



**Woodwell
Climate
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Center**



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Newsletter • November 2020
woodwellclimate.org

A new opportunity for climate action



Dr. Philip Duffy
President & Executive
Director



As the President-elect likes to say, “Here’s the deal:” science tells us that we need immediate and strong action to avoid catastrophic impacts of climate change. Actually, the need is more than immediate—it is long overdue. This means that the next four years present a critical opportunity for action which cannot be missed.

The Biden campaign has outlined comprehensive and ambitious climate policies covering decarbonization, resilience, environmental justice, and international leadership. The new administration will move as aggressively as possible to fully design and implement these measures.

Ambitious new policies mean greater need for science to inform those policies, and to assess their effectiveness. Woodwell has much to offer here, and we are well-connected to Biden’s climate change team. I expect opportunities for us to be involved in this important work.

New opportunities at the Federal level do not make Woodwell’s international work or our work with

the private sector any less essential. In fact, our partnerships with leaders in business and finance drives increasing private-sector concern about risks posed by climate change—this may be critical in pushing through the policies we need.

It is heartening to once again expect the federal government to play a constructive role in addressing the greatest threat to humanity’s future. It will be a relief to have national leadership which supports science, integrity, and truth—things we once took for granted.

Even so, the challenges we face are enormous. We need to completely eliminate human emissions of greenhouse gases, and in addition, remove a massive amount of CO₂ from the atmosphere. We know how to do some of this, but not all, and we’re running out of time. The need and opportunity for science-based action has never been greater. We’re excited to work with you to help meet the challenge.

A climate agenda for the Biden-Harris administration

Dave McGlinchey, Chief of External Affairs

Dr. Heather Goldstone, Chief Communications Officer

President-elect Joseph Biden Jr. has made climate change a top priority in his campaign and transition. Woodwell Climate Research Center suggests five priorities for the incoming Biden-Harris administration to advance ambitious and science-backed climate action, starting on day one.

1 Rejoin the Paris Agreement and restore U.S. leadership on climate.

As one of the largest emitters, the United States has an obligation and opportunity to be a global leader on climate action by committing to aggressive emissions reductions and by supporting developing countries in their efforts to both mitigate and adapt to climate change.

3 Consider permafrost thaw when setting emissions reduction targets.

Recent developments in climate science suggest that today's top-line climate policy goal—limiting global warming to 1.5 or 2°C—may not be strict enough to avoid catastrophic climate outcomes, including extreme weather, massive sea level rise and uncontrollable warming due to natural climate feedback loops. Greenhouse gas emissions from thawing permafrost threaten the success of emissions reduction measures and must be a core consideration in setting policy targets, nationally and internationally. The Biden-Harris Administration can take the lead on this during international negotiations by making it clear that U.S. emissions reduction goals will take into account permafrost thaw emissions.

4 Prioritize scientifically sound natural climate solutions.

Forests and soils already absorb roughly a third of global greenhouse gas emissions, and recent science indicates that natural climate solutions could provide a significant fraction of the emissions reductions needed to meet the goals of the Paris Agreement. The Biden-Harris Administration can support scientifically robust natural climate solutions while removing federal government support or forest policies that incentivize rapid-turnover planting and harvesting or burning of wood for energy.

5 Integrate climate change into all areas of federal policy

Climate change affects every person and every facet of life, from food and housing to health and transportation. Thus, understanding of climate risks, mitigation options, and resiliency strategies can and must be brought to bear on all aspects of federal policy-making, not just dedicated climate policy. Climate change should be a core element in addressing national security, immigration, healthcare, infrastructure, housing finance and insurance, and agriculture. Last, but not least, COVID-19 stimulus should be structured to propel us toward resilient infrastructure and a low-carbon economy.

2 Restore rigor and credibility to federal climate science.

The Biden-Harris Administration should install qualified scientists who appreciate the scale and severity of the climate crisis in leadership roles at the Office of Science and Technology Policy, the Global Change Research Program, and the National Climate Assessment. The Administration should also reinvigorate science advisory groups and ensure that key administrative and advisory positions within federal agencies, including EPA, NASA, NOAA, and USDA, are filled by appropriately qualified experts.



Natural climate solutions: “Time is not on our side”

by Dr. Heather Goldstone, Chief Communications Officer



Natural climate solutions—the management of soils, forests, and other land-based systems to absorb and store carbon—are cost-effective strategies for large-scale carbon capture that are ready for immediate deployment. While technologies for carbon capture remain under development, nature-based solutions, including tree planting and improved agricultural practices, can be implemented now. But nearly a dozen scientists, including Woodwell Climate’s Dr. Jon Sanderman, are cautioning that it will take time, perhaps decades, for natural climate solutions to reach their full potential. And that means we need to get started now.

“Everyone knows this delay exists, but it is not well accounted for in estimates of the potential of natural climate solutions. And that means we risk dramatically overshooting emissions targets,” Sanderman said.

Work involving Woodwell Climate scientists has produced seminal estimates of the climate mitigation potential of land-based systems. A 2017 study concluded that, globally, natural climate solutions could provide roughly a third of the emissions reductions needed in

the coming decade to limit warming to less than 2°C. For tropical countries, the possible contribution from natural climate solutions has been estimated to be even greater—potentially mitigating 50 to 100 percent of greenhouse gas emissions.

Those estimates represent best-case scenarios, in which natural climate solutions are pursued and implemented with maximum ambition—an approach that has been criticized by some as unrealistic. The recent letter presents a more cautionary tale, arguing that a range of delays and time lags could halve the total carbon *accumulation* achieved by 2030 or 2050, although such delays do not impact the eventual *rate* of carbon capture that soils and trees could provide.

Writing in the journal *Global Change Biology*, the authors describe a range of factors that contribute to time lags in reaching the maximal extent and intensity of benefits from natural climate solutions. There are inherent biological factors, like the time it takes for trees to grow or for ecosystems to stabilize after restoration. Then, there is the (uncertain) time it takes for new practices to be adopted and implemented on large scales.

“The reality is it takes a long time to scale up to the tens of millions of hectares necessary for each pathway, and many sequestration measures take 5-10 years before carbon removal occurs in earnest,” Sanderman explained. “Together these two delays likely mean that without concerted action the real 2050 potential of some NCS pathways is perhaps only 50% of what has been reported.”

The delays are not equal for all pathways, and some delays can be reduced or avoided. For example, conservation of intact ecosystems delivers full benefits immediately, while ecosystem restoration takes much longer. The authors offer ten best practices for minimizing delays, including protecting existing ecosystems, prioritizing pathways with the shortest inherent delays, coordinating efforts globally, and improving management practices to speed up carbon sequestration.

But, across the board, the largest and most avoidable source of delay is inaction; the longer we wait to start, the longer it will take to achieve results. “This is really a call to action,” Sanderman said. “We must act now to maximize the benefits of natural climate solutions.” Walela Suruí, a law student and Indigenous activist of the Paiter Suruí people, spoke to the audience of the Climate Week NYC event to urge public action. “We have been fighting this fight for 500 years. We will not stop now. We will not give up now. Our hope is that more people will join us in the fight. That they understand the importance of standing forests. That they understand the importance of protecting the rights of Indigenous people—and Indigenous people themselves. So I want to take the opportunity to ask those of you watching to join with these communities—not only Indigenous people but all communities who fight for standing forests, and who understand its importance to people that live there and to the world.”

Expansion of tall shrubs points to larger Arctic change story

by Miles Grant, Director of Publications & Media Relations



Tall shrubs have been expanding their coverage in the warming Arctic tundra region for decades. Now, a study led by Woodwell Climate Research Center scientist Dr. Anna Liljedahl shows that tall shrub expansion along riparian corridors is an indicator of major changes to permafrost, soil microbes, and river flows.

Researchers found streamside shrubs over five feet high are indicators of what are known as taliks—patches of unfrozen soil within permafrost that allow stream water to seep into the ground, potentially changing water systems for hundreds of miles downstream. The taliks fill with water in the summer when stream levels are high, then release their water in winter when precipitation is scarce and stream levels drop. This keeps flow downstream of the talik steadier year-round, while increasing the risk for streambeds to go dry above the talik in summer.

According to the study, the trend of increasing streamside tall shrubs point to widespread permafrost thaw reaching

tens of meters beneath the stream that shifts tall shrub covered stream reaches towards losing water volume in summer. Conversely, a lack of tall shrubs points to what may be considered a more normal (gaining) stream reach, where the stream discharge increases downstream.

“Our team examined small streams north of Toolik, Alaska, and found the tall shrub cover along the streams coincides with taliks and losing streamflow conditions,” said Dr. Liljedahl. “They’re clear indicators of areas where stream water is seeping into these taliks—the higher the loss into the ground, the lower the streamflow downstream, and the more extensive shrub canopy (higher the leaf area index) along the streambank.” Dr Liljedahl thinks that it is possible that thriving tall shrubs require winter access to water (which the talik provides), something that was proposed by research study in Greenland and Scandinavia nearly 85 years ago and forgotten.

Based on the ample evidence of shrub expansion across the Arctic tundra in the literature, the researchers believe this

trend has been occurring for decades in northern Alaska and elsewhere in the circumpolar Low Arctic. These new data may help researchers understand observed changes in Arctic river flows.

“These streams, which you can easily walk across, are the capillary of the Arctic hydrological system. They are small but many. If you add them up it is possible that they may be driving the changes documented in the large Arctic rivers,” said Dr. Liljedahl. “Larger rivers are seeing an increase in winter flow – is this phenomenon along small streams adding to that? What are the implications for water chemistry and temperature?”

There could be some benefits to the tall shrub expansion. More regular water flow could be good for fish, and the addition of cold water from the taliks could help counter rising stream water temperatures, while the tall shrub also shading the stream and keeping the temperatures cooler. Also, added vegetation provides a welcome food source for moose, beavers, and hare in the otherwise treeless tundra.

However, there are worrisome implications to these findings, which challenge a leading theory about permafrost thaw. Current theory holds that shrubs initiate talik development due to the accumulation of snow around tall shrubs that keeps the ground below warm in winter, promoting permafrost thaw. But the study by Dr. Liljedahl’s team suggests it’s the permafrost thaw and taliks that come first and that the winter access of talik-water that allows tall shrubs to thrive and grow into tree-size on the tundra landscape. If that is the case, it suggests permafrost thaw in the cold continuous permafrost region began earlier and has been more widespread than previously thought.

This study was made possible with support from the National Science Foundation’s Arctic System Science Program EARly-concept Grants for Exploratory Research (EAGER).

Polar opposites team up to examine impact of Arctic disturbances on winter weather patterns

by Annabelle Johnston
Communications Intern



When harsh weather settled over the northern hemisphere in winter 2013/2014, media outlets were swept with polar vortex frenzy, drawing connections between Arctic changes and mid-latitude weather patterns that came as no surprise to Dr. Judah Cohen and Woodwell Climate's Dr. Jen Francis. While it's well known by meteorologists that changes to the jet stream affect winter weather, Cohen and Francis set out to prove that rapid Arctic warming is also influencing the jet stream, and therefore also plays an underrepresented role in shifting mid-latitude weather patterns.

Most weather models do not accurately simulate the behavior of the stratospheric polar vortex (a pool of cold air 30 miles high over the Arctic, encircled by fast westerly winds), and often produce inaccurate long-term predictions as a consequence. The mainstream seasonal forecasts today rely on indicators that date back to the early 1990s; the National Oceanic and Atmospheric Administration (NOAA) annual weather projections, for example, focus heavily on tropical events and do not take into account Arctic warming nor its atmospheric impacts. However, both Cohen and Francis are working to fill this knowledge gap.

Francis hypothesizes that rapid Arctic warming—Arctic amplification—will lead

to more persistent weather regimes and extreme weather events, such as the prolonged cold spell of Winter 2013/2014 or the ongoing multi-year drought in the western U.S. It was her 2012 paper “Evidence Linking Arctic Amplification to Extreme Weather in Mid-Latitudes” that put her on Cohen's radar and began their long-standing working relationship.

“At the time, she was studying the disappearance of Arctic sea ice and I was looking at snow coverage,” says Cohen. “Originally, I thought we were pushing two different things but eventually, I realized our ideas were compatible. Maybe these were just two parts of a larger changing system.”

From there, Cohen led an Arctic/mid-latitude linkages working group, they attended numerous workshops and conferences on the topic, and collaborated on publications. Both scientists prioritize science communication for public audiences and regularly meet with the media to present updated seasonal weather forecasts and demonstrate the importance of the monumental changes underway in the Arctic.

Despite the overlap in their work, the duo could not be more different. While Francis sails south for the winter season, Cohen bundles up annually to ski. Yet, the two stay in close contact, frequently sending each other headlines about anomalous weather and catching up on Zoom.

Cohen writes and manages a weekly blog, Arctic Oscillation and Polar Vortex Analysis and Forecasts, which provides real-time insights and analysis of Arctic-driven weather and temperature patterns. Unlike others, Cohen provides snow accumulation forecasts, emphasizing the influences of variability in ice and snow conditions on hemispheric weather.

“Judah is doing a big service to the weather forecasting community,” says Francis. “Scientists agree that the Arctic

has changed a lot and many agree those changes must have an impact on mid-latitude weather patterns, but no one is sure exactly how. He is taking cutting-edge research and putting it into practice regularly.”

Projet Équateur supports science-based economic growth in the DRC

by Anabelle Johnston
Communications Intern



As industrialization, deforestation, and wildfires continue to threaten the Amazon, tropical forests across the Atlantic sit at a critical development juncture. The Congo River Basin holds over a quarter of the globe's remaining tropical forests, with approximately 60% of these forests, including naturally occurring old-growth forests, located within the Democratic Republic of the Congo (DRC)—one of the most resource-rich nations in the world. Woodwell Climate Research Center works cooperatively with key stakeholders to develop strategies to help the DRC meet its carbon emissions reduction commitments while fostering economic growth. That collaborative model has enabled work to advance during the pandemic, as local scientists and stakeholders have continued to carry out pilot programs and push for policy changes.

Unlike in the United States, where carbon-cutting measures largely focus on the energy and transportation sectors,

policy to curb emissions in the DRC centers around reducing deforestation of primary intact tropical forest and restoration of degraded forest land. That puts national climate policy potentially at odds with local food production needs, as more than 98% of all deforestation in the DRC occurs as a result of slash-and-burn agricultural practices undertaken by small farmers. Hundreds of thousands of family farms currently operate under this model, consuming much of what they produce and selling slim surplus in loosely integrated markets. As a result, industrial policy practices and incentives

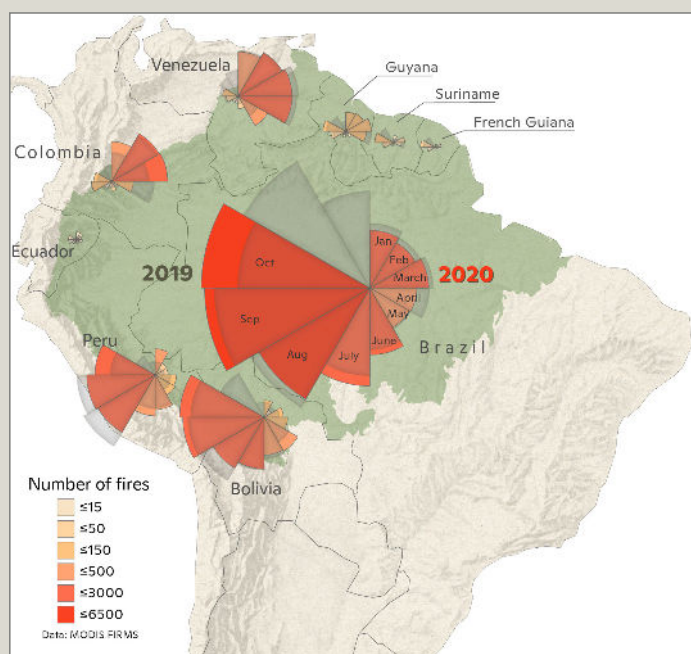
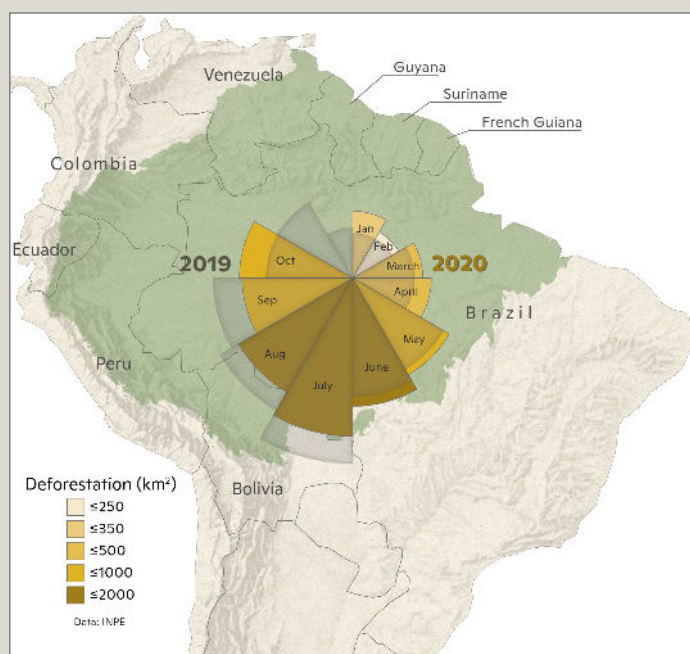
common in other tropical regions, such as Brazil or Indonesia, are not effective in the DRC.

Instead, Woodwell Climate's Projet Équateur, led by assistant scientist Dr. Glenn Bush, works on a local level to identify scalable strategies to improve net social welfare, creating incentives for forest conservation by meeting local farmer needs and introducing new agricultural techniques to increase economic activity.

To meet these goals, Projet Équateur combines research with policy

engagement, partnering with a local college in Mbandaka, the Institut Supérieur de Développement Rural (ISDR), and the Botanical Garden of Eala (a national government facility) in the Équateur province. In this peat-rich region, Bush and team members investigate how to best manage lands that are already in use, provide technical agricultural training, and work alongside farmers to test more efficient production methods.

Traditional slash-and-burn methods require a substantial proportion of



Amazon deforestation and fire outlook

Deforestation and fires in the Brazilian Amazon drew international attention last year as they jumped to their highest level in over a decade. 2020 has been different, but no less extraordinary. October was a record-setting month for both deforestation and fires. In total, deforestation in 2020 has dropped to somewhat less than last year's record extent, but is still above average. And because it is an extraordinarily dry year, fires are now greater than in any year since measurements began in 1998.

Amazon forests absorb and store roughly a tenth of human carbon dioxide emissions each year, but this critical carbon sink is threatened by deforestation and degradation of forest health. Deforestation in the Brazilian Amazon declined by 70% between 2004 and 2014. In recent years, however, deforestation has increased and fires have followed as people burn the trees they've recently cut down.

Building on the deforestation and fire data released regularly by Brazilian

government scientists, we present an analysis of the carbon footprint of this year's deforestation as well as where deforestation is happening and an analysis of the current climate conditions—key information for identifying fire risk hotspots and shaping solutions.

LEARN MORE

For additional analysis and maps visit woodwellclimate.org/amazon

cultivated land to lie dormant for 7-15 years to regain fertility, but introducing the Velvet bean (*mucuna pruriens*) can dramatically decrease the length of the fallow period. The velvet bean provides a restorative cover of easily manageable vegetation that smothers weeds, shades and cools the soil, while also fixing nitrogen and shedding organic matter. This practice can boost production from cultivated land without the need to clear additional forest. Resulting agricultural surpluses can strengthen local markets with local produce to meet growing demand.

Projet Équateur has also experimented with cultivating community orchards to combat nutrition challenges. The village management of nutrient-rich fruit and nut trees can strengthen community bonds while improving nutritional health, as participation is widely accessible to all in the community.

Years of government instability have resulted in widespread economic insecurity and public health challenges within the DRC, forcing many citizens to continue to rely directly on forests to meet their primary income, health, and nutrition needs. Projet Équateur is aiding the regional transition from subsistence farming to a market-based economy by providing education and investing in community infrastructure such as school buildings and water points as directed by community leadership. These projects utilize Reducing Emissions from Deforestation and Forest Degradation (REDD+) funding, a U.N. carbon market mechanism. Program participants receive support for forest conservation efforts through direct payments for carbon emission reductions from changes to forest landscape management practices.

“We aim to empower communities by providing the education and infrastructure they ask for to make their own decisions about paths to sustainability,” Bush said. “When developing policy, we want to understand who are the winners,

who are the losers, and how we can offset any losses in a fair and transparent way.”

Current Projet Équateur work focuses on scaling up discrete pilot infrastructure and agricultural projects to develop methods that can be scaled up and institutionalized across the country. The goal is to avoid further deforestation on community land by improving agriculture and rural livelihoods within an enforceable land use framework—effectively conserving forests without causing detriment to those living in the region. This work is informed by close collaboration with stakeholders, including private corporations looking to invest in land based enterprises e.g. agriculture and forestry in the region. Projet Équateur scientists and policy experts work alongside industrial agricultural concession cooperators to help identify approaches to improve their environmental and social performance and with organizations looking to buy and sell carbon credits. Bush and his team have also been studying power relationships and the representation of different stakeholders in land policy and management processes.

Due to close collaboration with local partners, Program Manager Joseph Zambo, and other national scientists, Projet Équateur has continued to operate under national public health guidelines through the COVID-19 pandemic. Although international scientists have been unable to travel to the DRC, local scientists and farmers continue to work on technological pilot programs and look towards institutionalization of these practices on the provincial level. Projet Équateur’s network of trusted local partners, developed over a decade of groundwork with officials from the provincial government, national ministry of the environment, university researchers, and community leaders have made this continuity and advancement possible.

“We often say environmental conservation is a luxury that only

developed countries can really think about. But that’s not true. The people I’ve met on the ground in rural DRC are in touch with their environment because they have to be. As farmers, foragers, and entrepreneurs, they are directly immersed in nature and almost every aspect of it. In a modest way our science can have profound impact providing the knowledge and confidence for people to do what it takes to mitigate further climate change and adapt to some of its inevitable effects,” said Bush.

Assessing new salt marsh restoration technique in Buzzards Bay

by Dr. Heather Goldstone, Chief Communications Officer

Michael Graca, Communications Director, Buzzards Bay Coalition



Woodwell Climate Research Center is working with local partners to address the problem of salt marsh decline along Massachusetts’ Buzzards Bay by assessing a restoration technique, known as runneling, that has been shown to be effective in other places in the Northeast. The work could reverse ongoing losses in some marshes and help guide new restoration projects.

The project is a partnership involving the Buzzards Bay Coalition, the Buzzards Bay National Estuary Program, Save The Bay in Rhode Island, the U.S. Geological Survey, and the Bristol County Mosquito Control Commission. The team is working

with local landowners—the Dartmouth Natural Resources Trust (DNRT) and the Town of Fairhaven—on the study.

The work is critical because salt marshes are not only beautiful but also vital natural resources. Marshes filter out pollution from reaching the Bay, provide habitat for wildlife, and protect homes from flooding. However, increasing stress from pollution and sea level rise is leading to the dramatic loss of many of these critical habitats, which further endangers the long-term health of the Bay.

“We can never fully improve and preserve Buzzards Bay and its water quality, if we stand by as the Bay loses its salt marshes. These marsh habitats play an essential role in sustaining a healthy Bay ecosystem, and over the past two decades, we’ve seen dramatic and accelerating losses of marshlands,” said Mark Rasmussen, president of the Coalition.

Rachel Jakuba, Ph.D., the science director for Buzzards Bay Coalition, notes that some of the challenges facing salt marshes come from what are known as interior “die-back areas”—places where increasing high tides are leaving more water stranded on the marsh, rather than draining away when the tide recedes. The standing salt water kills marsh plants that are adapted to dry conditions at low tide. In addition, these areas of impounded water create mosquito breeding habitat that can pose public health threats.

“These die-back areas threaten the marsh. They expand over time, effectively eating the marsh from the inside out as these areas grow,” said Dr. Alice Besterman, a post-doctoral researcher with Buzzards Bay Coalition and Woodwell Climate Research Center who is coordinating the research of this promising restoration technique to shrink die-back areas.

Runnelling is a restoration technique in which shallow channels are dug in the marsh to aid the natural tidal flow and drain impounded water.

“The idea is for the standing surface water to drain out of these die-back areas, which should allow for vegetation to begin growing back, restoring other ecosystem properties,” said Besterman. The strategy has been employed in Rhode Island by project partner Save The Bay, but this marks only the second time it is being tried in Buzzards Bay.

The project team worked with local officials, conservation agents and landowners to evaluate twelve sites for their potential to benefit from runnelling, settling on salt marshes on Allens Pond in Dartmouth and Little Bay in Fairhaven, both of which have multiple die-back zones. The pilot runnels were completed at Ocean View in late October; work at Little Bay is ongoing.

“The salt marsh here at Ocean View Farm is home to several rare and endangered species,” said Linda Vanderveer, Land Manager for DNRT.

“Seeing die-back in the marsh is concerning, especially for the wildlife that depend on it for nesting, feeding, and shelter. We are excited to work with the Coalition and all of the project partners to try and restore the health of the marsh not only for the benefit of wildlife, but also so that others may benefit. It’s our hope that the runnelling technique will advance the science of salt marsh restoration on the South Coast.”

The installation of the runnels takes place partly by hand and partly through the use of a specialized excavator operated by the Bristol County Mosquito Control Commission. The equipment is designed to minimize impact on marsh vegetation.

In fact, it exerts less pressure per square foot than a human foot, making it possible to install the runnels quickly and with minimal impact to the environment.

The effect of the created runnels will be assessed as a part of multi-year study, including monitoring on “treatment” areas where runnels have been created, and “reference” areas where no action was taken. Before the runnels could be installed, Besterman



and colleagues conducted a months-long study of the salt marshes—including soil composition, water levels, marsh levels, and plant surveys as well as other ecosystem properties. In all, the team gathered 69,000 water level measurements, 680 marsh elevation readings, and vegetation surveys at 400 plots. Gathered data will be used to assess whether and how the technique contributes to strengthening the health of the marshes and which marshes are good candidates for using runnels.

“The goal of restoration is to enhance the resilience and self-sustaining nature of marshes. Careful scientific studies like this one are important to ensure that our actions have the desired effect and do not have unintended consequences that endanger the sustainability of marshes in the face of climate change,” said Dr. Linda Deegan, senior scientist at Woodwell Climate Research Center. “Before widespread implementation, we need to understand when runnels can help and when they are not appropriate.”

Halting the decline of the Bay’s salt marshes not only will help efforts to improve water quality, but it will also protect critical habitat for myriad fish and shellfish species that spawn, grow and live in these areas. Coastal developments will also benefit, as marshes help to absorb the energy of ocean waves and absorb the temporary flooding caused by storm surges.

This project is supported by Southeast New England Program (SNEP) Watershed Grants. SNEP Watershed Grants are funded by the U.S. Environmental Protection Agency (EPA) through a collaboration with Restore America’s Estuaries (RAE). For more on SNEP Watershed Grants, visit www.snepgrants.org.

Staff profile: Rachael Treharne

by Anabelle Johnston
Communications Intern



Dr. Rachael Treharne is an ecologist who studies Arctic disturbances and their impact on carbon cycling. She currently

is working on a model that incorporates permafrost thaw and Arctic wildfires into global carbon emissions budgets, a departure from her field-based research. Additionally, Rachel is expanding her science communications and media work, bringing her findings directly to stakeholders and the public.

Why did you pursue a career in science?

I love research and am fascinated by the Northern ecosystems I work in, but I didn’t intend to pursue a career in science beyond my PhD. Because my motivation is with the urgent need for climate mitigation, I moved into a very applied role in carbon finance after finishing my thesis. This was a great experience but also made it clearer to me that there are still gaping holes in how climate science is understood and embedded in policy frameworks and mitigation efforts.

What questions does your research aim to answer?

We are ‘off the edge of the map’ with climate change; there is more carbon in the atmosphere than at any point in human history. I’m interested in questions that can help us fill in the new map of where we are now and where it looks like we’re going. A bit more specifically, I’m interested in how Arctic ecosystems and the reservoir of carbon they hold are responding to climate change, and what that means for future warming.

What’s your biggest challenge or obstacle?

I’m in a healthy and happy place today, but have struggled significantly with mental health problems, as well as my identity as a member of the LGBT+ community in the past. I’m extremely lucky that I’ve always felt welcome in science, but I’m acutely aware that the scientific community has work to do to make us a more inclusive and diverse workplace and to make sure that everyone can feel that way.

What brought you to Woodwell Climate Research Center?

I pursued a role at Woodwell because I wanted to work on filling some of the gaps in climate science and in brokering that science to policy and decision-making communities.

What makes Woodwell Climate special in the scientific community?

Climate scientists face a lot of challenges in bringing our science to where it can have real impact. The close connections between Woodwell and relevant policy communities mean that our science is uniquely targeted to decision-makers, and that we are able to really effectively communicate the implications of that science and create real impact.

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

The attribution of extreme events to climate change; putting a number on how much climate change has weighted the dice towards an individual extreme event.

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

The pink boat! In April last year I took part in the Extinction Rebellion actions which closed six key areas of London to traffic for almost two weeks. As part of these actions ‘Berta’, a pink boat emblazoned with ‘Tell the Truth’ and named after Honduran environmentalist Berta Cáceres, was locked onto Oxford circus. The pink boat is a potent symbol for change, while I think ‘Tell the Truth’ resonates with regard to the connection between science and advocacy.



Leave the legacy of a healthy planet

Support Woodwell and climate science for generations to come

What will your legacy be? Good estate planning could enable you to make a larger charitable gift than you ever thought possible. A bequest is a simple and popular method of partnering in the Center's future by naming Woodwell Climate as a beneficiary in your will, and you don't need to be wealthy to do it. Learn more about legacy giving options that combine your philanthropic interests with your financial needs and tax-planning strategies, or start using FreeWill right now (freewill.com/woodwellclimate) to create a legally valid will—for free—and secure your legacy for the people and causes you love. For more information or to request a brochure, please contact Beth Bagley at ebagley@woodwellclimate.org.

CARES Act expires December 31

The CARES Act, which provides tax deduction incentive for charitable contributions, whether or not you itemize your deductions, is set to expire on December 31. Learn more and take advantage of the Act before year's end with a donation to Woodwell Climate Research Center.

Online, Mail, Phone, or Wire

During COVID-19, online gifts are especially helpful in rapidly and securely accepting your gift. We gratefully accept your support through our website, or contact Paula Beckerle for assistance with wire transfer gift instructions. If sending a check is your preferred way of giving, please note that while our name has changed, checks to either Woodwell Climate Research Center or Woods Hole Research Center are accepted and that our Tax ID# remains the same: 04-3005094.

In the news: highlights

New Method to Save Salt Marshes Piloted in Buzzards Bay. *WCAI* interviews Alice Besterman. November 17

Climate change: Can Biden make a difference? BBC's *The Real Story* hosts a panel discussion that includes Phil Duffy. November 13

New Paltz considers possible future flooding from climate change. *Hudson Valley One* reports on presentation of the Risk program's assessment work. November 12

Was a Federal Scientist's Dismissal an 11th-hour Bid to Give Climate Denial Long-Term Legitimacy? *Inside Climate News* quotes Phil Duffy. November 11

Climate change intensifies tsunami threat in Alaska. *High Country News* quotes Anna Liljedahl on work in which she's involved. November 11 (The Alaska Tsunami That Can't Be Stopped. *The Atlantic* picks up the story. November 15)

Morning Energy Newsletter. *Politico* quotes Phil Duffy. November 5

Fate of climate crisis hangs on election as US exits Paris agreement. *The Guardian* quotes Phil Duffy. November 4

US is leaving the Paris Accord: How that will affect efforts to stop climate change. *ABC News* interviews Phil Duffy. November 2

Arctic Sea Ice Overdue. On *Living On Earth*, host and board member Steve Curwood interviews Jennifer Francis. October 30

Warmer climate and Arctic sea ice in a veritable suicide pact. *Yale Climate Connections* quotes Jennifer Francis and references a new study she has co-authored. October 28

War on NOAA? A Climate Denier's Arrival Raises Fears the Agency's Climate Mission Is Under Attack. *Inside Climate News* quotes Phil Duffy. October 25

'We are out of time:' Destructive wildfires in Colorado will grow worse as season lengthens, scientists warn. *CNBC.com* quotes Phil Duffy. October 21

A Conversation. In *Daedalus Magazine*, Nancy Lipton Rosenblum interviews Rafe Pomerance. October 20

A regional TV station of the Amazonian Network (Rede Amazonica) of TV Globo interviews Foster Brown on Acre River's historically low levels for late in the dry season. October 19

Photos reveal the extent of melting ice in the Arctic. *Business Insider* quotes Jennifer Francis. October 18

Panel Examines Combating Climate Change Through Private and Public Reforms. *Harvard Crimson* covers a panel that featured Phil Duffy. October 16

Experts: Displacement From Climate Change May Alter Industry. *Realtor Magazine* recaps Spencer Glendon's address to the Urban Land Institute. October 16

cover: Dr. Anna Liljedahl collecting data on stream flow and Arctic shrubs in Alaska. / photo by Gerald Frost

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