Changes in Valley Floor Rivers that have Challenged Fish

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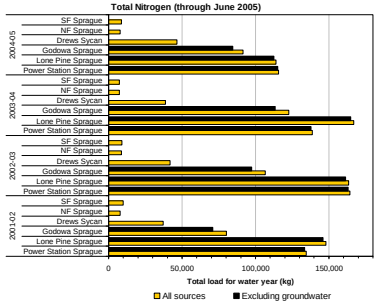
Nutrients

Increased nutrient flow into rivers - graph shows nitrogen loading in Sprague River



Promotes excessive growth of plants &algae.

From decreased shading:

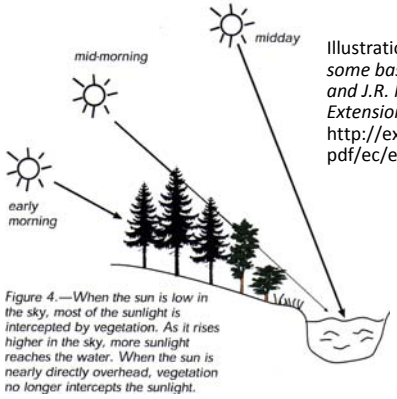


Figure 4.—When the sun is low in the sky, most of the sunlight is intercepted by vegetation. As it rises higher in the sky, more sunlight reaches the water. When the sun is nearly directly overhead, vegetation no longer intercepts the sunlight.

Graph from: Upper Klamath Lake drainage stream temperature analysis, by M. Boyd and B. Kasper, ODEQ, 2002.

Land management actions that removed riparian (streamside) vegetation and changed flow regimes caused fundamentally important changes in our rivers that strongly affect fish.

Riparian plants like willows and sedges have very strong, deep root systems that hold river banks together. When these plants are removed, river banks rapidly erode and narrow, deep river channels become wide and shallow.

Changes in the timing and amount of water flowing down the river also influence many processes that affect fish.

Such changes cause or contribute to many other problems.

Changes that reduced sucker populations reduced trout populations as well – improving the rivers will help both suckers and trout.

Increased Water Temperature

From decreased summer flows:

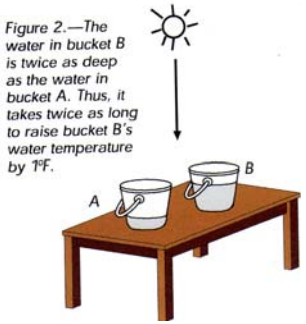


Figure 2.—The water in bucket B is twice as deep as the water in bucket A. Thus, it takes twice as long to raise bucket B's water temperature by 1°F.

From larger surface area of over-widened river:

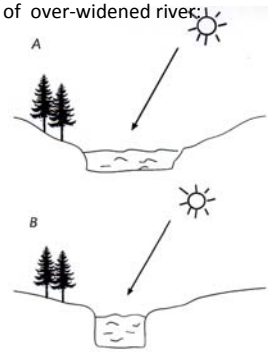
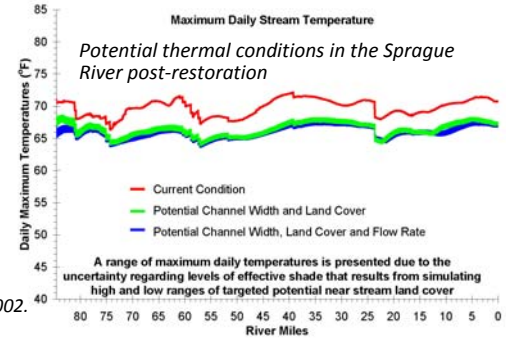


Figure 3.—Stream A and B both carry the same volume of water. Stream A has twice as much surface area to receive solar radiation as does stream B. Thus, the water temperature in stream A will rise nearly twice as fast as that in stream B.

Illustrations from: *Stream Temperature: some basic considerations, by J.A. Moore and J.R. Miner, Oregon State University Extension Service, 1997.* http://extension.oregonstate.edu/catalog/pdf/ec/ec1489.pdf

Potential thermal conditions in the Sprague River post-restoration



Fish Passage

Chiloquin Dam impeded fish movement upstream for 90 years before its removal in August, 2008.

Restoring riparian plant communities and associated processes key to restoration

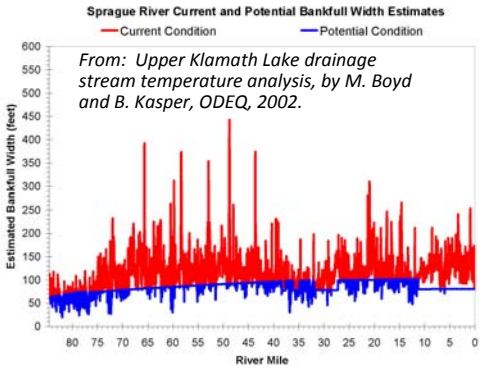
Left: Changed grazing management allowed sedge community to recover on this Sprague River ranch.

Right: Now instead of the banks eroding during high flows, the channel narrows as the sedges catch sediment moving down the river, and anchor it in place with their roots.

Left: Restored channel processes allow gravels to sort into usable patches again.

Right: Estimated capability of the Sprague River to narrow once channel processes are restored.

From: Upper Klamath Lake drainage stream temperature analysis, by M. Boyd and B. Kasper, ODEQ, 2002.



Water Quality

- Dissolved oxygen (DO) is what fish "breath". Warm water and excessive plant growth lead to low DO at night – can directly kill fish.
- pH is a measure of the acidic or basic (alkaline) nature of river water. Excessive plant growth leads to high pH during the day. Ammonia is a nitrogen compound present in all rivers. In a certain chemical form, it is highly toxic to fish. Excessive nutrient loads, warm water, and high pH all increase the concentration of the toxic form.
- All of these water quality factors challenge fish in the impaired reaches of our valley floor rivers.

Fish Habitat

- Spawning gravels can be covered by fine sediment. In over-widened channels, gravels may not "sort" themselves out into patches usable for spawning.
- "Rearing" habitats are places where young fish can survive and grow, usually along channel edges and in backwaters. Over-widened channels provide poor rearing habitat for our native species.
- Non-native predators like largemouth bass and yellow perch prey on young suckers.