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Shutdown will cast a long shadow over research

The sudden halt to US government functions leaves me worried about the effects on science for years to come, says Anne Jefferson.

As the longest-ever government shutdown finishes its fourth week, I keep waking up in the night with thoughts of a fence. In Cuyahoga Valley National Park in Ohio, we've planted thousands of saplings with the help of hundreds of volunteers. Those tiny trees are supposed to be part of a decades-long experiment on the critical zone, the life-sustaining region from groundwater to treetops. The only thing that protects the saplings from hungry deer is a thin fence. And the Park Service rangers who protect the fence are furloughed — not working because they're government employees. Although the deer haven't got through yet, other environmental data sets are already being hurt: the longest-running study of predators and prey, how salinity affects commercial seafood, how forests recover from acid rain, to name just a few.

The harm that worries me most is to the people behind those projects, the scientists themselves.

I'm one of the lucky ones. I can get paid and carry on with some research and teaching. (I receive funding from the National Science Foundation, which is affected by the shutdown, but hasn't yet missed a scheduled payment for my projects.) Meanwhile, tens of thousands of federal scientists must sit idle, and others must work without pay. On the surface, my job as an associate professor of geology at Kent State University in Ohio is unaffected. Below the surface, almost every hour of my working day is punctuated by uncertainty, frustration and delays. Every day this historic hiatus drags on, the costs get higher for the fabric of US science.

I've replaced some of the time I'd normally spend working with federal researchers instead advocating on behalf of the very idea of federally funded science. On 29 December, seven days after the government closed, I began collecting and sharing stories of the shutdown's effects on US science at #ScienceShutdown on Twitter.

The human costs of the shutdown are clear from the stories shared on Twitter: a postdoctoral fellow worries about feeding his infant son; and a graduate student has lost her health insurance because of a delay in her doctoral defence.

A professor has lost the chance to collect data on Hurricane Florence's impact on urban forests; undergraduates, set to work over the winter break, have lost an opportunity to gain research experience. Postdocs have shared their fears over missed career opportunities because they can't submit conference abstracts or papers while they are furloughed.

Friends who work in the federal government are trying to figure out how long they can last before they have to find a new job. They love their work, and are proud to serve the American public and the greater good. This pride makes it even harder to cope with the disrespect and economic hardship they are experiencing.

Students tell me that they are rethinking their career plans. They no longer see federal science jobs as a dependable choice. Graduate-school positions may be harder to attain, because programmes lack funds that would normally have been awarded by now.

Back-pay won't replenish the loss of human capital: talent that leaves or stays away from government jobs will weaken US science for decades.

Already, the short-term effects are plain. Collaborations and on-going projects grind to a halt, funding gets delayed, research sites and data become inaccessible, conference sessions have empty panels, and public lands and water get degraded.

Right now, I should be writing a proposal to the US Geological Survey (USGS). It's due on 31 January. Funding requires a USGS scientist as a co-investigator, and almost all are furloughed. I can't ask whether the deadline will be pushed back, or by how much, because the people who might know are also furloughed. Across the country, in many disciplines, teams face the same dilemma, or worse.

The syllabus for the hydrology course I'm teaching this semester is uncertain, because I don't know whether the federal data sets needed for homework assignments are available. Learning to use these is a major objective for my students, and I fear they will thus be less prepared for their careers than their predecessors. The historical weather data I need to study precipitation are unavailable. Some real-time data are available, but if something goes wrong, no one is around to fix it. There's a similar problem with keeping meteorologists on the job, while furloughing the scientists who build and maintain the weather models.

We must show political leaders all the ways in which the shutdown is hurting their constituents and country. We should ask that they provide secure funding to the end of the fiscal year or beyond, rather than just reopening government with a short-term continuing resolution that could lead to another shutdown later this year.

And we need to make US science more resilient to future shutdowns — the last multi-week one was just five years ago. Federal agencies should be required to share plans for dealing with a shutdown well in advance, and to update plans when it looks as if a funding lapse is coming. We need to know what counts as essential services, and how their workflows will be maintained. Public comment on standing plans would allow all Americans to weigh in on mission-critical functions.

I hope, without expectation, that we can retire the #ScienceShutdown hashtag before this article is posted, and never use it again. Even so, we will be paying for the shutdown for years and decades to come. ■

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