



Dam Removal and River Restoration in the Klamath Basin

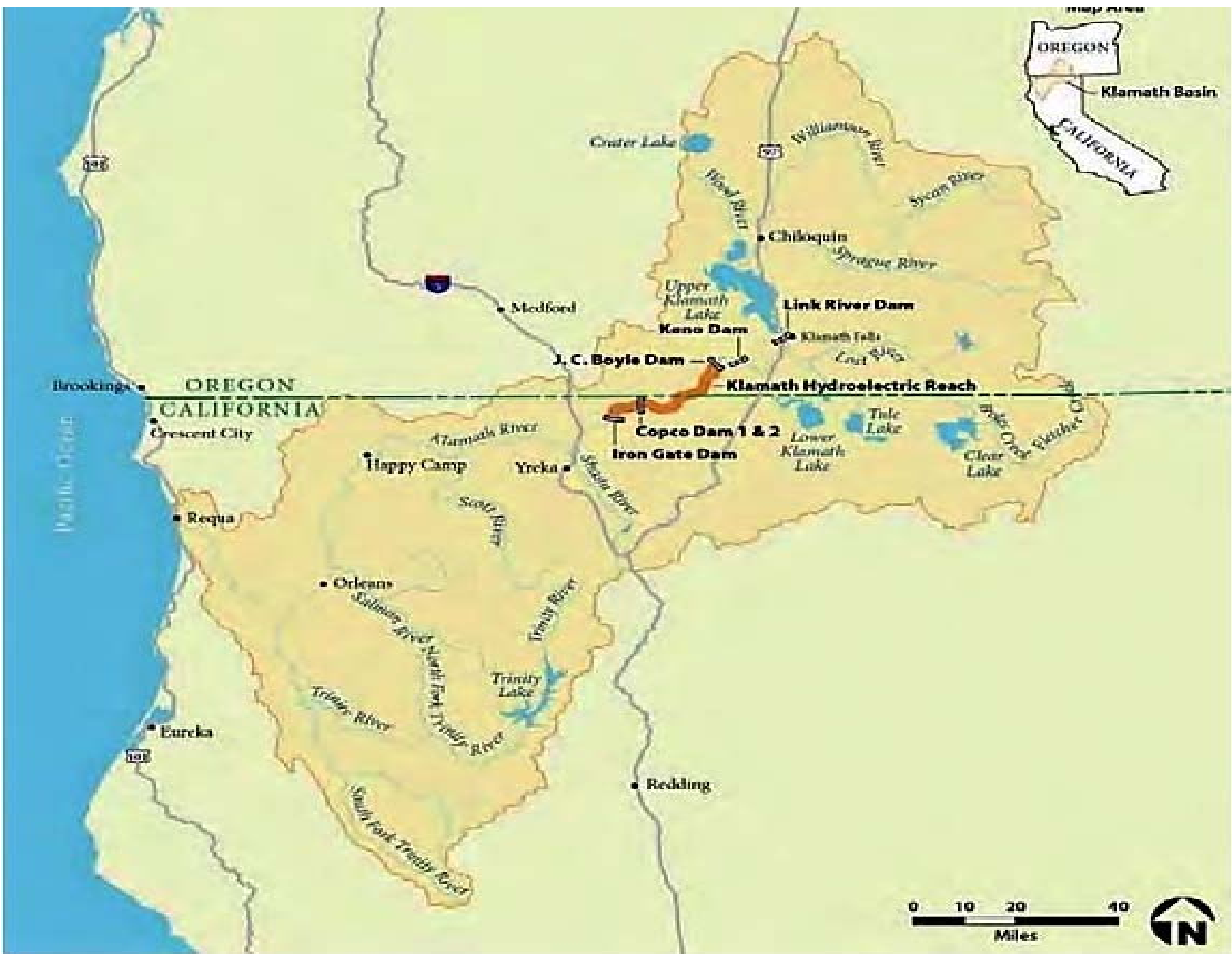
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Abstract

There is ongoing conflict in the Klamath River basin with diverse stakeholders and disparate interests competing for usage of vital water resources. In addition, there are several dams along the Klamath that have significantly altered the hydrologic regime of the river system. Pacific Power, and companies like them, view dams as beneficial sources of clean and renewable energy. The farmers that cultivate the area view the dams as irrigation controls for their fields. Fish ecologists view the dams as disrupting the fragile ecosystem of salmon and blocking fish passage. The Native Americans call the basin their home and view the river as a sacred being that benefits their way of life. A coalition of stakeholders have joined forces to remove some of the dams in order to restore the river to its natural state, while power companies and irrigators are trying to sustain an economic foothold in the region. Water usage in the Klamath basin has a complicated history, with many perspectives and no easy answers. The fight for an equalized and healthy river system continues. This paper provides an overview of the issues and strategies involved therein.

Introduction

At the center of the feud over water usage are the dams, The recent effects of climate change have made water usage and control an issue. As snow pack in the area starts to slowly disappear from the mountains the sources of water start to become scarce. Also as summers become and hotter and dryer the demand for water increases as farmers need more water for irrigation, salmon need steady flowing, cool water, and residents need more water for their homes. Increasing temperature and the lack of flow has also resulted in the infestation of blue-green algae blooms that have made water toxic to drink and uninhabitable for organisms including endangered salmon populations. The cooperation of the effected parties: the farmers, fishermen, Native American population, and other residents, has been vital in order to mitigate the water issues in the area. The decided solution for these groups was the removal of four dams along the river: the J.C. Boyle Dam, Copco 1, Copco 2, and Iron Gate dams. The removal of these dams is seen as a way to restore the river to a more natural state by increasing the rate of flow and water level in the surrounding area.



(Location of J.C. Boyle Dam, Copco 1, Copco 2, and Iron Gate dams)

The Series of Events That Led to Action:

- 1995**- Thousands of adult sucker fish die-off in Upper Klamath Lake.
- 1997**- Coho salmon listed as federally endangered species by NOAA.
- 2001**- Water deliveries to Reclamations Klamath Project are reduced due to drought and endangered salmon population.
 - Agricultural water needs are addressed by the federal government and water restrictions are eliminated.
- 2002**- 33,000 adult salmon die due to the blocking of passage up-stream and adverse water level and temperature conditions. Higher temperatures contributed to infection called "Itch."
- 2005**- Annual health warnings posted concerning water quality near Iron Gate and Copco Reservoirs due to the abundance of toxic algae blooms.
- 2006**- Restrictions placed on the harvest of Coho salmon along the Oregon and California coast including the Klamath River.
- 2010**- Drought led to restrictions of water deliveries to Reclamations Project.
 - Klamath tribes are forced to go without ceremonial sucker fish for the 25th year in a row and are without salmon for the 92nd year consecutively.

Correlating salmon runs with water flow from Iron Gate Dam

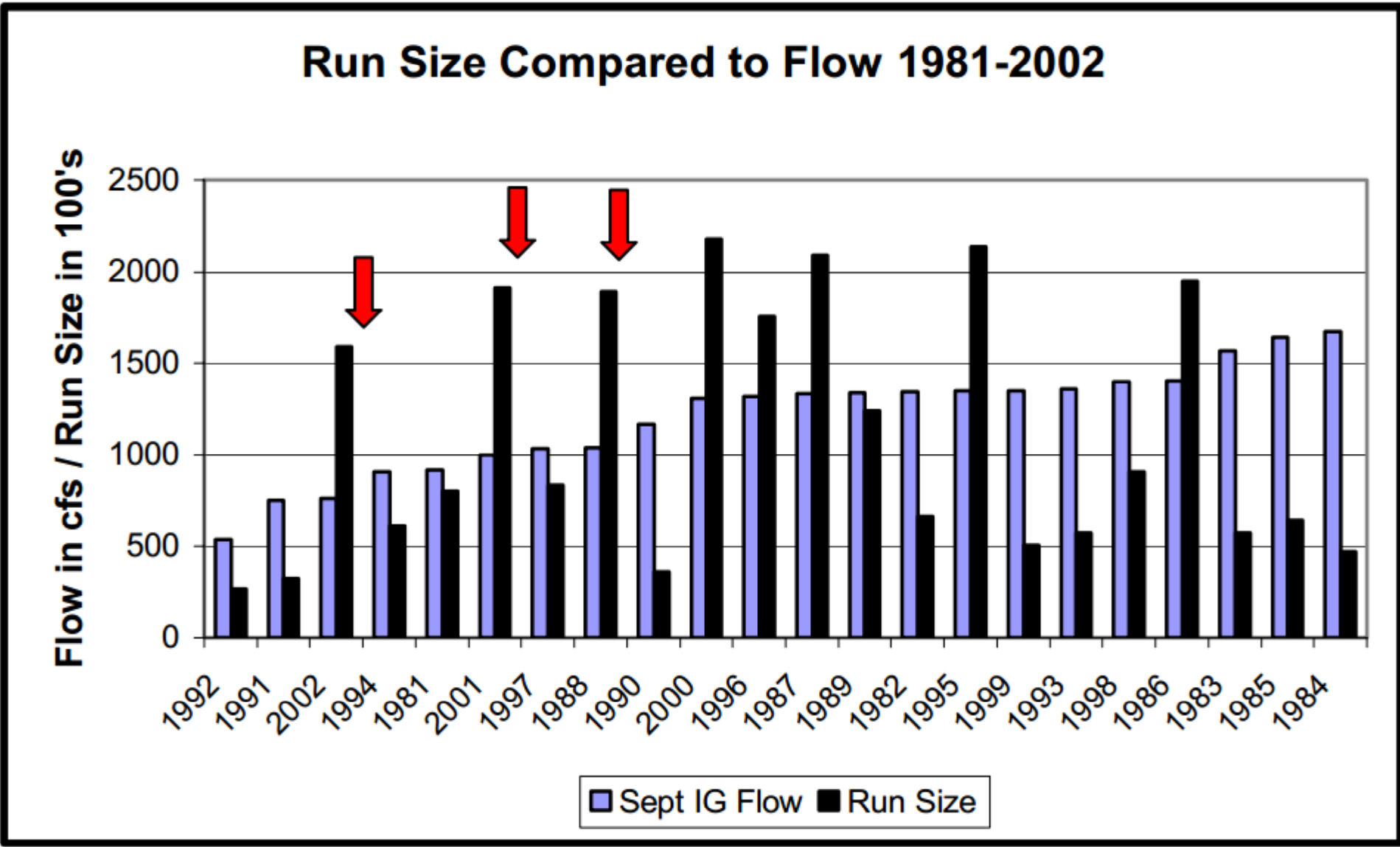


Figure 7: Ocean escapement of adult fall Chinook compared to average September Iron Gate Dam flow releases. Years are ranked from the lowest September flow releases to the highest.

Relationship between temperature and the life reproduction of Ich

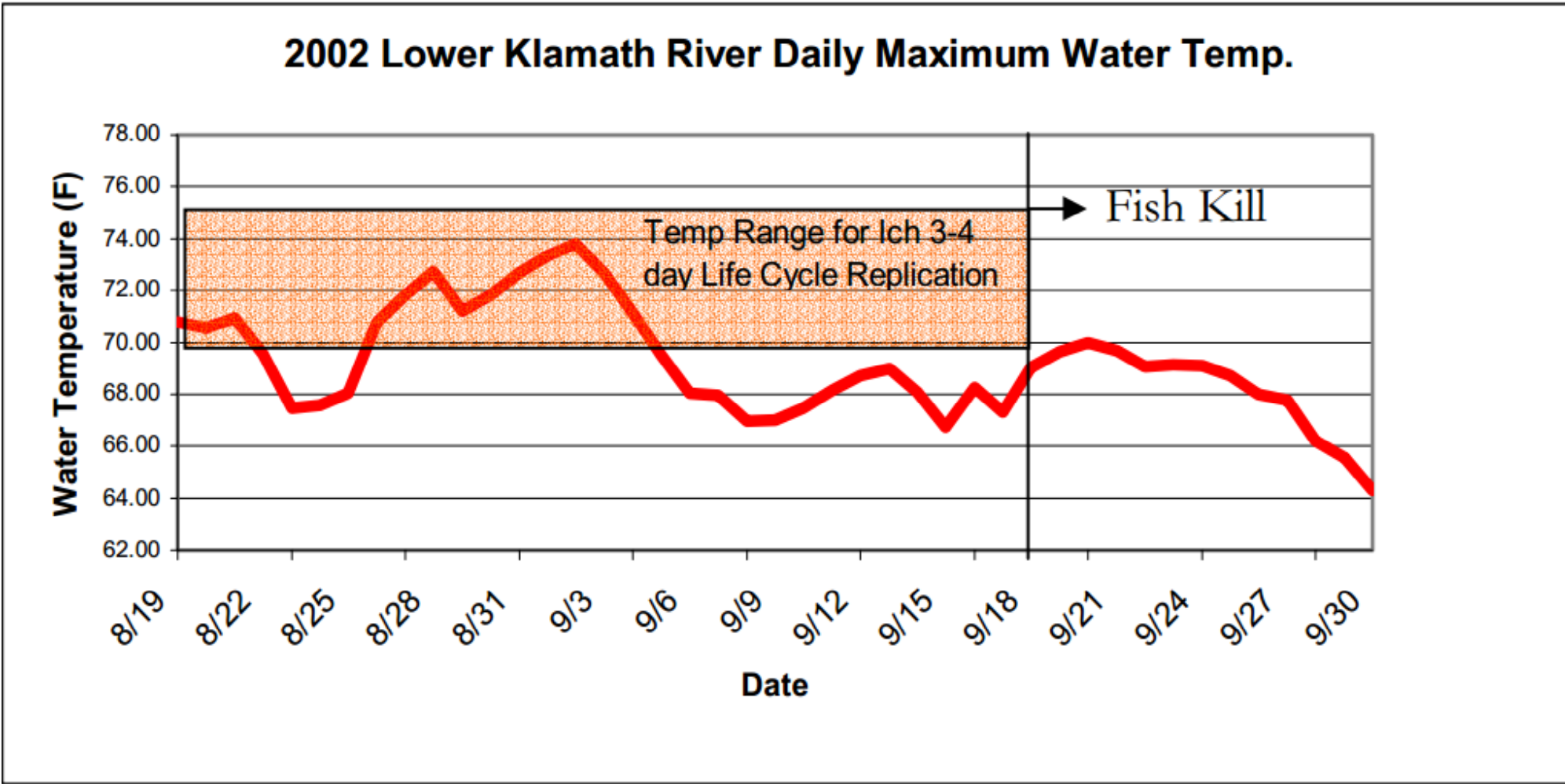


Figure 2: The rate of development of the increases with temperature. The detached reproductive stage of the Ich life cycle may be completed in 3-4 days at 69.8F – 75.2F (21 – 24 Degree C) or 10-14 days at 59F (15 Degree C).

\$\$\$ Cost Analysis \$\$\$ Is It Worth Removing Dams?

Cost Comparison:

-Keeping the dams in place:

\$ 400 million: Outfitting facilities with up to date aquatic resource mitigations since the majority of the dams were built before environmental mitigations were required.

\$ 60 million: toward up keep and maintenance

-Removal of the dams:

\$ 450 million

200 million of this would be the responsibility of Pacifi Corp rate payers in Oregon and California.

250 million from sale bonds in California

Yes, it would be more feasible to remove the dams.

What Is Being Done?

- 2005- **The Klamath Hydroelectric Settlement Agreement (KHSa)**
- 2005- **Klamath Basin Restoration Act (KBRA)**
 - Both have worked with Pacifi Corp to remove dams and restore the river.
- 2014- **Water Usage Program (WUP)**
 - Agreements to rotate water use among water right holders.
 - Management of water to meet flows during low flow periods.
 - Upland management (including juniper removal, crop rotations, improved soil conditions and management.

Conclusions

- Water Usage needs to be checked in the Klamath Basin especially with the effects of climate change.
- Salmon populations are dramatically effected by dams due to low flow rates and increasing temperatures
- Removing of dams will help to increase the flow of cool water and provide easy passage up stream for salmon.
- Cost analysis suggests it is financially feasible to remove out-dated dams.

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