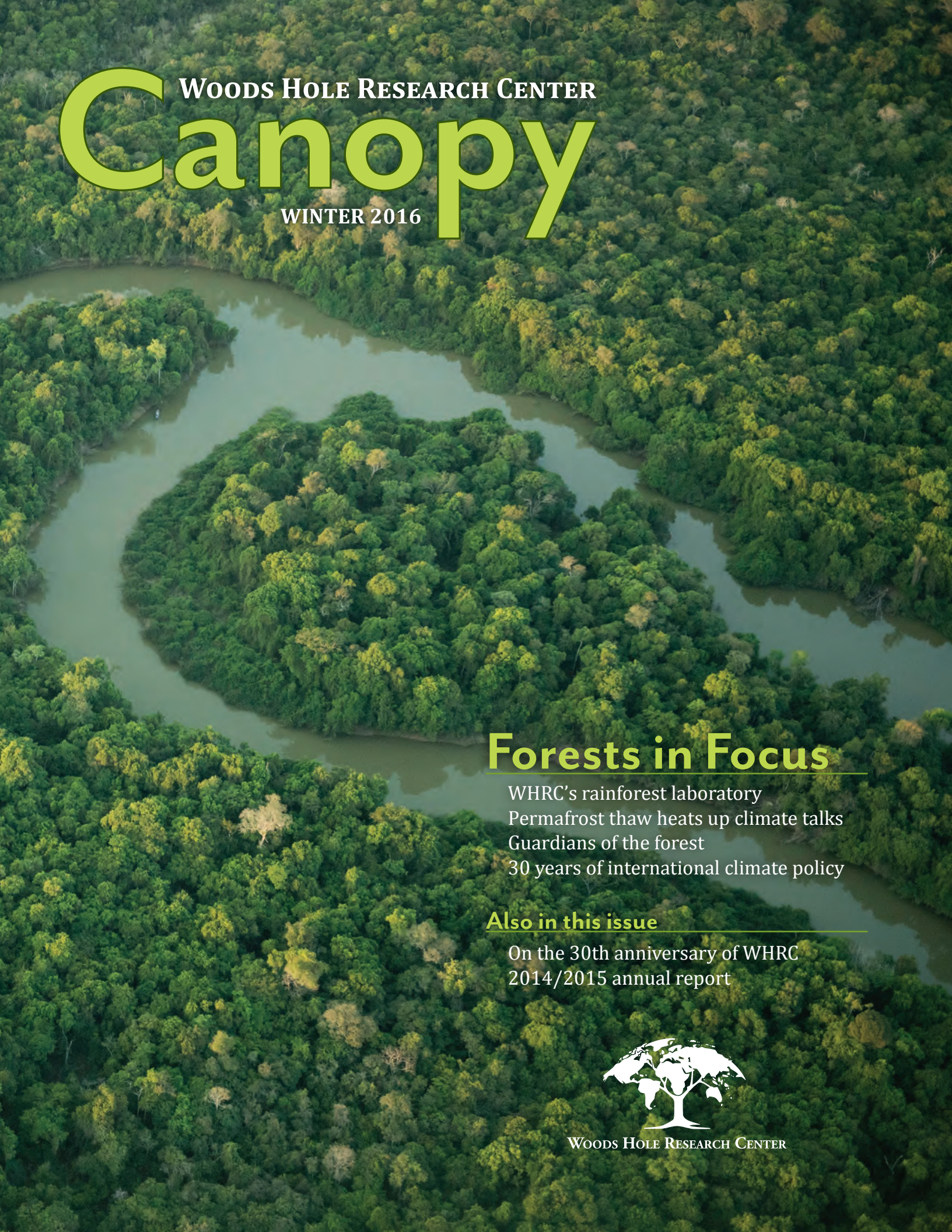

Woods Hole Research Center

Canopy

WINTER 2016

Forests in Focus

WHRC's rainforest laboratory
Permafrost thaw heats up climate talks
Guardians of the forest
30 years of international climate policy

Also in this issue

On the 30th anniversary of WHRC
2014/2015 annual report

Woods Hole Research Center

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Cover: An arial view of the Sete de Setembro River in the Mato Grosso State in western Brazil. The river is named for Brazilian Independence Day on September 7. *Photo by Chris Linder*

Canopy
Woods Hole Research Center

Canopy is published by Woods Hole Research Center (WHRC) in Falmouth, Massachusetts. WHRC is an independent research institution where scientists investigate the causes and effects of climate change to identify opportunities for conservation, restoration and economic development around the globe.

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The Paris Agreement: Opportunity and Responsibility

After a couple of weeks of reflection, the climate agreement finalized recently in Paris seems more important than ever. The UNFCCC COP21 climate meetings in Paris in December highlighted a simple but critically important message from climate science—that the choices made in the next 10 or 20 years will have enormous consequences lasting a millennium or more. If the Greenland ice sheet melts, for example, sea level will rise about 23 feet. That would literally alter the landscape, submerging more than 1400 cities and towns in the US, including much of Cape Cod. That won't happen in 10 or 20 years, of course, but the commitment that would make it inevitable might. Similarly, enough warming in the Arctic would result in the release of massive quantities of greenhouse gases from thawing permafrost and a strong, self-reinforcing cycle of warming and more thawing. It's probably not too late to stop these and other horrendous consequences, but in 20 years it might be.

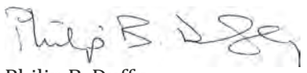
We all have an opportunity—and a responsibility—to do everything we can to prevent these outcomes, and the best vehicle for accomplishing that is probably the Paris Agreement. As I've written before, the agreement, impressive though it is, is only a first step. The commitments made so far last only until 2030, and so do not determine whether or not climate change will be limited to an acceptable level. That depends on the strength of future commitments, which the agreement requires each nation to make every 5 years. If these are strong enough, we can probably prevent really awful consequences.

How can WHRC contribute to the success of the Paris Agreement? First, it is extremely urgent and extremely important to know at what level of warming major irreversible consequences like those mentioned above become inevitable. Evidence suggests that 2 degrees of global warming is too much, but we need to be more sure of the consequences of different amounts of warming. Our arctic research seeks to answer exactly that question in the case of thawing permafrost (among other goals).

Second, several of us at WHRC have written before about the potential for restoration of the biosphere to remove CO_2 from the atmosphere. (A recent piece in *Nature Climate Change* by WHRC's Richard Houghton and others makes this case very effectively.) In conjunction with rapid reductions in fossil fuel use, this can play an important role in controlling future climate change. A new initiative involving WHRC, The Nature Conservancy, and other partners aims to develop, promote, and implement this approach to limiting climate change.

Finally, good measurements of greenhouse gas emissions are critical to the success of the Paris Agreement. Without such measurements, we can't trace our progress or identify parties who are not meeting their commitments. WHRC is arguably better than anyone else at measuring forest biomass, a key ingredient in estimating land-sector emissions (which in many developing countries exceed fossil-fuel emissions). We can contribute to the measurement regime of the Paris Agreement by teaching developing countries to measure their forest-based emissions. An even more important contribution might be to make independent measurements of these emissions, since nationally self-reported emissions might be unreliable or perceived as unreliable. Just knowing that an independent party (like us) is measuring emissions might have a salutary effect on the emissions countries report to the UN.

WHRC continues to vigorously address several key issues, asking how much climate change is OK, controlling climate change by restoring the biosphere, and measuring progress in controlling land-sector emissions. These are important efforts, and I hope you will join us in making them successful.



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Thank you, Casey Lambert

This year, Karen "Casey" Lambert stepped down from the WHRC Board of Directors after eight years of dedicated service.

"Casey Lambert has been thoroughly engaged with the Board of the Woods Hole Research Center and has brought her insights and wisdom to our deliberations. Her untiring participation will be missed by all of us, and we are sorry to see her move on."

– Lawrence Huntington, Former Chairman of the Board

"On behalf of the WHRC Board, I want to express many thanks to Casey Lambert for her years of service. Casey has been the kind of board member that every organization needs. Completely dedicated to our mission, she brought directness and candor to board discussions. Casey has been a good match for WHRC. She has high expectations and is determined to make an impact on the world. We will miss her lively presence!"

– Wilhelm Merck, Chairman of the Board

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Board Spotlight: Constance Roosevelt

A long-time environmentalist, Connie writes and speaks about science and conservation. She has been a book editor at Time/Life, Viking Press, and William Morrow, and has contributed articles on endangered primates and ecotourism for *The New York Times*. She has served on other non-profit boards, including the Brooklyn Museum and NY State Board of The Nature Conservancy.

"WHRC has its finger on the pulse of nature's ability to emit and sequester greenhouse gases. This is critical information for finding solutions to climate change."

– Connie Roosevelt, WHRC Board Member

WHRC's rainforest laboratory

Spotlight on Tanguro Ranch in the Brazilian Amazon

Chris Linder

The Amazon rainforest is one of Earth's greatest treasures. It is home to over half of the world's species, locks in an estimated 125 billion metric tons of carbon, cycles 20% of the planet's fresh water, and as such is an important driver of atmospheric circulation and global climate. What happens in the Amazon affects all life, and its preservation is an essential component of the endowment that will ensure the future of life on Earth.

WHRC researchers, with their decades of work in the Brazilian Amazon, are among a select group making the science-based linkages between Amazon forests, agriculture, and global climate. Since 2004, the 200,000-acre Tanguro Ranch has served WHRC as a laboratory for evaluating and understanding the environmental consequences of deforestation and expanding industrial agriculture.

Deforestation, driven primarily by demand for agricultural land, has shrunk the rainforest, impacted ecosystems, and even threatens the viability of agriculture itself. WHRC scientists are at the forefront of understanding these processes and developing policy remedies.

TANGURO RANCH

Tanguro Ranch was created in the early 2000s by Blairo Maggi, then governor of Mato Grosso state and member of one of the wealthiest Brazilian families, when he combined three neighboring cattle ranches and converted them to soy production. No environmentalist, Maggi was then known as the "king of soy" for being the single largest producer of soy. In 2005 he received Greenpeace's ignominious Golden Chainsaw Award for overseeing Mato Grosso while it led Brazil in Amazonian deforestation for three years running. Despite this, Maggi was bound by the revisions to the Forest Code, which required restoration of all of the riparian forests (forests adjacent to streams and wetlands) previously cleared on his land. After a fortuitous meeting with a WHRC scientist, a deal was struck to allow WHRC and our Brazilian partner IPAM to run large-scale agricultural research projects at Tanguro. In return, WHRC and IPAM would help Maggi understand the environmental implications of his farming practices and develop a methodology for restoring riparian forests.


Chris Linder

Tanguro Ranch has proven to be the ideal laboratory for WHRC scientists. By combining satellite observations and computer models with field experiments around the ranch, WHRC scientists measure how deforestation has impacted this ecosystem in expected and unexpected ways, including raising land temperatures, decreasing precipitation, and changing how nutrients move through the system. Deforestation releases carbon dioxide, the main greenhouse gas that contributes to global warming.

One way to minimize deforestation is through agricultural intensification: growing more on less land. For example, lands which formerly hosted one crop per growing season now produce one or two additional crops. This can be seen clearly at Tanguro Ranch, where crop trials are underway to identify the most efficient crops to cycle in. This intensification further alters the balance of these systems and regional climate, and while it is too early to identify outcomes, WHRC scientists are measuring the changes due to intensification as they occur in order to identify the optimal equilibrium of sustainable productivity.

Above: Dr. Marcia Macedo examines corn in a double-cropped field typical of WHRC's agricultural intensification experiments. *Below:* A modern farm on land that has been cleared of forests.


Chris Linder

TANGURO AS A MICROCOSM

Tanguro and its neighbors in the Xingu region represent a microcosm for the challenges faced by Brazil, and the world, as the demand for food, fuel and fiber for 7 billion people is balanced against the need to preserve functioning natural ecosystems that provide essential services, including climate stabilization. It is in this place, and in so many like it around the globe, where the very real struggle between economic prosperity and environmental responsibility is being waged.

To learn more about WHRC's work in Brazil and to find out how you can get involved, go to: whrc.org/our-work/programs-projects

IPAM: our Brazilian partner in science and policy

The Amazon Environmental Research Institute (IPAM) was founded in 1995 to address three interwoven Amazonian problems: degraded landscapes, unsustainable economic schemes, and social injustice. IPAM, which began with just a handful of Brazilian and WHRC scientists, technicians and advocates, is today a mature organization of 140 employees and nine offices in Brazil.

WHRC played a significant role in the creation of IPAM and has served as a "sister" institution ever since. Partially due to our collaborations, the last decades have seen significant conservation gains in the Amazon Basin, as witnessed by the 70% decrease in deforestation rates since 2005.

Over the years, WHRC/IPAM products like datasets, geospatial tracking mechanisms and policy reports have been used to educate the Brazilian Congress on the effects of deforestation. Further, they have helped to arm indigenous leaders with tools to monitor and protect their lands and to assist farmers in monitoring and understanding their environmental impacts.

However, many of the conservation gains in the Amazon are now under direct attack in the Brazilian Congress, due to attempts to limit the rights of indigenous peoples and weaken the Brazilian Forest Code (a requirement for landowners in the Brazilian Amazon to maintain 80% of forests as legal reserves).

During the COP21 meetings in Paris, WHRC and IPAM reinforced their partnership by signing a five-year memorandum of understanding. The MOU is designed to identify and pursue new cooperative projects and programs that will create effective dialogue between science and policy in Brazil.

Here are just a few highlights of our plans:

- In January, we will create the **Forest Code Observatory** – a platform to strengthen the role of civil society in reducing deforestation and restoring degraded lands in Brazil;
- We will communicate the links between healthy forests, climate, and **indigenous territories** to policy makers with the goal of combating recent proposed changes to the Brazilian constitution limiting the rights of these traditional communities;
- We will use rapidly advancing technologies to monitor Brazil's Intended Nationally Determined Contribution (INDC) and create an **annual "carbon report card"** from deforestation;
- **Staff exchanges** will be pursued to help to build organizational capacities and create efficiencies.

Like all good relationships, our partnership with IPAM is based on having similar interests and complementary strengths. By combining WHRC's focus on science with IPAM's insight and influence in the Brazilian policy world, together we can have an impact beyond what either of us alone could achieve.

In Paris after signing the five-year MOU, left to right: Fernanda Bortolotto (IPAM), Phil Duffy, Sonia Guajajara (Articulation of Indigenous Peoples of Brazil), Andre Guimares (IPAM Executive Director), and Paulo Moutinho (IPAM former director and senior scientist).

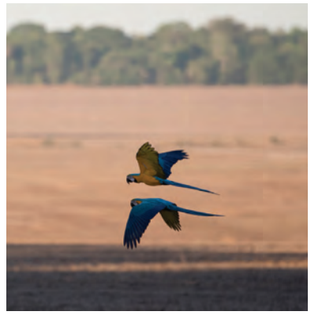
Tanguro Ranch Mato Grasso, Brazil

A team of WHRC scientists visited the Tanguro Research Station last July. They collected samples from a recent nitrogen experiment, developed techniques for a pilot study on methane emissions, and continued ongoing research on energy and water cycles. Time was also taken to visit a remote village in the Xingu Indigenous Park. *Photos by Chris Linder*

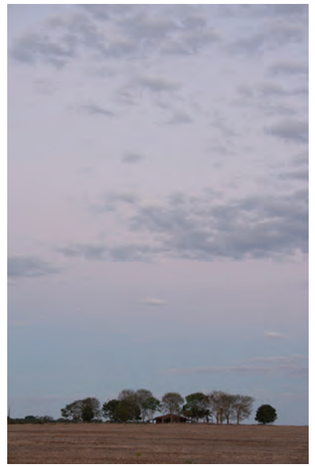
Above: The porch of a house used by WHRC researchers who work at Tanguro Ranch. *Below:* A tractor rests in a harvested soy field on Tanguro Ranch.

Above left: Palms rise out of a Tanguro Ranch resevoir that was originally created to provide water for cattle. Today all of the pastures have been transformed into soy fields, but the reservoirs remain. *Above right:* IPAM Research Assistant Leonardo Maracahipes extracts a filter from a funnel used to remove and measure sediments in stream water. *Below right:* Blue macaws forage for residual soy in harvested fields on Tanguro Ranch.

Above: A river meanders inside the Xingu Indigenous Reserve.



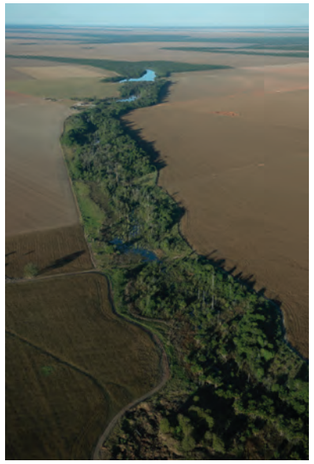
Below left: Capybaras yawn and nap on the banks of a reservoir at Tanguro Ranch. *Left:* Sandro Rocha and Sebastião Nascimento measuring flow rates in a stream draining agricultural fields on Tanguro Ranch. *Above:* IPAM technician Sandro Rocha downloads data from soil moisture monitoring instruments in a soy field.



Left: A former ranch owner's home in the middle of a soy field on Tanguro Ranch. *Above left:* Cotton is being tested as an alternative to the annual soy crop. *Above:* The IPAM field staff poses with some WHRC researchers at Tanguro Ranch. *Right:* Indigenous communal houses at the Kuikuru indigenous village in Xingu Indigenous Park, northwest of Tanguro Ranch. *Below right:* WHRC assistant scientist Marcia Macedo receives a traditional indigenous temporary tattoo at the Kuikuru Indigenous Village, Xingu Indigenous Park.

Right: WHRC researcher Paul Lefebvre climbs down into a 10-meter soil pit to maintain instruments that monitor soil moisture, in order to compare how water moves through agricultural fields and native forest. *Below:* Panorama of an experimental fire parcel at Tanguro Ranch. This parcel was burned in 2004, 2007, and 2010 and was further devastated by a severe windstorm in 2011.

Left: Paul Lefebvre and Leonardo Maracahipes test a water collection device for use in studies of methane content in ranch reservoirs. *Above:* Mosaic of harvested fields and remnant patches of forest typical of the region around Tanguro Ranch. *Right:* Remnant riparian forests follow a stream interrupted by several dams within the ranch.



Permafrost thaw heats up climate talks

Locked within ancient arctic frozen soil, known as permafrost, is more carbon than has been emitted through fossil fuel combustion to date. As the Earth warms, permafrost thaws, releasing greenhouse gases into the atmosphere and accelerating climate change. For the past 15 years, WHRC scientists have been conducting experiments in the Arctic to answer such key questions as: How much carbon-rich permafrost is in the Arctic? How much carbon could be released from permafrost if global warming is not controlled? And, how can global climate models more accurately account for carbon emissions from thawing permafrost?

Almost as concerning as thawing permafrost itself is the fact that most policy makers are unaware of this huge potential source of emissions. That is, until recently.

WHRC's arctic team of Max Holmes, Scott Goetz, and Sue Natali held the attention of international climate experts and policy makers during a formal side event presentation at the United Nations Framework Convention on Climate Change (UNFCCC) 21st Conference of the Parties (COP21) in Paris in December. Over one hundred COP21 delegates, observers, and journalists attended the event, which was held in collaboration with the International Cryosphere Climate Initiative (ICCI). Together, ICCI and WHRC released "Thresholds and Closing Windows: Risks of irreversible cryosphere climate change"—a publication intended to communicate to policy makers the importance of cryosphere-related thresholds that will have global impacts.

A feature article in *The Washington Post* immediately followed the COP21 side event, bringing prominent attention to permafrost. It may be surprising, given the abundant media coverage of COP21 and the global climate crisis, that both the public and policy makers are not cognizant of the issues of thawing permafrost. Below is an excerpt from Chris Mooney's *Washington Post* article:

The [COP21] goal is an agreement that would set the world on a path to limit warming to below 2 degrees Celsius, or perhaps even 1.5 degrees Celsius, above pre-industrial levels. But at a news conference here at the Le Bourget conference center Wednesday morning, scientists pointed out a factor that could make hitting these targets quite a lot harder. It's called permafrost.

...The news about permafrost has been building in recent years, but it is still a relatively new area of scientific inquiry and one where there is much uncertainty. Thus, even as negotiators in Paris appear to be amping up their ambition and are even talking more about trying to limit global warming to 1.5 degrees C, there may be another wild card they have to contend with.

The fact that this climate threat has not received the attention it deserves from policy makers stems from the fact that it has not been included in emissions projections of the Intergovernmental Panel on Climate Change (IPCC). And while it's too early to tell if this particular goal has been moved forward, WHRC's activities in Paris, and before, made substantial gains in exposing the issue.

ARCTIC TEAM LEADS THE WAY

From the Alaskan tundra to the international climate policy stage in Paris, The mission of WHRC's arctic team steadily gained momentum as the urgent message that *greenhouse gas emissions from permafrost thaw are potentially very large* was delivered to key decision makers, and ultimately, to President Obama himself.

Sue Natali speaking on permafrost thaw to the press at COP21.

Formed over 10,000 years ago and rich in carbon, permafrost covers one quarter of the Northern Hemisphere, primarily in the Arctic. Permafrost is exposed and thawing near Longyearbyen, Spitsbergen, Norway.

In June of 2015, Sue Natali presented WHRC's most recent findings at the UNFCCC Bonn Climate Change Conference in Germany. *Agence France-Presse* published an article based on an interview with Sue that was picked up by nearly 300 media outlets around the world. Following this conference, the arctic scientists traveled to Washington, DC, where they briefed high-level officials at the State Department about the global threat from thawing arctic permafrost.

The GLACIER conference held in Anchorage, Alaska, in late August brought together foreign ministers, scientists, policymakers, and stake-holders from both arctic and key non-arctic states and nations. Discussions centered on individual and collective action to address climate change in the Arctic, raised the visibility of climate impacts in the Arctic as a harbinger for the world, and heightened awareness of the Arctic's unique role in global climate change—all with the hope of driving political will for ambitious action at COP21. The arctic team's prior meetings at State had placed this issue in the center of the State Department's climate policy agenda, as evidenced by President Obama's remarks in Anchorage that put permafrost thaw in the spotlight.

"It was truly gratifying to see the extent to which WHRC's permafrost science was influencing the policy-making process at State and, by extension, internationally," observed Max Holmes.

In October, the same scientific team traveled to Reykjavik, Iceland, to raise awareness of permafrost thaw at the Arctic Circle Assembly. That annual conference has become the largest international gathering on the Arctic, attended by more than 1,500 participants from nearly 50 countries. Think tanks, indigenous groups, corporations and NGOs from around the world are invited to hold meetings within the Arctic Circle platform to advance their own missions and with the broader goal of increasing collaborative decision making.

Reflecting on the progress of the past six months, Dr. Natali remarked, "It's critical that we continue to engage in conversations with parties who have a variety of interests in the Arctic and ensure that discussion of any economic benefits of a warmer Arctic also contemplate the true costs of environmental impacts that are occurring both locally and globally."

WHRC to release popular science book on arctic permafrost

WHRC is pleased to announce its first ever full-length popular science publication, sumptuously illustrated with the photographs of conservation photographer Chris Linder. This coffee-table style book will take readers on a journey of adventure and discovery to some of the most inaccessible and hauntingly beautiful places on Earth—the Siberian Arctic and the Alaskan Arctic.

Through its evocative images and essays by leading scientists from the United States and Russia, the book will tell the story of how vast stores of ancient carbon locked up in permafrost soils are thawing and returning to the modern carbon cycle and how a dedicated team of scientists and students is struggling to understand the problem. The book will be part popular science, part photography, and part travel/adventure.

Sponsorship opportunities available

WHRC is seeking the support of our friends to underwrite the publication. All sponsors at the $1,000+ level will be prominently recognized in the front matter of the book and receive an invitation to the launch party, targeted for late 2016.

For more information on sponsorship levels and benefits, contact Alison Smart, Chief Development Officer, at asmart@whrc.org or 508-444-1545.

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Recognition in commensurate category on benefactor acknowledgment page. Includes a complimentary special edition of the book.

Woods Hole Research Center is a not-for-profit 501(c)(3) organization. Gifts made to the publication will be tax deductible to the extent allowed by law.

We thank the Ruth McCormick Tankersley Charitable Trust for its generous early support of this publication.

ABoVE: WHRC scientist leads major NASA research program

Six years ago, the head of NASA's Carbon Cycle and Ecosystems program asked the scientific community to help NASA map its next generation of research priorities. Many scientists responded, including WHRC Senior Scientist Scott Goetz, whose ideas eventually became the Arctic-Boreal Vulnerability Experiment (ABoVE), the only project ultimately embraced by NASA.

The need for a better understanding of the changing Arctic is clear: climate change is occurring faster in the Arctic than anywhere else and results in numerous societal impacts, including thawing permafrost and resulting damage to infrastructure, increased coastal erosion, widespread fire, and changes in vegetation cover. Beyond these local impacts, the possibility of massive greenhouse gas emissions from thawing permafrost constitutes the potential for further acceleration of global climate change.

Dr. Goetz and his colleagues' central idea was to put together a cross-disciplinary team of scientists to understand the vulnerability of the Arctic to climate change. After an elaborate three-year process involving over 200 experts from disciplines in the natural and social sciences, the project scope was broadened to include impacts of arctic climate change on people both within and beyond the Arctic, and the ways in which these people are responding to changes occurring in the region. A 22-person science definition team including Dr. Goetz was formed to develop a 10-year research program to be known by the acronym ABoVE.

In the first round of ABoVE funding, over 100 proposals were submitted, of which 21 were selected for funding. Of the winning proposals, WHRC scientists lead three, and WHRC scientists are co-investigators on two others. In addition, Dr. Goetz was selected as the Science Lead for the entire ABoVE program, an honor – and a responsibility – that recognizes his expertise and leadership in arctic science. WHRC's ABoVE projects include one led by Sue Natali to examine and project winter greenhouse gas emissions from permafrost. Brendan Rogers leads another whose object is to better understand increases in fires at high northern latitudes and possible strategies for improved management. Dr. Goetz is also the lead investigator on a project to look at the implications of a warming-induced arctic-boreal biome shift, and he is a co-investigator on a project that examines the effects of fire on permafrost carbon stocks. Finally, Christopher Schwalm is co-investigator of a project that will integrate the data and models utilized by ABoVE researchers.

As the research on ABoVE proceeds, WHRC scientists will be at the forefront of NASA's large-scale study of environmental change.

The ABoVE science team at its first meeting in Minneapolis, MN.

Master and apprentice

A conversation with Richard A. Houghton and Alexander Nassikas

Senior Scientist Richard A. "Skee" Houghton is an ecologist who studies the role that land-based ecosystems play in climate change and the global carbon cycle. His focus is on determining the sources and sinks of carbon that result from land-use change. Skee joined WHRC in 1987 and holds the George Masters Woodwell Chair for Global Ecology. He contributed to the reports of the IPCC, which was awarded the Nobel Peace Prize in 2007. In 2012, Skee was elected a Fellow of the American Geophysical Union, an honor conferred annually upon not more than 0.1 percent of the total AGU membership.

Alexander "Zander" Nassikas graduated from Wesleyan University in 2014 with a B.A. in Neuroscience. He joined the staff of WHRC the same year and works as a research assistant with Skee Houghton. Zander contributes data analysis and modeling to a project that aims to locate and quantify historical carbon emissions from global land-use and land cover change.

Canopy joined Skee and Zander for a conversation about themselves, their science, and their motivations.

Canopy: What led you to study science?

Skee: I've always liked the thinking and creativity that come with science. One may not think of science as creative, but where do you suppose hypotheses come from? Testing them is science. Coming up with the hypothesis is the creative element. I also liked the outdoors. There were a couple of muddy ponds at the end of my street that, as a boy, I spent hours exploring. In college, I was tested as not particularly scientifically inclined. Rather, journalism or law was suggested—but I was not deterred. I studied the carbon budget of a tidal marsh for my dissertation research and worked on the carbon budget of an oak-pine forest. The opportunity to study the global carbon budget was fortuitous—a matter of being in the right place at the right time. Besides being intellectually exciting, studying climate change and understanding the global carbon cycle bring a satisfaction of knowing that I'm doing something useful, even valuable.

Zander: A big part of what led to my decision was the type of childhood my parents created. My siblings and I were always encouraged to talk about what we had seen and observed each day, and I have always been driven to know the "why" behind the "what." I loved my science classes in elementary school because, in addition to going outside and getting muddy catching tadpoles in the ponds behind the school, the "Wow!" factor of discovery was huge. In college, I turned to neuroscience primarily because it is an intriguing, specialized field of biology. Then, I had the opportunity to go to the Amazon rainforest to visit the Biological Dynamics of Forest Fragments Project. This trip changed my entire focus. The Amazon provided clear evidence that climate change wasn't an abstract or distant event. The effects were right there in front of me. One morning, we walked through lush tropical forest amid a din of birdsong; the air was dark and moist and the greens of the place were vibrant. When we crossed the line of deforestation into the first fragmented space, the entire environment changed. The air was hot and burned; the caked, dry dirt underfoot cracked and broke under our shoes. There were no birds. It was maddening to see this, but I was also energized. Here was a cause I wanted to join. Now I find myself at WHRC, studying carbon emissions and deforestation from the master of carbon himself.

Canopy: What are you working on currently and how does a research assistant help you?

Skee: Zander and I are responsible for estimating the global sources and sinks of carbon from land use. Our primary work is to document changes in land use, that is, the conversion of forests to croplands, and model the associated changes in carbon. The work calculates the annual emissions of carbon to the atmosphere from countries, regions, and the world. Sometimes, while pulling together the disparate pieces of history and data on carbon we gain insights into other lines of inquiry. An example is the carbon sink we calculate as a result of reconstructing past rates of logging and agricultural abandonment. If our documentation of history is right, there are considerable areas of secondary forests throughout the world, and we can estimate the amount of carbon they are taking out of the atmosphere. That estimate was a clue that forest management might be significant enough to help stabilize the atmospheric concentration of carbon dioxide as the world transitions from fossil fuels to renewable forms of energy.

Left to right: Richard "Skee" Houghton and Alexander "Zander" Nassikas.

I have always been fortunate in having a research assistant or two to help me. Right now, Zander and I are working with data that almost no one else in the world is paying attention to. Zander contributes data analysis and modeling to the project, and my work is much improved by being able to bounce ideas off of him. The best research assistants not only do what needs to be done, but take that extra step and help formulate ideas. Insights obtained by digging deep are rewarding in themselves, in addition to advancing science and possibly suggesting solutions.

Canopy: How has being a research assistant at WHRC influenced your plans for the future?

Zander: My work at WHRC has completely shifted the way I look at the planet. I understood that the Earth was in trouble, but when you actually see the trends in warming, deforestation, or population growth, it's absolutely staggering. I hadn't even heard the term "land-use change" before I came here, but now I see it as an incredible asset in climate mitigation if done intelligently and in an organized and careful manner. My future plans now include earning a graduate degree in forestry, which would never have crossed my mind a few years ago. Overall, my career plan is to work as hard as I can to keep this planet habitable. I consider myself lucky to have begun my career at WHRC and with Skee. I don't know exactly what the future holds, but I do know that I am well prepared for it.

Canopy: What have you learned from Zander?

Skee: From Zander I have learned the power of naiveté. The question "Why?" isn't asked nearly enough in science—but it's enormously valuable. It helps define what's important, and it helps demystify science for those who are not scientists.

Canopy: What are some of your memorable moments working with Skee?

Zander: The most memorable moment was when Skee came into my office and asked if it would be okay to list me as a co-author on his commentary to be submitted to *Nature Climate Change*. I tried to stay as calm as I could, but I was off-the-walls ecstatic. This would be my first publication, and to have my name in the same author line as R.A. Houghton would be amazing. The publication process itself was also memorable, as it gave me a behind-the-scenes look at the scientific method, especially as it pertains to publication and getting an idea out there.

Another time, Skee and I were walking in the woods behind his house. He was looking for fallen logs to stock up on fuel for winter. I thought about how amazing it was to walk through the woods with someone who has spent his career studying carbon emissions from the world's forests. I asked him if he thought it was hypocritical to burn wood and thus release carbon. He replied, "You know, these forests are still growing back from having been pastures 150 years ago. Next year's growth will take up the carbon released through burning this year. I'm just accelerating the decomposition process—and I'm not using fossil fuels."

Help Us Spread the Word!

WHRC experts are passionate about helping the public understand the science behind climate change, and we know you are too.

You can bolster the cause by sponsoring an event, lecture, or film screening with WHRC experts at your home, business, or social club. Contact Alison Smart to discuss the possibilities: 508-444-1545 / asmart@whrc.org

WHRC has a long and rich history of impacting international climate policy. Through the years, our scientists have helped to discover and implement strategies for climate change mitigation. We are proud of our past and more motivated than ever to do our part in identifying and pursuing opportunities for conservation, restoration and economic development around the world.

30 years of international climate policy

1978

Science magazine publishes a landmark paper led by WHRC founder George M. Woodwell. The study shows that human-induced land-use change might be an important source of CO_2 in the atmosphere. A heated debate ensues and the research agenda takes on the important task of developing methodologies to accurately quantify CO_2 emissions from land-use change.

1979

First World Climate Conference.

1983

WHRC scientist first articulates the "bookkeeping model," still used today to calculate the emissions of CO_2 to the atmosphere from deforestation and forest degradation.

1985

Woods Hole Research Center is established as an independent, non-profit research institute.

1988

WHRC convenes an international conference on "Steps towards an international convention stabilizing the compostion of the atmosphere."

1988

The Intergovernmental Panel on Climate Change (IPCC) is established.

1989

WHRC works with the IPCC to establish the Climate Action Network (CAN) to facilitate co-operation of national and international non-governmental organizations.

1989

WHRC, the Tata Energy Research Institute, the United Nations Environment Program, and the World Resources Institute organize an international conference in New Delhi, India, "Global Warming and Climate Change: Perspectives from Developing Countries."

1990

The IPCC releases its first Assessment Report, with contributions from WHRC scientists.

1990

WHRC and the African Centre for Technology Studies organize an international conference on "Global Warming and Climate Change: African Perspectives," and issue the Nairobi Declaration.

1990

WHRC and the Universidade de Sao Paulo organize the "Regional Conference on Global Warming and Sustainable Development" in São Paulo, Brazil.

1991

WHRC takes part in the first meeting of the Intergovernmental Negotiating Committee (INC) to draft the text of the United Nations Framework Convention on Climate Change (UNFCCC).

1992

WHRC participates in the Rio Earth Summit.

1992

The INC text is adopted and the UNFCCC established.

1995

Berlin, Germany: WHRC works with governmental delegates at the first Conference of the Parties (COP1) where the Berlin Mandate lays the groundwork for the Kyoto Protocol, committing industrialized nations to reduce greenhouse gas emissions.

1995

WHRC leads the establishment of the World Commission on Forests and Sustainable Development.

1996

Geneva, Switzerland: COP2 concludes with the "Geneva Declaration," calling for significant reductions in greenhouse gas emissions. WHRC endeavors to develop additional policy dialogues after the meeting to strengthen ongoing efforts at policy.

1996

The IPCC guidelines use a simplified version of the WHRC "bookkeeping model" for calculating carbon emissions from land-use change.

1997

Kyoto, Japan: The UNFCCC adopts the Kyoto Protocol, committing developed and developing countries to reduce greenhouse gas emissions. WHRC co-organizes a panel discussion with experts from Asia's leading policy research institutions.

1998

Buenos Aires, Argentina: In preparation for COP4, WHRC co-organizes a workshop to help government delegates formulate priorities and exchange ideas with experts.

1999

Tenth session of the Subsidiary Bodies in Bonn, Germany: WHRC and several other institutions form the Consortium for North-South Dialogue/Partnership for Climate Change.

1999

Bonn, Germany: COP5 delegates continue work on preparing for the future entry into force of the Kyoto Protocol. WHRC experts participate in special side events.

2000

The Hague, Netherlands: WHRC moderates the discussion "Capacity-Building Needs of Developing Countries with a focus on the Implementation for the Kyoto Protocol."

2001

WHRC scientists contribute to the IPCC Third Assessment Report.

2001

Marrakesh, Morocco: COP7 seeks to finalize agreement on the operational details for commitments on reducing emissions of greenhouse gases under the 1997 Kyoto Protocol.

2002

New Delhi, India: COP8 adopts the Delhi Declaration on Climate Change and Sustainable Development.

2003

Milan, Italy: COP9 is remembered as the "Forest COP." Consensus is reached on carbon sinks under the Clean Development Mechanism (CDM.)

2004

Buenos Aires, Argentina: Among other issues, the Parties address and adopt decisions on issues relating to land use, land-use change and forestry.

2005

Montreal, Canada: COP11 establishes an Ad Hoc Working Group on the Kyoto Protocol (AWG-KP).

2006

Nairobi, Kenya: COP12 focuses on climate change mitigation policies that work synergistically with development goals.

2007

Two WHRC scientists are awarded a portion of the Nobel Peace Prize through participation in the Intergovernmental Panel on Climate Change.

2007

WHRC scientists contribute to the IPCC Fourth Assessment Report.

2007

Bali, Indonesia: COP13 negotiations move toward a powerful new mechanism to compensate tropical countries for their reductions of greenhouse gas emissions from deforestation and forest degradation (REDD). WHRC scientists present a report on the Democratic Republic of Congo that draws controversy, highlighting that the majority of carbon emissions come from smallholders rather than industrial interests.

2008

Poznan, Poland: COP14 makes progress on issues of concern to developing nations, including reducing emissions from deforestation and forest degradation (REDD). WHRC gives presentations and leads discussions on four reports related to REDD.

2009

Copenhagen, Denmark: seeks to attain a comprehensive policy framework for responding to climate change on a global scale. WHRC assembles a background document to assess REDD readiness, highlighting potential gaps and synergies and encouraging collaboration and partnerships in all facets of readiness efforts.

2010

Cancun, Mexico: COP16 creates the Green Climate Fund to provide financing for climate-friendly projects in developing countries.

2011

Durban, South Africa: COP17 seeks to resolve the relationship between the Kyoto Protocol and the global climate change agreement. WHRC participates in discussions focused on the global mechanism to reduce emissions from deforestation and forest degradation in developing countries (REDD+).

2012

Doha, Qatar: The Doha Amendment to the Kyoto Protocol is adopted.

2013

WHRC is ranked as one of the world's top three most influencial Climate Change Think Tanks by the International Center for Climate Governance.

2013

Warsaw, Poland: COP19 adopts decisions to further advance the Durban Platform, the Green Climate Fund and Long-Term Finance, and the Warsaw Framework for REDD+.

2014

The International Center for Climate Governance ranks WHRC the world's most influential Climate Change Think Tank of 2014.

2014

WHRC scientists contribute to the IPCC Fifth Assessment Report.

2014

Lima, Peru: The goal of COP20 is the creation a draft agreement requiring emissions reductions by all signatories in advance of COP21. The resulting Lima Accord commits all signatories to create national emissions reduction plans. WHRC scientists participate in four official side events.

2015

The International Center for Climate Governance again ranks WHRC the world's most influential Climate Change Think Tank.

2015

Paris, France: 196 countries sign the Paris Agreement aimed to limit global warming to less than 2°C.

1978 1979 1983 1985 1988 1989 1990 1991 1992 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

Guardians of the forest

WHRC and indigenous people of the tropics

With science, maybe they will listen to us.

This poignant remark was made at COP21 in Paris by Juan Carlos Jintiach, a member of the Shuar, an Indigenous group in the Amazon Rainforest of Ecuador and representative of the Coordinator of Indigenous Organizations of the Amazon, or COICA, during a joint press conference with WHRC and its partners.

The press conference promoted a recent analysis on carbon stored in indigenous territories within tropical regions, arming leaders of these traditional communities with powerful data supporting policies which protect their lands and their rights. Led by WHRC Associate Scientist Wayne Walker, the analysis maps and quantifies, for the first time, the carbon stored in indigenous territories across the world's largest expanses of remaining tropical forest.

Tropical Forest Carbon in Indigenous Territories: A Global Analysis reveals that the carbon stored aboveground in tropical forests contained within indigenous territories spanning Mesoamerica, Amazonia, the Democratic Republic of the Congo (DRC) and Indonesia is equivalent to more than three times global fossil fuel emissions in 2014. This represents more than one-fifth (20.1%) of the carbon stored above ground in all the world's tropical forests—a conservative estimate because robust data on the distribution and extent of indigenous territories in other parts of tropical Asia and the Congo Basin remain either lacking or out of reach.

"Indigenous peoples worldwide have always been thought of as guardians of these forests," explained Dr. Walker. "Now we have shown that they are also the caretakers of a significantly large store of potentially vulnerable carbon and are therefore global players in climate change mitigation. We know they are reliable keepers of that carbon—and the range of globally important ecosystem services provided by tropical forests—but only if their role is formally recognized in the context of national and international policy processes.

Although indigenous communities practicing traditional ways of life have a much lower impact on tropical forests than westernized cultures, their ability to prevent illegal development and protect their territories from high-impact uses is often limited by a lack of legal and financial support, including a lack of formal title to their lands. Currently, almost half (45.5%) of the carbon contained in the indigenous territories of Mesoamerica, Amazonia, DRC and Indonesia is considered at risk because it lies within territories that lack legal recognition.

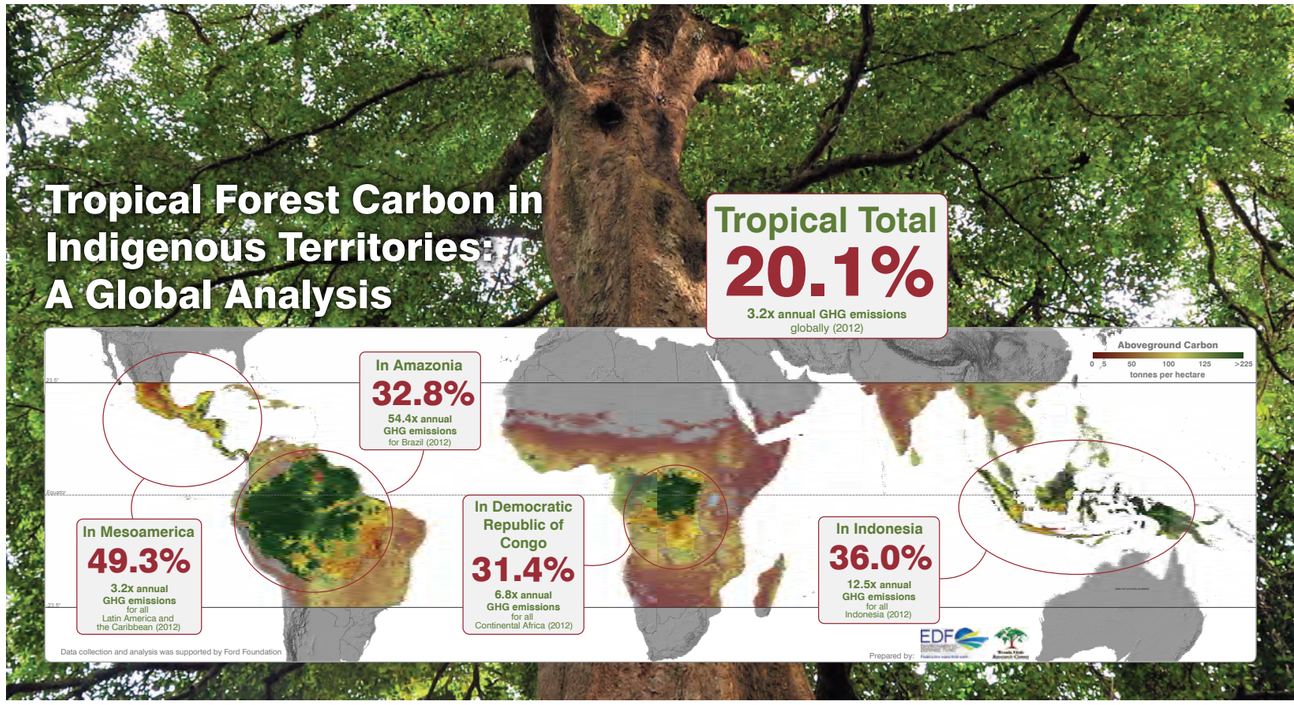
Addressing the situation in these vulnerable territories represents an important opportunity to positively impact climate change through tropical forest conservation. Strong tenure rights will enable indigenous peoples to better protect their lands—and the forests they contain—from outside development and other threats. Dr. Walker's analysis provides compelling evidence that countries with indigenous territories could increase their Intended Nationally Determined Contributions (INDCs) to climate change mitigation by granting land tenure rights and recognizing the contributions of indigenous peoples.

Previous research has shown that community forest rights that are legally recognized and protected by governments often translate into healthy forests with high forest carbon storage and reduced deforestation. But achieving secure rights requires investments to strengthen legal protections and ensure their implementation, as well as to strengthen the capacity of local people to sustainably manage and benefit from forest resources.

In Paris, indigenous leaders and their networks, including WHRC, called upon world leaders to help their members protect tropical forests in their territories. As a result, the Paris Agreement prominently recognizes the importance of protecting the world's forests, recognizes the major role to be played by indigenous peoples in that effort, and establishes an international platform for these groups to share experiences and best practices on mitigation and adaptation.

Now with a landmark climate agreement in place, WHRC will embark on a new research effort that builds upon our existing work with indigenous peoples in Amazonia. Financed by the Norwegian Forest and Climate Initiative (NICFI), this five-year project will seek to better identify and understand the drivers of deforestation and quantify associated carbon losses within indigenous territories and inhabited protected natural areas. The results will be used to provide a scientific basis of support for strengthening Amazonian indigenous organizations' land use planning and territorial rights efforts while aiding the private sector to better understand when it is contributing directly or indirectly to forest loss that impacts indigenous territories.

Dr. Alessandro Baccini (third from right) teaching representatives from indigenous groups in the Amazon Basin how to measure tree diameter as part of a series of capacity building training workshops in Ecuador.



The fallacy of "pristine ecosystems"

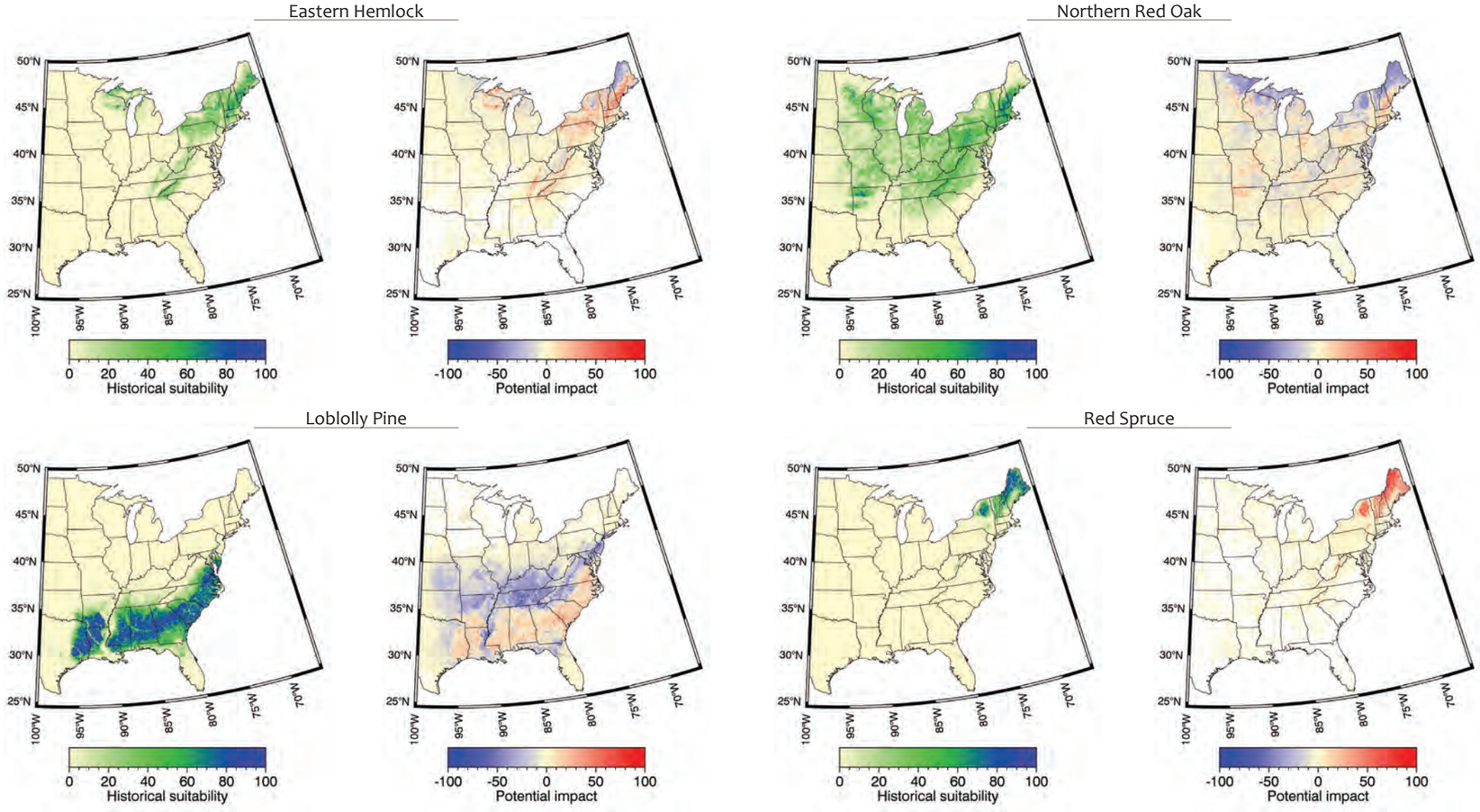
Managing national parks in a changing climate

National park managers within the United States are expected to maintain parks in a "pristine, natural state." For many decades, national park management strategies have been designed to achieve pre-European ecological conditions. Climate change, however, is upending many of these plans by altering distributions of plant and animal species. New work led by Drs. Patrick Jantz, Brendan Rogers, and Scott Goetz creates tools to assist national park managers in planning for changing future landscapes.

The scientists studied three national parks (Great Smoky Mountains, Shenandoah, and the Delaware Water Gap) and modeled current and projected tree species distributions under different future-climate scenarios over the next 85 years. They found significant changes in the distribution of many species, including Eastern Hemlock, Sugar Maple and Red Spruce, even within the next several decades.

Northern and mountain species are generally hit the hardest. Overall, however, the number of species that gain suitable habitat in the park units is greater than the number that lose habitat, suggesting increased competition for growing space and resources. This raises difficult questions for resource managers. Will the new arrivals be a tide or a trickle? Should they try to hold them back and for how long? Should some species be favored over others? Because there is often a symbiotic relationship between trees and the animals that inhabit them, a change in tree species can radically alter the entire ecosystem. How do managers answer these questions? Should they target ecosystem functions, ecosystem services, species diversity, animal habitats, or something else?

Part of the scientists' work is to identify the adaptive capacity of individual species. For example, which species will be able to keep pace with climate change in fragmented landscapes and utilize newly suitable habitat? How buffered will they be against disturbances and unfavorable environmental changes? The work suggests that many species will not be able to take advantage of new habitat because it is too far away or the intervening landscape is too fragmented, indicating they are highly vulnerable. In these cases, should active management such as assisted migration be considered? The researchers also incorporated maps of suitability for pests and pathogens, which showed that even in places with suitable climate in the future some species will have difficult times fighting off pests and diseases.



Top left: Eastern hemlock is representative of many northern pines and hardwoods that may shift to the higher elevations and more northern parts of New England and the Great Lakes. *Bottom left:* Loblolly pine is common in the south and may migrate northwards because of increased temperature and precipitation. *Top right:* Northern red oak is widely distributed and has a wide tolerance for environmental conditions. *Bottom right:* Red spruce is found in the most northern and high-elevation locations, and its habitat suitability is projected to worsen everywhere in the U.S.

The scientists are working with park managers to outline strategies and scenarios for adapting to inevitable transitions in park landscapes. Despite the difficult questions this work uncovers, managers are welcoming; ignorance is not bliss. For example, armed with this new knowledge, national park managers will be prepared to combat new species invasions and pathogen threats to maintain a healthy, though different, system.

Unfortunately, park budgets are stretched to the limit, making it difficult to respond to the immediate impacts of climate change, such as increasing fire, flood and drought. This makes anticipating changes that may happen decades in the future a low priority, often resulting in short-term management approaches with little long-term planning. Data, maps, and assessments like those produced by WHRC are essential for providing park managers with important tools to plan for the realities of the future.

Leaving a Legacy

Planned gifts can allow donors to have a larger charitable impact than they ever thought possible. If you have already included the Center in your estate plans, or would like to learn about planned giving options, contact Alison Smart: 508-444-1545 /asmart@whrc.org

Education and capacity building

Climate change, forest conservation, and economic development in the Democratic Republic of the Congo

The second largest tropical forest on Earth rises within the boundaries of the Democratic Republic of the Congo (DRC), where subsistence agriculture continues to drive deforestation. As the population of these forest-dependent communities grows and the climate becomes increasingly erratic to accomodate traditional agriculture, pressure on the forest increases, leading to overhunting of animals and plants in addition to expanding deforestation. The resulting barren forests require villagers to travel greater distances to gather food and fuel for their families and the marketplace.

Dr. Wayne Walker with local leaders in the Congo, mapping out the boundaries of their territories.

The forests of the Congo Basin contain over 22 billion tons of carbon, and as such play an important role in regulating the global climate. The political turmoil following independence from Belgium in the 1960s, combined with the DRC's vast and diverse mineral wealth, led to a series of violent conflicts, continuing political instability and poor governance. Though moving forward, progress is slow to mend the political system and civil infrastructure decimated by decades of conflict. Achieving progress in an environment where markets do not function and the rule of law is only weakly enforceable is the great challenge of sustainable development programs.

DRC's natural forests are the mainstay of resources for rural household livelihoods. The majority of forest dwellers practice low intensity, traditional "slash and burn" agriculture and harvest wild food products and fuelwood. Deforestation pressures are increasing in this context, where the expanding poor rural population drives the conversion of yet more forest to agricultural land.

WHRC has been working in the DRC for over a decade to promote that nation's interests in international climate policy negotiations. At COP13 in Bali, WHRC scientists identified that it was not industrial interests, as had been assumed, but small-holder farming practices that were causing deforestation in the Congo. These findings led to the creation of the UN program REDD, or Reducing Emissions from Deforestation and forest Degradation, which is designed to disperse international funds aimed specifically to benefit poor, marginalized forest communities to reduce deforestation.

Although national policies and plans for sustainable development are being developed, decades of instability and underinvestment in public policy and infrastructure have resulted in a knowledge vacuum at every government level and little operational or managerial infrastructure. WHRC's DRC program, Projet Equateur, was designed to identify and test methods to fill the knowledge and infrastructure gaps to make REDD+ work.

A resident of Buya 1 transplants a fruit tree seedling in the community demonstration orchard, as part of the Projet Equateur agroforestry training program.

The pilot project revolves around community-based sustainable development projects built on forest conservation and management where the communities drive the development activities. WHRC collaborates with community representatives, local government and other institutional partners to plan and manage rural development projects in "real time." This participatory process began in the village of Buya I, where WHRC researchers first held workshops to understand the role of forests in the community.

At the beginning in Buya I, there was no concept of human-caused climate change, but there was widespread recognition of changing natural cycles, including rainfall and drought, coupled with the need to travel greater distances to gather necessities from the forest. Recognition that the impacts of climate changes were not just happening in their community, but around the world, created a new conversation about sustainability and a focus for development. Part of the process is the identification of key threats to local families such as food scarcity, access to healthcare, clean water and education, all of which relate back to economic opportunities. The result is a combination of typical development projects, promoting agricultural training and building schools and water wells, in addition to literacy programs that include climate change and sustainability.

Current projects include implementing new cook stove and charcoal kiln technology, introducing green manure crops to nourish fields depleted of nutrients, establishing test orchards and agroforestry schemes, small stock rearing experiments, building a permanent school, and improving access to potable water. The improved cook stove technology has been particularly well received. There are now 12 low-cost cook stoves scattered around Buya I that serve as "test kitchens" to demonstrate the efficiency of the design—less fuel consumption and more effective heating of cooking pots. Three new drying kilns for food conservation have been built to test the new indirect cassava drying method, which uses less than half of the fuel of earlier models. Selected farmers are testing Mucuna as a green manure to revive exhausted soils with much needed nitrogen and organic matter, and avocado, rambutan, custard apple, and oil palm trees have been propagated and are ready for distribution.

The importance of this work lies not just in the activities that improve livelihoods, but also to document and test the success of these processes and practices for the purpose of creating a new and truly sustainable development model. A deeper, well-documented understanding of the economic costs and benefits of how to plan and manage sustainable development will provide vital information for planning and implementing effective policies at scale. A key collaboration with the provincial institute for agriculture and rural development provides a natural home for the project experiences that can be utilized to teach and train current and future generations of DRC economic development professionals.

Support What Speaks to You

We encourage you to engage with an aspect of WHRC's work that inspires you. The Center relies on the generosity of donors, and we warmly welcome contributions directed toward any of our specific areas of work. To discuss the possibilities, contact Alison Smart: 508-444-1545 / asmart@whrc.org

On the 30th anniversary of Woods Hole Research Center

A note from the Founder, George M. Woodwell

Left: Founder George Woodwell in the early days of Woods Hole Research Center in Fisher House. *Center:* WHRC moves to its new green campus on Woods Hole Road in 2003. *Right:* Our scientists training the next generation of arctic researchers in the *Polaris* program.

From the perspective of an octogenarian, thirty years is but a minute or two. But those years were a big bite from the lives of many of you, who with enthusiasm joined ecologists in trying to figure out how the world works as a biotic system. And you had confidence enough in the mission to help this small group, buoyed by common-sense Katharine, build an institution around a core of principles pried with persistence from insights into the structure and function of units we called "ecosystems." And, as earthly limits in the form of biotic impoverishment emerged from these studies as progressive reality, you endured, even encouraged, our hammering on causes, politicians and economists who dream of an infinite, limitless, world that works according to their hopes and aspirations and contrived rules. Now, thirty years and more later, as we move to a new phase in maturity of science and government, but with even greater challenges, we can look back and celebrate a quite remarkable success in showing that the common property resources of air and water and land as well as equity in access and in all human interactions require continuous definition and defense by science and scientists working in the public interest. Governmental defense of those essential resources flaps in the political winds and requires constant reappraisal and definition by scientists. The role of the independent institute of ecology emerges as essential in empowering government itself.

What a magnificent adventure we all had! The core conviction was that ecology required a free-standing research program, free from the competition of biomedicine, commercial interests, agricultural development, industrial ambitions, and political hegemony. The focus should be global ecology in the age of global climatic disruption, a topic I had decided years earlier was the Big Issue. And the biotic components, long neglected, were very large and our business. So it was and is. You supported us in every way and at every turn. Some will remember how Foster Brown, a geochemist, joined one Christmas when we were painting our new quarters in Fisher House in Woods Hole. And, not much later, Ramakrishna, a lawyer, joined. There was no money at all for these distinguished scholars, no salary, only a purpose. Grants did come and we pushed on with research and vigorous reaches into public affairs. The World Commission on Forests and Sustainable Development held hearings around the world and helped set the stage for the 1992 Framework Convention and its Conferences of the Parties, feeble though they proved. And we moved on to build a campus that stands today as a model of energy conservation and management for the new world of renewable energy and self-sufficient communities. Our contemporary staff, well steeped in science and details of the global flows of carbon, can go to Paris to what appears likely to be the most significant meeting of a decade in resolving the crisis of climate. The staff can carry a fully credible solution to the global carbon crisis built around enhancing the giant natural biotic flows of carbon, the largest and most important in the world, toward the objective of an early shift in climatic trends from warming to cooling with the century-long objective of re-freezing the Arctic!

The Center moves on. We salute a new director with new perspectives and new energy and wish him the same vigor and confidence and energy in the Board and among supporters that has blessed the Center through its first thirty years. And we extend thanks to our leadership: Chairmen, John Cantlon, ecologist, university provost, admirable colleague and friend; and then the magnificently supportive Larry Huntington, long-time associate at the World Wildlife Fund, its chairman and, later, ours for two decades, no less! And now Wil Merck, conservationist, philanthropist and inveterate leader of non-profits. What a delight!

Thank you all!

Thank you, Larry Huntington

This fall, after 22 years of dedicated service, former WHRC Chairman Larry Huntington stepped off the Board and was named an Honorary Director. Here, we celebrate his longtime leadership and enormous impact on the Woods Hole Research Center.

Larry has been remarkable through thick and thin; not only for his wisdom but also his unfailing good humor.

- Thomas Lovejoy, Board of Directors

The Lawrence S. Huntington Environmental Prize was established in 2012 in honor of his service on the WHRC Board. The prize recognizes leaders who advance and promote research and communication on climate, earth sciences and conservation. *Left:* Larry presents the 2013 prize to Gro Harlem Brundtland, Former Prime Minister of Norway.

Larry, I applaud your competent, charismatic leadership for years at the helm of the Board and recently your thoughtful presence on the Board. Many thanks for your commitment; you have made a lasting contribution to the Center. You will be missed!

- Amy Regan, Board of Directors

Larry is a consummate gentleman and natural leader. I think his devotion to the Center came from his respect and concern for the environment which developed from his love of outdoor adventure (ocean racing and mountaineering). He is universally respected and admired for his gracious, inclusive style and his willingness to "stay the course" no matter how great the challenge.

- Vicky Lowell, Board of Directors

Larry was a delight, generous with time and thought, ever gracious and yet clear and firm as a board chairman. At that time, he was leading the Fiduciary Trust Company in New York, not a trifling responsibility. We shared successes and had our disappointments, but we built the funds and the building and the campus, a huge success that enlisted the energy and resources of the entire Board and stalwart supporters.

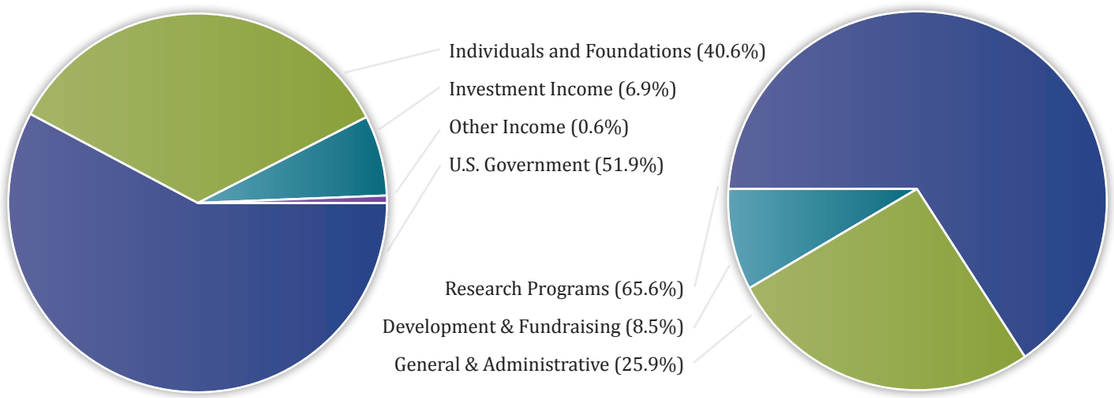
We celebrate and admire his 22 years of dedication to a purpose that he shared and advanced so successfully with trustees, donors, and scholars in building a powerful institutional response to the cascading global crisis of environment. Larry, we salute you!

- George M. Woodwell, Founder

Statement of Activities

2014/2015 Report

Support and Revenue / Expenses



	Unrestricted	Temporarily Restricted	Permanently Restricted	Total 2015	Total 2014
Support and revenue					
Contributions					
U.S. Government	$ -	$ 4,759,371	$ -	$ 4,759,371	$ 4,984,373
Foundations and other	1,979,833	1,739,808	100	3,719,741	3,106,241
Investment income	189,599	443,447	-	633,046	857,655
Donated equipment	20,935	-	-	20,935	10,991
In Kind donations	16,404	-	-	16,404	21,588
Change in value of split-interest agreements	(8,432)	-	-	(8,432)	(9,849)
Other income	19,672	-	-	19,672	9,810
Net assets released from restrictions	6,722,721	(6,722,721)	-	-	-
Total support and revenue	8,940,732	219,905	100	9,160,737	8,980,809
Expenses					
Research programs	5,912,283	-	-	5,912,283	6,286,338
General and administrative	2,332,486	-	-	2,332,486	2,477,491
Development and fund raising	762,775	-	-	762,775	583,502
Total expenses	9,007,544	-	-	9,007,544	9,347,331
Change in net assets	(66,812)	219,905	100	153,193	(366,522)
Net assets					
Beginning of year	6,850,690	2,413,461	3,687,779	12,951,930	13,318,452
End of year	$ 6,783,878	$ 2,633,366	$ 3,687,879	$ 13,105,123	$ 12,951,930

Statement of Financial Position

2014/2015 Report

Fiscal Year 2015 Highlights

In Fiscal Year 2015 (FY15), Woods Hole Research Center received another unmodified (unqualified) audit opinion from the external audit firm of Calibre CPA Group with no findings or questioned costs, demonstrating the integrity of our staff and the diligence of our finance office.

While still challenging, FY15 presented some bright lights over the prior few years. Total revenue was up 2% from $9.0M to $9.2M. Program expenses were down 6% and WHRC reduced general and administrative costs for the year by the same percentage. Total net assets stabilized as a healthy year of earnings on investments was coupled once again with our Board of Directors and our donors demonstrating their commitment both in Annual Fund giving and pledges to our President's Fund for Excellence.

As has been the case for a number of years, the majority of WHRC's revenue has come from US government grants, totaling 52% in FY15, a slight decline from 56% in FY14. And while competition is great for declining federal dollars, we are entering FY16 with significant new funding from NASA through the multi-year ABoVE program and renewed interest from several private foundations whose interests overlap closely with our expertise.

As we complete a full year under the direction of our new President and move into the second half of FY16, we look forward to the fresh opportunities in support of the work we do.

Full financial statements are available at: www.whrc.org/home/financials

	2015	2014
Assets		
Current Assets		
Cash and cash equivalents	$1,695,121	$1,803,857
U.S. Government contributions receivable	532,834	1,034,367
Other contributions receivable, net	949,984	548,122
Prepaid expenses and other receivables	243,545	198,201
Total current assets	3,421,484	3,584,547
Investments		
Endowment and quasi-endowment investments	5,264,206	5,016,353
Other investments	976,098	897,111
Total investments assets	6,240,304	5,913,464
Net property and equipment	6,170,337	6,781,952
Other assets		
Other contributions receivable, net of current portion	448,820	69,065
Beneficial interest in real estate trust assets	212,651	212,651
Bond proceeds held in trust for debt retirement	18,277	19,420
Total other assets	679,748	301,136
Total assets	$16,511,873	$16,581,099
Liabilities and Net Assets		
Current liabilities		
Accounts payable	$262,069	$352,321
Accrued expenses	231,530	237,154
Liability under charitable gift annuities	9,701	9,533
Refundable advances	8,826	16,297
Loan payable	414,192	114,192
Total current liabilities	926,318	729,497
Long-term liabilities		
Liability under charitable gift annuities, net of current portion	52,321	56,230
Loan payable, net of current portion	2,428,111	2,843,442
Total liabilities	3,406,750	3,629,169
Net assets		
Unrestricted		
Operating	2,905,079	2,474,464
Board designated for quasi-endowment	532,488	532,488
Net investment in property and equipment	3,346,311	3,843,738
Total unrestricted	6,783,878	6,850,690
Temporarily restricted	2,633,366	2,413,461
Permanently restricted	3,687,879	3,687,779
Total net assets	13,105,123	12,951,930
Total liabilities and net assets	$16,511,873	$16,581,099

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We are deeply grateful to the individuals, foundations, and businesses listed on the following pages who supported us through gifts and pledges made during the Center's fiscal year July 1, 2014 - June 30, 2015. Donations made after June 30, 2015 will be listed in the next Canopy magazine.

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