The Ecological and Evolutionary Dynamics of Aquatic Landscapes that Support Pacific Salmon

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The nested structure of salmon habitat

9 major rivers

each with many populations

North Pacific Ocean

Bristol Bay

Bristol Bay sockeye salmon

L.A. Rogers
Population diversity in Bristol Bay sockeye salmon

Dann et al. 2013 CJFAS
Very fine-scale local adaptations in sockeye salmon
Salmon landscapes are shifting mosaics of suitable habitat
*(sensu* Stanford et al. 2005)*
Remarkable variation in abundance at population scales

Short-term assessments mis-represent long-term potential of habitat.

Examples from Wood River:

data from UW – Alaska Salmon Program
Sockeye salmon returns to Wood River, Alaska

- Escapement
- Catch
Global sockeye catch 2018 (387M pounds)  
(Lake Beverley contribution = 13%)  
(<0.01% of global sockeye habitat)
Pairwise correlations in productivities among 43 pink salmon stocks

Correlation

Distance between stocks (km)

95% confidence interval

Mueter et al. 2002 *Fish. Oceanog.*
Chinook salmon – habitat use within watersheds (how consistent is production within individual tributaries?)

Nushagak River Chinook salmon
Shifting habitat mosaics and fish production across river basins

Sean R. Brennan, Daniel E. Schindler, Timothy J. Cline, Timothy E. Walsworth, Greg Buck, Diego P. Fernandez

CONSERVATION
Do watershed predators benefit from geomorphic complexity and variation in salmon spawn timing?
Bears are “surfing” the salmon wave

Density Of Points by Habitat Type

June-1  Jul-20  Sept-7  Oct-27

Falls  Streams  Rivers  Lake

Biocomplexity also important in the ocean
‘Coarsening’ biocomplexity is a serious threat to the resilience of salmon ecosystems

Chena River, Alaska

Road cutting off main river channel from ‘off-channel’ wetlands that are critical fish habitat

Eliminates possibility for rejuvenation of habitat because river can’t migrate across floodplain

Courtesy of Chris Stark, UAF
Collins, 2002