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Elwha: Roaring back to life

By Lynda V. Mapes

Seattle Times environment reporter

Photos and video by Steve Ringman

Seattle Times staff photographer



ELWHA RIVER — The Elwha watershed is booming with new life, after the world’s largest dam removal.

The first concrete went flying in September 2011, and Elwha Dam was out the following March. Glines Canyon Dam upriver tumbled for good in September 2014. Today the river roars through the tight rock canyon once plugged by Elwha Dam, and surges past the bald, rocky hill where the powerhouse stood. The hum of the generators is replaced by the river singing in full voice, shrugging off a century of confinement like it never happened. Nature’s resurgence is visible everywhere.

“Big things can happen if people persevere,” said Mike McHenry, biologist with the Lower Elwha Klallam Tribe, which got the ball rolling on dam removal when it was still thought a crazy idea. “Back in 1990, you ask somebody in Anywhere, USA, about dam removal,” McHenry said, “they would have told you that you were nuts.”

Not anymore. Washington, still one of the most hydropower-rich states in the nation, is also

today the world’s dam-busting pioneer.

PacifiCorp did the math on keeping the Condit Dam on the White Salmon River in Southwestern Washington and blew it up with one blast on Oct. 28, 2011.

It took an act of Congress in 1992 to finally free the Elwha, taking down the pair of dams that had blocked the 45-mile mountain river for a century.

The big idea in all three cases was to get rid of hydropower dams no longer worth their maintenance and repair. The dams also had no fish passage, as required by modern environmental laws. Dam removal is restoring 70 miles of spawning habitat in the Elwha.

The \$325 million Elwha experiment remains the biggest dam removal project ever. With 83 percent of the Elwha watershed permanently protected in Olympic National Park, it offered a unique chance to start over. It's as if the whole watershed was waiting.



A view of the lower Elwha River dam site, 2010 on the top and 2016 on the bottom. Scientists are amazed at the speed of change under way in the Elwha.

Elk stroll where there used to be reservoirs. Bigger, fatter birds are bearing more young, and moving in to stay. A young forest grows where there was blowing sand in the former reservoir lakebeds. Seeds tumble down the river's coursing current. The big pulse of sediment trapped behind the dams is passed; the river has regained its luminous teal green color, and its channel is stabilizing.



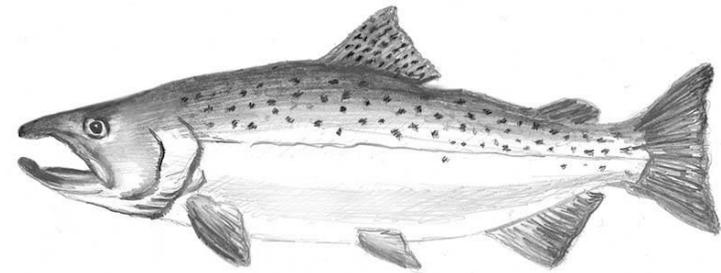
Logs are tumbling and stacking in the river, building complex, braided channels, islands and jams.

And fish are booming back: More than 4,000 chinook spawners were counted above the former Elwha Dam the first season after it came down. Overall, fish populations are the highest in 30 years. And that's before the first progeny of salmon and steelhead going to sea since dam removal come back this year.

Upper river



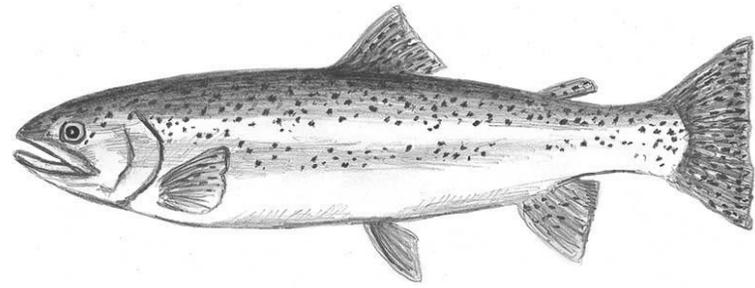
Lake Mills used to pool here behind the 210-foot-high dam, built in 1927 to produce more hydropower. The biggest buildup of sediment was here, behind the uppermost of the two dams. There were no ocean-going fish above this barrier for at least a century. Only resident fish, such as rainbow trout, were seen here. Two dams blocked 90 percent of salmon habitat in the river.



Chinook salmon

Elwha chinook – the biggest salmon in the river and unique in Puget Sound – cruised right past the former Glines Canyon Dam site just three days after it was blown out of their way. Three weeks later, they had muscled through the Goblin Gate and the Grand Canyon of the

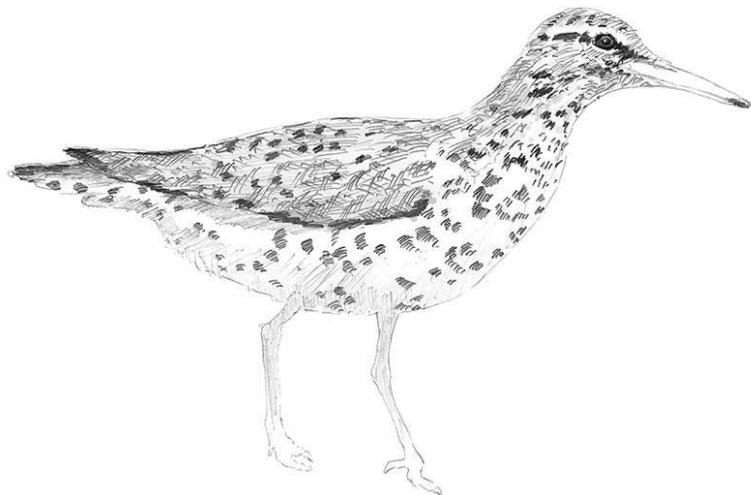
Elwha, heading toward the the river's headwaters at the foot of Mount Olympus. Blasting last September was intended to take out a rock pile at the former Glines Canyon Dam site to help more fish reach the upper river. More blasting work may be needed.



Rainbow trout go to sea



Big action from small mammals



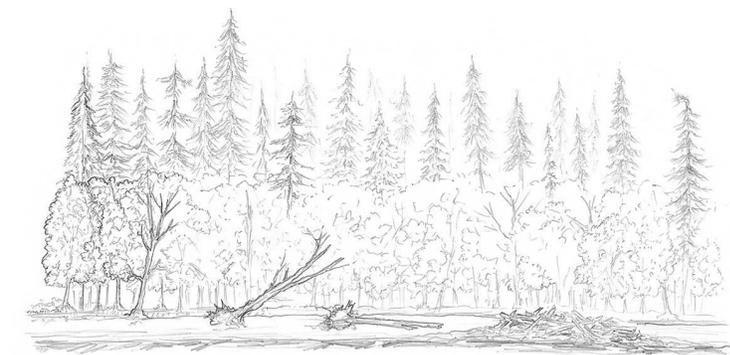
A spotted sandpiper bonanza

Big wood on the move



The dams blocked not only salmon heading upstream, but logs and root wads headed downstream. Especially behind Glines Canyon Dam, the upper of the two, wood that should have been distributed all throughout the river was stacked and stuck along the shores of Lake Mills. The Lower Elwha Klallam Tribe used a helicopter to pick up logs stuck against former lakeshores and pile them in log jams on the former lakebed to help new plantings get a better start. The logs shelter plants from wind, provide shade, accumulate organic matter and help hold moisture in the ground.

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New logjams create prime fish real estate

What used to be Lake Aldwell is now a broad floodplain that the river winds through, carrying logs and gnawing trees from its banks as it goes. These stack up and jam, creating a braided river channel as the river flows around them. Fish hide in the shady cover of the logs and lurk in plunge pools dug by the river pouring over the logs. The river also is creating

new side channels fish use for spawning and rearing – a good thing because some of the old side channels filled in with sediment released by dam removal.

Logs become homes

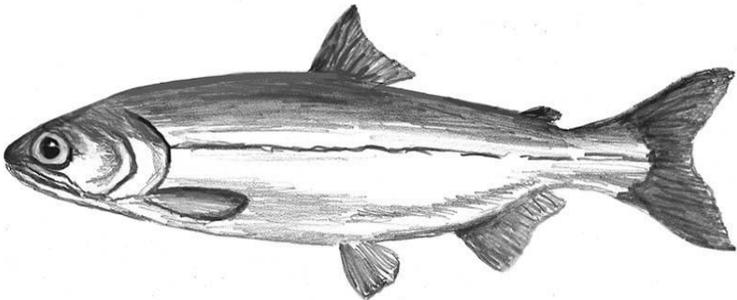


Logs on the banks and former reservoir beds have become islands of biodiversity. The logs create shelter for seeds to sprout, birds to perch and a menagerie of small mammals to hide. The birds bring more seeds and fertilizer; the plants create soil, and the small mammals are bioengineers in their own quiet way. They cache seeds that sprout, leave manure that feeds new ground, and feed the animals that eat them.

Middle river



The middle river was the realm between Glines Canyon Dam and the Elwha Dam, the lower of the two at 108 feet tall. No ocean-going fish lived here between the two dams for more than a century. Animals that normally fed on those fish were starved for nutrients from salmon. The river lacked the structure of gravel, sediment and big wood that an undammed river would have conveyed from the upper watershed and its banks.



Back and busy: salmon

The middle Elwha and its tributaries went from no Coho at all before dam removal, to producing about 32,000 outgoing salmon fry in 2014. Chinook redd counts are up more than 350 percent and steelhead 300 percent from 2013 to 2015. Even sockeye have been spotted

in Indian Creek, perhaps from landlocked kokanee in Lake Sutherland that have rediscovered their ability to go to sea.



Beavers are engineering a comeback



Visiting their winter range: elk

Lower river's resurgence



In this 2010 photo adult Chinook salmon are blocked in their journey upriver by Elwha Dam, built five miles from the river mouth with no fish passage. Even after 100 years they persisted, circling at the face of the dam every spawning season, trying to get upstream.

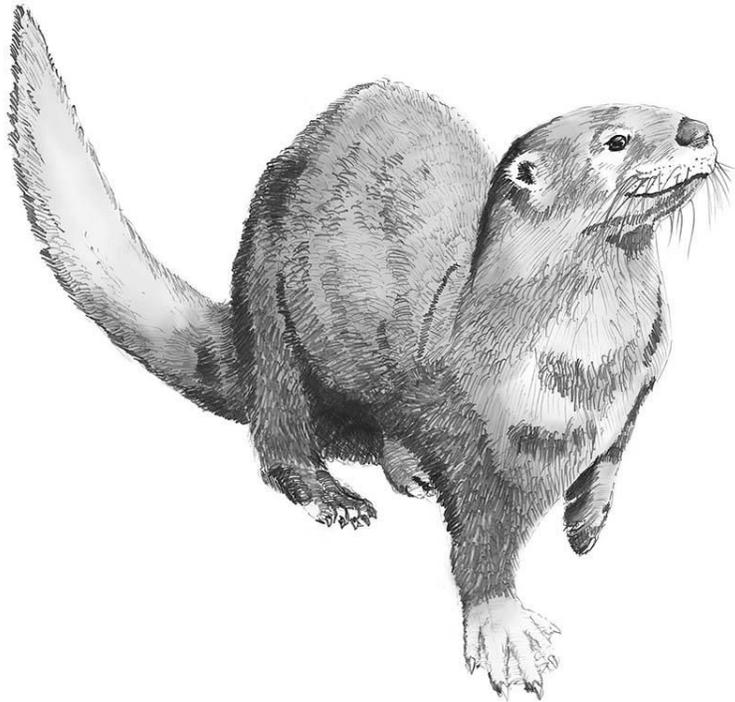
The lower river was the only place available to salmon after 1910, when Elwha Dam was built five miles from the river mouth without fish passage. Entrepreneur Thomas Aldwell built Elwha Dam to generate hydropower to attract industry to the city of Port Angeles. Cheap hydropower helped jumpstart the economy on

the Olympic Peninsula. But it came at a price: Anadromous fish populations in the river declined by 98 percent overall during the past century.

River-bottom invertebrates hammered

Scientists monitoring invertebrates in the river bottom documented a near total population crash as sediment smothered the lower river once the dams came down. These tiny animals at the base of the food

chain, including caddis flies, stone flies and mayflies, are starting to recover now that the sediment pulse is passed.

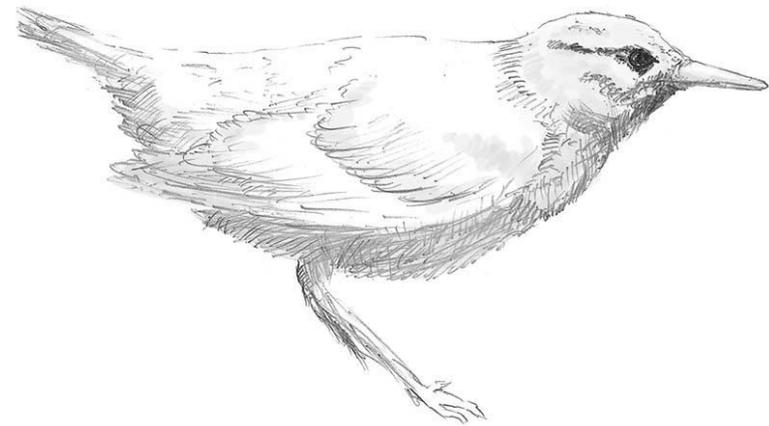


Otters on the move

As fish come up river, otters appear to be on the hunt for them. Otters tagged and tracked in wildlife research by the Lower Elwha Klallam Tribe were discovered to be moving from the middle and upper river to the lower river once Elwha Dam was out. One otter in particular had never visited the lower river until the dam was history. “Maybe she saw these fish and wanted to see where they were coming from,” says Kim Sager-Fradkin, biologist for the tribe.

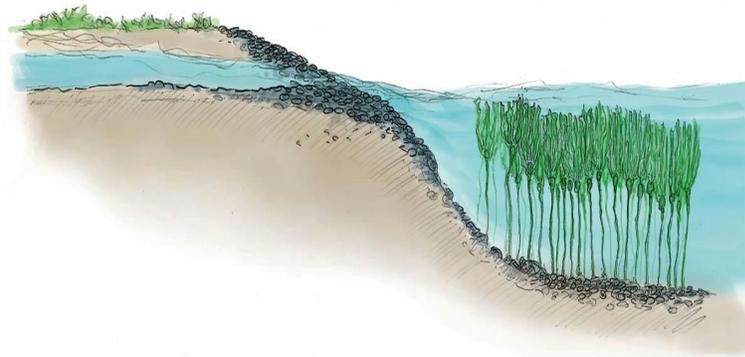
After dam removal: eagle feeding frenzy





Dippers are flourishing

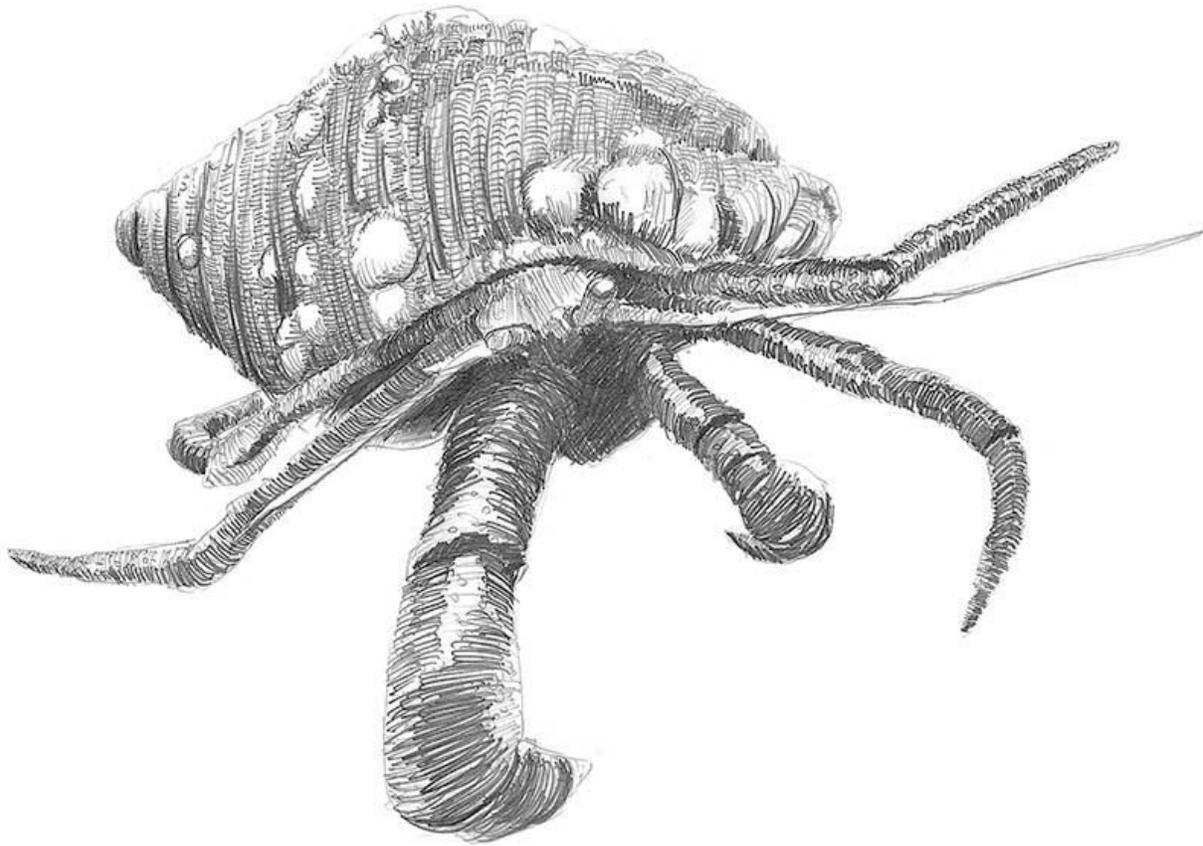
At the mouth of the Elwha



Before dam removal: the vegetation

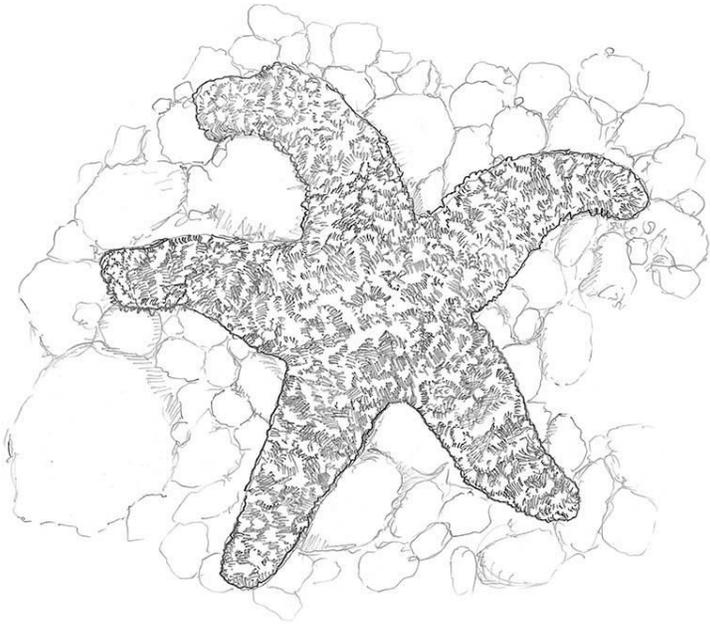
The beach where the river flowed into the Strait of Juan de Fuca was steeply sloped and covered with ankle-turning cobbles, starved for sand locked up behind the dams. Offshore, kelp grew abundantly in the nearshore waters – 15 species in all. The kelp roots grabbed onto the cobbled bottom. Red algae also thrived.

Hermit crabs

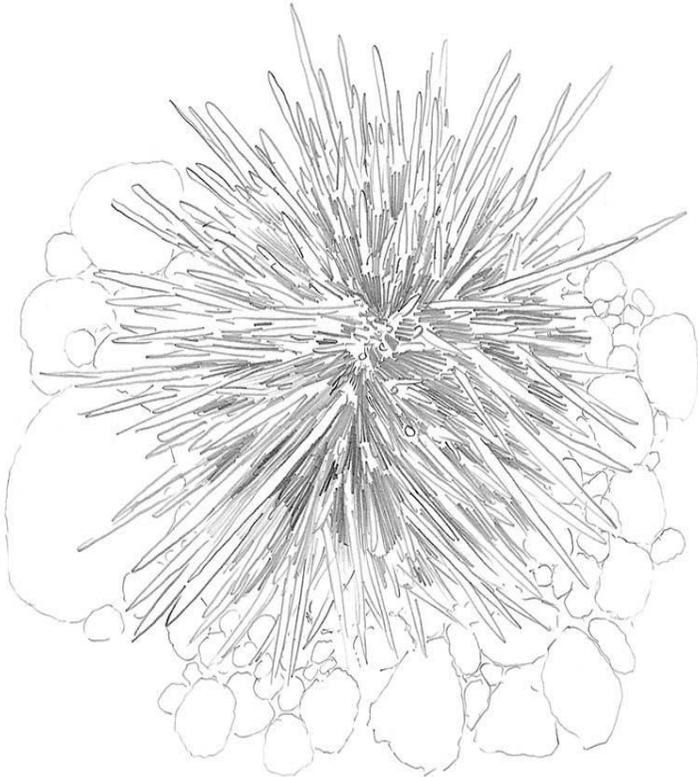


Winners and losers are created in a big, quick habitat do-over, such as a rocky bottom changing in less than four years to a sandy one. Hermit crab were abundant in the near shore, snugged in the tiny spaces between the rocks. They got buried as the dams came down, and the Elwha got to work moving silt, sand, clay, cobble and rock. Most of the stuck sediment the river was expected to move (except during major flood events) has come out by now, completing the first major milestone of dam removal.

Starfish



Sea urchins



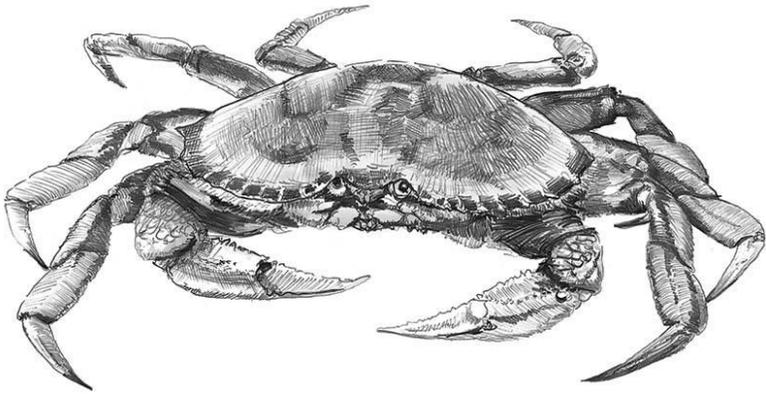
After the dam

Unplugging the Elwha birthed Washington's newest beach. The river built it grain by grain, by moving a massive load of sediment from behind the dams. The vast majority of the sediment released from the reservoirs wound up in the Strait of Juan de Fuca, where winds, tides and the prevailing currents carried it mostly east of the river mouth. About 4.6 million cubic yards of sand and gravel deposited at the river delta, with drifts piled more than 30 feet deep on the bottom of the nearshore, below the tide line. Most of the mud was carried far away on the current.

Forage fish and even minnows

Sardines, anchovies, sand lance, eulachon, surf smelt, herring and even fresh-water red side shiners, probably from Lake Sutherland, are showing up in the nearshore in numbers not seen in years, if ever. Forage fish fatten up bigger species of fish, including salmon. Ducks, eagles and other birds also feast on them.

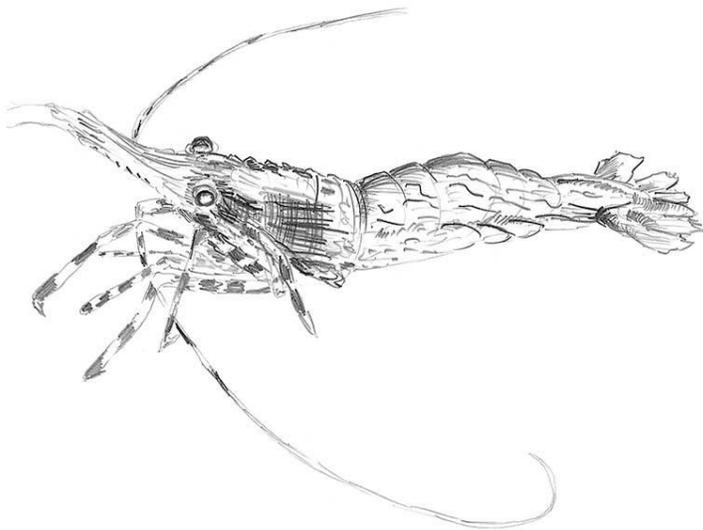
Dungeness crab



came down.

These tasty bottom-feeders are cruising the sandy bottom of the nearshore. Still not yet shown up in the intertidal zone – but greatly anticipated – are clams. Lower Elwha Klallam tribal elders speak fondly of the clams their elders used to gather at the beach before the dams were built. Some used to head to the beach after a winter storm, cued by great clouds of gulls gathering to feast, too. Subtidal clams though are doing well and abundant, even increasing since the dams

Shrimp... and more



Biologists netting nearshore waters are finding all kinds of animals, including shrimp, as the river undergoes tumultuous change, from a closed system, to an open one. Since dam removal, shrimp are showing up for the first time in biologist's sampling nets. Even adult chum salmon are turning up in the nearshore. Chum don't have the charisma of Chinook, but they feed the river and the land and are key to reweaving the web of life in the Elwha.

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Lynda V. Mapes: 206-464-2515 or lmapes@seattletimes.com

Contributing to this report were scientists convened for the 2015 Elwha River Science Symposium at the Olympic National Park campus of NatureBridge.

Particularly helpful were experts from the USGS, NOAA Fisheries, Washington State Department of Natural Resources, the Lower Elwha Klallam Tribe, National Park Service, Washington Sea Grant, US Fish and Wildlife Service and Coastal Watershed Institute.

- **Reporting:** Lynda Mapes
- **Photos:** Steve Ringman
- **Development:** Thomas Wilburn
- **Graphics and illustration:** Mark Nowlin, Kelly Shea
- **Page design:** Frank Mina

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