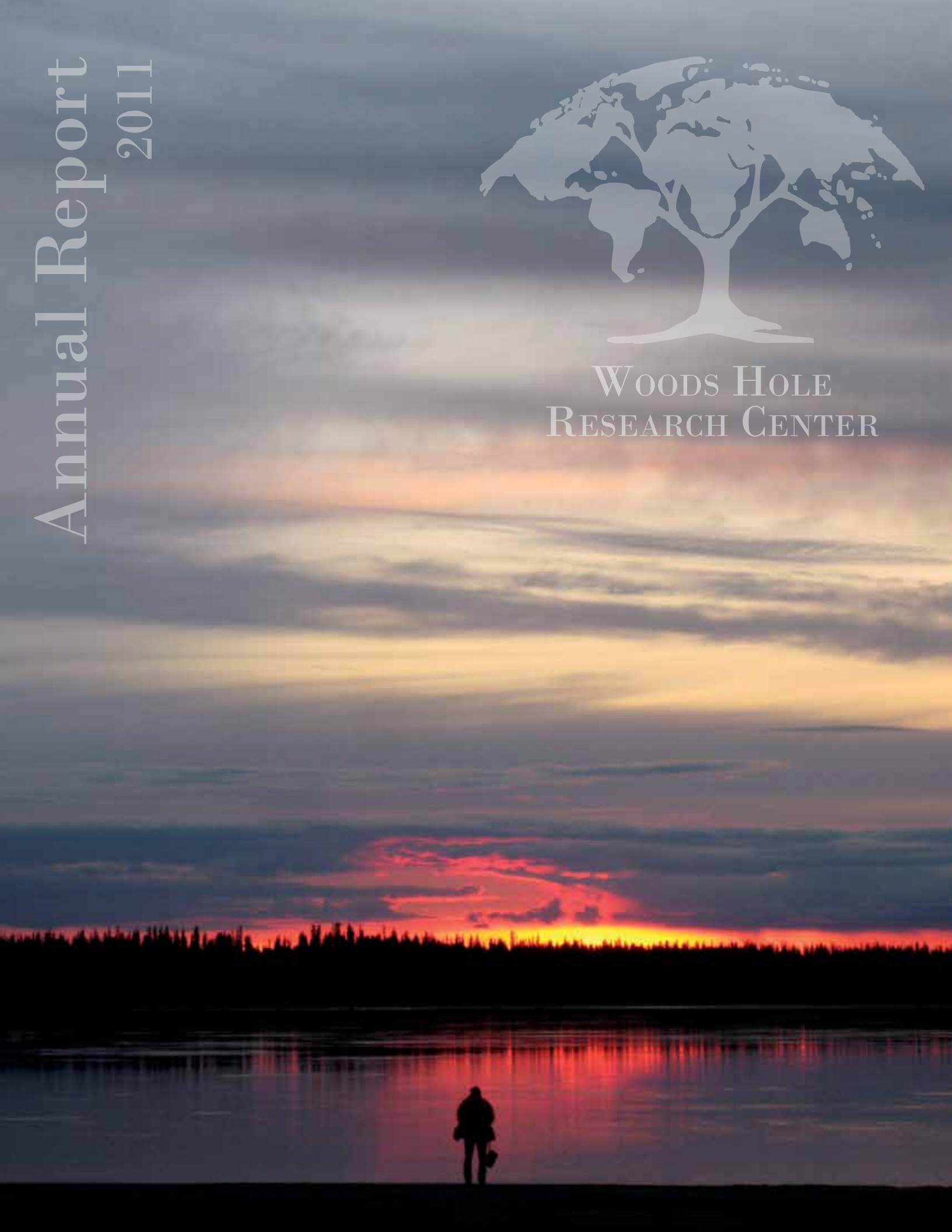


Annual Report
2011



WOODS HOLE
RESEARCH CENTER



A Letter from the Director

Dear Friends of WHRC,

Voices of reason that value knowledge are ever more important in times of challenge – and these are challenging times. The climate is changing at a rate that is unprecedented since humans invented agriculture, but at the same time, segments of our society not only dismiss the evidence but also question the value of science itself.

The forests, soils, air, and water that provide the essential necessities of human well-being and prosperity are also changing. Our scientists, featured in the following calendar pages, combine analysis of satellite images of the Earth with field studies to measure, model, and map changes in the world's ecosystems, from the thawing permafrost in the Arctic to the expanding agriculture regions of the tropics. Some notable highlights of the past year include:

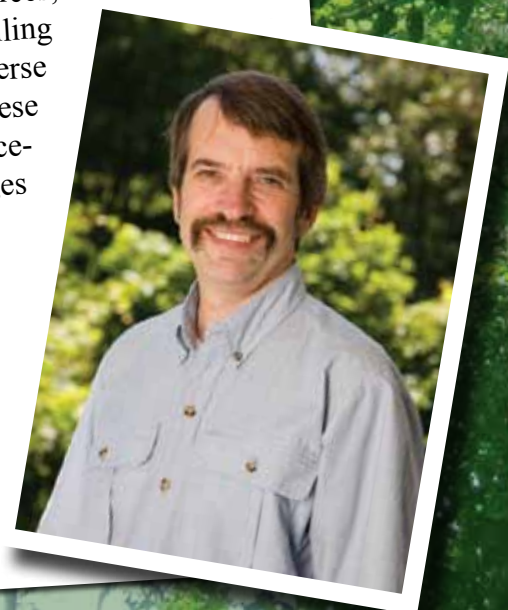
- Completion of the most detailed and state-of-the-art map of forest biomass across the tropics, which will help countries design forest conservation programs
- Initiating a network for monitoring the world's greatest rivers, using chemical analyses of river water as a tool to diagnose changes in the upstream forests and soils
- Releasing a national report on changes in the US nitrogen cycle, chronicling effects on air quality, drinking water quality, climate, and biodiversity and offering solutions

In the coming election year, the findings of environmental science and the value of investing in science and education will be debated in political arenas. At the Woods Hole Research Center we will continue advancing science and knowledge, tirelessly and unyieldingly, as one of society's most important assets. We envision a world in which the insights of science guide management of the Earth's natural resources, so that we and future generations may sustain prosperous and fulfilling lives without degrading the ecosystems that support us and a diverse abundance of life. I thank those who have generously supported these efforts, and I welcome new supporters and partners in seeking science-based solutions to the world's environmental and economic challenges during the coming year.

Sincerely,



Eric A. Davidson
President and Executive Director



Dear Friends,

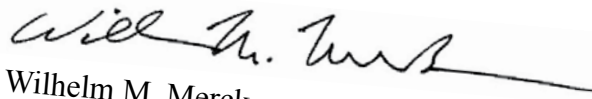
At our June 16, 2011 Board meeting, WHRC completed two transitions. First, the Board appointed Eric Davidson as Executive Director. Eric has been with the Center since 1991, compiling a distinguished career as a soil scientist. Since June, he has thrown himself into the task of managing people, budgets, board members, and all the other issues, large and small, that leadership demands. For a view into Eric's style and mode of thought, I highly recommend his Director's blog, available on our website. It shows, in his own words, why we are fortunate to have him at the helm.

The other transition was my election to Chairman of the Board of Directors, succeeding Larry Huntington. Larry passed the baton having overseen tremendous growth at the Center, in terms of personnel, budgets, and the organization's influence. Larry's 14 year tenure as Chairman was marked by a steady hand, good humor, and complete dedication to the Center and its work. Fortunately, Larry remains on the Board, and the Center continues to benefit from his long experience.

I joined the Center's Board six years ago, having served on the boards of several conservation groups. My career in the investment industry had progressed into timberland investment, which gave me the chance to see natural resource issues from both the for-profit and the conservationist point of view. From that experience, one learns that good science makes for good natural resource management.

As a donor, I value WHRC's high impact, obtained from a relatively small budget. So whether you are a new friend to the Center, or have been with us since the beginning, I appreciate your support and invite you to join us in our next phase on the front ranks of environmental science and policy.

The world needs our work. Thank you.



Wilhelm M. Merck
Chairman



**A Letter from
the Chairman**

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This reflects those on the Board of Directors between July 1, 2010 and June 30, 2011.

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& Van Der Tuin, PC

**Denotes Deceased*

Staff

This reflects those on staff between July 1, 2010 and June 30, 2011. Please visit www.whrc.org for a current roster.

PRESIDENT AND EXECUTIVE DIRECTOR

William Y. Brown, Ph.D. (February 2010 – January 2011)
Richard A. Houghton, Ph.D. Acting Director
(January 2011- June 2011)
Eric A. Davidson, Ph.D. (June 2011 – Present)

DEPUTY DIRECTOR

(June 2011 – Present)
Scott J. Goetz, Ph.D.

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Claudia Stickler, Ph.D.
Thomas A. Stone, M.A.
Mindy Sun, M.S.
Wayne S. Walker, Ph.D.
George M. Woodwell, Ph.D.

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Andrea Cattaneo, Ph.D.
Sudeep Samanta, Ph.D.

ADJUNCT SENIOR SCIENTIST

Richard S. Williams, Ph.D.

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Andréana Paola Mekui Biyogo, Gabon
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Edersson Cabrera, Colombia
Oswaldo Carvalho, Brazil
Marcos Costa, Brazil
Karen Frey, US
Laura Hess, US
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Quyên Nguyen, Vietnam
William Parton, US
Diego Pinheiro, Brazil
Sergio Rivero, Brazil
Sophyra Sar, Cambodia
Abel Siampale, Zambia
Carlos Sierra, Germany
Mukund Srivastava, India
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Sitwala Wamunyima, Zambia
Jorein Vonk, Switzerland
Bienvenu Dinga, Republic of Congo

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Marcia Macedo, Brazil
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Ledimere Oliveira, Brazil

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Lisa Cavanaugh
Annalisa Eisen
Michael J. Ernst
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Emily Olmsted
Tina Praprotnik
Ujwala Ramakrishna



Scott Goetz

*Named WHRC
Deputy Director
and Vice President
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Tracy Johns, M.S.
Josef M. Kellndorfer, Ph.D.
Danielle Knight, B.A.
Nadine T. Laporte, Ph.D.
Paul A. Lefebvre, M.A.
Michael M. Loranty, Ph.D.
Paul Mann, Ph.D.
David G. McGrath, Ph.D.
Daniel Nepstad, Ph.D.
John Poulsen, Ph.D.
Kilaparti Ramakrishna, Ph.D.
Federico Rosario

Sponsored Programs

UNITED STATES AGENCIES

National Aeronautics and Space Administration: Linking Historical and Future Land-Use Change to the Economic Drivers and Biophysical Limitations of Agricultural Expansion in the Brazilian Cerrado, Michael T. Coe

National Aeronautics and Space Administration: A Proposal for LBA-ECO Project Scientist, 2008-2009, Eric A. Davidson

National Aeronautics and Space Administration: Linking High-Frequency, Automated Measurements of Greenhouse Gas Emissions from Soils with Microwave-Based Estimates of Soil Saturation in Agricultural and Forest Landscapes, Eric A. Davidson

National Aeronautics and Space Administration: Modeling Strategies for Adaptation to Linked Climate and Land Use Change in the United States, Scott J. Goetz

National Aeronautics and Space Administration: Continental Scale Modeling of Bird Diversity Using Canopy Structure Metrics of Habitat Heterogeneity, Scott J. Goetz

National Aeronautics and Space Administration: Integrating Vegetation 3D Structure and Ecological Modeling for Continental Scale Assessments of Biodiversity, Biomass and Disturbance, Scott J. Goetz

National Aeronautics and Space Administration: Quantifying Changes in Northern High Latitude Ecosystems and Associated Feedbacks to the Climate System, Scott J. Goetz

National Aeronautics and Space Administration: Carbon Management in the Northeastern US: Assistance to RGGI (Regional Greenhouse Gas Initiative), Richard A. Houghton

National Aeronautics and Space Administration: Biomass for Carbon Budgeting, Richard A. Houghton

National Aeronautics and Space Administration: National Biomass and Carbon Dataset 2000: A High Resolution Baseline to Reduce Uncertainty in Carbon Accounting and Flux Modeling, Josef M. Kellndorfer

National Aeronautics and Space Administration: Ecosystem Structure Measurements from DESDynI: Studies of Technological Options and Data Fusion Using IceSAT/GLAS, Airborne Lidar and LOS/PALSAR Datasets over Central Chile, Josef M. Kellndorfer

National Aeronautics and Space Administration: Biomass Mapping of the U.S. - Past Experiences and Future Directions in Data Fusion and Product Validation, Josef M. Kellndorfer

National Oceanic and Atmospheric Administration: Carbon Implications of Ecosystem Responses to North American Climate Change, Scott J. Goetz

National Science Foundation: BE/CNH: Feedbacks among Forestry, Agriculture, and Fire in Amazonia, Michael T. Coe

National Science Foundation: Fire, Land Use, and the Savannization of Seasonally-Dry Amazon Forests, Michael T. Coe

National Science Foundation: MSM Collaborative Research: Agricultural Expansion in the Brazilian Amazon and Its Influence on the Water, Energy and Climate Cycles, Michael T. Coe

National Science Foundation: Collaborative Research. IPY: Observation and Modeling of Tundra Ecosystem Responses to Climate Change, Scott J. Goetz

National Science Foundation: Collaborative Research: The Northeastern Carbon Sink: Enhanced Growth, Regrowth, or Both? Scott J. Goetz

National Science Foundation: OPUS: Human Modification of the Terrestrial Carbon Balance, Scott J. Goetz

National Science Foundation: Collaborative Research: New Analyses of 50-Year Net Ecosystem Productivity and Carbon Accretion in Secondary Forests, Scott J. Goetz

National Science Foundation: Collaborative Research: Shifting Seasonality of Northern Forest Response to Arctic Environmental Change, Scott J. Goetz

National Science Foundation: Collaborative Research: IPY: Arctic Great Rivers Observatory (Arctic-GRO), Robert Max Holmes

National Science Foundation: Improving Analytical Capabilities at the Northeast Science Station, Cherskiy, Siberia, Robert Max Holmes

National Science Foundation: Collaborative Research. IPY: The Polar Project: Rising Stars in the Arctic, Robert Max Holmes

National Science Foundation: Collaborative Research: ETBC: Controls on the Flux, Age and Composition of Terrestrial Organic Carbon Exported by Rivers to the Ocean, Robert Max Holmes

National Science Foundation: HSD: The Role of Natural Resources in Mitigating Political, Environmental, and Health Shocks to Extremely Poor Households in Southeastern Africa, Nadine T. Laporte

U.S. Department of Agriculture: Automated Measurements of Greenhouse Gas Emissions from Howland Soils, Eric A. Davidson

U.S. Department of Agriculture: Using Model Analyses and Surface-Atmosphere Exchange Measurements from the Howland Ameriflux Supersite in Maine, USA, to Improve Understanding of Forest Ecosystem Cycling, Eric A. Davidson

U.S. Department of Agriculture: Towards Spatially Explicit Quantifications of Carbon Flux (2000-2007) in Northeastern U.S. Forests Linking Remote Sensing with Forest Inventory Data ("RGGI"), Josef M. Kellndorfer

U.S. Department of Energy: Renewal of Collaborative Research: Economically Viable Forest Harvesting Practices That Increase Carbon Sequestration, Eric A. Davidson

U.S. Geological Survey: Yukon River Basin Project, Robert Max Holmes

FOUNDATIONS

Climate and Land Use Alliance: Accelerating Brazil's Transition to a Sustainable Low-Emission Development Pathway: Research, Capacity Building, and Policy Analysis in Support of the National Climate Change Plan, David G. McGrath

ClimateWorks Foundation: Securing and Expanding REDD Successes in Brazil, Daniel C. Nepstad

Cogan Family Foundation: Polaris Project Support, Robert Max Holmes

Armand G. Erpf Fund: Educational Lecture Series, Eric A. Davidson

Armand G. Erpf Fund: Library Collection, Eric A. Davidson

Goldman, Sachs & Co: Valuation and Marketing of the Sustainable Uses of Forests, Richard A. Houghton

Google Foundation: Pan-Tropical Mapping of Forest Cover and Associated Above-Ground Carbon Stock, Josef M. Kellndorfer, Nadine T. Laporte

Grantham Foundation: Avoiding Deforestation in the Amazon, Daniel C. Nepstad

Horizon Foundation: Cape Cod Land Cover: Five Decades of Change, Thomas A. Stone

Gordon and Betty Moore Foundation: An Amazon Floodplain Regional Co-Management System for Biodiversity Conservation and Sustainability, David G. McGrath

Gordon and Betty Moore Foundation: A Regional Co-Management System for Conserving Biodiversity and Sustainably Managing the Lower Amazon Floodplain Regional Ecosystem, David G. McGrath

Gordon and Betty Moore Foundation: Pan-Tropical Mapping of Forest Cover and Associated Above-Ground Carbon Stock, Josef M. Kellndorfer, Nadine T. Laporte

Gordon and Betty Moore Foundation: Replacement of Scientific Equipment for the Acquisition of New Experimental Data on Amazon Forest Susceptibility to Fire, Eric Davidson

Gordon and Betty Moore Foundation: Fire, Land Use, and the Savannization of Seasonally-Dry Amazon Forests, Michael T. Coe

Gordon and Betty Moore Foundation: A Program for Valuing the Potential Reduction of Carbon Emissions from Deforestation and Forest Degradation (REDD) for the MAP Region Designed in Conjunction with Stakeholders that Will Facilitate National and International Negotiations, I. Foster Brown

Gordon and Betty Moore Foundation: A Brazil Low-Emission Land Use Strategy, Daniel Nepstad

David & Lucile Packard Foundation: Pan-Tropical Mapping of Forest Cover and Associated Above-Ground Carbon Stock, Josef M. Kellndorfer, Nadine T. Laporte

David & Lucile Packard Foundation: An Integrated Science, People, and Policy Approach to Supporting REDD across Scales: Brazil and the Forum on Readiness for REDD, David G. McGrath

David & Lucile Packard Foundation: Strategic Planning and Review, William Y. Brown

Adelard A. and Valeda Lea Roy Foundation: Cape Cod Land Cover and Sea Level Rise, Thomas A. Stone

Sheehan Family Foundation: Cape Cod Land Cover: Five Decades of Change, Thomas A. Stone

OTHER

Columbia University: Meeting the Challenge of 2050: Intelligent Agriculture and Food Systems, Nadine T. Laporte

Electric Power Research Institute: Creating Greenhouse Gas Emission Offsets from Avoided Deforestation in the Amazon's Xingu River Basin, Daniel Nepstad

Goodall Institute: REDD Capacity Building in Tanzania, Nadine T. Laporte

Harvard University: Interactions between Climate, Forests, and Land Use in the Amazon Basin: Modeling and Mitigating Large-scale Savannization, Michael T. Coe

Instituto de Pesquisa Ambiental da Amazônia (IPAM): Accelerating Brazil's Transition to a Sustainable Low-Emission Development Pathway: Research, Capacity Building, and Policy Analysis in Support of the National Climate Change Plan, David G. McGrath

Montana State University: Ecological Condition of U.S. National Parks: Enhancing Decision Support through Monitoring, Analysis, and Forecasting, Scott J. Goetz

Norwegian Agency for Development Cooperation (Norad): Forum on Readiness for REDD: Partnerships for Long Term Capacity in REDD Design and Implementation 2010-2012, Wayne S. Walker

Pennsylvania State University: Synthesis of Decadal-Scale Measurements of Decadally-Cycling Soil Carbon in Two New England Forests, Eric A. Davidson

Rutgers University: Denitrification - Integration across Landscapes and Waterscapes, Eric A. Davidson

United Nations Environment Programme: REDD+ in the DRC, Nadine T. Laporte

University of Florida: Experiments in Environmental Governance in the MAP Region: Madre de Dios, Peru - Acre, Brazil - Pando, Bolivia, I. Foster Brown

University of Florida: Strengthening Environmental Management in the Brazilian Southwestern Amazon, I. Foster Brown

University of Maryland: Workshop on Vulnerability and Resiliency of Arctic and Sub-Arctic Landscapes - the Role of Interactions between Climate, Permafrost, Hydrology, and Disturbance in Driving Ecosystem Processes, Scott J. Goetz

University of Wisconsin: Against the Grain: The Effects of Widespread, Intensifying Agriculture on the Biosphere and Climate System, Michael T. Coe

Staff Publications

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zone using synergy of ERS-1/2 tandem coherence and MODIS vegetation continuous fields. *Remote Sensing of Environment* 115(3): 931-943. DOI: 10.1016/j.rse.2010.12.003.

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Solutions

WHO WE ARE AND WHAT WE DO:

The Woods Hole Research Center (WHRC) is a private, non-profit research organization focusing on environmental sciences. Our scientists combine analysis of satellite images of the Earth with field studies to measure, model, and map changes in the world's ecosystems, from the thawing permafrost in the Arctic to the expanding agriculture regions of the tropics. We work locally and regionally, with in-depth expertise and collaborations in North and South America and Africa; and we also work globally, with expertise on how humans are changing global cycles of carbon, nitrogen, and water. Our scientists, economists, and policy experts are internationally recognized leaders in their fields, publishing in the highest quality peer-reviewed journals as well as communicating science in policy arenas. We merge natural science with economics to discover sustainable paths for human prosperity and stewardship of the Earth's natural resources. Some common themes among our various activities include:

- Scientific exploration and research
- Education and outreach regarding how ecosystems are changing and why these changes are important for society
- Science-based solutions to environmental and economic challenges

Our vision is a world in which the insights of science guide management of the Earth's natural resources, so that we and future generations may sustain prosperous and fulfilling lives without degrading the ecosystems that support humanity and a diverse abundance of life.

MISSION STATEMENT:

To advance scientific discovery and seek science-based solutions for the world's environmental and economic challenges through research and education on forests, soils, air, and water.

The following highlights represent a selection of work illustrating our commitment to our vision and mission:

FORESTS are foremost!

Glenn Bush, Nadine Laporte, Alessandro Baccini, Wayne Walker, Greg Fiske, and Chloe Starr organized and led a workshop on Tropical Forest Monitoring in Rwanda in partnership with a variety of local government partners and with the Dian Fossey Gorilla Fund International. Participants included the Rwandan Minister of Natural Resources, directors of the Tourism and Conservation Division of the Rwandan Development Board and the National Environmental Management Authority, and also a representative from the UNEP - UN REDD Program headquarters in Nairobi. A key message was that even African nations with small forest areas compared to Democratic Republic of Congo (DRC) have a lot to



contribute to tropical forest management. Rwanda is a leading regional example of what can be achieved with appropriate leadership and governance in the wake of extreme national insecurity, and under extreme social, demographic and economic constraints, thus contributing to finding solutions to forest conservation challenges.

Wayne Walker participated in a workshop in Mexico City entitled, "Linking community monitoring with national measurement, reporting, and verification for REDD+." The purpose of the meeting was to work toward a consensual view among participants (65 people from 17 countries, including government officials, local NGO representatives, indigenous leaders, and academics/researchers) on how indigenous peoples and local communities can contribute to the monitoring of carbon stock changes. This is an issue that is very much at the forefront of the REDD negotiations, because it is key for workable solutions that are agreeable both to indigenous groups and national governments.

Skee Houghton spent most of the last few months writing papers and contributing four chapters for various books on the role of forests in the carbon cycle. Skee says that "three points need repeating over and over again (with data!). First, the expansion of agricultural lands, globally, has decreased forest cover and added to the atmospheric burden of carbon dioxide. Second, stopping deforestation and reforesting unused lands could reverse that process and remove carbon dioxide from the atmosphere. And, third, natural forests have been accumulating carbon for reasons not well understood." Skee continues to beat the drum that a big part of the solution to our climate change problem has to include forests – keeping the ones we have and re-growing the ones we've lost.

Josef Kellndorfer and Alessandro Baccini received a new USAID grant to support Mexico in its REDD (Reduced Emissions from Deforestation and Degradation) framework. Josef, Alessandro, Wayne Walker, Postdoctoral Fellow Oliver Cartus, Research Assistants Tina Cormier and Jesse Bishop, and UNIX / Linux System Administrator Stanley Hammond will provide the technical leadership of the project, using satellite data for monitoring, reporting and verification of REDD projects



VIETNAM - PHOTO BY WAYNE WALKER

located in Mexico's forests. This project will have high visibility at US and Mexican government levels and will be a leading example of how to make science-based solutions applicable for REDD.

Toby McGrath and Leandro Castello organized a meeting with our IPAM partners that brought together representatives of community organizations, NGOs, and government agencies working in one of the colonist settlements near Santarém, Brazil. The objective of the meeting was to discuss the bottlenecks and to find solutions to managing forest resources, including approval of forest management plans.

Foster Brown was part of a delegation from the State of Acre, Brazil, at a workshop held by the Brazilian Space Research Institute on the origin of smoke that has affected the Amazon for several decades and that has recently worsened. Smoke from forest burning affects millions of square kilometers and often exceeds ten times the maximum level recommended by the World Health Organization. Foster helped facilitate this collaboration between the Brazilian Space Agency and the Acre Public Ministries, marking a key precedent for finding solutions to controlling the burning.

SOIL with a nitrogen focus!

Eric Davidson ran a week-long workshop in Colorado to gather together experts in agronomy, air pollution, soils, aquatic ecosystems, biodiversity, and human health to write a technical report on nitrogen-climate interactions. This report will be submitted in early 2012 to the National Climate Assessment. The report describes the state of the science on understanding how excess nitrogen contributes to climate change and also how climate change can worsen the problems of excess nitrogen in the environment. For example, while air pollution controls have successfully reduced nitrogen dioxide emissions by cars and energy plants in the US, warmer temperatures mean that less progress has been made on air quality than expected. Unfortunately, the same amount of harmful ozone is produced with less nitrogen oxide in the air when the temperature is higher. Epidemiologists attending the meeting provided estimates of mortality and respiratory disease resulting from these climate-nitrogen interactions. A report aimed at identifying solutions for the general public is in final phases of publication.

WATER studies are gelling!

Max Holmes, Mike Coe, and Rob Spencer have initiated monthly sampling on the Amazon River in anticipation of their Global Rivers Observatory project supported by the Harbourton Foundation. Comparing this new undertaking in the Amazon to the historically influential "point measurements" of atmospheric carbon dioxide made by Dave Keeling in Hawaii, this team believes that it is embarking on the next most powerful "Point Observation of

Global Significance" by initiating measurement of carbon flux and composition near the mouth of the Amazon River. Just as blood chemistry can be used to evaluate changes in a person's health, so too can river water chemistry be used to evaluate the changing "health" of a watershed. Diagnosis of a problem is the first step toward finding solutions to it. It is also an extraordinary opportunity for the WHRC, our Brazilian partners, and our collaborators in the Woods Hole Consortium (WHOI and MBL) to make a major contribution by collecting and analyzing samples that are critical for understanding the changes underway in the 6,000,000 km² Amazon watershed.

In addition, this same team has proposed to the National Science Foundation to build a hydrologic and biogeochemical model for the entire arctic region. These new collaborations represent a gelling of our "water" research efforts, combining the strengths of Holmes' and Spencer's field measurements of river chemistry with Coe's expertise on modeling river discharge and how it is impacted by climate and land-use change. Toby McGrath and Leandro Castello contribute their expertise in fisheries management, although the report for Toby falls under forests this time around. Mike Coe also participated in a two-week exploratory visit to the Mekong River that was funded through an NSF grant for "Catalyzing New International Collaborations." He visited researchers, government officials, and local stakeholders in Thailand, Laos, and Vietnam to learn about their concerns for the river and to find places where our work could be helpful. Not unlike the Amazon, the Mekong region is experiencing expanding and intensifying agriculture, dam construction, and resource exploitation, but at a surprisingly fast pace throughout the region. Mike views this as fertile ground for future research projects to help understand the scale of the environmental impacts that are likely to occur with these changes and to point toward mitigation (solution) strategies.



SUCÚA, ECUADOR - PHOTO BY WAYNE WALKER

Financial Report

Fiscal Year 2011 was a challenging one for the Center. The final year of activities for several large private foundation grants which were recognized as revenue in prior years resulted in the significant change in assets (\$21M to \$16M) over the FY2010. Delays in funding and, in some cases, reductions in total awards from various government agencies resulted in a slowdown in some activities. We are happy to note that funds-flow from government sources is returning to what is usual for WHRC in FY 2012. Although significant, less than one half of the Center's core funding comes from government support. We

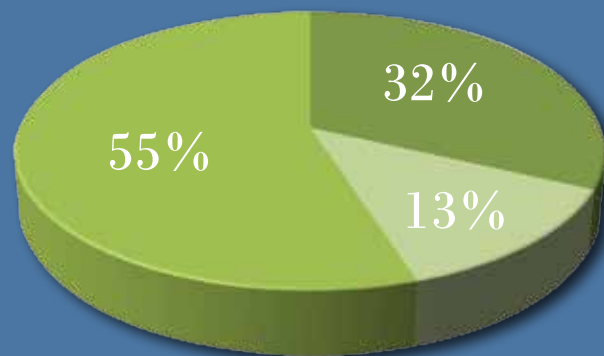
are most grateful for the commitment of our Board of Directors and other long-term and faithful individual donors who acknowledge the urgency of the work done at the Center by supporting our scientists year after year. WHRC appointed a new Director in FY11 and with energized leadership and the continued support of our mission-driven donors we are able to seek science-based solutions to the world's environmental and economic challenges. Donations are put to immediate use in helping to preserve forests, soils and water for this and future generations.

Statements of Activities (in thousands)

	Unrestricted	Temporarily Restricted	Permanently Restricted	2011	2010
Support and Revenue					
Government	-	3,486	-	3,486	3,487
Foundations and Other	-	1,872	5	1,877	4,613
Individual Contributions	1,124	-	-	1,124	996
Investment Income	251	508	-	759	622
Donated Equipment and Other Income	281	10	-	291	47
Gain on Property Sale	-	-	-	-	551
Net Assets Released from Restrictions	9,670	(9,670)	-	-	-
Total Support and Revenue	11,326	(3,794)	5	7,537	10,676
Expenses					
Research Programs	9,341	-	-	9,341	8,760
General and Administrative	2,692	-	-	2,692	2,152
Development and Fundraising	463	-	-	463	438
Total Expenses	12,496	-	-	12,496	11,350
Change in Net Assets	(1,170)	(3,794)	5	(4,959)	(674)
Net Assets					
Beginning of Year	8,819	9,415	3,663	21,897	22,571
End of Year	\$7,649	\$5,621	\$3,668	\$16,938	\$21,897

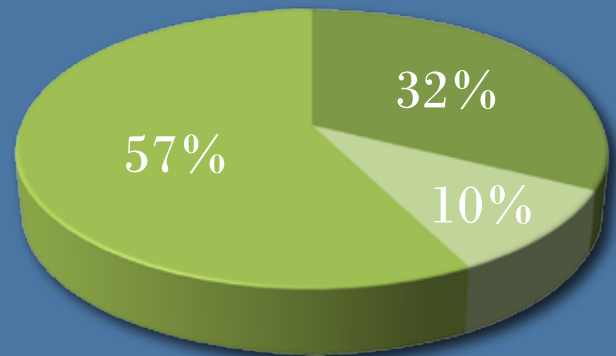
Sources of Funds Comparison

FY10 REVENUE



US Government	\$ 3,818,926
Foundations	\$ 6,549,294
Individual Donations	\$ 1,496,541
Total	\$11,864,761

FY11 REVENUE



US Government	\$ 3,486,145
Foundations	\$ 6,177,636
Individual Donations	\$ 1,124,650
Total	\$10,788,431

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*This reflects giving between
July 1, 2010 and June 30, 2011.*

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Renee Bennett and Kimberley O'Sullivan
Ralph and Cecilia Otto
Gary and Naomi Palmer
Nicholas and Mary Paola
Bernard and Claudine Parisot
Jeffrey and Susan Parker
Walter and Ruth Paul

John and Natalie Payne
Elizabeth Paynter
Herta Payson
Robert and Pamela Pelletreau
Murray and Nadja Pendleton
Susan Peterson
Henry and June Pfeiffer
Donald and Susan Pickering
Paul and Sandra Pimentel
Warren and Kathleen Pinches
Jerry and Sheila Place
Scott and Brandy Ann Place
Roger and Serra May Plourde
Christopher and Pamela Polloni
Priscilla Porter
William Porter
H. Randolph and Dorothy Poulsen
Rex Pratt and Diane McMahon-Pratt
Stephen Pratt
Edward Price
Donald Procter
Elisabeth Raleigh
Alan and Margaret Ranford
Thomas and Ruth Rauschendorfer
Samuel and Mary Raymond
David and Laurie Reed
John Rich
Frances Ricketson
Barbara Riddoch
Pat Riley
Mary Ring
John and Marie Rixon

Alison Robb
James and Derreth Roberts
Samuel Roberts
Mr. and Mrs. Daniel Robertson
Mimi Robins
Eric Roccario
Howard Roche
Peter and Jane Roda
James and Dianne Roderick
Nancy Rodriguez
Joan Rodriguez
Bob and Gabriela Romanow
Edward and Wendy Rose
Robert Rose
Marc Rosenbaum and Jill De La Hunt
Priscilla Roslansky
Perry Ross
Nicholas Rossettos
Michael Ruddy
Gilbert Ruff and Susan Bonthron
Dorothy Ryder
Richard Sailor and Mary Johnston
Norma and Roger A. Saunders and
The Saunders Family Charitable Fund
Paul and Carolyn Sax
Martin and Gladys Schwartz
Dorothy Sebesta
Richard and Lucille Seeley
Deborah Gates Senft
William Sennett



DEMOCRATIC REPUBLIC OF CONGO - PHOTO BY MADINE LAPORTE



BERG EN DAL, SURINAME - PHOTO BY WAYNE WALKER



EIGHT MILE LAKE, HEALY, AK - PHOTO BY MICHAEL LORANTY

Michael and Amy Shaw
 Peter and Anne Sheldon
 James and Lesley Shepard
 Daniel and Joanne Shively
 Thomas and Heidi Sikina
 Vivian Sinder-Brown
 Paul and Mary Louise Smith
 Wesley and Nancy Smith
 Robert and Elizabeth Snow
 May Soll
 Louisa Spencer
 Ann Sprayregen
 John St. Laurent
 Jennifer Stamp and Tom Anderson
 Wallace and Pamela Stark
 Kenneth Stasney
 Stuart Stearns
 Michael Stein
 Peter Stern and Joan Johnston-Stern
 Thomas and Judith Stetson
 Michael and Daphne Stevens
 Gilbert and Sally Steward
 Allan Stocker
 George and Dorothy Stone
 John Swope
 Jared and Heather Tausig
 Michael Testa
 Walter and Nancy Thompson
 Edward and Elizabeth Thorndike
 Art and Dana Tillman
 Timothy and Janet Trask
 Raymond Troxler
 Leo Tugan-Baranovsky
 Joseph Tulchin
 Elinore Tushner

Unitarian Universalist Meeting House
 John and Frederica Valois
 Jack and Uta Valpey
 Alexander and Landis Van Alen
 Vera Van Atta
 Mathias and Cornelia Van Thiel
 Richard and Catherine Viagrande
 Phillip and Ellen Viereck
 Frances Villiers-Fisher
 Martha Vinick
 Karen Vogt
 Arthur and Joanne Voorhis
 Stephen and Carol Ann Wagner
 Robert Walker
 Diana Weatherby
 Frances Weiffenbach
 William and Judith Weil
 Wellfleet Motel and Lodge
 Andreas and Denise Wesslerle
 Robert and Nettie West
 Ruth Whipple
 Stuart and Matilda White
 Susan White and Ellen Corcoran
 The Tamzen White Family Fund
 Linda Whitney
 Joan Wickersham
 Sugan Wigley and John Burnett
 Joanie Wiinblad
 Anne Wild
 Thomas Wilkinson
 Marsden Williams
 Richard and Mary Ellen Williams
 Robert Williams
 Benjamin and Ann Williamson
 Ted and Helen Wilson



RWANDA - PHOTO BY GREG FISKE

Norman and Elizabeth Winskill
Charles and Roxanna Wisniewski
Louise Wolf
John Woodwell
Marjorie Woodwell and Woody Swan
David and Julianne Worrell
Margaret Wright
Gary and Mary Yantz
Roth and Ruth Young
Louise Zawadzki
Erik and Linda Zettler
Michael Zimmermann
Arthur and Charlotte Zitrin
Laura Zschock

GEORGE PERKINS MARSH SOCIETY

Born in 1801, George Perkins Marsh was the first to draw attention to the notion that the natural menace to nature was humans themselves. He published his ideas in a book called *Man and Nature* in 1864, to wide acclaim. Still in print, it continues to influence our vision of the natural world.

The Society, named in his honor, recognizes friends who have elected to partner in the Center's future by supporting the Center through a life income gift, retirement plan, life insurance policy, or bequest. Please let the Development Office know that you have included the Center in your estate plans by calling Kristin McLaughlin at 508 444 1521 or by emailing kmclaughlin@whrc.org.

Deborah Cernauskas
Margaret Cornman*
Robert Downs
Denny Emory
John Eustis
Iris and Robert Fanger
David and Edith Ross
David Hoover and Carol Swenson
Rosalie Talbert*
George and Katharine Woodwell
Redwood and Mary Wright

GIFTS IN HONOR OF:

Foster Brown
from Ed and Pamela Rosenthal

George and Yara Cadwalader
from Benjamin and Ann Williamson

Iris Fanger
from Alan and Elizabeth Green
William and Linda Cotter

Nora Greenglass
from Alan and Fran Greenglass

John Holdren
from Jerry and Lalise Melillo

Skee Houghton
from Jerry and Lalise Melillo

Kira Lawrence
from Charles and Patricia Lawrence

Victoria Lowell
from Elizabeth Foss

David McGrath
from David and Cynthia McGrath

Maryellen Meleca and Christine Graziano
from Jerry and Sheila Place

Colin and David Millar
from Ruth B. Whipple

Mary Lou Montgomery
from Deborah Senft
Duncan and Dorothy Aspinwall

Chris Paola
from Nicholas and Mary Paola

Jerry and Sheila Place
from Scott and Brandy Ann Place

Samuel and Nancy Roberts
from Samuel Roberts, Jr.

Amy Rosenthal and Jason Funk
from Edward and Pamela Rosenthal

Wilson, Cathy and Colette Snyder
from Alan and Judith Hoffman



VIETNAM - PHOTO BY WAYNE WALKER

Tom and Ann Stone
from George and Dorothy Stone

Teachers of Upland Regional School
District from Jeffrey and Susan Parker

Allison White
from Angela Hart Morris
Paulette Loomis

George and Katharine Woodwell
from Abigail Norman
Hamilton and Edith Kean,
Dan and Bunny Gabel,
Richard and Mary Ellen Williams,
William and Margot Moomaw

GIFTS IN MEMORY OF:

Edward Adelberg
from Jonathan Aibel and Julie Rohwein

Clarita Bright
from Sierra Bright

Don O. Currier
from Hazel Currier

Molly and Jack Hough
from Nancy Ketchum

Governor Robert LaFollette
from Andreas and Denise Wesserle

Barbara Little
from Ann Newbury

Governor Gaylord Nelson
from Andreas and Denise Wesserle

Philip Person
from Arthur and Charlotte Zitrin

James R. Roberts
from James and Derreth Roberts

Joan B. Ross
from Perry Ross

Owen Roth, OSB
from Frederick and Barbara McAlpine

Charles T. Russell, Jr.
from Anne Wild

Lloyd O. Sandt, Jr.
from Hobard Heisler

Sandra St. Laurent
from John St. Laurent

G. G. Whitney, Jr.
from Linda Whitney

Roswell Williams
from Vincent and Carol Murphy

Ramsey R. Wright
from Maragaret Wright

**Denotes Deceased*



Please note: This report was prepared with great care, but if errors have occurred, please contact: Kristin McLaughlin, Associate Director of Development, Woods Hole Research Center, 149 Woods Hole Road, Falmouth, MA 02540-1644; 508 444 1521, kmclaughlin@whrc.org



WOODS HOLE RESEARCH CENTER; FALMOUTH, MA. - PHOTO BY DANIELLE KNIGHT



SUCÚA, ECUADOR. PHOTO BY WAYNE WALKER



Once again in our 2011 Annual Report we have included a calendar for the coming year, with each month highlighting WHRC scientists and their research. Because so much of our work is done on the ground around the globe, this year we have included field notes to give you a sense of how we work. By the end of the year we hope that you have learned a little bit more about who we are, what we do, why our work is important, and how your generous support allows us to make a difference around the world. In addition, every month has a QR/link (see below) to take you to a video of each scientist discussing the highlighted work. For more information on WHRC, please visit www.whrc.org.



WHAT'S THIS?

A QR (Quick Response) code allows you to access a website via your smartphone without entering the web address. To use, download a QR code reader app to your smartphone. Then launch the app and scan the code. This code will take you directly to the WHRC homepage.

Use the QR codes on each month of the 2012 WHRC calendar to view videos from the featured scientists, or visit <http://www.whrc.org/resources/videos/AR2011/index.html>.



National Biomass and Carbon Dataset

May 30 4:24 AM

We used hundreds of thousands of forest survey plots to calibrate our carbon mapping models for the Biomass and Carbon Dataset (NBCD) project. We needed an efficient approach to acquire field data and we found this in the partnership with the USDA Forest Service Forest Inventory and Analysis program. It's been a great collaboration, with field trips to the Forest Service's office in Durham to mine the impressive database of close to two million surveyed trees touched by foresters around the country.

JANUARY 2012



In April 2011, the Woods Hole Research Center released the first hectare-scale maps of canopy height, aboveground biomass, and associated carbon stock for the forests and woodlands of the conterminous United States. The multi-year project, referred to as the National Biomass and Carbon Dataset (NBCD), produced maps of these key forest attributes at an unprecedented spatial resolution of 30 m. The dataset represents a comprehensive assessment of forest structure and carbon stock within the lower 48 States at the beginning of the third millennium, providing an important baseline with which to improve our understanding of the United States forest resources and its link to the terrestrial carbon flux in North America. The NBCD data set also fills a crucial gap in biodiversity science and will provide ecologists and land managers with new and better information to support biodiversity conservation, wildfire risk assessment, and timber production while helping climate scientists and others to better understand the role that U.S. forests play in the global carbon cycle.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 New Year's Day 	2 New Year's Day Observed	3	4	5	6	7
8 New Year's Day 	9 New Year's Day Observed 	10 Save the Eagles Day	11	12	13	14
15 	16 Martin Luther King Jr. Holiday 	17	18	19	20	21
22 	23 New Year's Day 	24	25	26	27	28
29 	30 New Year's Day Observed 	31				

December 2011							February 2012						
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25	26	27	28	29	30	31	26	27	28	29			



WOODS HOLE RESEARCH CENTER
whrc.org

Featured Scientist: Josef Kelldorfer, Ph.D. Senior Scientist/Coordinator of the REDD Group
Project: National Biomass and Carbon Dataset
Image: Aboveground Woody Biomass and Carbon Stock of the Conterminous United States.

Day 3:

I met with Mr. Efero, the director of Bureau Diocésian de Développement and the president of a civil society group in Equateur Province, to brief about our project of selecting suitable plot sites for the community mapping workshop.




I presented a series of maps of community mapping the main road from Mbandaka to Bikoro. These maps have information about the different forests, farmland along within the forests, recently cleared farmland, farmland biomass, and the rate of deforestation in this region. We are planning some participatory mapping and socio-economic study in this region, which will inform selection of pilot areas for potential REDD projects.



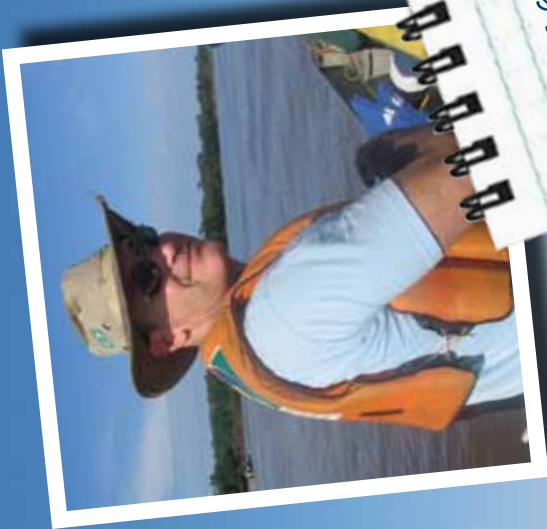
FEBRUARY 2012



While central African countries have been spared the high rates of deforestation in the last decade, the next decade is set to be different. The growing need for food security, economic growth and investment are setting the scene for a potential rapid decline in forest - similar to that of Brazil in the last 4 decades. To help avert more forest loss we organized a series of workshops in the Congo with local communities, universities, NGOs, and national government to discuss the future of the forests and investigate novel pathways to reduce poverty while minimizing forest destruction. A planned new WHRC office in the Democratic Republic of the Congo will help to bridge the gap between science and policy by setting up research projects and build the capacity to improve the management of the world's second largest rainforest on Earth.

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26	27 President's Day	28 Mardi Gras	29 Leap Day																																																																																																																																	
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Today we collected data at our sites on a cattle ranch in eastern Mato Grosso, Brazil. It is a fairly typical example of the streams on a ranch that is designed for efficient cattle production. All of the trees have been removed, and the water is now a sterile environment; it is too hot and the oxygen content is too low to support fish.








MARCH 2012



Rapid agricultural expansion in the southern and eastern Amazon has altered many watersheds in this region. In Mato Grosso, Brazil this is one of the key issues we are researching by installing instruments and collecting a wide range of data on watersheds in evergreen forest, savanna, pasture, and soy landscapes. This data will help us understand the consequences of deforestation on the local water and energy balance in each of these landscapes. Streams in agricultural areas have more water in them than those in areas with native vegetation because monocultures, like soybeans and pasture grass, use less water than the complex natural environment that they have replaced. More water in the streams also indicates that less water is being evaporated by plants and returned to the atmosphere, which may then decrease rainfall. The field data we collect will be combined with our computer models of the Amazon to allow us to understand how these alterations occurring locally may create larger regional climate changes and ultimately affect the future of the Amazon Basin.

This project is a collaborative effort between the Woods Hole Research Center, Marine Biological Laboratory, the Instituto de Pesquisa Ambiental da Amazônia, and the Federal University of Viçosa, Brazil.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
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18	19	20	21	22	23	24
25	26	First Day of Spring 27	28	29	 FIRST	31
						St. Patrick's Day



WOODS HOLE RESEARCH CENTER
 whrc.org

Featured Scientist: Michael T. Coe, Ph.D. Senior Scientist/Coordinator of the Amazon Group
 Project: Agricultural expansion in the Brazilian Amazon and its influence on the water, energy and climate cycles
 Image: Small stream in a cattle pasture in eastern Mato Grosso, Brazil. Courtesy of Michael T. Coe.







I pass stone walls as I walk through the woods of Woods Hole on my way to and from the Center nearly every day. Obviously, the walls weren't built in the woods but in a former landscape of sheep and pastures. The forests grew back around the stone walls when pasturing moved west more than a hundred years ago. It's hard to imagine a treeless landscape here.

APRIL 2012



One of the key elements to stabilizing the concentration of CO₂ in the atmosphere is management of forests: nations must stop deforestation and, at the same time, expand the areas of forests. The transition from deforestation to reforestation has occurred in many of the developed countries but in only a few of the developing ones. The good news is that rates of deforestation in Brazil and Indonesia have fallen significantly in recent years. The not-so-good news is that deforestation seems to have resumed in the northeastern U.S. --- this time not for new agricultural land but for commercial development and second homes. The transition from deforestation to reforestation may not be as permanent as commonly thought.

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<table border="0"> <tr> <td colspan="3">March 2012</td> <td colspan="3">May 2012</td> </tr> <tr> <td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td> <td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td> </tr> <tr> <td></td><td></td><td></td><td></td><td>1</td><td>2</td><td>3</td> <td></td><td></td><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> <tr> <td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td> <td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td> </tr> <tr> <td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td> <td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td> </tr> <tr> <td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td> <td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td> </tr> <tr> <td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td>31</td> <td>27</td><td>28</td><td>29</td><td>30</td> </tr> </table>							March 2012			May 2012			S	M	T	W	T	F	S	S	M	T	W	T	F	S					1	2	3				1	2	3	4	5	4	5	6	7	8	9	10	6	7	8	9	10	11	12	11	12	13	14	15	16	17	13	14	15	16	17	18	19	18	19	20	21	22	23	24	20	21	22	23	24	25	26	25	26	27	28	29	30	31	27	28	29	30
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Featured Scientist: Richard A. Houghton, Ph.D. Senior Scientist
Project: Global Carbon Cycle
Image: Woods of Falmouth, MA. Courtesy of Diane Quaid.







X Day 1: Hurricane Irene makes landfall 150 miles west of Cape Cod. The Cape's vulnerability to the sea and warming-induced sea level rise is clearly illustrated in the background space photo taken in June 2011. The impact of Hurricane Irene, with winds diminished to 40 to 60 mph, still flooded many coastal streets, as seen in the lower left insert, and knocked out power across the region, to 40 to 60 mph, still flooded many coastal streets, as seen in the lower left insert, and knocked out power across the region, upper left insert shows historical hurricane tracks for the region, wind speeds include: green = 46 to 69 mph; yellow = 70 to 86 mph; orange = 87 to 109 mph; and red = > 110 mph.



MAY 2012



The Losing Cape Cod project, originally produced in 1999 by WHRC Senior Research Associate Tom Stone, mapped the rapid land-cover changes on Cape Cod due to residential and commercial development from 1951 to 1990. Now, over ten years later, with the support of the Adelaar A. & Valeda Lea Roy Foundation, Horizon Foundation, and the Sheehan Family Foundation, Stone is once again mapping the Cape in his new project, Cape Cod Land Cover and Sea Level Rise. By using GIS datasets from the year 2005, Stone's research spans five decades of mapping and monitoring Cape Cod's environmental changes while illustrating the impact of the potential effects of sea level rise on the land cover, property, and infrastructure of the region. Open spaces and natural lands of the Cape face new pressures from a rapidly changing climate that brings, with warming, increasing rates of sea level rise. This, combined with predicted increased storminess, will likely mean greater rates of coastal erosion, more flooding, and damage to our highly productive salt marshes, which serve as nurseries for much of our fisheries.

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27  FIRST	28 Memorial Day	29	30	31	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p style="text-align: center; font-size: 8px;">April 2012</p> <table border="1" style="width: 100%; font-size: 8px;"> <tr><th>S</th><th>M</th><th>T</th><th>W</th><th>T</th><th>F</th><th>S</th></tr> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr> <tr><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td></tr> <tr><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td></tr> <tr><td>29</td><td>30</td><td></td><td></td><td></td><td></td><td></td></tr> </table> </div> <div style="width: 45%;"> <p style="text-align: center; font-size: 8px;">June 2012</p> <table border="1" style="width: 100%; font-size: 8px;"> <tr><th>S</th><th>M</th><th>T</th><th>W</th><th>T</th><th>F</th><th>S</th></tr> <tr><td></td><td></td><td></td><td></td><td></td><td>1</td><td>2</td></tr> <tr><td></td><td></td><td></td><td></td><td>3</td><td>4</td><td>5</td></tr> <tr><td></td><td></td><td></td><td></td><td>6</td><td>7</td><td>8</td></tr> <tr><td></td><td></td><td></td><td></td><td>9</td><td>10</td><td>11</td></tr> <tr><td></td><td></td><td></td><td></td><td>12</td><td>13</td><td>14</td></tr> <tr><td></td><td></td><td></td><td></td><td>15</td><td>16</td><td>17</td></tr> <tr><td></td><td></td><td></td><td></td><td>18</td><td>19</td><td>20</td></tr> <tr><td></td><td></td><td></td><td></td><td>21</td><td>22</td><td>23</td></tr> <tr><td></td><td></td><td></td><td></td><td>24</td><td>25</td><td>26</td></tr> <tr><td></td><td></td><td></td><td></td><td>27</td><td>28</td><td>29</td></tr> <tr><td></td><td></td><td></td><td></td><td>30</td><td></td><td></td></tr> </table> </div> </div>	S	M	T	W	T	F	S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30						S	M	T	W	T	F	S						1	2					3	4	5					6	7	8					9	10	11					12	13	14					15	16	17					18	19	20					21	22	23					24	25	26					27	28	29					30		
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Featured Scientist: Thomas A. Stone, M.A. Senior Research Associate
 Project: Cape Cod Land Cover and Sea Level Rise
 Images: (background) Cape Cod by Image Science and Analysis Laboratory, NASA - Johnson Space Center; (top left) Hurricane tracks produced by Tom Stone; (bottom left) Sea level rise off Bristol Beach in Falmouth, MA by Mitch Buck, Woods Hole Group.



BUILDING THE GLOBAL RIVERS OBSERVATORY







Nikita Zimov and I had been running our 18ft boat north on Siberia's Kolyma River for over three hours. Our depth sensor told us that the water temperature had been 61F the whole time. Then, within 5 minutes, the water temperature plunged to 34F and we were surrounded by huge hunks of floating ice. We had arrived at the Arctic Ocean!

JUNE 2012



Scientists from the Woods Hole Research Center have joined with colleagues from the Woods Hole Oceanographic Institution, the Marine Biological Laboratory, and collaborators around the world to launch the Global Rivers Observatory, which investigates river chemistry and land-ocean linkages in a growing number of globally significant river systems (see map above). Since river water chemistry is a function of processes occurring in the river's watershed, changes on land lead to changes in river chemistry. Thus, much as human health can be evaluated by analyzing blood chemistry, so too can watershed health be assessed by monitoring river water chemistry. Because river inputs to the ocean impact ocean processes, changes on land are also altering the marine environment. Funded by the U.S. National Science Foundation, the Harborton Foundation, and private donors, this effort is measuring concentrations of carbon, nitrogen, phosphorus, and other naturally occurring compounds in the rivers near their mouths where they empty into the ocean. The resulting data are allowing improved understanding of how climate change, land use change, and other disturbances are impacting the functioning of the earth.

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<p>Father's Day</p>	<p>24</p>	<p>25</p>	<p>26</p>  FIRST	<p>27</p> <p>First Day of Summer</p>	<p>28</p>	<p>29</p>	<p>30</p>																																																																																					







Day 2: I met the boat, an aluminum skiff, that was to take me across the river to the community of Igarapé do Costa. The boat crossed the river to the shore of the large island that divides the Amazon river into two main channels and proceeded upstream along the shore. As we moved up the coast towards the canal into the lakes, we crossed in front of a large ocean-going ore carrier heading up to the bauxite mine at Porto Trombetas. Floodplains are dynamic places, and sooner or later all floodplain areas will be reworked by the river, but instability in the Amazon seems to have increased in recent years, and may be related to increased volume of shipping along the main navigation channel.



JULY 2012



The Amazon varzea, the core area of the Amazon floodplain, is one of the largest and most biodiverse tropical wetland systems in the world. Its fertile soils and abundant plant and animal resources supported some of the densest and most politically complex societies in the Amazon basin. Varzea resources have continued to play a central role in the regional economy. In recent decades the rise of commercial fishing, logging and extensive cattle ranching have modified varzea habitat and depleted key resources, leading to conflicts over access to and use of floodplain lakes, forests and grasslands. WHRC scientists are working with floodplain communities, grassroots organizations, key government agencies and other stakeholder groups, to develop a multi-scale co-management system for reconciling conflicts and sustainably managing varzea resources. The overall objective is to develop the policies, and technical and organizational capacity needed for the co-management of floodplain fisheries and other natural resources and so conserve the ecological integrity and services that major tropical wetlands like the Amazon provide.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2  FULL	3	4 Independence Day	5	6	7
8	9	10  LAST	11	12	13	14
15	16	17	18  NEW	19	20	21
22	23	24	25  FIRST	26	27	28
29	30	31				

June 2012

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27	28	29	30	31		

August 2012

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14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			



Day 18: Carrying a load of sampling equipment up to the glacier terminus the weather briefly clears to reveal Mount Nyiragongo and a spectacular glacier nestled in the valley in front of me. Moving up the mountain and onto the glacier with heavy fieldwork gear the altitude makes it challenging work as I'm currently above 18,000 feet. The glacier, now beneath my feet, offers a unique insight into the carbon cycle as this frigid landscape provides a sentinel environment for the study of perturbation to global ecosystems through increasing anthropogenic deposition of fossil fuel combustion byproducts.



AUGUST 2012



Glaciers and ice sheets combined represent the second largest reservoir of water in the global hydrologic system and glacier ecosystems cover 10% of the Earth, yet the carbon dynamics underpinning these systems remain poorly understood. Increased understanding of glacier biogeochemistry is a priority, as glacier environments are among the most sensitive to climate warming and industrial forcing. Our recent work has found carbon-containing aerosols, derived mainly from biomass and fossil fuel burning, are a source of highly aged but yet reactive carbon to glacier ecosystems. Once deposited on glacier surfaces this material is exported downstream in meltwaters where it provides an energy subsidy to receiving aquatic ecosystems. If this depositional flux is ubiquitous and anthropogenic, then the surface biogeochemical cycles of today are universally post-industrial in a way we do not fully appreciate. In frigid glaciers any input stands out, making glaciers ideal sentinel ecosystems for the detection and study of anthropogenic perturbation of remote environments through deposition.

Sunday		Monday		Tuesday		Wednesday		Thursday		Friday		Saturday	
<small>July 2012</small> S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	<small>September 2012</small> S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30												
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Featured Scientist: Robert G. Spencer, Ph.D. *Assistant Scientist*
 Project: Is the export of ancient, labile carbon from glacial ecosystems driven by the deposition of fossil fuel combustion byproducts?
 Image: Mount Nyainqentanglha in the Tibetan Himalayas. Courtesy of Robert G. Spencer.

Partly Cloudy

Weather

Date Sept. Time 3:52pm

Location Howland Forest

Notes


We set up our new laser system for measuring carbon dioxide, methane and nitrous oxide in a forested swamp near Howland Forest Maine. The system is running smoothly, collecting these three gases emitted from soils every second of the day. We thought our biggest issue with this system would come from putting it in a wet swampy area, but it turns out that we have to be careful about moose who seem to be attracted to our instrumentation and can cause lots of damage.



SEPTEMBER 2012



WHRC scientists are using the latest technology to measure greenhouse gas emission from forest soils. In a project led by Dr. Eric Davidson and carried out by Research Associate Kathleen Savage, a new laser instrument is being used to measure nitrous oxide and methane emissions at the Howland Forest of Maine. Previously, air samples had to be returned to the laboratory for analysis, but we are now one of the first to deploy this new instrument for automated, round-the-clock measurement of these important greenhouse gases. Savage has added the laser to our system for measuring carbon dioxide fluxes, so that we are now measuring all three of the most important greenhouse gases simultaneously. The old-growth forest at Howland includes both wetland and upland soils, providing a good opportunity to study a landscape that is taking up carbon dioxide from the atmosphere but also emitting some methane and nitrous oxide. We can now accurately add up the net effect of all three gases and the role that forests play in moderating the Earth's climate.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<small>August 2012</small> S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	<small>October 2012</small> S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 Labor Day	4	5	6	7	8
2 Grandparent's Day	3	11	12	13	14	15
9 International Day for Preservation of the Ozone Layer	10	18	19	20	21	22
16 International Day for Preservation of the Ozone Layer	17	25	26	27	28	29
23  FULL 30	24					







Day 1: Iquitos Peru
on the bank of the Itaya River near
its junction with the main stem of the
Amazon, a barge brings massive logs down
river for processing at a local saw mill. The
size of the logs suggests that their
journey began at the site of a primary
tropical rainforest likely hundreds
of years old. Such age-old forests,
capable of storing carbon and harboring
biodiversity while feeding and
sheltering forest peoples, are
irreplaceable in terms of their
economic and ecologic benefits.



OCTOBER 2012



Indigenous peoples of the Amazon basin have a special stake in the maintenance of tropical forests. As Amazon forests are cleared for timber production, cattle ranching, and industrial agriculture, indigenous communities risk losing their homes, livelihoods, traditional ways of life and, hence, their cultural identity. Through the UNFCCC and other international initiatives, progress is being made on the design of incentive-based policy mechanisms to compensate tropical nations for reducing greenhouse gas emissions from deforestation and forest degradation (REDD). Indigenous participation in the development of REDD is recognized as being critical to the success of any emissions-reduction program. WHRC scientists, Drs. Baccini and Walker, are involved in capacity building activities focused on indigenous peoples of the Amazon Basin, transferring knowledge on the role that forests and carbon play in climate change mitigation while developing skills needed for their effective participation in REDD.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6
7  LAST	8 Columbus Day	9	10	11	12	13
14  NEW	15	16	17	18	19	20
21  FIRST	22	23 World Food Day	24	25	26	27
28  FULL	29	30	31 United Nations Day			
			Halloween			

September 2012							November 2012						
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23	24	25	26	27	28	29	18	19	20	21	22	23	24
30							25	26	27	28	29	30	



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Featured Scientists: Alessandro Baccini, Ph.D. Assistant Scientist and Wayne Walker, Ph.D. Assistant Scientist
Project: Pan-Tropical Mapping
Images: Logging barge, Iquitos Peru. Courtesy of Wayne Walker. Scientists' photo taken during an indigenous cultural event in Puyo Ecuador.




My hand disappears from sight a few centimeters below the silt-laden waters of the Envira River, which means that the hubcap-size freshwater sting rays and several-meter long anacondas become invisible below the surface. Such information gives a certain adrenaline boost to our late afternoon baths in the river.



NOVEMBER 2012



WHRC Scientist Foster Brown has lived and worked in the far western Amazon, in the State of Acre, for more than two decades. His research activities have concentrated on improving the early warning systems for disasters in southwestern Amazonia and measuring how fast the state is clear-cutting and degrading the forests. Dr. Brown explains, “When I try to distill my motivation of why I do science, it comes down to influencing people and their decisions about how we use the planet. If the knowledge produced doesn’t reach people who are making decisions then much of the value of what I do would be lost.” Acre has become a world leader in subnational REDD negotiations and perhaps the most difficult factor affecting the viability of Acre’s proposal will be the informed consent of rural communities to partake in the initiative, in other words, reducing their deforestation rates.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<small>October 2012</small> S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	<small>December 2012</small> S M T W T F S 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	6 Election Day 	7 	8 All Saints Day	9 10	11 12 13 14 15 16 17
4 Daylight Saving Time Ends 11 Veteran's Day 18	5 12 19	13 20 26	14 21 28	15 22 29	16 23 30	17 24
25	26	27 FULL 	28	29	30	31








Day 3: A cold day in the field measuring belowground changes associated with permafrost thaw. The carbon stored in permafrost beneath tundra has the potential to substantially warm global temperatures as it is released to the atmosphere, but we don't yet know how quickly this will happen or to what extent feedbacks (such as increased snow cover) might mitigate this effect.

DECEMBER 2012



The impacts of climate change are amplified at high latitudes, and tundra ecosystems are responding rapidly. At the Woods Hole Research Center we are using a multifaceted approach to measure the complex changes occurring in arctic tundra, and to model how these changes will influence climate in the future. One of the first indications of this was our work documenting widespread increases in plant productivity throughout the Arctic, and independent observation of tundra shrub expansion. While carbon dioxide is removed from the atmosphere as a result of increased tundra productivity, the darker shrub vegetation absorbs more solar radiation, leading to additional warming. At the same time, widespread permafrost thaw is changing the very appearance of the arctic landscape, in addition to releasing long-frozen carbon.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
<small>November 2012</small> S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	<small>January 2013</small> S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31					1	
2	3	4	5	 LAST	6	7	8
9	10	11	12	 NEW	13	14	15
Hanukkah Begins 16	17	18	19	 FIRST	20	21	22
23	24	25	26	27	28	29	First Day of Winter 29
30	31 New Year's Eve	Christmas Day					



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Featured Scientist: Scott Goetz, Ph.D. Deputy Director and Senior Scientist
 Project: Tundra Ecosystem Responses to Climate Change
 Image: North Slope of Alaska. Courtesy of Michael Loranty.

Cover Photo: Yukon River, Alaska. Photo courtesy of Robert Spencer.

Opposite page: Cherskiy, Russia. Photo courtesy of Logan Berner.



For more information please contact:
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