Quality Water, Quality Life: Aquatic Health and Contaminants in the Midcoast Oregon Salmon Watersheds

From ridge tops to reefs, environmental degradation has caused many salmon populations to decline to one to ten percent of former numbers. Young salmon survival in freshwater is only 2 to 5% from egg to smolt phase just before entering the ocean phase of their life cycle. Many causative effects for this decline are known, but many remain to be clarified. Politics often prevents adequate investigation of contaminant effects for water quality. Chronic low dose accumulative effects of toxic contaminants take a toll that is generally unrecognized by fisheries managers.

Our benevolent rainfall flows down out of the Coast Range to become, once again, part of the sea and the productivity of the salmon cycle of the near-shore ocean. Nutrients from the ocean, in the form of salmon and lamprey spawner carcasses, had fertilized our forests, streams, and rivers like an incoming tide for thousands of years. Our forest garden grew rich because of this tide of nutrients. Reduced numbers means reduced nutrients, which reduces development, growth, and survival abilities of the fish.

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The land also nourishes the sea. Freshwater flows down out of the mountains, past our farms and towns, through the jetties, and out over the continental shelf. These nutrient tides over land and sea have been shaping salmon for thousands of years, providing diversity, fitness, and resilience to the young fish and other stream organisms that support the salmon cycle complexity.

For many hundreds of years humans have increasingly affected the quality of this complexity in ways that have stressed the fish. In the last two hundred years we have greatly increased pollution. Fish harvest levels increased unsustainably, while beaver and timber harvests altered the landscape stressing the salmon cycle. Increasing pollutants have contaminated the flow to the sea.

Copious leaching rainfall and snowmelt dissolve and transport nutrients and contaminants down the river out of the Coast Range.

Calcium and iron ride the waters downstream and out over the shelf during the winter, enriching the sea floor mud.

As upwelling conditions increase in the summer, much of this iron distributes northward with the currents and combines with nitrates to fertilize plankton blooms that feed the food chain for the salmon. Iron and nitrate are in shorter supply over much of the ocean and limit productivity in many parts of the ocean. Here, off of the Oregon coast, the iron leached from our soils provides an important key to salmon ocean productivity.

Large quantities of nitrate ride downstream through the freshwater, from red alder tree vegetation cover concentrations in our timberland. The red alder 'fix' nitrogen out of the air providing fertilizer to nearby trees increasing productivity. A large concentration of alder can produce too much nitrogen for close by trees to use and can then 'spill over' into the streams altering stream chemistry. This process can increase soil and stream acidity to accelerate leaching of exchangeable calcium and essential micronutrients out of the system too fast, resulting in deficiencies in the adjacent soils and water. These localized deficiencies can negatively affect sensitive forest and aquatic life which can then have detrimental impacts on salmon habitat and salmon population recovery. The helpful forest management of red alder needs to include improved 'best management practices' to avoid harmful 'spillover' of nitrate and hydrogen ions into our salmon habitat waters.

Too much of a good thing can become more of a problem than a help to forest health and aquatic health. Human-caused increases of acidification pressures are increasing pollutant effects in salmon habitat more frequently and severely than the prehistoric aquatic conditions that the salmon ecology has been adapted to. The increased stresses pressure the salmon to change too rapidly for their plasticity and resilience to keep up with. The pace of our pollution has been too fast. Monitoring of contaminants is very important for understanding salmon decline pressures.

If we continue to allow toxic lead from lost fishing sinkers, bullets, boat anchors, and huge quantities of degrading lead paint flakes from bridges to flow down out of our low calcium watersheds, to contaminate the productivity of our freshwater, near-shore marine habitat, and marine protected areas, we will only continue to harm salmon in our waters from ridge tops to reefs. Sinkers get ground up in bedrock riverine potholes, exponentially increasing surface area for dissolving in the slightly acidic water.

If we continue to allow agricultural lands to add herbicides and other pesticide contaminants to our waters, and unfiltered storm water pollutants from road runoff, we will continue to degrade the aquatic health and salmon recovery. If we don't continually improve our questions, we are destined to have to live with decreasing quality of life.

Does the affinity of lead for iron in the water cause them to bind together to carry the lead as colloid out to the iron-rich productive areas, causing toxic effects? Does the lead colloid passing down the river expose salmon gill and gut acidic microenvironments to increased uptake and toxic effects in these sensitive tissues? Lead exposure reduces fitness of salmon to survive in the ocean phase of their life cycle. Does the lead affect calcium utilization in pteropods and cocolithophores to make it even harder for these prey species to grow and reproduce in the face of increasing freshwater and ocean acidification?

We need to carefully monitor what contaminants flow out between the jetties to pollute the productivity of the near-shore ocean that we rely on for the economic, ecologic, and human health of our mid coast watersheds. And, we need to pointedly investigate contaminant effects in the high risk freshwater developmental life phase of the young salmon.

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