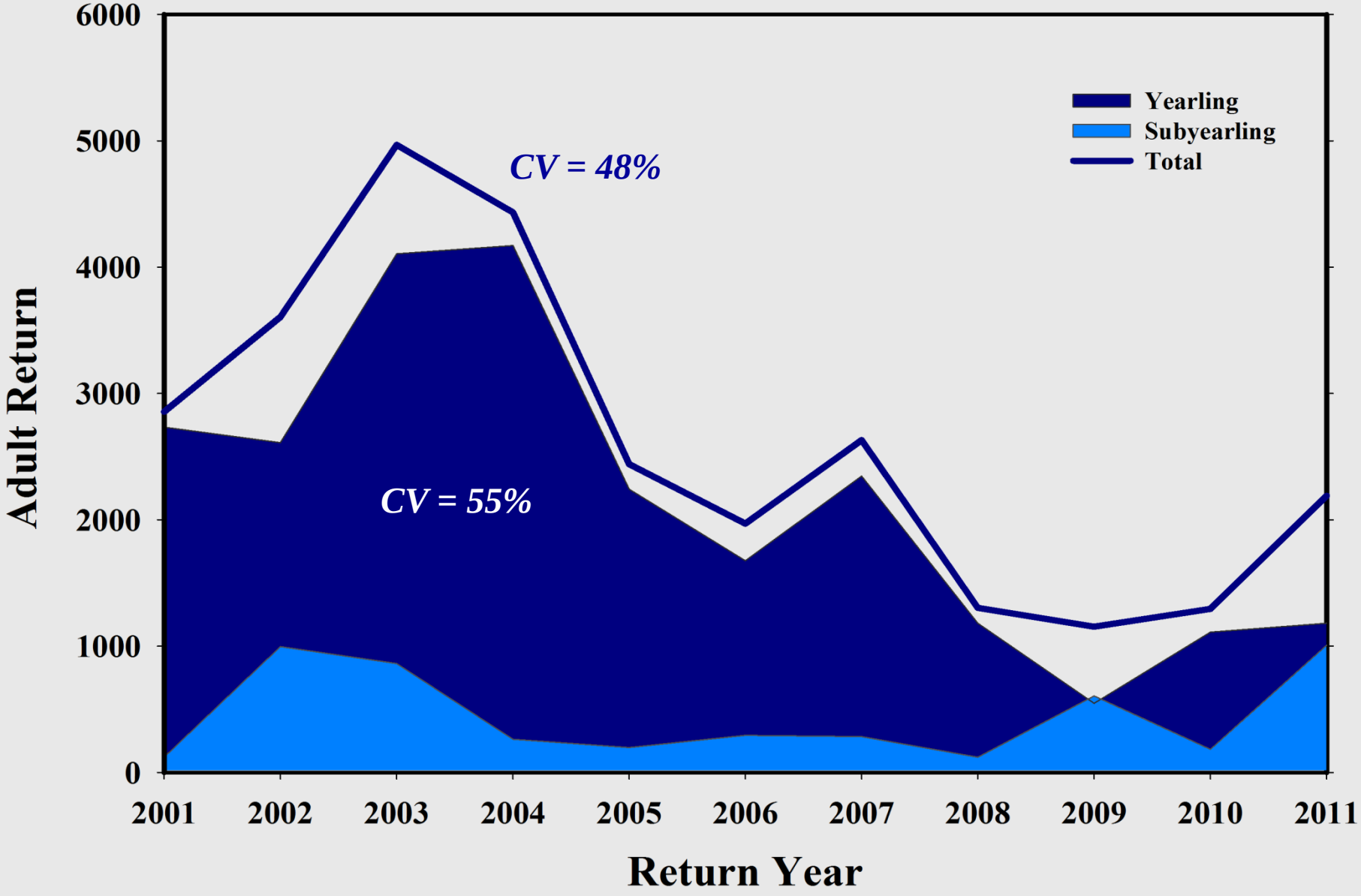
Life History Diversity Provides Stability to Populations

Proportion of returning adult Chinook that migrated as subyearling or yearling smolts

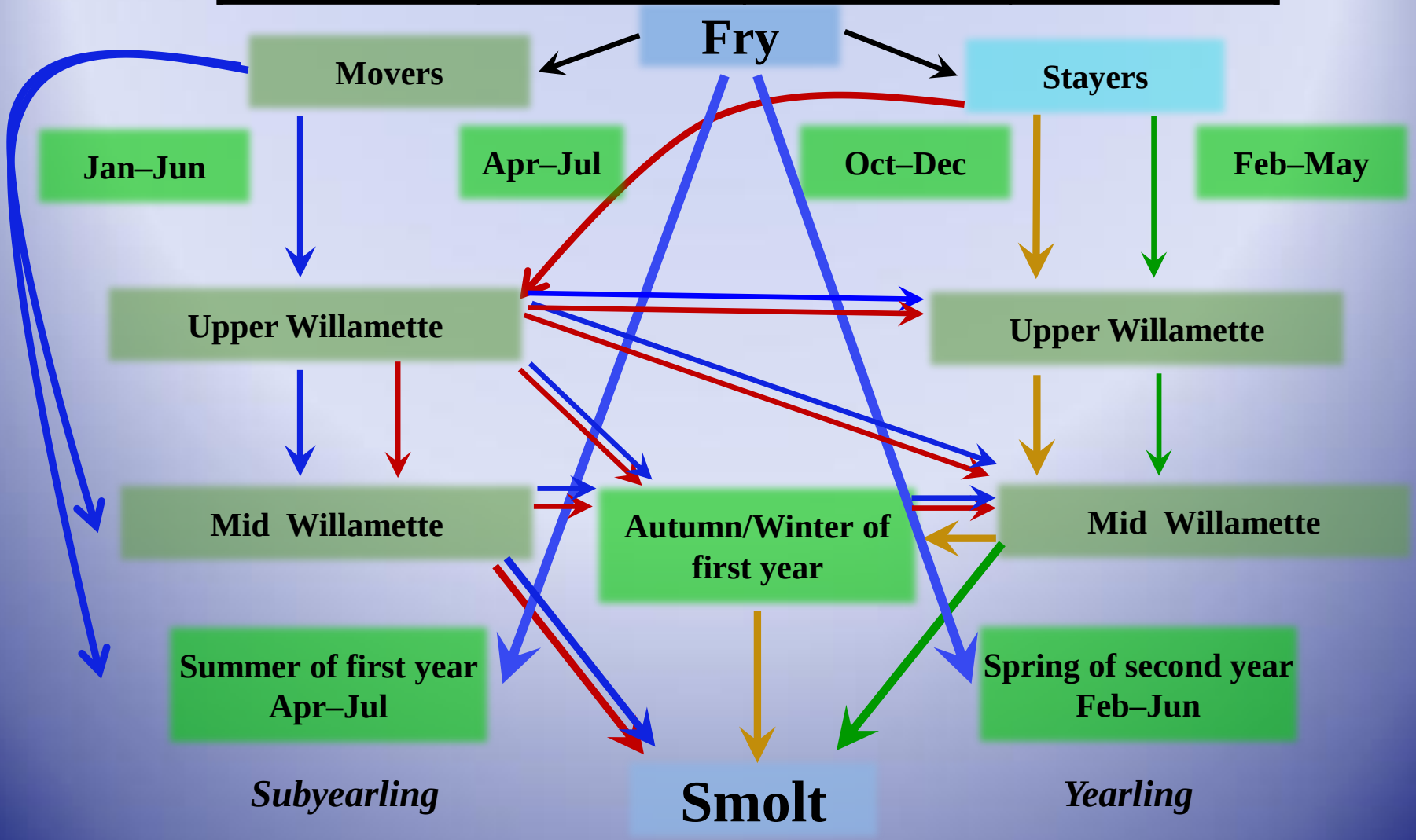
1998 – 2006 brood years



McKenzie River Return of Wild Spring Chinook Salmon



Temperature	Density	Flow	Floods
Incubation	Spawners	Incubation	Timing
Rearing	Fry	Rearing	Magnitude
Migration	Subyearlings	Migration	Connectivity

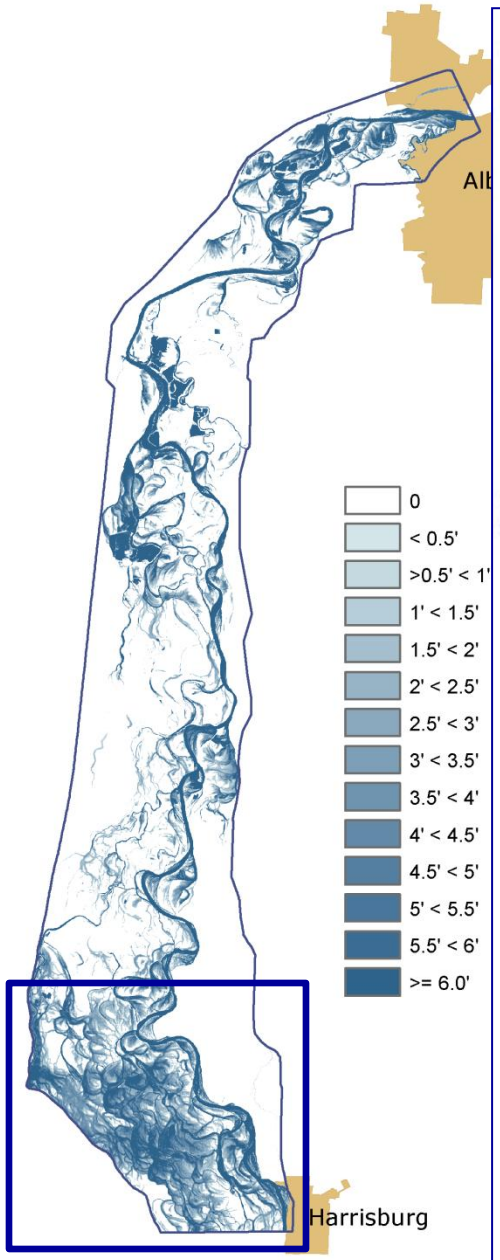


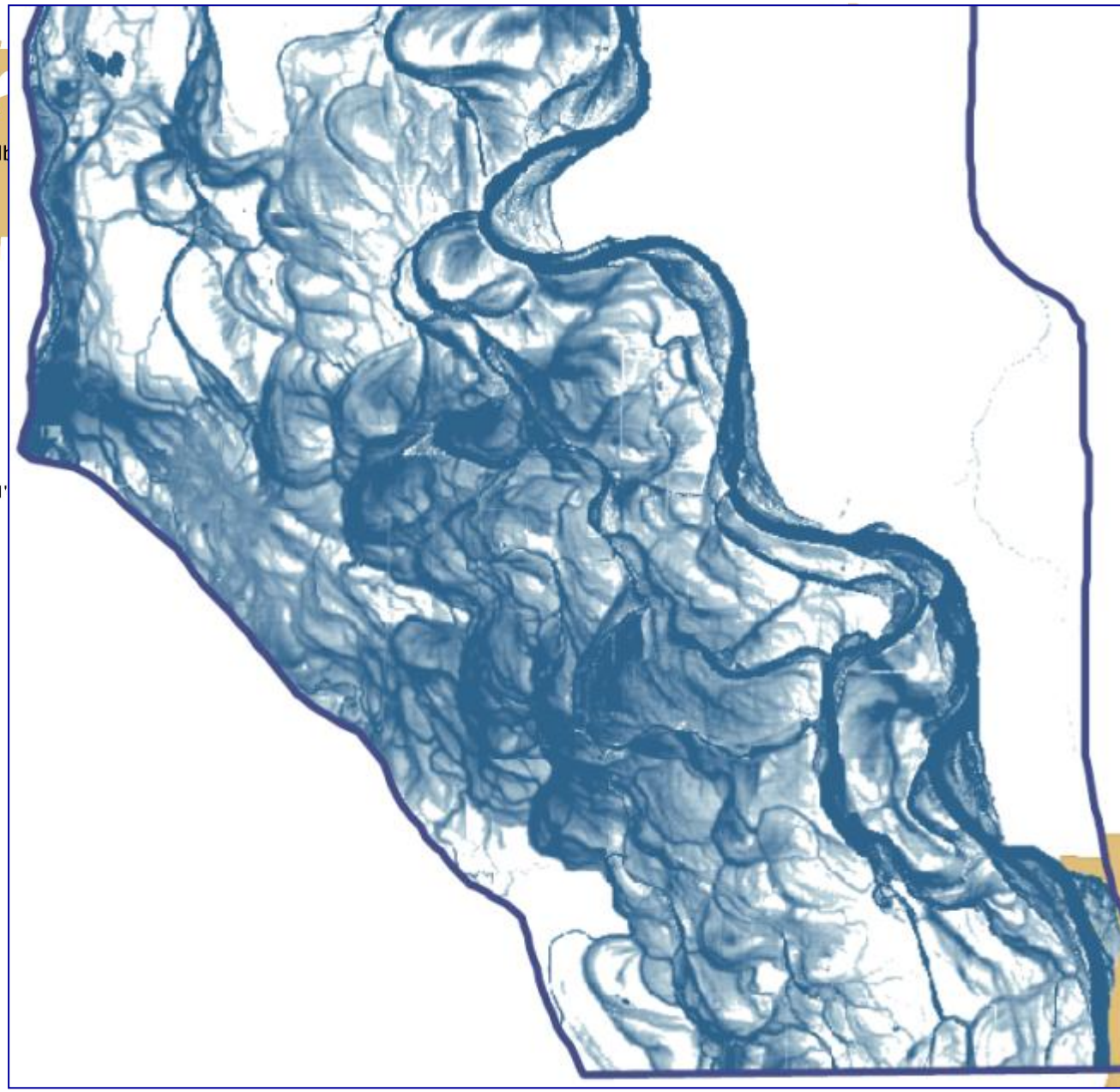
Dynamic Rivers provide Diverse Habitats that support Diverse Life Histories

Willamette River downstream of McKenzie confluence – Green Island

2-year Flood Inundation Depth of Water

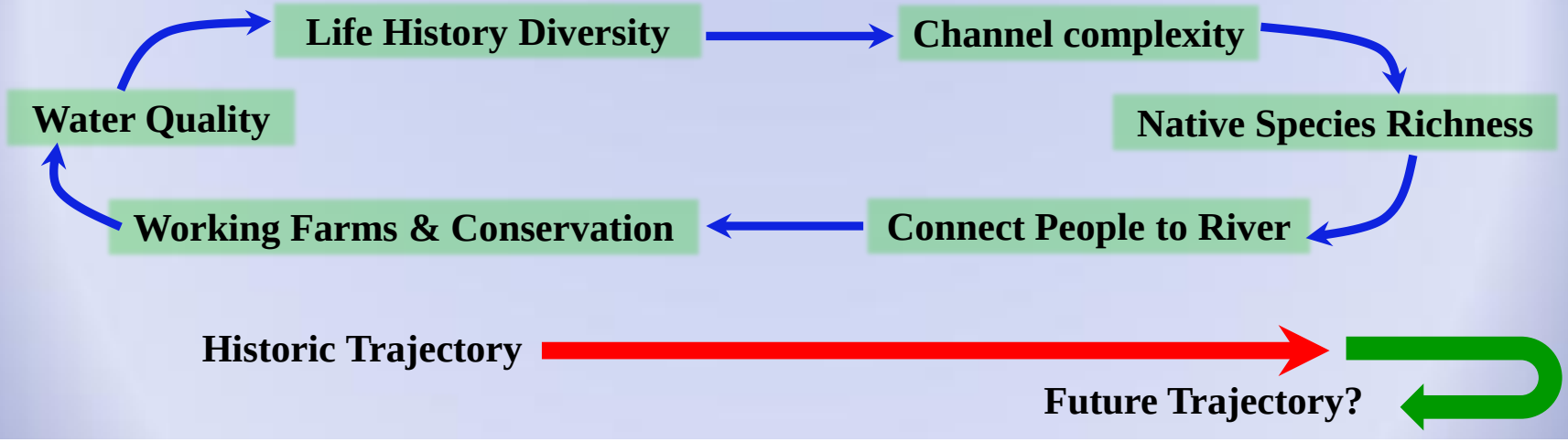
Slope

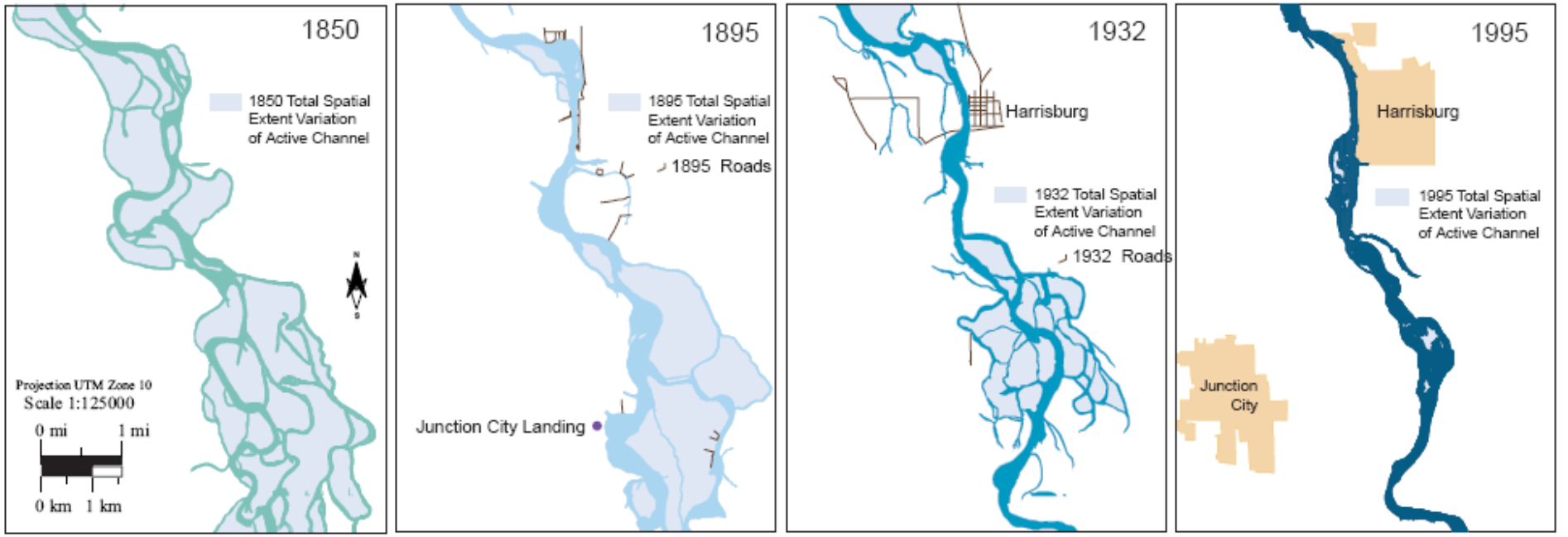




David Hulse, U of O, Landscape Architecture & River Design Group

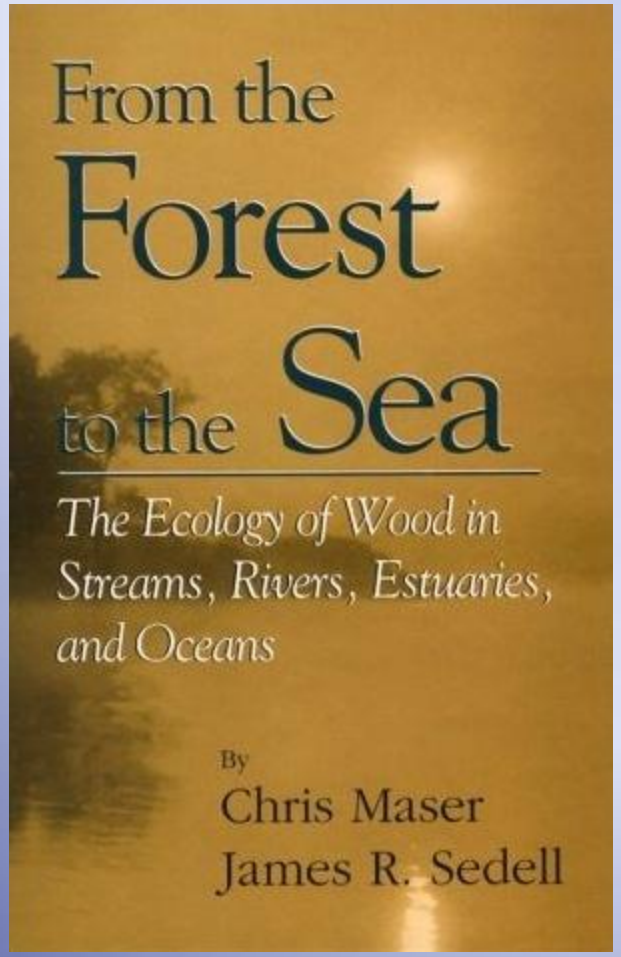
Measuring Progress—Biological & Social Connections





Historical Willamette River Channel Change - S. Gregory, L. Ashkenas, D. Oetter, P. Minear, K. Wildman

In honor of Jim Sedell (1944 – 2012)



Within the time scale of a person's lifetime and the lifetimes of his or her children and grandchildren, entire ecosystems change. Ironically, however, it is within this time scale that people are most blind to changes occurring around them.