Restored Anadromy- Detecting historic fish passage above natural waterfalls in the Oregon Cascades

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ABSTRACT

Historically, restoration focused on mitigation of impacts due to man-made barriers, and project success depended heavily upon observed passage beyond these barriers to reconnect fragmented habitats. Restoring aquatic connectivity for migratory fishes in the headwaters of rivers can be an expensive proposition if the total length of aquatic habitat to be regained is uncertain. We collected telemetry data on non-marked steelhead, *O. mykiss,* which were transplanted above a hydropower dam and observed for behaviors such as habitat exploration, holding, spawning, and outmigration timing from June 2010 to June 2011.

Because salmon can act as vectors depositing marine nutrients in the riparian zone, we also collected foliar samples from Douglas fir, *P. menziesii* (>100 years old) and soil samples, to determine ^{15}N nutrient linkages between headwater tributaries of the river and discern the extent of historic anadromy above both the dam as well as a natural waterfall complex with anecdotal historic anadromy. By comparing the telemetry data with the potential historic distribution, as elucidated by nutrient deposition patterns throughout the tributaries of a coastal river, we hope to improve the methodology used to define success for mitigation of anthropogenic barriers. We anticipate having final nutrient analysis results sometime in early 2012.

STUDY AREA

The North Umpqua River is 170m long, drains 1217 km^2, & encompasses 53,578 total acres.

Combined with the South Umpqua River, the river drains one of the longest coastal basins in Oregon (approx 340 km in total length & drainage area of over 12,200 km^2), & flows in a NW direction another 180 km to the ocean.

The North Umpqua River supports wild populations of Chinook (spring & fall), sea-run cutthroat trout, Coho, steelhead (summer and winter), resident rainbow, & lamprey too!

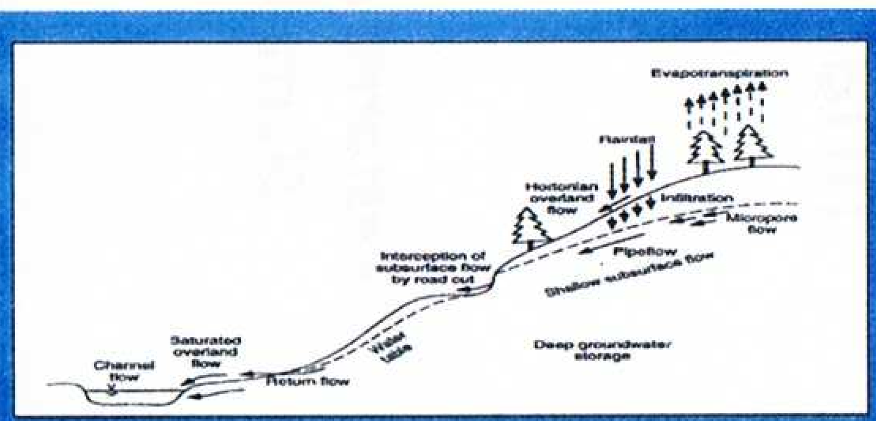
METHODS

Salmon-derived nutrients have been well documented throughout the entire range of Pacific salmon species. Nutrient detection depends upon the total biomass of salmon tissue deposition over many years. Because several species of salmon inhabit the North Umpqua Basin, it may be possible to detect these inputs along the riparian zones.

Transect Specifics:

ABOVE & BELOW waterfalls (with similar site characteristics)
Low gradient stream reaches (if possible)
Older Douglas fir trees (DBH=1.0m+)
- healthy, single top (1 bole), new foliar growth

<5% Nitrogen-fixing riparian species
- red alder, fireweed, *ceanothus*, deerbrush, etc.)



Bankside	Adjacent Upslope	Upslope
0 – 10 m	10 – 50 m	100 – 150 m

Toketee Falls

^{15}N Transect Assumptions

NURD Falls (positive controls) -
Steamboat Falls (6 m high)
Copeland Falls (4.8 m high)
North Umpqua River

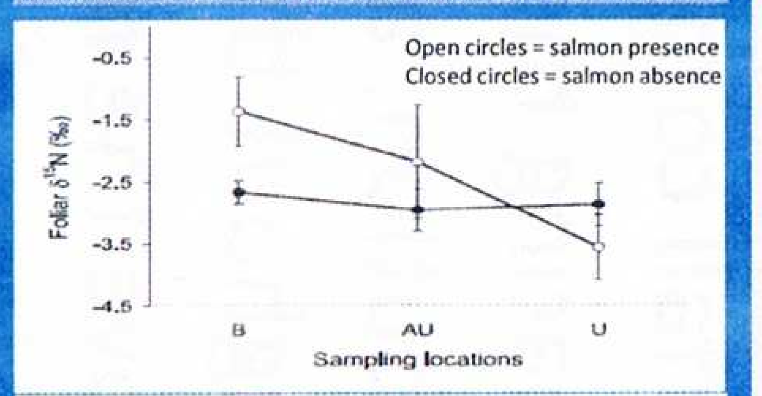
DLRD Falls (negative controls)–
Boulder Falls (13 m high)
Toketee Falls (36 m high)
Watson Creek Falls (83 m high)
Clearwater Falls (9 m high)
Whitehorse Falls (4.5 m high)

Unknowns –
Fish Creek Falls (4.2 m high)
Dog Prairie Creek
Camas Creek
Brodie Creek
Rough Creek
Clear Creek

Doug fir - Current year's growth

PREVIOUS RESEARCH W/ SAME PROTOCOL

Koyama – Isotopic Pattern after 30 years (Idaho)



Marine nitrogen in central Idaho riparian forests: evidence from stable isotopes
Akihiro Koyama, Kathleen Kavanagh, and Andrew Robinson (CJFAS - 2005)

Steamboat Falls

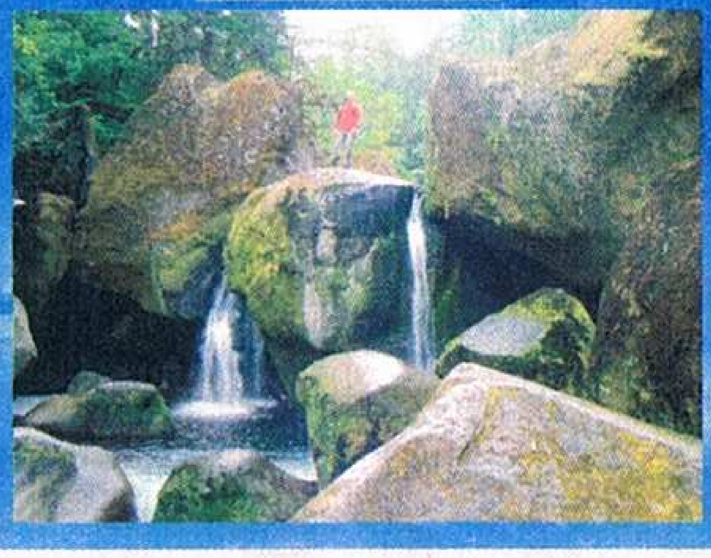
North Umpqua River

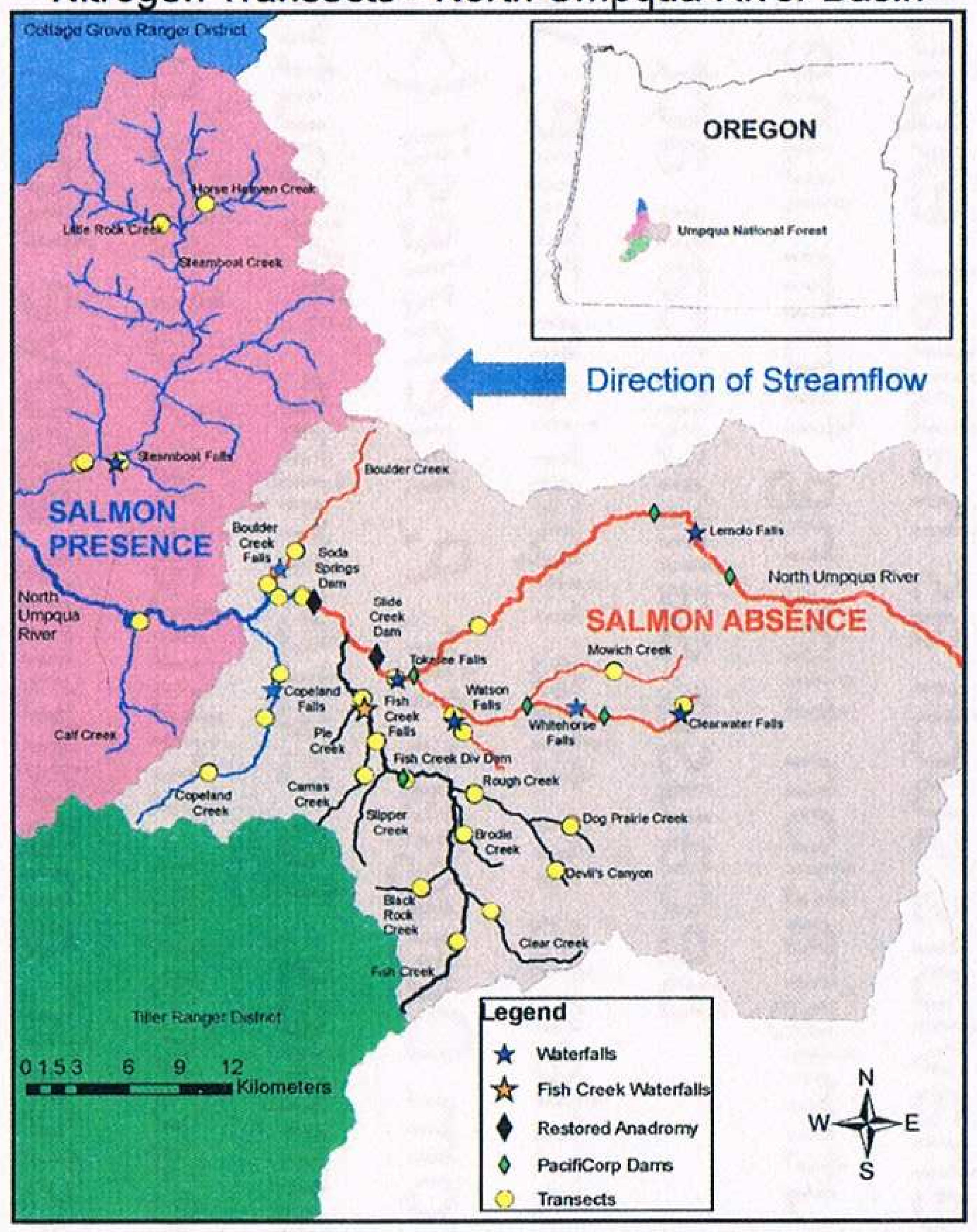
Credit - unknown

OBJECTIVE

Determine if there is isotopic evidence of historical anadromy throughout the North Umpqua Basin, above Soda Springs Dam, & above the 5.1 km natural waterfall in Fish Creek.

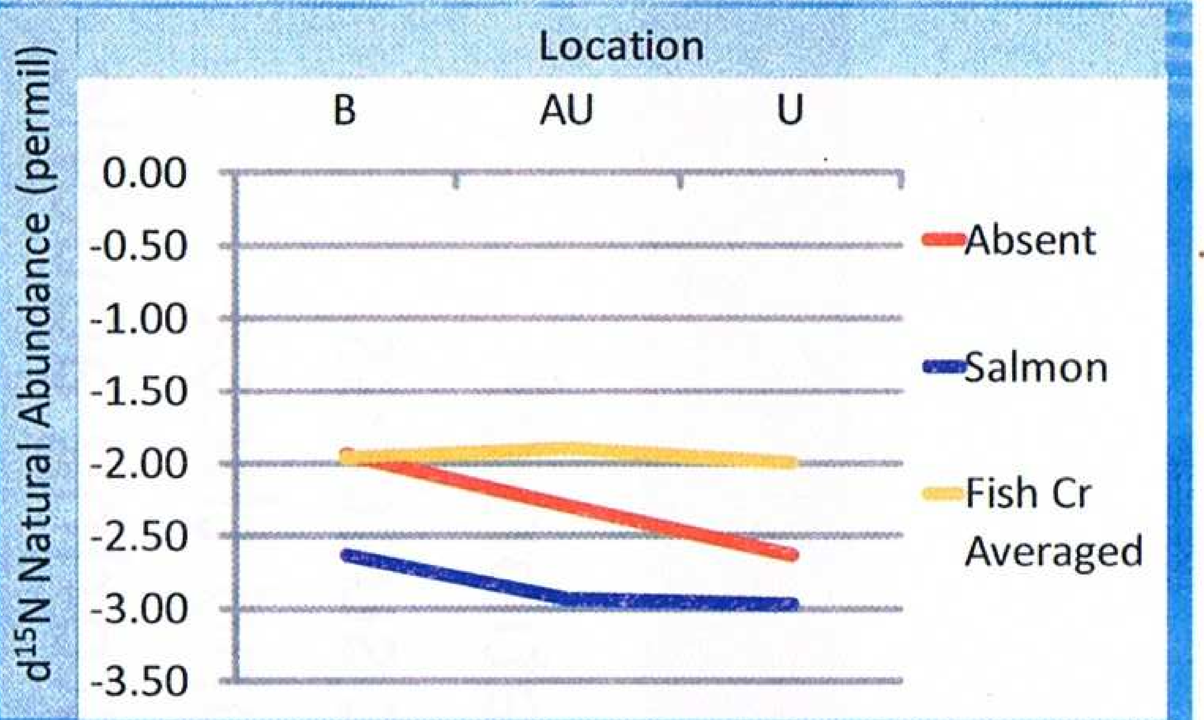
Fish Creek Falls

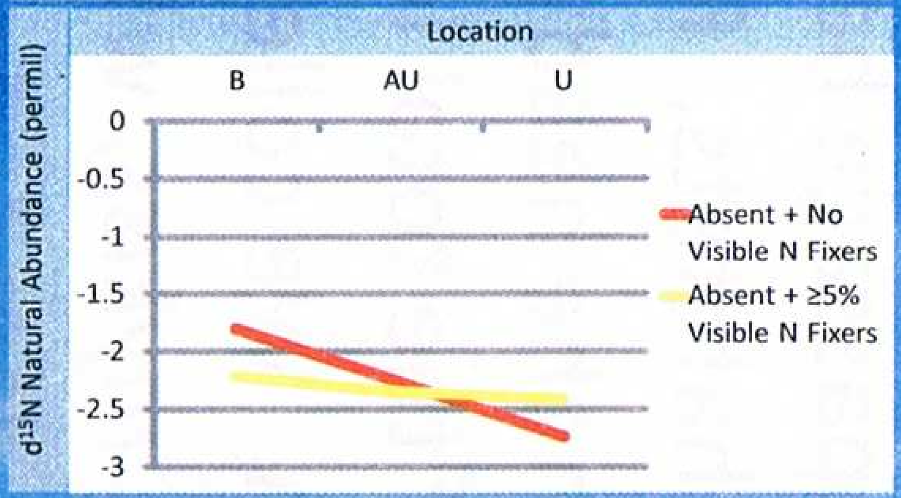


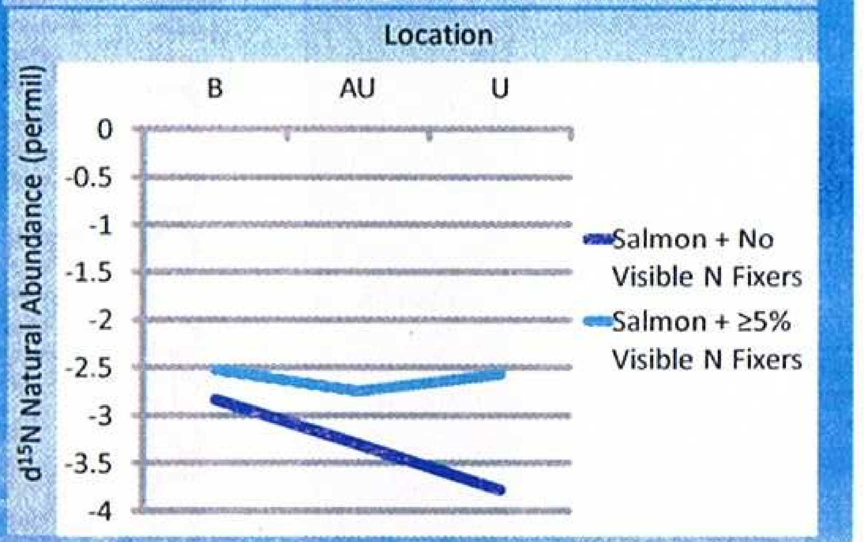


Watson Falls

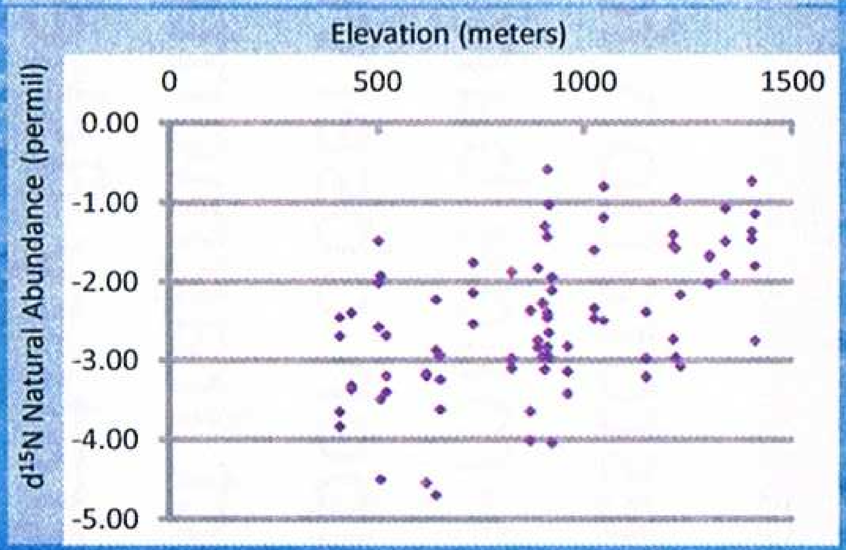
RESULTS

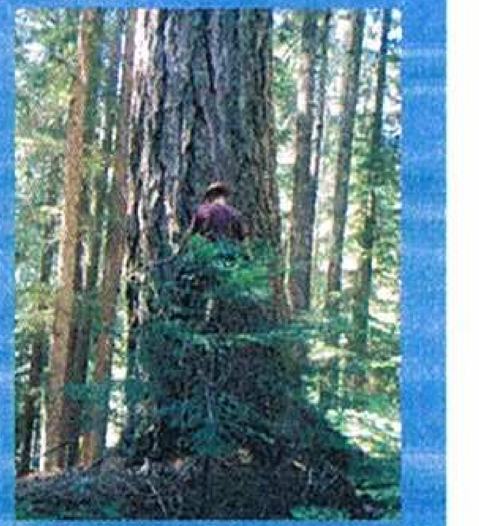


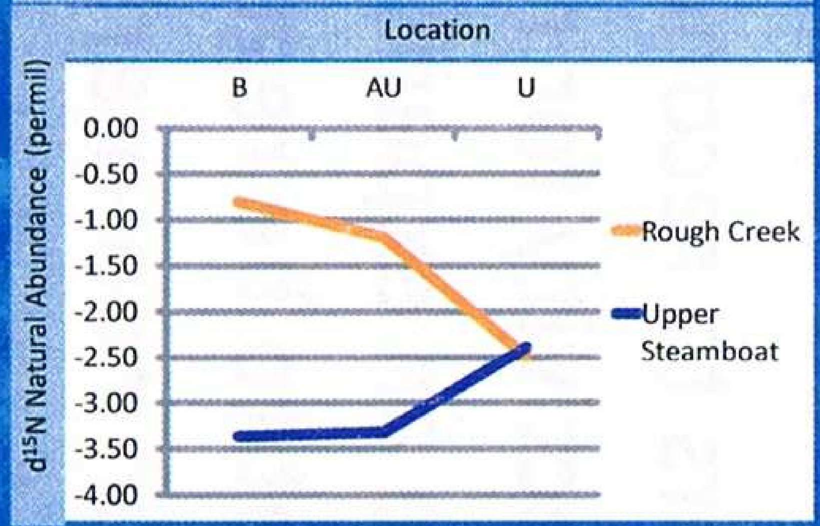


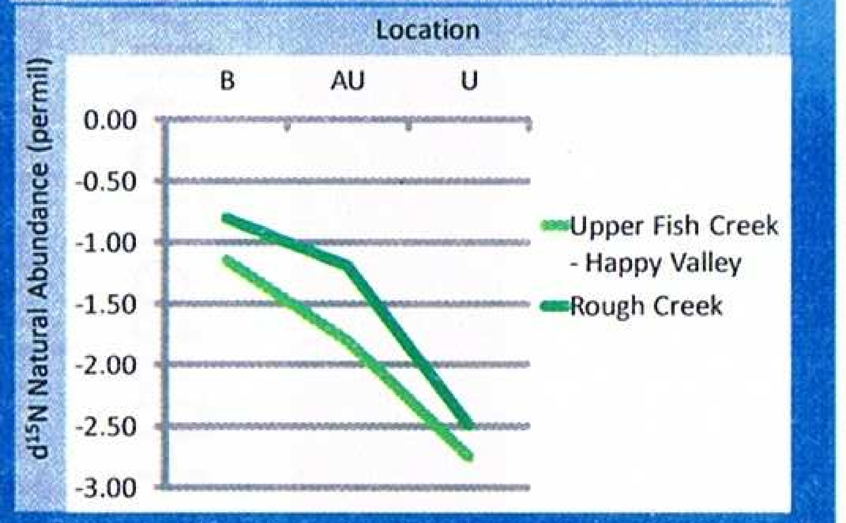


Whitehorse Falls









Clearwater Falls