

At Chernobyl, danger lurks in the trees



Chernobyl reactor Nos. 5 and 6 were under construction at the time of the No. 4 explosion and remain frozen in time. But forests in the Chernobyl Exclusion Zone have been absorbing radioactive elements since the 1986 accident, and scientists fear a wildfire could trigger another release. Photo © Jane Braxton Little.

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For 27 years, forests around Chernobyl have been absorbing radioactive elements. A fire would send them skyward again – a growing concern as summers grow longer, hotter and drier.

By Jane Braxton Little

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CHERNOBYL, Ukraine – Most days Nikolay Ossienko patrols the forests surrounding the Chernobyl nuclear power plant, clearing brush and dead trees from the grid of fuel breaks that crisscross the 1,000-square-mile area. But on hot July afternoons, when black thunderheads loom on the horizon, he climbs a rusty ladder 75 feet up a rickety fire tower. When he spots smoke, he radios the six other towers to pinpoint the location, then trucks off to the blaze.

If these forests burn, strontium 90, cesium 137, plutonium 238 and other radioactive elements would be released.

"Our number one job is to save the forest from fire," said Ossienko, a burly, blue-eyed Ukrainian whose warm smile winks with a missing tooth.

It's a job with international consequences. For almost three decades the forests around the shuttered nuclear power plant have been absorbing contamination left from the 1986 reactor explosion. Now climate change and lack of management present a troubling predicament: If these forests burn, strontium 90, cesium 137, plutonium 238 and other radioactive elements would be released, according to an analysis of the human health impacts of wildfire in Chernobyl's exclusion zone conducted by scientists in Germany, Scotland, Ukraine and the United States.

This contamination would be carried aloft in the smoke as inhalable aerosols, that 2011 study concluded.



And instead of being emitted by a single reactor, the radioactive contamination would come from trees that cover some 660 square miles around the plant, said Sergiy Zibtsev, a Ukrainian forestry professor who has been studying these irradiated forests for 20 years.

"There's really no question," he added. "If Chernobyl forests burn, contaminants would migrate outside the immediate area. We know that."

Overcrowded pines

Combined with changes in climate, these overcrowded pines are a prescription for wildfire. In their assessment of the potential risks of a worst-case fire, Zibtsev and the team of international scientists concluded that much of the Chernobyl forest is "in high danger of burning."

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Zibtsev has been worrying about catastrophic wildfire in Chernobyl since witnessing runaway wildland fires in the western United States while on a Fulbright Scholarship in 2005. He has watched the threat get worse each passing year. Rainfall in the region is decreasing and seasonal droughts are lasting longer, changes Zibtsev attributes to climate change. Scientists say these patterns of drier and longer summers are contributing to forest drying and increased insect attacks.

The predominantly pine forests themselves are part of the problem. After the explosion – the worst nuclear accident in human history – the area surrounding the power plant was evacuated, the fields and forests abandoned. To keep the contamination from moving beyond the area known as the "zone of alienation," the Ukraine government forbade all commercial activity. For forests, this meant a halt to logging, thinning and removing dead trees. While most of Ukraine boasts woodlands that are carefully manicured, the Chernobyl forests have grown into unmanaged thickets with dense brush below and lifeless canopies above.



The risk of fire in these forests has concerned scientists since 1992, a drought year when more than 65 square miles of forests burned. They know that these ecosystems are trapping radionuclides and slowly redistributing them in soil and vegetation, a process called "self-repair." In some places the contamination level is the same as it was in 1986, most of it in the top 10 centimeters of the soil. Absorbing cesium, plutonium and strontium helps contain radionuclides within the exclusion zone, but it dramatically heightens the alarm over wildfire.

Two-acre test fire

A 2002 test fire offers insight on the scope of the radioactive risk. Set to assess plume and radionuclide behavior, the two-acre ground fire near the failed power plant released up to five percent of the cesium and strontium in the biomass. A high-intensity crown fire would release much

higher amounts than burning needles and leaf litter, said Vasyl Yoschenko, who set the fire and heads the radioecological monitoring laboratory at the Ukrainian Institute of Agricultural Radiology. Other studies predict that the fine particles emitted from a forest fire could be transported hundreds of miles away.

"Imagine going to bed at night knowing something like this could happen," said Chad Oliver, director of the Global Institute of Sustainable Forestry at Yale University, who has studied the region since 2005.

Oliver, Zibtsev and others began calling attention to the potential for another Chernobyl disaster at variety international and scientific conferences, but the issue drew little more than finger pointing. Until their 2011 study, no one had assessed the human health effects of a catastrophic wildfire in the exclusion zone.

A worst-case scenario

Led by Oliver and Zibtsev, scientists at several institutions in Europe and North America analyzed a worst-case scenario: A very hot fire that burns for five days, consumes everything in its path, and sends the smoke 60 miles south to Kiev. A separate worst-case study is underway looking at the risks for Sweden, Finland and other European countries heavily impacted by the 1986 explosion.

Women in their 20s living just outside the zone face the highest risk from exposure to radioactive smoke, the 2011 study found: 170 in 100,000 would have an increased chance of dying of cancer. Among men farther away in Kiev, 18 in 100,000 20-year-olds would be at increased risk of dying of cancer. These estimates pale in comparison to those from the 1986 Chernobyl explosion, which predict between 4,000 and over a million eventual deaths from radiation exposure.

Instead, the greatest danger from forest fire for most people would be consuming foods exposed to smoke. Milk, meat and other products would exceed safe levels, the 2011 study predicts. The Ukrainian government would almost certainly have to ban consumption of foodstuffs produced as far as 90 miles from the fire.

No need for evacuation

After years of anxiety, the results of the study surprised Oliver. People living outside the exclusion zone would not have to be evacuated. There would be no cause for panic in Kiev, he said.



But the predictions for Ossienko

and his fellow firefighters are not so rosy. They would be exposed to radiation beyond all acceptable levels. In addition to "normal" external radiation, they would be inhaling radionuclides in the smoke they breathe – being irradiated both outside and inside.

On top of the significant health risks, these crews are utterly unequipped to fight large fires, Zibtsev said. At Ossienko's fire station near the Belarus border, four well-maintained fire trucks gleam inside a shed, all ready to roll. But the fire lanes designed to get them to a blaze quickly are untended, often blocked by fallen trees and brush. Ossienko is proud of the Soviet tank modified for firefighting with a 20-foot blade like a gigantic pointed cow-catcher. He says it can "crush trees and brush – anything." But reporting smokes by climbing fire towers is no one's idea of an early-warning system, and the lone helicopter occasionally available lacks even a bucket for dropping water on a fire.

'They're obviously not prepared'

The firefighters themselves are dedicated and hard working, Zibtsev added, but they don't have much professional training, protective suits or breathing apparatuses – standard equipment for American firefighters dealing with hazardous materials. "They're obviously not prepared for a major wildfire situation," he said.

The United Nations recently acknowledged the potential for another Chernobyl disaster and has mounted a \$20 million sustainable development project designed to address wildfire and other environmental issues.

The UN project recognizes – "finally!" said Zibtsev – that well-managed forests will contribute to the decrease of fire hazards within the region. Zibtsev, who is responsible for the program's fire management system, and Oliver envision a four-pronged approach that starts with cutting trees out of the roads so firefighters have access. Modern firefighting and fire detection equipment should dramatically improve fire response time. And then? "Start thinning!" Zibtsev said.

All this will take time, said Oliver: "If we can live out 30 to 40 years and not have a big one, we might be a lot safer."

Meanwhile, Ossienko is at work in the heat of the Chernobyl summer, watching for smoke and, with the rest of the world, hoping for none.

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Jane Braxton Little is an independent journalist and photographer based in California's northern Sierra Nevada. Her travel to Ukraine was funded by a grant from the Fund for Environmental Journalism, a project of the Society of Environmental Journalists.

Photos, from top: Brush, vines and undergrowth have taken over much of the forest in the Chernobyl exclusion zone, enveloping even houses; Firefighter Nikolay Ossienko; Forestry professor Sergiy Zibtsev; Fire trucks at the ready; A Soviet-era tank modified for firefighting, at the Chernobyl fire station near Belarus.

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