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Climate communication at the core of Dr. Jen Francis's work

by Anabelle Johnston

Communications Intern

When Dr. John Abraham suggested nominating Dr. Jen Francis for the American Geophysical Union Climate Science Communication Prize at a casual dinner in early 2019, he was met with his colleagues' resounding support. Founded in 2011, the award is given annually to a scientist who has worked to improve public understanding of climate change and foster conversations that promote scientific values—two focal points of Francis's career.

"The past recipients are amazing," says Francis. "I'm unbelievably honored to have my name join that list."

For the past decade, Francis has engaged a wide spectrum of audiences about climate change and extreme weather, such as various public groups, realtors, press events, congressional staffers, the U.S. Navy, the FBI, teachers associations, White House staffers, and numerous educational groups. She regularly reaches out to reporters and responds promptly to requests for media interviews, writes articles for public audiences (including two articles for *Scientific American* and one for *The Old Farmer's Almanac*), and participates in videos and documentaries such as Eli Kintisch's *After the Ice*, a miniseries about Bering Sea communities facing profound environmental change, Rainn Wilson's *An Idiot's Guide to Climate Change*, *PBS News Hour*, *BBC*, *Al Jazeera*, and many others. Her newspaper op-eds and public presentations highlight the relationships between changing Arctic temperatures and mid-latitude extreme weather, and more broadly, explain the risks to society and ecosystems already posed by the climate crisis.

Following her seminal 2012 paper that first introduced the idea that rapid Arctic warming could change the jet stream and contribute to more frequent extreme weather events, Francis was interviewed by countless reporters and featured in several documentaries, including an Australian one entitled *Extreme Weather*, produced by Anja Taylor. Francis knew then that her research had the potential to reach a large audience and underscore the urgency of climate change to those less swayed by projections and models.



"The topic I was working on was suited to creating stories that the public could relate to. The Arctic is changing so fast that you don't need a microscope or complicated graphs to see it. By connecting the melting sea ice to crazy weather, we can demonstrate that climate change is happening now. I think efforts to communicate this sense of urgency about the climate crisis play a large role in the increased public attention to this issue and are why climate change is rising in political priority," explained Francis. "I was thrown into the spotlight by this controversial research, and at the time I hadn't received any formal training in science communication. I scrambled to navigate this new world. Early on I learned to stick to the high road, especially in dealing with rude climate-change deniers and even members of the scientific community who criticized my work in *unconstructive ways*."

Francis also communicates directly with politicians and policy makers, and has testified before the Senate and Congress on multiple occasions. Most recently on December 8, 2020, she testified before a Senate subcommittee focused on issues of Arctic security alongside military personnel and shipping industry professionals. By framing physical risks within this larger context, Francis is able to bring climate change to the forefront of important conversations with these unexpected stakeholders. To prepare for this testimony, Francis worked closely with the Woodwell Climate External Affairs team, including Dave McGlinchey and Emily Marshall.

"I feel very fortunate to be a part of an organization that puts such an emphasis on scientific communication. Our Risk team makes business and policy leaders aware of the severity of the climate crisis and illuminates how these issues are affecting us now as well as how they will affect us in the future," says Francis. "Dave and Emily helped me put together slides and work through my statement. We at Woodwell are committed to bringing our science to stakeholders. There is so much collaboration that goes into effective science communication and I appreciate that my team here sees this as an imperative part of our mission."

TIDE Project reveals not all nitrogen is equal

New work provides insight into detrimental impacts of nitrate on saltmarshes

by Dr. Heather Goldstone
Chief Communications Officer

For nearly two decades, the saltmarshes of the Plum Island Estuary have been poked, prodded, treated with nitrogen, and sampled as part of the TIDE project, led by Woodwell's Dr. Linda Deegan. The project's unique combination of long-term monitoring and experimentation in a real-world setting has led

contributed to an overload of nitrogen in coastal ecosystems. The new work shows that the ultimate effect of the nutrient excess depends on the form of nitrogen, and offers new insight into the effects of nitrate (NO_3^-), the form of nitrogen that most easily travels from land to the ocean.



“While the TIDE project had demonstrated marsh deterioration with increased nitrate, this work explains why. Prior to this work, the expectation was that both nitrate and ammonium would stimulate both plant production and decomposition equally,” Deegan said. “This work showed that nitrate had a little impact on plant production but disproportionately fueled bacterial activity that can break down organic material in marsh soils.”

Understanding that different impacts of ammonia and nitrate could be key for managing coastal salt marshes—a critical issue for communities facing rising sea levels and increasing storm intensity.

“Understanding how salt marsh ecosystems will respond to global change drivers, such as nutrient enrichment and sea level rise, requires expertise across a range of disciplines,” said lead author Dr. Jennifer Bowen of Northeastern University. “Our team includes biogeochemists, microbial ecologists, and people specializing in plants, invertebrates, and fisheries species that all shed light on different aspects of the whole ecosystem response to these disturbances.”

The TIDE Project is funded by the National Science Foundation.

to numerous important discoveries, including the surprising realization that excess nitrogen from human activities can contribute to physical deterioration of marshes and loss of fish production and (earlier this year) that marshes can rebound quickly once nitrogen pollution stops. Now, a new part of the project highlights the complexity of nitrogen's impacts on marshes.

Nitrogen is a critical nutrient for all life, and primarily as ammonium is used as a fertilizer to stimulate plant growth. But septic systems, wastewater treatment plants, agricultural and residential fertilizer use, and other human activities have

Above left: Dr. Jennifer Francis testifying before the Senate Commerce, Science, and Technology Committee in 2019.

Above: West Creek at Plum Island photo by David S. Johnson, Virginia Institute of Marine Science



Special Event

The Dalai Lama with Greta Thunberg and Leading Scientists: A Conversation on the Crisis of Climate Feedback Loops

January 9, 2021
10:30pm EST

This virtual event, hosted by the Mind & Life Institute, aims to raise awareness about climate feedback loops, reinforcing the urgency of slowing down their devastating effects and offering actionable solutions. The intention is to address this issue through integrating three essential perspectives—science, moral/contemplative wisdom, and social action—in order to reach a wide international audience to impact public policies and personal behavior through the world.

The event coincides with the global premiere of a series of films, *Climate Emergency: Feedback Loops*. These five short films feature several Woodwell scientists, including Dr. Susan Natali, and are offered freely online.

The event will be streamed through Mind & Life Institute's website (mindandlife.org) and YouTube channel (youtube.com/mindandlifeinstitute).

Please check our website for more information as the date draws closer.

Above (clockwise from top left):
His Holiness the 14th Dalai Lama,
Greta Thunberg, William Moomaw, Susan Natali



Study: mineral content critical to global carbon impact of permafrost thaw

by Anabelle Johnsothn
Communications Intern

More carbon is locked away in northern permafrost soils than is currently in the atmosphere. In recent decades, scientists have sought to determine the impact of Arctic warming and permafrost thaw on atmospheric CO₂ levels. Strides have been made in the understanding how organic carbon stored in permafrost is converted into CO₂ by microbes and released to the atmosphere, acting as a positive feedback to climate warming. However, less is known about the transformation and fate of permafrost carbon in formerly glaciated terrains. Such terrains contain relatively ice- and mineral-rich permafrost and cover vast swaths of the north. Working on the formerly glaciated Peel Plateau in Canada's Northwest Territories, Dr. Scott Zolkos and colleagues aimed to close this knowledge gap and begin to create a more complete picture of Arctic carbon cycling.

"Minerals within deeper permafrost on the Peel Plateau were finely ground by glacial activity, remained unmodified for millennia within frozen ground, and are therefore chemically reactive upon thaw," explains Zolkos. "Thaw and chemical weathering of these sediments, which contain inorganic carbon-bearing minerals, may result in fundamentally different CO₂ cycling compared with regions containing relatively organic-rich permafrost, like Siberia."

It is not only the ice- and mineral-rich composition of permafrost on the Peel Plateau that makes it a hotspot for cycling of inorganic carbon—which includes CO₂ and bicarbonate (CO₂ in a form that is less readily exchanged with the atmosphere)—but the magnitude and rate at which permafrost is thawing. "Widespread thaw and ground collapse [thermokarst] is mobilizing thousands



of cubic meters of sediments into stream networks on the Peel Plateau,” says Zolkos.

To understand how thermokarst and mineral weathering influence carbon cycling on the Peel Plateau, the team started sampling in the headwaters and progressed downstream to the Peel River.

“As expected, CO₂ in headwater streams was mainly sourced from soils and mixing with the atmosphere,” notes Zolkos. “In contrast, much of the CO₂ within thermokarst sourced from mineral weathering, and this weathering increased bicarbonate concentrations downstream by 100 times.”

Increased bicarbonate fluxes in streams on the Peel Plateau are indicative of environmental change occurring across the larger Mackenzie River basin, in which accelerating thermokarst is partly responsible for increasing bicarbonate fluxes to the Arctic Ocean. Within the marine environment, this bicarbonate may buffer against ocean acidity, convert into CO₂, or be buried in sediment after transforming into carbonate.

The fieldwork, conducted in summer 2017, was conducted on the traditional lands of the Gwich’in peoples. Zolkos is deeply thankful to the Aurora Research Institute, the Gwich’in Renewable Resources Council, and the residents

of Fort McPherson, whose assistance and knowledge greatly improved understanding of, and inspired appreciation for, the striking ecological changes occurring on the Peel Plateau. Across the northern permafrost zone, rapid warming and permafrost thaw are driving a suite of landscape and ecosystem changes. The Peel Plateau work has inspired Zolkos to pursue career research to better understand how these changes are unfolding across the Arctic, and what the implications are for people, ecosystems, and global climate.

Woodwell partner a founding member of Net Zero Asset Managers Initiative

Wellington Management commits to carbon neutral investments by 2050, carbon neutral operations by 2022

The Net Zero Asset Managers Initiative has launched with thirty founding members, including Woodwell partner Wellington Management. Members of the group manage combined portfolios totaling more than \$9 trillion, and have committed to net zero emissions in their managed assets by 2050. The announcement garnered headlines from the likes of Financial Times, Wall Street Journal, and Reuters.



LEARN MORE

For more information visit netzeroassetmanagers.org



Staff profile: Jonathan Sanderman

by Anabelle Johnston
Communications Intern

Dr. Jonathan Sanderman's work focuses on the role of soils in climate change mitigation and sustainable food production. His research includes both place-based fieldwork and large-scale computer modeling. He currently is working on a global-scale soil climate mitigation strategy and investigating the delayed impact of natural climate solutions. He is a collaborator on the recently launched Soils Revealed platform, and leads Soil Spectroscopy for the Global Good, an effort to advance global soil carbon monitoring capacity.

Why did you pursue a career in science?

Math and physics were my favorite subjects in high school. I started college in an engineering program but Electricity & Magnetism scared me off. I settled into an Environmental Studies program where my eyes were opened to the many environmental problems facing humanity. For a while I thought I might go into environmental law or policy but then my quantitative side got the better of me and I settled into environmental science. I ended up doing my thesis looking at global change impacts on soils and I haven't looked back.

What questions does your research aim to answer?

The soil is this incredibly complex zone of the Earth where atmosphere, biosphere and lithosphere connect—the so-called critical zone. Soils also sustain life as we know it. I study the mechanisms of carbon stabilization and loss from soils with studies ranging from molecular level investigations of organo-mineral bonding and microbial dynamics to global level analyses of land use impacts on soil carbon levels.

What projects are you working on now?

Much of my current work is focused on various aspects of using soils as a natural climate solution. Humanity has greatly run down soil carbon levels due to agricultural land uses. This soil carbon debt has created a great opportunity to remove carbon dioxide from the atmosphere and store it in soils. Improving soil carbon levels can also be a big boon to food security by building more resilient agricultural systems. We are asking questions such as: What is the soil carbon sequestration potential of different land use practices? Will future climate change prevent soils from storing more carbon? How do we develop a credible but low-cost monitoring, reporting and verification system for soil carbon?

What's your biggest challenge or obstacle?

Data availability. Unlike forests, where remote sensing can provide globally detailed insights, soils are hidden from view and as such data on soil carbon levels are highly sporadic both in space and time. This greatly limits our ability to build models that can accurately forecast soil carbon change despite future soil carbon stocks being one of the greatest uncertainties in the global carbon budget. My research group has embraced infrared spectroscopy as a low-

cost solution to greatly increasing the availability of soil data.

What brought you to Woodwell Climate?

Impact and scale. Woodwell is famous for its work at large spatial scales and I wanted to be able to expand from primarily place based research to large scale modeling and mapping. First and foremost, I was attracted to Woodwell's focus on doing science that has an impact, where a peer-reviewed publication is not the end of a project; rather, a peer-reviewed paper is the beginning of a conversation.

What makes Woodwell Climate Research Center special in the scientific community?

The same thing that attracted me—the focus on ensuring our science has impact. Not only do we ask societally relevant questions, we partner with other not-for-profits, policy makers, and for-profit businesses to ensure that our findings move the needle on climate mitigation.

If you could work on any climate science topic outside your current research area, what would that be?

I'm an optimist by nature and I like working on soils and with the agricultural sector because there is a lot of hope and optimism that relatively simple shifts in agricultural management can simultaneously increase farm sustainability and mitigate climate change.

What's your favorite climate-related creative work (book, movie, artwork, etc.)?

The new documentary, *Kiss the Ground*. What's there not to like about Woody Harrelson talking about the power of soils to mitigate climate change?



Cranberry farmland restoration report

Drs. Linda Deegan and Chris Neill contributed to Living Observatory's recently released report, *Learning from the Restoration on Cranberry Farmland: Preliminary Benefits Assessment*.

LEARN MORE

To read the report visit www.livingobservatory.org

In the news: highlights

Woodwell President Phil Duffy and Senior Advisor John Holdren contributed to a document outlining recommendations for the incoming US President: *Revamping Federal Climate Science*, *Center for American Progress*, December 15

Anna Liljedhal is interviewed about her recently released tundra shrubs study: *How tall tundra shrubs reveal the hidden presence of permanently thawed tundra soil*, *Arctic Today*, December 15

Senior Scientist Skee Houghton provided perspective on a new study showing a decline in the carbon dioxide fertilization effect: *News Plants' Ability to Store Carbon Weaker Than Thought, Study Warns*, *Sixth Tone*, December 10

Senior Scientist Jen Francis spoke about the Arctic Report Card: *Greenhouse gas emissions transforming the Arctic into 'an entirely different climate'*, *The Guardian*, December 8, which was republished a few places: *Daily Magazine*, *democraticunderground.com*

Jen Francis was interviewed on the podcast *Shaping the Future: Abrupt cooling in the Arctic?*, Cambridge Climate Lecture Series, December 8

External Affairs Coordinator Natalie Baillargeon was featured in a profile piece: *Advocate for Climate Action*, *Grécourt Gate*, Smith College's news publication, December 3

Board member Bill Moomaw co-authored an op-ed urging the creation of a strategic national carbon reserve. Although not listed as an author, Wayne Walker made significant contributions: *A strategic natural-carbon reserve to fight climate change*, *Seattle Times*, December 1

Jon Sanderman is a partner on the Soils Revealed platform that launched this week: *Scientists map soils' potential to combat climate change*, *Newswise*, December 1

Sue Natali featured prominently in a piece on gas emissions craters: *The mystery of Siberia's explosive craters*, BBC, November 30

Jen Francis was quoted on the role of climate change in warmer winter weather, which deflates natural gas prices: *Gas market chilled by warm winter forecast*, *Bloomberg | Quint*, November 29

The recently launched CONSERV project was profiled: *Amazon initiative pays farmers and ranchers to keep the forest standing*, *Mongabay*, November 24

Jen Francis explained the "warm Arctic, cold continents" phenomenon: *Warm Arctic, Cold Continents? It Sounds Counterintuitive, but Research Suggests it's a Thing*, *InsideClimate News*, November 22

Jen Francis was among those experts featured in Rainn Wilson's climate change docuseries: *Rainn Wilson wants you to get serious about the fight against climate change*, *Mashable*, November 22

Dr. Anna Liljedahl's work on landslide-tsunami risks linked to glacial melting continues to garner attention: *Urgent Assessment of Unstable Slopes in Alaska Could Buy Time to Warm Residents of Potential Tsunami-Landslide Events*, *Science Times*, November 22

The Risk group's presentation to town officials in Decorah, IA drew local media attention: *New Flooding Study Says Decorah is Doing a Good Job of Flood Prevention*, *decorahnews.com*, November 22

Jen Francis discussed science communication with meteorologist Paul Huttner: *The art of science communication*, Minnesota Public Radio's *Climate Cast*, November 19

Donations play an important role in securing the future of Woodwell Climate Research Center's work—and help safeguard the health of our planet for generations to come.

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