Title
An Investigation of Floodplain Habitat for California's Native Fish Species

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An Investigation of Floodplain Habitat for California's Native Fish Species

Jeff Opperman
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Background

Riparian areas (land along river banks) are a natural place for human settlement given the richness of floodplain soils for farming, their proximity to freshwater and the opportunity for transportation and commerce, as seen in antiquity with the settlement of the Nile River delta and more recently with the collection of cities dotting the shores of the Mississippi River and its delta.

The floodplains of California's Central Valley are no exception. They have been lost to intensive farming, urbanization and massive water diversion projects. There is, however, a renewed interest in restoring floodplains to more natural states.

Project

In 2003, Jeff Opperman, then a postdoctoral researcher at the Center for Integrated Watershed Science and Management at UC Davis, was awarded a CALFED Science Fellowship to:

(1) Review the principles of floodplain geomorphology, hydrology and ecology in the Central Valley. His white paper examined the historical extent of loss of floodplains, described restoration approaches in the valley, and discussed potential implications of climate change;

(2) Participate in field studies at the Consumes River Preserve and its floodplains to study fish habitats for juvenile chinook salmon created by flooding; and

(3) Assist environmental consultants in developing a model to identify areas frequently flooded for a week or more, which are also associated with ecological benefits, such as phytoplankton production.

Salmon from field experiment. The larger fish were reared on a floodplain, the smaller ones in a river. Photo: J. Opperman

Findings

The field experiments conducted in collaboration with Carson Jeffres, a graduate student at UC Davis, showed that floodplains of the Cosumnes River, which are under water for weeks to months in the spring, are highly productive habitat for chinook salmon, as well as other fish. Juvenile chinook were observed to grow faster in floodplain habitats than in the river itself, probably due to the greater availability of food.

The results from modeling studies showed that in the Sacramento Valley, the Yolo Bypass, an engineered floodplain beside the Sacramento River, was the primary area affected by long-duration, frequent floods. The researchers attributed the minimal flooding of other areas to levees, channel simplification, water flow regulation and diversion, and channels cut below dams. In short, dams and other man-made structures were shown—not surprisingly—to disconnect rivers from their natural floodplains.

Riparian river bank in the Sacramento Valley bioregion. Photo: © Marc Hoshovsky

Implications

Flooding drives change in the surface features of a floodplain, creating topographic and ecological diversity, Opperman said. Frequent, long-duration flooding in the spring provides spawning and rearing habitat for native fish and promotes high biological productivity, which can enrich rivers and downstream ecosystems.

There is very little area in the Sacramento River Valley, however, that is available for the type of flooding that provides these ecological

benefits. If managers want to restore floodplains, they may need to re-engineer areas to allow for natural flooding. This re-engineering could include setting levees back, notching weirs, changing the topography, and regulating flows from upstream reservoirs. The model that Opperman helped develop can assist in identifying strategic areas for such restoration activity.

In the summer of 2006, Opperman accepted a position as a technical advisor for water management at The Nature Conservancy in his hometown of Cleveland, Ohio.

Jeff Opperman. Photo: Paola Bernazzani

Mentors

Research: Peter B. Moyle, UC Davis
Community: Elizabeth Soderstrom, National Heritage Institute; Ted Sommer, Department of Water

Collaborators

UC Davis Center for Watershed Sciences
Philip Williams & Associates, Ltd., Sacramento (an environmental consulting company)

Presentations and Posters

Opperman, J.J., C. Jeffres, and P.B. Moyle. Reconnecting Central Valley rivers and their floodplains: ecological benefits. Society of Ecological Restoration–California (SERCAL), Bass Lake, California, October 2005.

Opperman, J.J. and P.B. Moyle. Restoration of Central Valley floodplains. State of the Estuary Conference. Oakland, California, October 2005 (poster).

Opperman, J.J. and P.B. Moyle. Can ecological function be restored to California floodplains? A conceptual model. Floodplain Management Association, Sacramento California, September 2005.

Opperman, J., E. Andrews, S. Bozkurt, J. Mount, and P. Moyle. A conceptual model for restoring floodplains in California's Central Valley. Joint Assembly of the American Geophysical Union and the North American Benthological Society, New Orleans, Louisiana, May 2005.

Publication

Jeffres, C., J. Opperman, and P. Moyle. Rapid growth of juvenile Chinook salmon in ephemeral floodplain habitats. Submitted to *Transactions of the American Fisheries Society*.

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CALFED BAY-DELTA PROGRAM

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The CALFED Bay-Delta Program is a collaborative effort of more than 20 state and federal agencies with management or regulatory responsibilities for the San Francisco Bay-Delta system. The CALFED Science Fellows Program has been established to bring world-class science to all program elements to help achieve overall CALFED goals. California Sea Grant administers CALFED research projects towards those ends.

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