

## A river for warmer times: Deschutes may have a leg up on climate change

By Kate Ramsayer / *The Bulletin*



Fly fisherman Bruce Cockrell, right, of Sunriver, and rafters Donna Hike and her husband, Dave, both of Bend, enjoy the Deschutes River this week above Dillon Falls west of Bend. The steady flow of the Deschutes, aided by a giant underground reservoir, will be an advantage in battling the effects of a warming climate, a U.S. Forest Service hydrologist says.

[Rob Kerr / The Bulletin](#)

Even back when he was a river guide on the Deschutes, Gordon Grant thought there was something unusual about the river.

“The Deschutes always seemed a little odd to me, and I couldn’t quite put my finger on it,” he said.

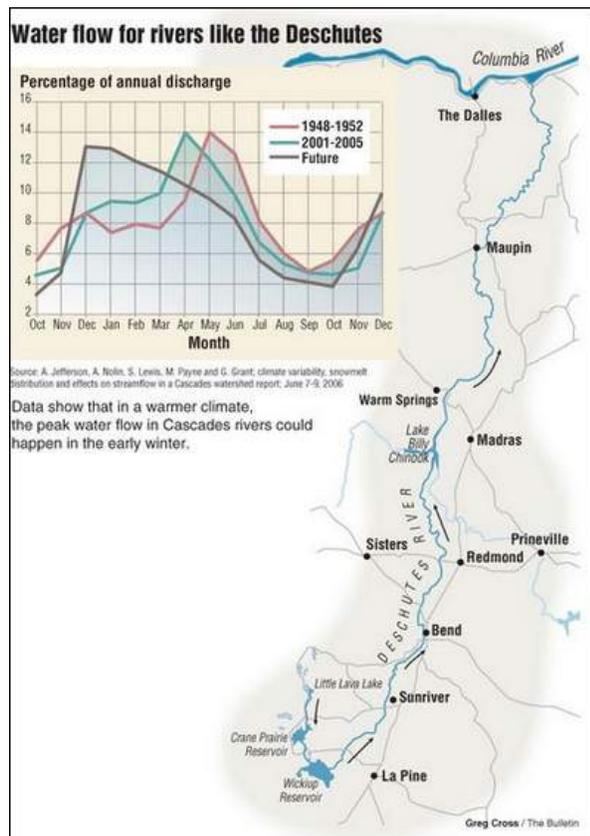
When he started studying it from a geologic and hydrologic perspective, he started realizing what it was that made the river different. It has a much more steady flow than other rivers, rarely floods and is fed by a giant underground reservoir.

But these oddities of the Deschutes River and several other waterways might be just the factors that buffer them from the effects of a warming climate, according to a new study conducted by Grant, a research hydrologist with the U.S. Forest Service’s Pacific Northwest Research Station in Corvallis, and others.

There are scientists concerned that higher temperatures could alter the timing of stream flows, resulting in flashy periods of high flows during the winter and trickles during the summer.

But while many streams might run dry during those summer months, the Deschutes River and others like it in the Northwest would still have water flowing, Grant said.

“Here we will have water, and the reality, I believe, is that in the future, the Northwest will be seen as a primary source of water for the entire West,” he said. “Either water will come to people, or people will come to water, and that has huge implications for planning and management and anticipating growth.”



But others say that the water in the Deschutes is already divvied up among various users, and changing the way water is apportioned would take a serious water crisis.

And the Deschutes River could see changes as well. Computer models of water flow in rivers like the Deschutes indicate that while they wouldn't go dry, they could still see significant loss of flow in the summertime, when it is needed for irrigation and for a healthy ecosystem, Grant said.

### Water from a giant aquifer

His study was based on computer models that looked at what would happen if temperatures warmed by 2.7 degrees Fahrenheit, which is about a middle-of-the-road estimate for what might happen in half a century, Grant said.

While it's still an early study and only looked at a generic High Cascades groundwater system, it

did indicate that these groundwater-fed rivers would behave differently in a warmer world, he said.

“Groundwater rivers are going to have a different response, and in some cases a very different response, than surface water rivers,” Grant said.

The uniqueness of these groundwater rivers stem from the fact that the young lava that makes up the High Cascades acts kind of like a giant sponge, taking in almost all the rain or snowmelt and storing it in the aquifer.

“There's a huge storage reservoir,” Grant said. “We think in the basalt, not just in the Deschutes but for the Cascades in Oregon, we figure there's something like the equivalent of the volume of the Great Salt Lake or Lake Geneva, or more, ... stored in the rock itself. It's very unusual to have this much water stored in a mountain environment.”

And these types of aquifers are continuously recharged when it rains or when snow melts, he said. Most of the time the water simply seeps into the ground, instead of running off on the surface in streams.

Underground, the water slowly percolates down a gentle slope, coming out in springs that feed the Deschutes. It's also pushed out by the pressure exerted by new water coming into the aquifer, kind of like when someone turns on a garden hose and the warm water that's been sitting in the hose is pushed out by the new flow.

With these mechanics at work to supply the Deschutes River, it doesn't really matter how the water falls to Earth.

"The water that comes down as rain and the water that comes down as snow is going to be equally stored in the system," Grant said.

And because it exits the system so slowly, and there's so much of it, the models predict that rivers like the Deschutes will have a buffer against warming temperatures.

"If you turned off the tap, if you had a drought like in Southern California, if it didn't rain for several months, that pressure wave is still pushing water out, and gravity is still making it flow out," Grant said. "You do see it beginning to drop off as summer goes on, but not much, because there's lots of water and it's moving slowly."

### **Flashy flows**

In other kinds of rivers, like the Crooked River and its tributaries in the Ochocos, scientists are concerned that warming temperatures will drastically alter the timing of water flows.

"Climate change is really going to eat away at the snow," Grant said. "It will change a lot of snow to rain in the winter, and then make the snow melt earlier."

There would be less water stored in snowpack form and more water flowing down streams as soon as it rains.

"There what's likely to happen is you're going to have much more flashy flows in the winter," Grant said.

And if the snowpack is smaller or melts earlier, then surface water-fed streams could exhaust their water supply sooner in the year.

"Those systems will also dry up, and they will dry up earlier," he said.

But groundwater-fed streams wouldn't be completely immune to these effects, according to the study.

Because water flowing into the aquifer increases the pressure and pushes water out, if the snowmelt comes early, it would shift the bigger flows to the late spring or early summer and result in less water around August. And because there is usually a steady flow at that time, the drop will mean that there could be more water to lose.

“At the time of maximum water stress, which tends to be late summer, there will be less water available,” Grant said. Farmers need water for irrigation, people are watering their lawns and keeping water in the river is ecologically important.

### **Incalculable value**

This could be the case not only for the Upper Deschutes, but for some of the rivers on the west side of the Cascade Range, the Upper Sacramento River and rivers around Mount Adams that are fed by groundwater.

And even if their flow is shifted, these kinds of rivers would still have water in them when surface water-fed rivers and streams are suffering, Grant said.

“The Northwest and those parts of the volcanic arc that have these groundwater systems will be seen as having resources, and there will be water available even when other systems are dry,” Grant said. “And the value of that is going to be almost incalculable.”

It’s very hard to predict what will happen in the future, he said, but the study suggests that water will be in demand and rivers like the Deschutes will have it.

People could dust off schemes to transport water elsewhere, or more people could move to areas that have water, since new developments will require new sources of water.

But the Deschutes River is already all divvied up, said Tod Heisler, executive director of the Deschutes River Conservancy.

“They’re already overappropriated,” he said. “You can’t squeeze water from a stone, so to speak.”

Irrigators take more than 90 percent of the water below the diversion dam in Bend, and water is stored in reservoirs as well. The organization is working to make sure that some water is preserved in-stream so that there is always a minimum flow for the ecological health of the river, which would be even more important if the flow is going to change, he said.

People could try to drill for groundwater in the area, he said. But it’s now state law that if you use new sources of groundwater, you have to mitigate for it by putting water back into the river, for instance by buying a water credit that was previously used to irrigate fields.

That takes a lot of time and effort, he said, but if it gets hotter and dryer and farms go out of business, more water rights could be shifted to groundwater.

However, it would take a very serious water shortage to change the groundwater mitigation rule and simply take water without compensating for it, he said.

“We’d have to really be experiencing a high level of duress, and under those conditions development or agriculture or other interests for water might very well eclipse those for environmental flows,” Heisler said.

The city of Bend is concerned about what will happen with water supplies and is working on gathering the funds and capabilities to start doing studies about what a warmer climate might bring, said Patrick Griffiths, water resources coordinator with the city.

“We are buffered by the aquifer, but we aren’t going to rest on the laurels. That doesn’t give us a lot of comfort,” he said.

And Grant said there are many more studies to do, including looking across the entire West to map where snowpacks, groundwater systems and dams are coming into play, to see which places might be at the greatest risk for losing water in a warmer climate.

Already, in the Western Cascades, scientists are seeing snowmelt occurring two weeks earlier than it did 50 years ago, and the minimum stream flows falling by about 25 percent, he said.

“We’re already seeing the effects in the Cascades.”

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