Stockholm Environment Institute

A new tool helps water managers consider ecosystem needs

SEI fact sheet
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As water supply becomes increasingly unreliable, state and local governments are forced to stretch their limited resources to meet various and competing needs. But water managers often only have the tools to consider urban, industrial, energy and agricultural uses. Ecosystem health is a crucial missing element.

Water diversions can decimate aquatic habitat by draining wetlands, hindering fish migration, and increasing saltwater intrusion. Climate change intensifies the impacts with warming waters, ocean acidification, and extreme weather. Addressing these effects – and choosing sustainable policy options – means integrating ecosystem needs into water management.

The Stockholm Environment Institute has developed a platform that allows users to model the effect of various management options on the availability of habitat and the viability of aquatic species. Using SEI's Water Evaluation And Planning (WEAP) system, this tool integrates hydro-ecological processes within a water operations model.

How it works

The model was originally created to inform water allocation and planning by modeling the unimpaired flow of water – or the flow of water if there were no dams, diversions or infrastructure. This allowed water managers to test out regulatory options and find ones that strike the right balance between ecosystem protection and society's water needs.

Figure 1. This schematic represents the information that is produced by WEAP between river nodes and the type of outputs that can be obtained for habitat assessment. The output data can be obtained for a set of external conditions and scenarios including reservoir operations or climate inputs.

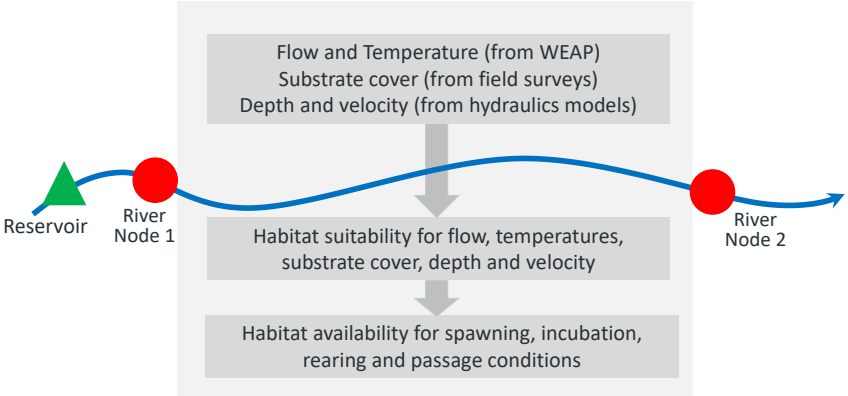

Photo (above):
Two female wild salmon swimming past an observation window as they traverse a salmon ladder
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But the newest version of the tool goes a step further: it now generates a complete aquatic habitat assessment at ecologically relevant points and creek reaches. This assessment models the daily hydraulic, substrate, and temperature conditions at each point; it then compares those conditions with the ideal conditions for aquatic species at that point in time. It thus enables users to see how real-world conditions affect species' various life stages.

The results can answer specific, policy-relevant questions, such as:

- How many acres of suitable habitat are available for spawning salmonids at any given moment?
- How frequently can salmonid juveniles successfully out-migrate to the ocean?
- How many cohorts of salmonid embryos will survive to hatching?
- What is the most upstream passage to which salmon migrate?

The model is linked to visualization tools – such as graphs and tables – that are designed to help users evaluate policy options. By translating the model's results into clear visuals, water managers and stakeholders can work together to consider concrete actions, such as potential modifications to existing reservoir operating rules.

Where the tool is used

The tool was first tested in California's Santa Clara Valley Water District, which provides water for 2 million people. The District aims to improve habitat for steelhead and chinook salmon – a challenging objective in a complex management system that includes streams, diversion canals, reservoirs, groundwater recharge, groundwater use, demand sites, and urban and natural rainfall runoff.

Through the use of WEAP and the new habitat assessment tool, District officials were able to evaluate how various regulations and operating regimes would affect fish habitat – across all life stages – along with water supply for people, industry and agriculture. This will help Santa Clara meet the requirements of the California Environmental Quality Act.

SEI is also using the tool – and adding to its capabilities -- in the South Fork Eel River of north-central California. Periods of low flow during the dry summer months are threatening both cannabis cultivation and the habitat of Coho salmon, Chinook salmon, and steelhead. Once constructed, the WEAP model will help illustrate the impact of instream flow requirements, curtailment procedures, and cannabis policies on water users in the basin.

Looking ahead, SEI's WEAP-based habitat analysis tool is well-suited to achieve multiple objectives, enabling policy-makers to consider ecosystem health along with the sustainability goals of laws like the Sustainable Groundwater Management Act. Restoration projects – such as those ongoing in the Mid Klamath Watershed – could also use the tool to prioritize actions and maximize benefits for wild salmon and other threatened aquatic species.

Learn more about the SEI US Water Program at: www.sei.org/us/water

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