

Climate-data rescue efforts gear up

Data disappearing is far from the only thing researchers are worried about under the Trump administration, but it's one they can do something about.

A week before the inauguration of President Donald Trump, more than 250 volunteers assembled at the University of Pennsylvania for a two-day data-backup operation. After some training, the volunteers went to work downloading data from US government websites—mainly belonging to the National Oceanic and Atmospheric Administration—and saving the information on independent servers. The effort was a mix of straightforward copying and writing software to access sites. In total, the volunteers duplicated about 1.5 terabytes—including statistics on renewable energy, toxic chemical releases, and oil spills—from more than 7000 websites.

The event was hosted by DataRefuge, one of several data-backup groups around the country. The groups are focusing mainly on data related to climate—much of which is in the US, although other places, notably Europe and Japan, also have Earth-observing programs. The groups point to the threats implied by the rhetoric of the Trump campaign and administration, which have used “hoax” and similar words to describe climate change and have disparaged climate scientists. “If you don’t want to do anything about climate change, you are in a stronger position if you get rid of the data,” says Texas A&M University atmospheric scientist Andrew Dessler.

“We are not trying to be paranoid,” says Bethany Wiggin, director of the University of Pennsylvania’s environmental humanities program and an organizer of DataRefuge. “Just because you take out an insurance policy doesn’t mean you think your house will burn down.” But she adds, “I teach a seminar on the history of censorship. Most of the time when information disappears, people don’t see it coming. It’s a slow starvation of resources.”

“We are watching”

Shortly after the election, the Union of Concerned Scientists (UCS) made backup copies of the integrity policies and associated information from the websites of 24

US agencies. “We started immediately thinking about what we should save,” says Gretchen Goldman, research director for the Center for Science and Democracy at UCS. Manipulation of information has happened before, she says and cites as an example the tampering by political appointees under President George W. Bush of data underpinning whether species deserved protection by the Endangered Species Act.

Even more is at stake now, Goldman warns, because there is more information online and more scientists rely on data from government websites. “With a president who doesn’t appear to respect scientific information, one abuse could be data mysteriously disappearing from websites, or government scientific websites may suddenly have misinformation.”

Data-rescue operations like the one in Pennsylvania, says Goldman, are a “great way for the scientific community to mobilize. It has great rallying value.” Rescue events are going on around the country and beyond—the University of Toronto hosted one in mid-December—and they are expanding to include a broader range of data from federal sites; a list of past and planned events is available at <http://www.ppehlab.org/data-rescue-events>. They show the administration that it can’t just quietly remove data, says Goldman. “We are sending a message that we are watching.”

Most of the data the operations are working to safeguard are from NOAA, the Environmental Protection Agency, the Department of Energy, and NASA. The data rescuers work from prioritized data sets after surveying researchers. “It’s not a grab-and-go,” says Steinn Sigurdsson, an astrophysicist at the Pennsylvania State University. “We want to make sure we have copies of things we need for research and potential future research.” Having coherent timelines and complete sets of validated raw observational data is the most important, he says.

The data rescuers comprise a loosely linked and growing network of researchers, librarians, archivists, and



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other concerned individuals—including scientists from within the targeted agencies. Several efforts are operating in parallel. DataRefuge validates the quality and provenance of the data it backs up. “We hope scientists will come back and annotate it,” says Wiggin.

Another organization, End of Term Presidential Harvest, was launched in 2008 and focuses on keeping copies of webpages from the outgoing administration. And Climate Mirror is an open project through which individual volunteers around the world copy data to independent servers. The volunteers get instructions and a list of data to choose from, says Nick Santos, a spatial data analyst at the University of California, Davis, who spearheads the effort. “It’s scattered; we try to maintain an index. Our approach has been that volunteers should only create the servers they can sustain. But we have launched a fundraising campaign to rent central servers.”

Even if data are neither deleted nor

changed, people involved with the efforts fear the data will become inaccessible. That could happen through budget cuts leading to neglect if routine maintenance of websites is no longer supported. Or it could happen through policy decisions. “It’s very easy to stop access to data,” says Sigurdsson. For example, he says, an executive order could restrict data access from outside the US. “Once you say parts are restricted, you have to sort the data, and in the meantime, it’s all closed off. If you don’t want people to poke around, that’s the easy way, particularly if the data are inconvenient,” like climate data can be to those who argue against manmade contributions to global warming.

A chilling environment

Of course, it’s impossible to predict how important backing up data might become. Some early signs have emerged that it’s a good idea. Shortly after the inauguration, for example, the Trump administration

instructed the EPA to delete climate change pages from the agency website, but then walked back on the order. And the new administration ordered scientists at the EPA and other federal agencies not to post on social media or communicate with reporters. Past administrations have temporarily paused media interactions until new policy and position statements were in place. But with the Trump administration, “the muzzling is on a scale that we have not seen before,” says Goldman. “Agency scientists are even restricted from speaking to Congress. It’s tremendously concerning.”

Inside the agencies that do climate-related research, Goldman says, “morale is low. People are scared.” One concern at UCS and among scientists more broadly, she adds, is that agencies may self-censor. “We are in a chilling environment.”

John Bruno, a marine ecologist at the University of North Carolina at Chapel Hill, collects data on coral die-off from



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around the world and compares them to ocean temperatures measured by satellites. "When I think rationally about the threat of data being made inaccessible, it seems ridiculous. But I also think it's plausible that the administration could hide, delete, or tamper with climate data. We rely so heavily on the data, that it would be catastrophic if it did happen."

Data continuity

Even more worrisome than the possibility of data becoming difficult to access, says Ben Santer, a climate researcher at Lawrence Livermore National Laboratory, would be an interruption of satellite records. "If there were a decision to focus on Mars at the cost of observing Earth, that would be bad." Satellite measurements of sea ice, water and atmospheric temperature, water vapor, and other environmental variables since the 1970s "give us an understanding of the size and rate of climate change," he says.

Continuing to monitor "is critical to understanding the causes of climate change and critical to evaluating and improving models," says Santer. "The biggest concern is a "diminishing ability to observe global-scale changes in Earth's climate system." Given the new administration's stated attitudes about climate, he says, "it is incumbent on us to respond, to use our voices. To clearly articulate the negative consequences of breaking continuity in long-term records of global climate change."

"The data become much more valuable as the data set gets longer," says Texas A&M's Dessler. "Climate data are not reproducible. If you lose measurements from the 1980s, you can't remeasure. And the way you maintain a good time series is to launch the next satellite while the present one is still in orbit." Luckily, he adds, "Europe makes a lot of measurements too, and they might pick up some of the slack."

The US has been the leader in gathering climate-related data, Dessler says. If it scales back, the main implications would be long term. "We would lose the ability to see things coming down the pike. . . . We measure sea level, gravity, and so on. If you don't monitor these things, it's like turning off headlights when you drive. For the first 20 feet or so it's okay, because you know what's ahead, but at some point you come to a curve."

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