

Classical Hypothesis for Pacific Salmon Evolution and Diversification

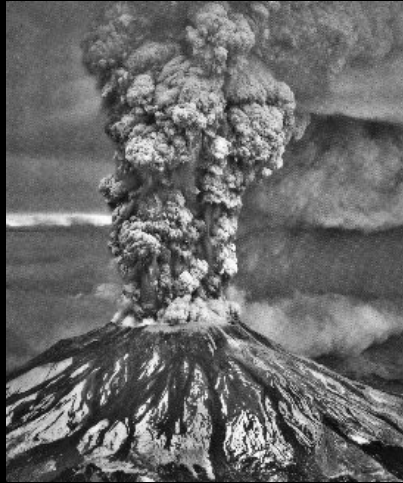
- Isolation during glacial advances
- **Problem:** Fossil salmon pre-date Pleistocene glaciations!

Evolution of the Pacific Salmon

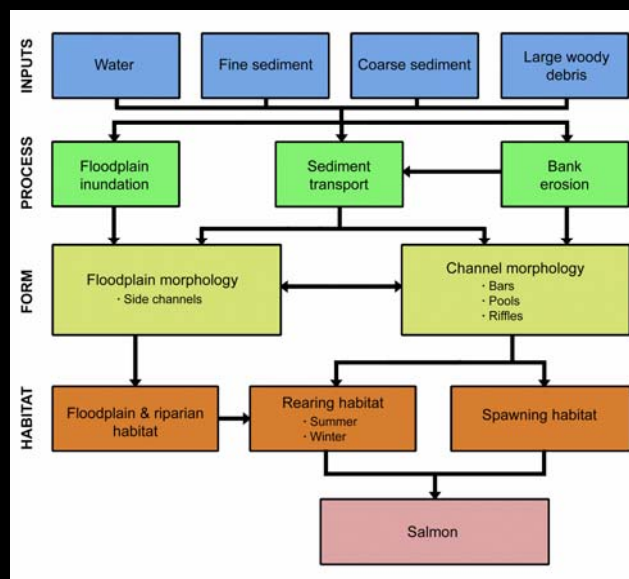
- Pacific salmon evolved between 20 million and 6 million years ago (Miocene).
- Radiation of Pacific salmon into distinct species coincides with uplift of Pacific Rim topography.

Salmon and Natural Disturbances

For millions of years salmon thrived in a landscape shaped by floods, volcanic eruptions, and natural disturbances.

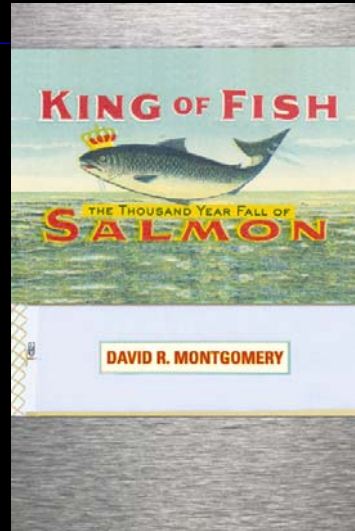


The supply and transport of water, sediment, and wood interact to structure salmon habitat.



History, The 5th H

Strikingly similar pattern of changes to river systems and salmon crises in Great Britain, New England, and now the Pacific Northwest.



George I Tries to Save the Salmon

In 1714 George I enacted a law to prevent blocking salmon from their spawning grounds in seventeen English rivers.

By 1868, all seventeen rivers protected by George I were either blocked or poisoned by pollution.
[habitat and hydro]

Alexander Fraser proposed steps to increase the number of salmon in Scottish rivers (1833):

- (1) don't block the ability of salmon to migrate up or down stream [hydro];
- (2) limit fishing intensity so as to not take the majority of the spawners [harvest];
- (3) prevent habitat degradation that could damage the fishery [habitat].

By the middle of the 19th century the plight of English salmon began to arouse widespread public concern over the danger of regional extinction.



“The cry of 'Salmon in Danger!' is now resounding throughout the length and breadth of the land. A few years, a little more over-population, a few more tons of factory poisons, a few fresh poaching devices ... and the salmon will be gone—he will be extinct.

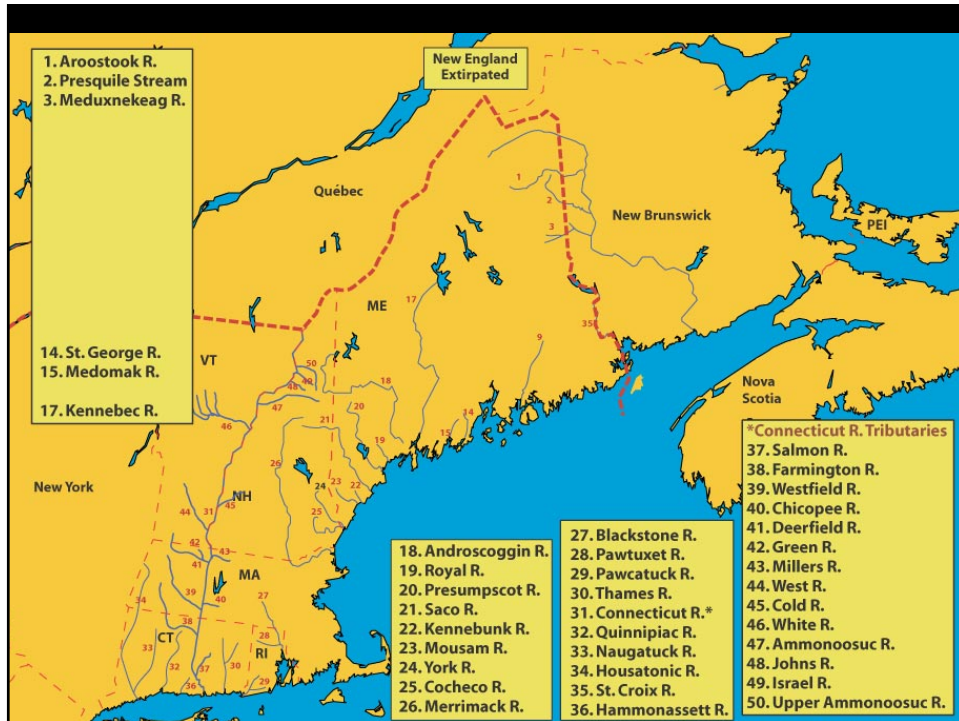
Shall we not step in between wanton destruction ... and so ward off the obloquy which will be attached to our age when the historians of the nineteen-sixties will be forced to record that: 'The inhabitants of the last century destroyed the salmon'...”

— Charles Dickens (1861).

New World Salmon

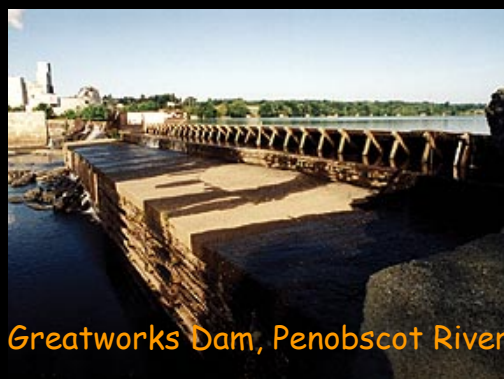
“If the Pigeons plagued us by their abundance, the Salmon gave us even more trouble. So large a quantity of them enters into this river that at night one is unable to sleep, so great is the noise they make in falling upon the water after having thrown or darted themselves in to the air.”

— N. Denys (1672 , p. 199).



Between 1820 and 1880 over one hundred and fifty fishery laws relating to salmon were passed by the state of Maine.

Enforcement, provided for at the local level, was virtually non-existent.



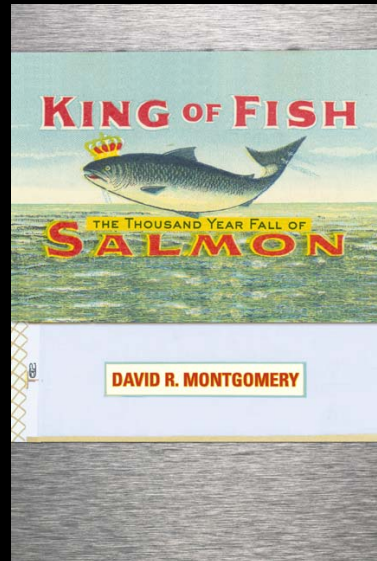
Greatworks Dam, Penobscot River

Key factors in British and New England salmon declines

Local control / lax enforcement

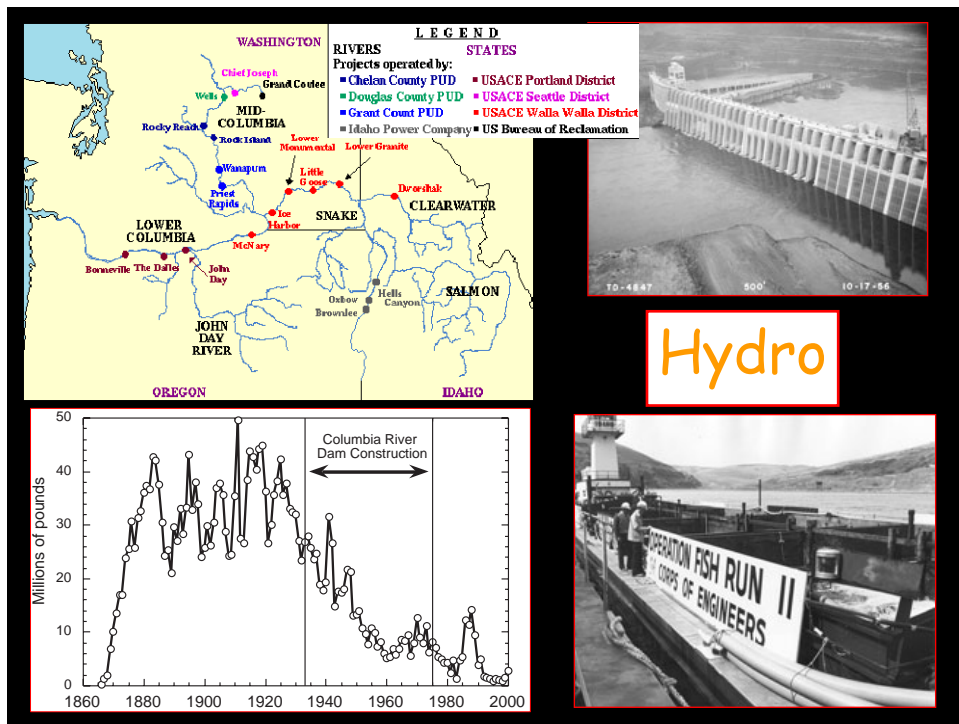
Gradual accumulation of many individual habitat impacts

Over-reliance on hatcheries



Harvest





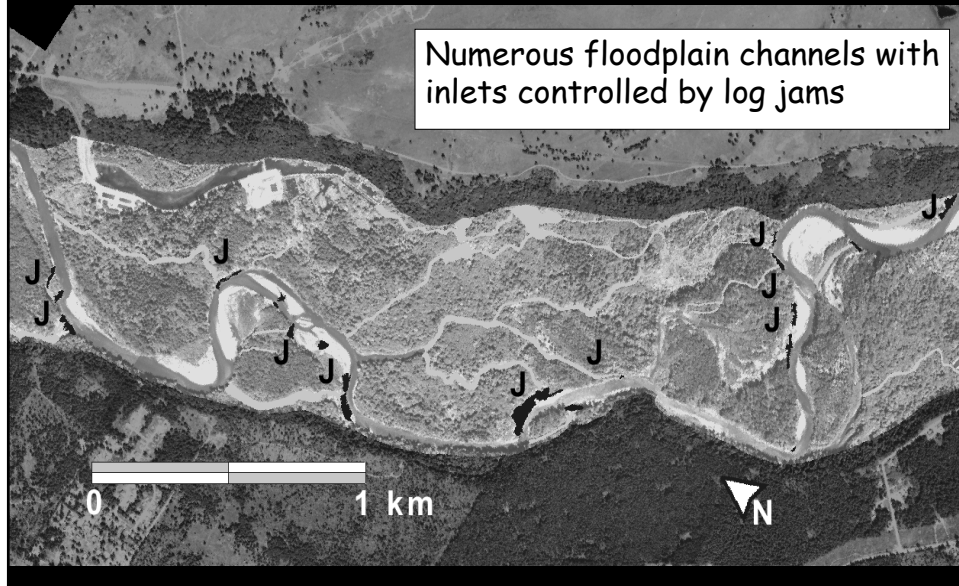
Big trees influenced big rivers



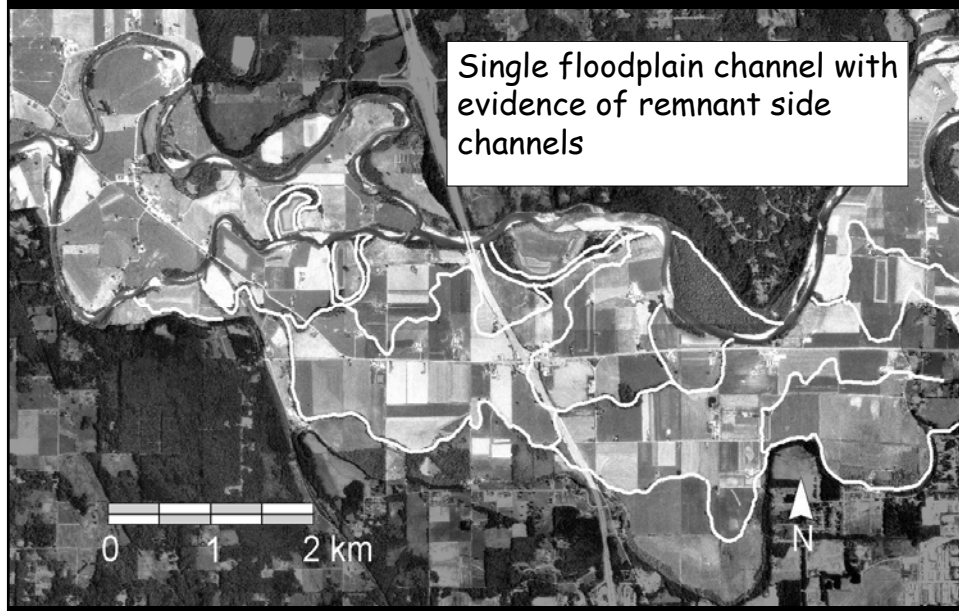
Nisqually River

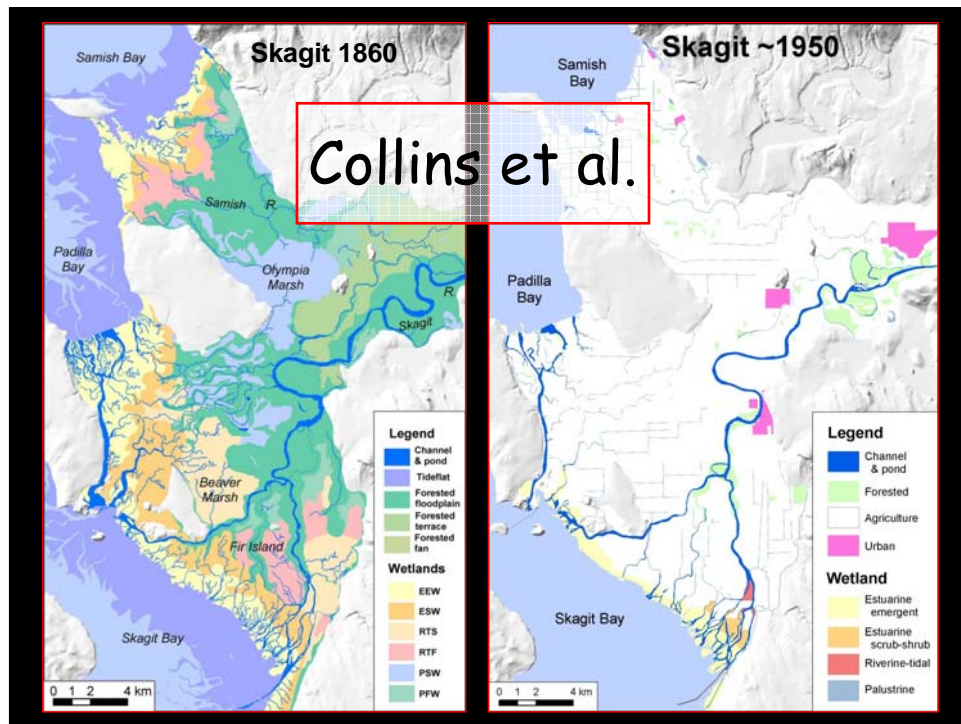


Nisqually River Floodplain

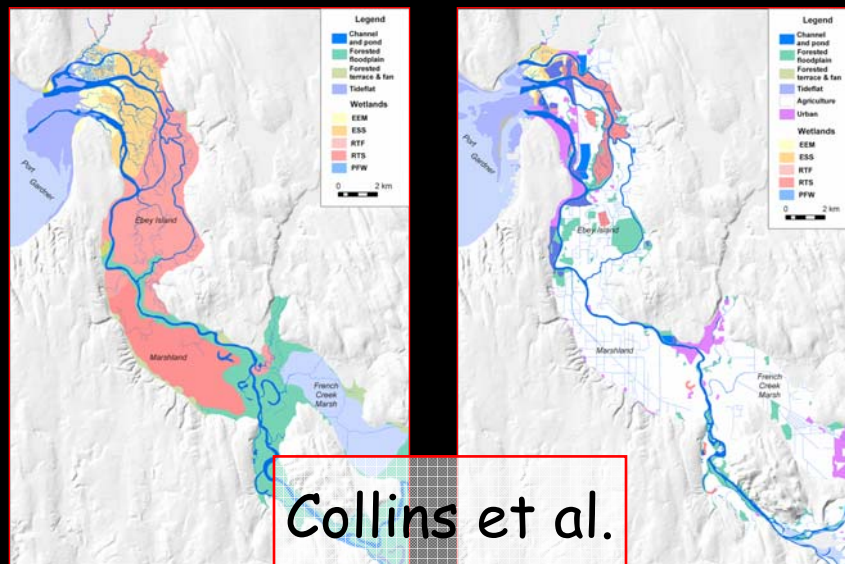


Stillaguamish River, Washington





Huge losses of side channels and valley bottom wetlands along most major Puget Sound rivers, yet the story for each river is unique.



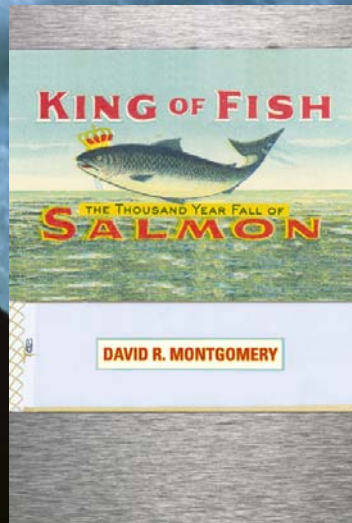
Provide some refuge for the salmon, and provide it quickly, before complications arise which may make it impracticable, or at least very difficult. ... If we procrastinate and put off our rescuing mission too long, it may be too late to do any good. After the rivers are ruined and the salmon gone they cannot be reclaimed ... all the power of the United States cannot restore salmon to the rivers after the work of destruction has been completed.

— Livingston Stone (1892)

One of the few strategies that might work over the long run would be to create a network of Salmon Sanctuaries by restoring forested river corridors along river floodplains.



History



Process

