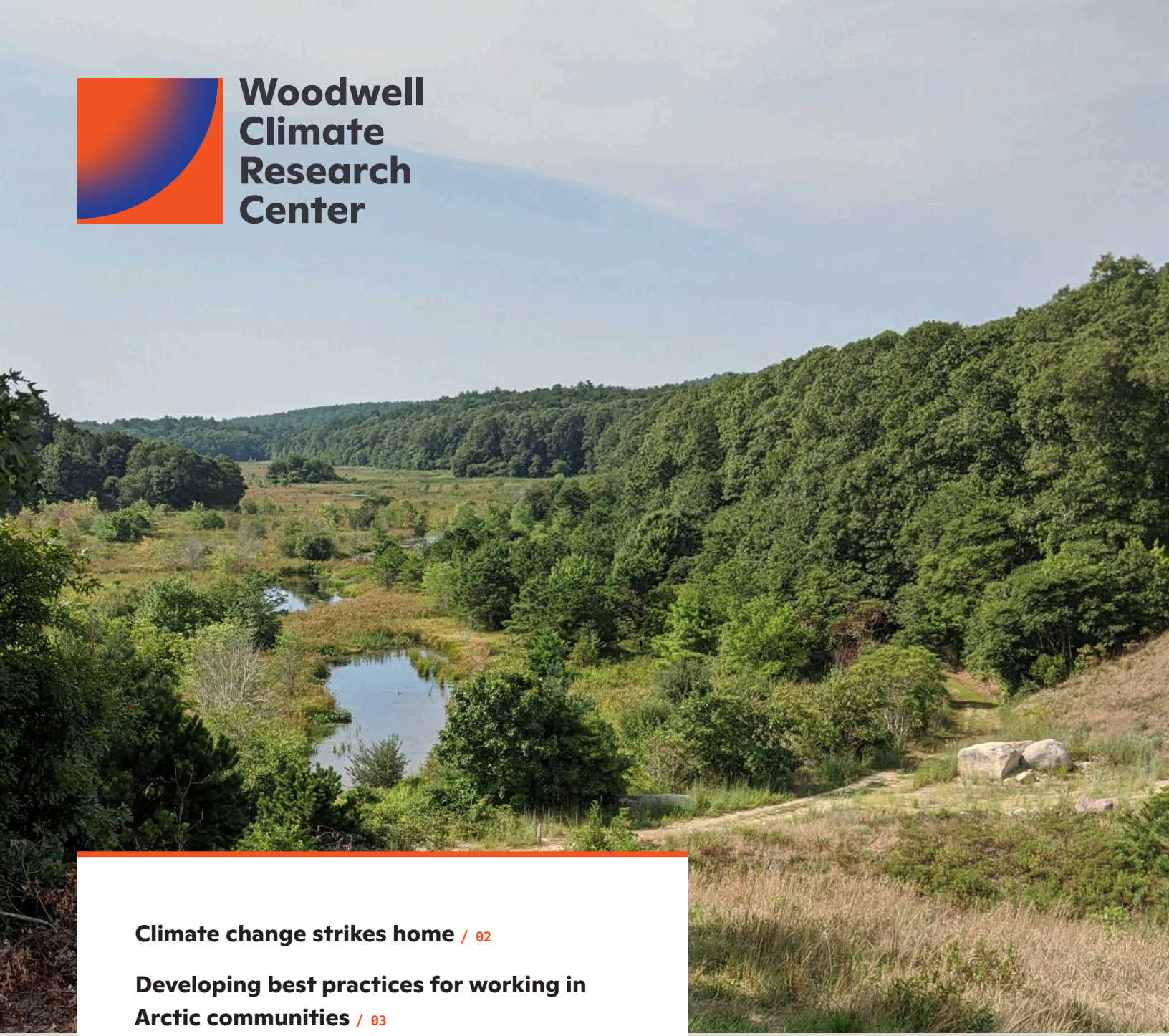
Woodwell Climate Research Center



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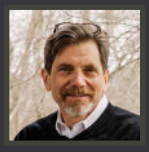
Climate Change Strikes Home



Dr. Philip Duffy
President & Executive Director

The wildfires which have consumed the Western United States this month are perhaps the most vivid demonstration yet that climate change is not only here, but can be deadly and severely disruptive. Furthermore, these fires may mark the beginning of climate change permanently and profoundly altering life as we know it in the USA.

The immediate impacts of the fires—loss of life and property, lost productivity,health consequences from smoke, increased greenhouse gas emissions—are only the beginning. Longer-term, these fires may have profound psychological and socioeconomic ramifications. Scientists like to talk about "tipping points" in the physical climate system; we also may now be experiencing a tipping point in human reactions to climate change.

Perhaps most immediately, homes in fire-prone areas are going to become even more difficult and expensive to insure than they already are. Beyond that, the fires, smoke, and rolling blackouts have had a dramatic impact on quality of life, even in locations where fire risk itself is low. This is causing people to rethink living in parts of the west, particularly California. This may accelerate overall out-migration from the state, and among the more wealthy may reverse recent in-migration. This would drive down property values and property tax revenues. On top of reduced income tax revenues because of COVID, this would severely compromise the ability of governments to provide services, just when those services are needed most. A lot of wealth would be lost, and a lot would leave the state.

What can be done? First and foremost, we need to stop making the problem worse. That means stopping the use of fossil fuels and stopping deforestation. Tragically, those steps, surpassing difficult though they will be to accomplish, won't make things better. They will only arrest the decline. This fundamental fact—the irreversibility of climate change—is why people like me constantly point out the urgency of addressing this challenge.

On a local and regional level, steps like clearing brush and enacting stricter building codes can be very effective at protecting structures and communities. In the 2018 Camp Fire, for example, newer homes built to higher standards survived much better than older ones. It would also be helpful to discourage people from living in high-risk areas, the "wildland-urban interface." This involves challenging policy issues, however. To name just one, the tendency of states to provide subsidized insurance for high-risk homes has exactly the wrong effect: it incentivizes living in locations where people and property will be subject to increasing risk.

Perhaps the greatest challenge of all will be to avoid having wildfires and other consequences of climate change become yet another factor increasing political polarization. (Even as climate change becomes more and more difficult to deny, the deniers seem to be turning up the volume.) In the short run, climate change will produce winners and losers, but long-term we will all suffer. Let's all do what we can to make sure that this reality motivates us to work together and make the sacrifices needed to meet the challenge.

What is Woodwell doing about wildfire risk? Our Risk Program models wildfire risk throughout the world, including in the Western US. This information is used now by decision makers in the financial world, and we're working to find new consumers of this information. Our Arctic Program looks at the growing threat of wildfire in far northern regions, and is working with policymakers to make sure they consider this source of greenhouse gas emissions. Woodwell's work in the Amazon is very focused on controlling deforestation, which is the main driver of fire there; we also work to get timely information on weather conditions and where fires are to state and local agencies.

Wildfire is only one of several rapidly worsening sources of risks from climate change. Hurricanes and flood risk generally are others. A high priority for these and other perils if not only to model the physical risks, but to work with partners who can help to illuminate their socioeconomic ramifications and act to manage the risk.

Thanks as always for your interest and support.

Developing best practices for working in Arctic communities

by Anabelle Johnston
Communications Intern

Woodwell Climate Research Assistant Darcy Peter is committed to conducting fieldwork that pushes the bounds of scientific knowledge while also involving and incorporating local Indigenous communities and their knowledge/experiences. With the Arctic Program's fieldwork postponed due to the coronavirus pandemic, Peter spent part of this summer developing a set of core principles for conducting respectful research that fulfills both of these goals.

The working document comprises twelve principles for working in northern communities, additional resources for self-education, lists of relevant conferences to attend and important governing entities in Alaska and Northern Canada, and decolonization resources, all centered around respect and relationship building. Peter is also developing a sample case study, demonstrating the process of obtaining funding and structuring the necessary steps to conduct meaningful, high-quality, respectful research with local communities.

Many scientists, Peter explained, have good intentions. However, most have never been to Northern regions before submitting proposals and applying for funding, and therefore don't fully understand the ties between the people and place.

To create this document, Peter reached out to her contacts from previous non-profit work in Alaska and Canada, as well as people she has known from her childhood in Beaver, Alaska. She also has received feedback and information from members of Woodwell Climate with expertise in other regions of the globe.

"The scientists at Woodwell Climate all want to prioritize relationship-building going forward," said Peter. "Dr. Sue Natali has been especially supportive. Everyone wants to learn and better understand each other, which is great."

The Arctic Program area is developing a committee that will review proposed plans for fieldwork and ensure future research follows the guiding principles Peter developed. This committee will include local community leaders, and funding has been allocated to financially compensate the members' time.

Above left: photo courtesy Jacob Frank/National Park Service

Above: Darcy Peter speaking with a group of scientists and local community members about the Polaris Project and experiences with climate change.

Woodwell Climate's guiding principles for working in local northern communities

While working respectfully in northern regions Woodwell Climate researchers should abide by these principles:

1. Researchers should abide by international, federal, state and local laws and regulations, and follow any existing research protocols while working in U.S. and international northern environments.
2. Thorough community contact and communication throughout the entirety of research (which includes proposal-writing and pre-planning) with local city, corporation, tribe, and additional other relevant entities throughout the entirety of research (including proposal-writing and pre-planning) is strongly advised to allow for transparency and as a form of respect
3. Respect is at the heart of all northern cultures and ethnicities. Working in northern regions requires mutual respect for and willingness to listen to unfamiliar cultural practices, languages, norms, traditions, and ways of life.
4. Researchers should familiarize themselves with local cultures, land ownership/use, historical events, and relevant entities before traveling to northern environments.
5. Include travel support in your research proposals for attending state/local conferences and workshops to share your research, to network with appropriate entities, and to build relationships.

PRINCIPLES continued on next page

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6. Researchers should take into account the knowledge and experience of the people, and respect any sharing of such knowledge and experience in the research process. The incorporation of relevant traditional knowledge into all stages of research is encouraged.
7. Researchers should provide financial compensation for local people/elders for any time, energy, input, and/or contributions made during the research project.
8. Any locals who contributed and/or helped in any way should be given appropriate credit and recognition on any research products, including in publications and presentations.
9. Guarantee confidentiality of any surveys and/or sensitive material.
10. Explanations of both on-going and final research objectives, methods, findings and their interpretation should be made available to the community, and in a language that is easily understood and applicable (i.e., not just a copy of the published paper).
11. The research itself must never be exploitative, in any way, of traditional and sacred land, its resources, or its inhabitants.
12. While working in the U.S., traditional Indigenous land acknowledgments should be at the beginning of any presentation, discussion, and publication as a form of respect and visibility.

Converting cranberry bogs back to wetlands helps communities prepare for changing climate

by Miles Grant
Director of Publications & Media Relations

As economic pressures increase on aging Massachusetts cranberry bogs, Woodwell Climate Research Center scientists are working with the state to restore bogs into wetlands, helping to create new opportunities for conservation and climate adaptation. Restoring commercial cranberry bogs to native ecosystems can help rebuild carbon storage, manage stormwater, create new public lands, and bring back habitat for native plant, fish and wildlife.

With newer, more efficient bogs springing up in places like Wisconsin and Quebec, Massachusetts' older cranberry bogs face difficult choices: expensive modernization, merging with neighboring operations, or selling. Woodwell's latest analysis indicates that 20% of all Massachusetts cranberry bogs are highly likely to be retired in the next decade while another 35% are moderately likely to be retired. Communities need plans for this land, and farmers need beneficial exit strategies.

Massachusetts recently secured a $10 million federal grant from the US Department of Agriculture to work with landowners to protect and restore historic wetlands on retiring cranberry farmland. Related investment by the state and other federal, regional, and local partners has doubled the resources available for land protection, wetland restoration, and learning in the next five years.The ultimate goal is to restore 900 acres of wetlands and permanently protect 1,800 acres of open space. Woodwell Climate Senior Scientists Drs. Linda Deegan and Christopher Neill have been studying the effectiveness of various restoration methods.

On a recent summer morning, Woodwell's Dr. Neill joined ecologists from the Massachusetts Division of Ecological Restoration (DER) and Mass Audubon for a tour of Tidmarsh Wildlife Sanctuary in Plymouth, a former commercial cranberry farm and now the largest freshwater ecological restoration ever attempted in the Northeast. They were joined by the bog's former owner, Glorianna Davenport, and Brian Wick, executive director of the Cape Cod Cranberry Growers Association.

"We're trying to pilot new methods of restoration, learning about what works and what doesn't, whether we should dig more or less. We want to know how much help these native wetlands need to come back and thrive," said DER's Alex Hackman

The group led a Boston Globe reporter and photojournalist on a tour of three sites - an abandoned bog, a site being actively restored, and a completed restoration site—showing each step of the transition from farm to nature preserve.

"We've studied both sites that are left to revert to forest and sites that are actively restored, with the bog plowed under to expose the former peat bog underneath. While the forest sites have an average of just six species per square meter, some invasive, restored wetlands have an average of 35 species, many native, all sprouted from seeds that were already there, dormant under the bog," said Dr. Neill. "That restored wetland is going to provide more ecosystem services, filter more pollutants, and store more carbon."

Above: Great Marsh at Plum Island on the eastern cost of Massachusetts

Massachusetts is expected to announce more bog conversion projects this fall. Additional partners on this work include the Buzzards Bay Coalition, the Town of Falmouth, Coonamessett River Trust, UMass Cranberry Station, Living Observatory and the Division of Ecological Restoration. Support for Drs. Neill's and Deegan's work has been provided by Woodwell's Fund for Climate Solutions.

Protecting coastal marshes can benefit carbon storage, study finds

by Miles Grant
Director of Publications & Media Relations

Protecting coastal marshes from nitrogen runoff can enable a rapid rebound in their carbon storage capacity, according to a new study from the TIDE Project in the Great Marsh's Plum Island Estuary north of Boston. Woodwell Climate Research Center and our partners have conducted research in the marsh as part of the TIDE Project for nearly two decades, first flooding study areas with excess nitrogen, then examining what happens when the flow of nutrients stops, and what steps help speed recovery.

Coastal marshes are crucial to safeguarding communities' climate resilience and environmental health, providing a buffer from rising seas and harsh storms, and filtering pollution from the water. They also sequester and store more carbon per unit area than any other type of land on Earth, including forests.

TIDE Project researchers previously had found that the introduction of excess nitrogen sped up microbial decomposition and reduced carbon storage. But when the nitrogen flow stopped, carbon storage levels quickly returned to previous levels.

"If we stop adding these nutrients to these coastal areas, even with the other factors remaining, there's a good chance for them to rebound," said Dr. Thomas Mozdzer, an associate professor of biology at Bryn Mawr College and the lead author on the study, which was recently published in *Science of the Total Environment*. "Within the first year, the marsh had recovered its ability to store carbon."

Nutrient runoff from septic tanks and sewage systems, agriculture, and lawns, and the burning of fossil fuels has increased dramatically worldwide over the last century, damaging coastal ecosystems. Previous Woodwell Climate research, led by Senior Scientist Dr. Linda Deegan, has shown excessive nutrient pollution causes changes in marsh microbes, algae, and plant life that lead marsh edges to collapse, compromising the salt marsh's ability to keep up with rising ocean levels.

"We know protecting coastal wetlands from excess nutrient pollution can provide lots of other benefits, from wildlife habitat to slowing incoming storm surges, but this study shows it can also increase their carbon storage," said Dr. Deegan. "By limiting the amount of nitrogen making its way into coastal areas, which is something local governments can directly impact now, towns can get a huge return on investment in terms of ecosystem services."

The TIDE Project, a collaboration launched in 2002, is supported by funding from the National Science Foundation.

Fund for Climate Solutions awards nine new research projects

by Anabelle Johnston
Communications Intern

Miles Grant
Director of Publications & Media Relations

Woodwell Climate Research Center has issued a round of grants from the Fund for Climate Solutions, an innovative internal funding instrument created by the Board of Directors. The Fund aims to advance climate solutions by extending or augmenting crucial research initiatives, seeding new projects that offer breakthrough policy or scientific impact, and allowing startup projects to get off the ground to show proof of concept work for outside funding opportunities.

The new projects being supported by the Fund:

RESILIENCE OF THE GLOBAL FOREST CARBON SINK

Project Lead: Dr. Richard Birdsey

This project aims to assess the resilience of the global forest carbon sink, an essential element of reaching net zero greenhouse gas emissions by 2050. Dr. Birdsey and a team of scientists from around the world will compile an inventory-based estimate of the carbon sink in the world's forests for the last 3 decades, identify the main factors that have significantly affected the magnitude of the forest carbon sink (or source) for different biomes and regions of the world, and assess the likelihood that the global forest carbon sink will persist, increase, or decrease over the next three decades.

FUNDS continued on next page

Above: Alex Hackman, Massachusetts Division of Ecological Restoration (DER), at a former cranberry bog freshly turned over to reveal peat swamp underneath

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CREATING A LONG-TERM COASTAL WATERSHED CLIMATE RESILIENCE EXPERIMENT

Project leads: Linda Deegan and Christopher Neill

This project marks the beginning of a partnership with the Buzzards Bay Coalition and a cranberry bog farmer to establish the first experimental research program designed to understand how restoration of agricultural wetlands and rivers in Massachusetts coastal watersheds will increase coastal resilience to climate change.

A LARGE-SCALE PATTERN APPROACH TO MEASURING CHANGES IN "WEATHER WHIPLASH" EVENTS

Project Lead: Dr. Jennifer Francis

This project will create a new technique to measure and analyze "whiplash" events, such as abrupt transitions from a prolonged heatwave to a cold spell, or persistent dry conditions to stormy ones. Once developed, the method could then be used to identify changes in frequency, both in the past and in future projections, based on climate model simulations under differing emission scenarios.

ESTIMATING NATIONAL-LEVEL EMISSIONS OF CARBON FROM LAND-USE CHANGE

Project Lead: Dr. Richard "Skee" Houghton

This project will use data from the UN Food and Agriculture Organization's 2020 Forest Resources Assessment to update to 2020 estimates of annual emissions of carbon from changes in land use, with a special focus on the impact of shifting cultivation, an agricultural system which keeps a large area of forest in fallow and, thus, prevents forests from accumulating carbon.

SALMON, WATER, AND PEOPLE ON THE KENAI PENINSULA: SCIENCE TO INFORM POLICY

Project Lead: Anna Liljedahl

The increase in temperature of streams on the Kenai Peninsula of Alaska poses a threat to migrating Chinook salmon, an economic pillar of many local communities. This project aims to gather critical data on Chinook salmon stress due to warming and will be conducted in collaboration with local stakeholders to drive policy conducted by the Kenai Peninsula Borough and the Alaska Department of Fish and Game.

BUILDING AN INTERNATIONAL NETWORK OF GROUND OBSERVATIONS FOR THE ARCTIC CARBON MONITORING AND PREDICTION SYSTEM

Project leads: Sue Natali, Brendan Rogers, Jennifer Watts

Currently, carbon emissions from thawing permafrost are not included in models utilized to inform international climate policy. This project will establish an international observatory to monitor key ecological and environmental changes relevant to Arctic carbon cycling, designed to support predictions of carbon emissions at the pan-Arctic scale.

TROPICAL FORESTS: THE ORIGINAL NATURAL CLIMATE SOLUTION

Project leads: Michael Coe, Marcia Macedo, Glenn Bush

Tropical forests represent the most efficient and cost effective natural climate solution, but without sound forest management, anthropogenic and climatic stressors could cause widespread degradation of the remaining forests; undermine national conservation, climate change, and socioeconomic development goals; and exacerbate global climate changes and the social conflicts likely to emerge from them. The goal of this proposal is to create the Tropical Carbon and Climate Portal (TCCP), which will provide streamlined access to data visualization tools, so non-technical users can explore and interpret historical and future climate and carbon data and help develop effective management of the remaining tropical forests into an uncertain future.

CLIMATE CHANGE AND GLOBAL SECURITY: MAPPING THE RISKS AND RESPONSE

Project Lead: Dr. Christopher Schwalm

Woodwell is part of a broader research and policy development partnership with Norwich University and the Center for Climate and Security to provide granular global security analysis built on sound science, as well as specific U.S. policy responses for addressing identified risks. This project will examine climate security threats in nuclear states, including those with nuclear latency – those who may be trying to acquire nuclear weapons. The analysis and results will then be distributed to key policymakers and decision makers.

HIGH CARBON AND PRIMARY FORESTS OF THE UNITED STATES: SCIENCE IN SUPPORT OF NATIONAL CONSERVATION AND CLIMATE POLICY

Project Lead: Dr. Wayne Walker

With the Trump administration threatening to expose 9.2 million acres of intact temperate rainforest in Alaska's Tongass National Forest to road building, this project will measure and map the current extent and magnitude of high carbon and primary forests across the United States, with a special focus on Tongass as a case study. The results will be communicated to the range of relevant stakeholder audiences, including state and federal decisionmakers, who'll be engaged using policy briefs and infographics. The findings will also be shared with the scientific community via the peer-reviewed literature.

To learn more about how to support the Fund for Climate Solutions, contact Leslie Kolterman, Chief Development Officer, at lkolterman@woodwellclimate.org.

Staff profile: Darcy Peter

by Anabelle Johnston
Communications Intern

Darcy Peter studies greenhouse gas emissions, permafrost thaw, and Arctic ecology. She is a Gwich'in Athabascan from Beaver, Alaska, located along the

Above: Darcy Peter collecting vegetation samples in Alaska as a Polaris Project student researcher in 2018 / photo by Chris Linder

Yukon River. Peter has worked for Alaska Native non-profits in environmental science, policy, and social science, and strongly believes in creating relationships that benefit both scientific researchers and Indigenous communities in regions that are studied.

Why did you pursue a career in science?

I pursued a career in science because, growing up in Alaska, I was always outside. Whether it was hunting or fishing with my family or just messing around at the playground, I loved learning about the environment. As I was growing up though, I also realized that everything was changing. I wanted to understand how and why.

What questions does your research aim to answer?

My research primarily focuses on the impact of greenhouse gases on permafrost thaw in Alaska, and understanding the biogeochemical processes that occur as a result. In addition, I look at how these changes in the environment impact the local Indigenous people who rely on the resources we study.

What's your biggest challenge or obstacle?

I'd say the biggest obstacle thus far has been the relationship building with local Indigenous communities. There is a lack of funding to travel to the area we research to interact and build relationships with people during the off-season. This is something I think is very important, but unfortunately not always logistically possible.

What brought you to Woodwell Climate?

I participated in the Polaris Project in 2017 and 2018, then volunteered in 2019. The Polaris Project has the unique opportunity of training the next generation of Arctic scientists. I feel personally responsible for providing perspectives and helping students learn the life skills that make great researchers, which aren't often taught in academia.

What makes Woodwell Climate special in the scientific community?

Woodwell Climate is an organization I've always admired. The groundbreaking climate change research conducted by respected scientists is certainly impressive, but I see a lot of potential in the freedom of being a non-profit organization. People can research what they want to research—no idea is too radical. The freedom at Woodwell Climate allows for creativity, and people always support your dreams and what interests you.

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

I think the TV show *Down to Earth*, featuring Zac Efron, does an incredible job in balancing the horrific realities that places around the world facing the direct impacts of climate change experience, and the positive things countries are doing to combat it. It's fun, real, terrifying, interesting, and highly educational.

In the news: highlights

WOODWELL CLIMATE RESEARCH CENTER HAS BEEN A PROMINENT SOURCE OF INSIGHT INTO THE WESTERN WILDFIRES

Wildfires, hurricanes, and vanishing sea ice: the climate crisis is here. *Financial Times* quotes Phil Duffy, September 17

In a Historic Wildfire Season, It's Time to Follow the Lead of Young Campaigners. In his *New Yorker* "The Climate Crisis" column, Bill McKibben interviews Jennifer Francis, September 17

In Visiting a Charred California, Trump Confronts a Scientific Reality He Denies. *New York Times* quotes Phil Duffy, September 14

As Wildfires Burn Out of Control, the West Coast Faces the Unimaginable. *New York Times* quotes Phil Duffy, September 14

Inside the wildfires devastating the Pacific Northwest and How climate change is tied to the wildfires burning through the West Coast. Phil Duffy on *ABC News Nightline*, September 14

Climate Grief Is Burning Across The American West. *Wired* quotes Zach Zobel, September 14

Devastating wildfires raise concerns about lack of preparedness for climate change. *ABC News* quotes Jennifer Francis, September 11

A Climate Reckoning in Fire-Stricken California.*New York Times* front-page story quotes Phil Duffy, September 11

SEVERAL TOP JOURNALISTS TURNED TO SUE NATALI FOR HELP EXPLAINING THE NEW SIBERIAN PERMAFROST CRATER

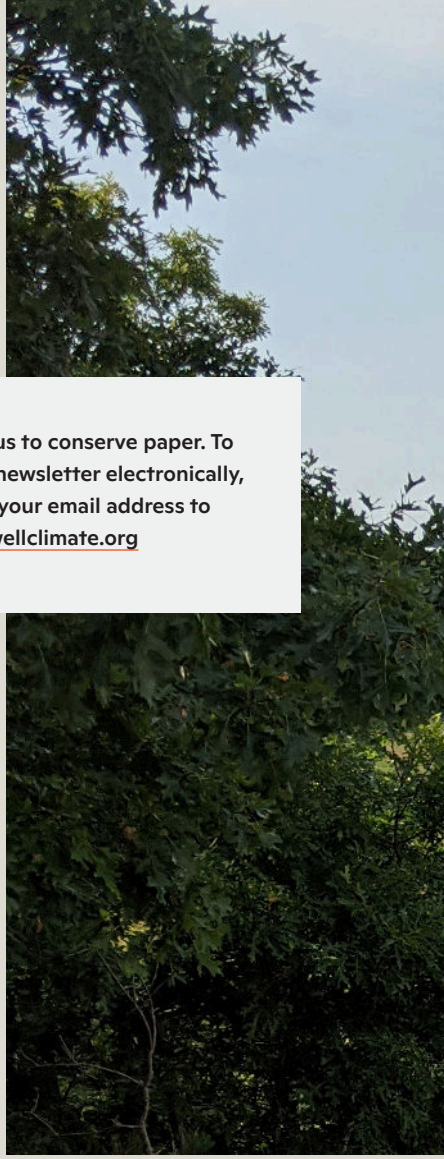
Massive mystery holes appear in Siberian tundra—and could be linked to climate change. *CNN*, September 4

Why This Monstrous Crater Suddenly Appeared in Russia. *Popular Mechanics*, September 1

Giant Crater in Siberia May Have Exploded From Climate Change-Induced Cryovolcanism. *Newsweek*, September 4

cover: Overlooking restored cranberry bogs at Tidmarsh Wildlife Sanctuary in Plymouth, Massachusetts

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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