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In the Mountains and Deserts of Utah, Columbia Spotted Frogs Are Sentinels of Climate Change

By Judy Fahys
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Columbia spotted frogs inhabit wetlands from Wyoming to Nevada and north to Alaska. Heat and drought associated with climate change, water development and chytrid fungus pose additional risks to their survival in the southern part of their range. Credit: Judy Fahys/InsideClimate News

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HEBER VALLEY, Utah—Finding Columbia spotted frogs in Utah's mountains is not easy. But it's possible, with a guide like Paula Trater. She leads a visitor down a dirt path, then through mucky wetlands filled with cattails and a riot of birdsong.

On this cool, spring afternoon, she stops at a breeding hotspot. She points out a pair of male frogs wrestling in shallow water as they show off for potential mates at the edge of the cattails. Listen, she says, for the "cluck-cluckcluck" of spotted frogs calling out for love. And look there, just under the water's surface, at that gob of frog eggs. Those dark specks in the goopy mass: they're soon-to-be tadpoles.

What Trater, a biological technician for the Utah Reclamation Mitigation and Conservation Commission, cannot do is rewind the clock to a time when Columbia spotted frogs were plentiful here in Wasatch County. Utah's spotted frogs were so rare by 1990 that they were being eyed for endangered species protections.

In the end, the U.S. Fish and Wildlife Service decided not to put spotted frogs on the federal list, and opted instead to use multi-agency conservation agreements in six states to try to preserve the sensitive populations that are left. The "Frog Lady," as Trater's known, has tracked the frog's precarious existence here in the Heber Valley, 45 miles east of Salt Lake, for more than two decades as part of that effort.

"It's hard to isolate the variables and figure out exactly what the problem is," she says. "But the obvious one is, if there is no habitat, no wetlands for them, they're not gonna have a place to procreate."

Like many other amphibians, Columbia spotted frogs in Utah face threats besides the ordinary hazard of becoming dinner for hungry birds or snakes. There's the deadly chytrid fungus, a pathogen whose spread is associated with climate change. And global warming itself promises hotter summer days and longer, deeper droughts.

Trater's heard how Mormon pioneers regarded frogs as messengers. The presence of frogs told them the water was clean and safe to drink. Back then, frogs hopped from "every little wet puddle," and frog-song filled the nights.

Now, they compete with humans over habitat here and in Utah's western desert, where billion-dollar water projects have threatened to destroy the wetlands the frogs need to live. The frogs are sentinels, once again, as the planet warms.

They have a message for people about the environment—a warning about the ways humans are changing the world, altering ecosystems and accelerating climate change.

"I just can't imagine life without frogs," Trater says, adding how happy it makes her to hear them calling to one another. "Hopefully there's enough left that there will be some for my grandkids."

Threats, Microscopic and Global

Trenton W. J. Garner, a conservation ecologist with the Zoological Society of London, warns that we don't yet know what impact destroying sensitive habitats might have on humans. But he doubts humankind will escape unscathed.

While Garner has not studied Columbia spotted frogs, he's an expert on amphibian biodiversity. As chytrid fungus causes amphibian die-offs and extinctions worldwide, he's seen how species losses are already transforming the world we know and opening the door to global "knock-on effects," or consequences.

"Eventually, we're going to see larger knock-on effects that are going to have much more direct implications for us," he says, noting those impacts might not be obvious at first. "We're pushing ourselves into a great unknown."

Studies by Garner's team and others have linked climate change with chytrid's spread. A waterborne pathogen that's been found in water bodies in at least 60 countries, chytrid has been blamed for the extinction of 90 species of frogs, toads and salamanders over the last half century. In more than 400 other species, there have been massive die-offs.

Chytrid, which starves and suffocates amphibians by damaging their skin, has been found in spotted frogs, whose range stretches from Wyoming west to Nevada and north to southeastern Alaska. In Utah, the fungus has afflicted mountain populations but not, so far, Columbia spotted frogs that live in the desert.

An Improbable Frog Oasis

Four hours west of the alpine wetland in Heber Valley, along the Utah-Nevada line, are the Snake Valley and a smattering of natural springs in the vast expanse of the Great Basin. It's hard to imagine a more unlikely habitat for water-loving creatures like snails and frogs. But each wetland spring is an improbable frog oasis.

Aquatic scientists Keith Lawrence and Jake Mecham prowl a few of these remote, desert spots each spring in search of spotted frog egg masses. They are part of a Utah Division of Wildlife Resources team that's monitoring Columbia spotted frogs for the same conservation agreement that guides Trater's work in the mountains.

But here in the desert, the scientists spend long spring days slogging around trickles of springwater that fill the deep dimples left by the hooves of the cattle that graze here much of the year. Identifying anything in this vast desert—let alone guesstimating the number of eggs about the size of peas—brings to mind the idea of finding needles in haystacks. For Lawrence, it's filled with the excitement of hunting for Easter eggs.

"This one right here is just a great example of one that was just laid maybe last night," Lawrence says, pointing to a filmy clutch of spotted frog eggs.

Last spring, the team estimated 4,000 breeding frogs at this site last spring, which is more than double the estimated number of frogs inhabiting a 10-mile corridor in the Heber Valley in recent years.

"When you're walking through [a desert habitat], you can hardly believe it when you walk upon 100 egg masses," he says. "We love to see it. They're doing really well here."

A Big "Water Grab" Looms on the Horizon

For spotted frogs in the desert, climate change and a giant water development project pose existential challenges.

The most concrete threat is a multi-billion-dollar, 300-mile pipeline proposed to supply water to about 1 million future Las Vegas residents. The Southern Nevada Water Authority, which serves Las Vegas, already has purchased rights to draw 16.5 billion gallons each year from the same underground water reservoir that's made life in the desert possible for indigenous people, ranchers, farmers and wildlife — and spotted frogs.

Drawing down the aquifer would affect an area the size of Vermont, potentially spelling disaster for the Columbia spotted frog and dozens of other species, according to the Great Basin Water Network, a coalition of farmers, ranchers, indigenous communities and local government agencies in the nation's two driest states. The pipeline would also impact Great Basin National Park, five national wildlife refuges, 11 state wildlife areas and parks and 35 hydrologic basins.

"The idea that we can just ignore [the needs of current water users] and go treat these aquifers as a reservoir of water for urban expansion—it's just ridiculous," says Patrick Donnelly, Nevada state director for the Center for Biological Diversity, a conservation group.

Publically, the water district says the pipeline idea is on hold for now. But in court and behind the scenes, the prospect of a pipeline remains. Last month a Nevada court sided against Las Vegas, reaffirming prior rulings suggesting the pipeline plans fail to guarantee that current users and the environment are protected. Donnelly's group has obtained documents showing the water district is pressing the Trump administration to ease federal environmental restrictions that might allow the pipeline to advance.

"As for species like the Columbia spotted frog, it is already at the very margins of acceptable conditions for its existence in the desert," Donnelly says. "We are already risking those populations, simply because our carbon emissions are driving catastrophic climate change."

'A Generalist Species'

Even if the water pipeline never materializes, the deeper and longer droughts, hotter summers and higher peak temperatures caused by climate change are just as troubling for spotted frogs.

Among the many studies linking climate change with extinctions, a recent analysis in the journal PNAS provides new insights into the role of climate change.

While many extinction studies look at average yearly temperatures, this one zeroes in on maximum annual temperatures as the leading factor driving species to—or over—the brink of extinction. Looking at past data, the researchers estimate that about one-third of plants and animals could face extinction by 2070 because of global warming.

"Basically, how hot it gets in the summer is what determines whether populations live or die," says co-author John J. Wien, an evolutionary biologist at the University of Arizona.

In Utah, where temperatures have been rising about twice as fast as the global average, the warming trend is not expected to reverse anytime soon. Scientists at Utah State University expect the number of high heat days will continue to grow in the West Desert.

Between the water drawdowns and increasing heat, the future for Columbia spotted frogs in the Great Basin continues to be precarious. David S. Pilliod, supervisory research ecologist for the U.S. Geological Survey's Forest and Rangeland Ecosystem Science Center in Boise, calls spotted frogs "a generalist species," flexible and adaptable to a range of conditions. That's why they are so widespread and capable of surviving in the cold deserts of the interior west, says Pilliod, who has published key research on spotted frog habitat.

Studies are underway, he says, to examine the sensitivity of spotted frogs to drought and to understand what the tipping points might be for population declines or collapses.

"Like other species, it may be death by 1,000 cuts, but longer and more frequent droughts that are occurring under climate change may be leading to conditions that can no longer support Columbia spotted frog populations," Pilliod said. "We are currently investigating whether wetland construction can mitigate this threat."

An Egg Harvesting Experiment

Three decades ago, as the U.S. Fish and Wildlife Service was contemplating a request to list Utah's spotted frogs on the endangered species list, state and federal officials were determined to build a dam in Wasatch County, upstream from the frogs that Paula Trater is tracking in the Heber Valley.

The construction of the Jordanelle Dam, which holds Colorado River water for cities and farms, began in 1990 at the same location as the single largest known spotted frog habitat in Utah's mountains at the time.

At a meeting with water and wildlife officials three decades ago, a congressional staffer recalled in an interview, the late U.S. Sen. Jake Garn dismissed the idea that "minor species" were worth protecting—especially in the context of a billion-dollar water project. "If the people who are pushing this [spotted frog listing] think they can stop the [Central Utah Project dam], then I'll stop the whole Senate," the aide told the Salt Lake Tribune.

Later that summer, conservationists leaped into action when they saw bulldozers scraping up dam fill near the grove of cottonwoods and willows that held the best spotted frog habitat. They asked the construction crews to steer clear long enough to mount a hasty salvage effort.

They nabbed 49 spotted frogs, tagged them, tossed them into coolers, drove them to a canyon downstream and released them in what looked like suitable habitat. They looked but never relocated those frogs. But other populations were eventually discovered downstream in the valley.

It's unpredictable whether relocation might be the solution for the frogs now. But faith in their resilience is driving an experiment planned for some of the Utah mountain populations this spring.

Lawrence, the aquatic scientist, says egg masses will be collected at some mountain sites so the tadpoles can be reared at a local aquarium. Once the tadpoles have matured into grown frogs, they will be planted in safe and suitable habitats.

Retired biochemist Peter Hovingh, a weekend herpetologist who filed an unsuccessful petition in 1989 asking the federal government to put spotted frogs on the endangered species list, says he's happy the frogs ultimately survived the dam, because "their death is greatly postponed."

But he still worries about all of the region's Columbia spotted frogs. For decades, he checked the springs and marshes where they live. But he's stopped going because he's afraid to see what might not be there any more.

"There's always a threat," he says. "Because human beings tend to think that all water belongs to them and, as long as human beings get first choice of any water, the threats are always going to be there one way or another."

Back up in the mountains, Trater hopes when she retires that she'll be able to roll her wheelchair up to the frog ponds and hear their cluckcluckcluck. She hopes that Columbia spotted frogs have started to help us grasp what's at stake when wetlands are lost and ecological systems begin to unravel.