Annual Report – FY2015

Research Activity for the period

July 1, 2014 to June 30, 2015

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2015 Annual Report to the Vice President for Research

i. Executive Summary

Major Accomplishments (overarching):

Climate change is a major security issue for our country and the world. It impacts human and ecosystem health, the economy, causes geopolitical stress, and increases the likelihood of storms, floods, droughts, wildfires and other extreme events. The Climate Change Institute has a legacy of major contributions to the understanding of the physical, chemical, biological and social complexity of climate change and the application of these findings at local to international scales.

One of several transformational contributions made by the Climate Change Institute is the understanding that the wind systems that deliver moisture, heat and pollutants throughout the planet can shift in a matter of a few years with dramatic and sustained changes in water availability, storms and health at local to regional scales. The Institute uses this perspective to understand and aid in prediction of future hemispheric scale weather impacts with the most recent being abrupt Arctic warming and strengthening of winds around Antarctica. To address the likelihood of continued abrupt changes in climate the Institute is developing software to aid in the understanding of non-linear climate responses for use in climate adaptation and sustainability planning.

CCI and SPIA share an NSF IGERT that is the first of its type in the nation – A2C2 (Adaptation to Abrupt Climate Change) that will by the end of its five-year term educate 25 PhD students.

At the CLAS (Climate Adaptation and Sustainability) Conference (23 October 2014) we launched a framework for developing CLAS plans that include publicly available software to understand past, present and future changes in climate at the level of Maine communities, to develop an understanding of vulnerability to climate change at the community level, and an introduction to a planning system that invokes plausible scenarios at the community level where local knowledge can be applied to produce local solutions. Although the recent CLAS conference was geared to Maine communities the CLAS framework will be expanded in the near future to encompass national to international CLAS planning capability. CLAS is rapidly emerging into a substantially larger effort under the new CCI umbrella of Climate Futures (Appendix i).

Selected examples (youngest to oldest based on report) of additional highlights of major accomplishments follow (selection derived from the CCI News and Events section of our website, for more details concerning each item listed below go to: http://climatechange.umaine.edu/:

- Ice Age to Digital Age - Explore Maine's Ice Age Trail with a free iPad app
- Maine Magazine Names Mayewski a Bold Visionary

- Mayewski Speaks at Arctic Education Event in Castine, Ellsworth American Reports
- Glacial Geology - UMaine Scientists in Mongolia Seek to Learn About Processes that Launch Earth out of an Ice Age - A. Putnam & P. Strand et al.
- PBS Program on Human Evolution Features Gill
- Where's Chuck? STEM Education Connects K–12 students with Scientists in the Field - Ice Coring in Peru - C. Rodda & C. Hamley
- Save the Snow - Undergraduate Research on Ruth Glacier in Alaska - A. Bradford & K. Kreutz
- Being Persistent: UMaine Scientists Taking Part in Dig at Wind Cave National Park - J. Gill/J. Martin/ C. Frost
- Science Reports on Antarctic Climate Change Research - Mayewski, Kurbatov, Spaulding, & Introne
- Providing Climate Context - UMaine scientists help establish link in past abrupt climate changes in Arctic, Antarctic – Kreutz
- Mayewski Delivers Keynote at Maine Emergency Management Conference, Media Report
- PBS Films Saltwater Sparrows at SHARP Site
- 2015 Borns Symposium Award Winners
- 5 reasons Maine should care about warming Arctic waters - P. Mayewski
- Hudson Students Participate in Follow a Researcher, WABI Reports - Rodda, Hamley
- Mayewski Cited in Press Herald Article on Arctic Policy
- 20th Century Dust Lows and the Weakening of the Westerly Winds over the Tibetan Plateau - Geophysical Research Letters - B. Grigholm et al.
- Aspen Faculty Pioneer Award - Abrupt Climate Change, Business and Policy course - J. Mahon/P. Mayewski/M. Hasting
- Current Research Connecting Climate Change, Fishermen and Marine Resources - S. Belknap (Maine Climate News)
- Zaro Leads Second Archaeological Excavation in Croatia
- Foot Steps of the Ancient Great Glacier of North America: A Long Lost Document of a Revolution in 19th Century Geological Theory -- H. Borns, Jr. & K. Maasch
- Doctoral Student's Fishermen's Forum Presentation Cited in Free Press Article – Tanaka
- Gill Quoted in Nature Article on Sexual Harassment, Assault
- Maine Climate Future: 2015 Update Report - MOFGA Conference – Fernandez
- Fernandez appointed to Chair the U.S. Environmental Protection Agency's Clean Air Science Advisory Committee
- Climate Change Institute's Arctic Research Cited in Press Herald Report
- Human Activities are Intensifying the Earth's Natural Greenhouse Effect -- Maasch -- Yale's Climate Connection
- UMaine Climate Change Report Featured by MPBN, AP
- Signs of the Times - Maine Climate Future: 2015 Update
- Birkel Quoted in Press Herald Article on Sea Level Rise off Maine
- Follow a Researcher -- Rodda & Hamley
- Old-timers still remember when Penobscot Bay froze - S. Birkel
- Robert H. Thomas, former CCI faculty, 1937 – 2015

- Mayewski Co-Writes Op-Ed on Climate Change for BDN
- CCI Scientists Guests on Maine Calling Radio Program -- Mayewski, Fernandez, and Birkel
- Extreme weather (video): Researchers look at the effects of a changing environment on Maine's marine waterways, croplands and municipalities – Mayewski & Birkel
- Maximum Impact -- Superstorm Sandy, Tidal Marshes & Migratory Birds -- B. Olsen
- World Ocean Radio discusses the Climate Change Institute and the recent Climate Adaptation and Sustainability Conference
- Successful Crowd Funding Campaign for Climate Change Film
- UMaine Archaeologist Honored for 'Pioneering Interdisciplinary Studies' - D. Sandweiss
- PBS NewsHour Reports on Climate Change Research by Kreutz, Student in Alaska
- Preserving Biodiversity - Falkland Islands - J. Gill, K. Hamley, D. Groff
- Extreme Living: UMaine Researchers Document Highest Altitude Ice Age Human Occupation
- Humans were living at extreme altitudes 1000 years earlier than thought
- Mayewski Quoted in The National Article on Abu Dhabi Climate Change Conference
- Science Nation Reports on Research by Kreutz
- Weathering the Storm - CLAS Conference to prep community planners on ways to cope with climate change
- Documentary Series Featuring Mayewski Wins Emmy Award "Years of Living Dangerously"
- Documentary Series Featuring Mayewski Wins Multiple Awards "Thin Ice"

I. Overview

A. Overview

The Climate Change Institute (CCI) (http://climatechange.umaine.edu), prior to 2002 known as the Institute for Quaternary Studies, is one of the oldest climate research organizations in the world and likely the first with a multi- and inter-disciplinary focus. CCI is a global leader in research and in combination with its University of Maine academic unit partners the institute offers a very strong and unique array of graduate and undergraduate research opportunities. CCI integrates transformational field, laboratory and modeling activities to understand the physical, chemical, biological and socio-cultural components of the climate system of the past and present, to better predict future changes in climate and their impacts here in Maine and across the globe. Institute investigations span the last 2 million years to the present - a time of multi-millennial to centennial scale climate changes punctuated by abrupt (annual to decadal) shifts in climate. CCI investigations inform predictions for future climate change based upon an understanding of the full dynamic range of the natural climate system and the evolving dramatic influence of human activity. CCI has a legacy of major scientific contributions to understanding the timing, causes, and mechanisms of natural and human-forced climate change, and on the effects of physical and chemical climate changes on the biological, economic, social, and political conditions of humans and the ecosystem.

B. Mission

The mission of the Climate Change Institute is vitally linked to the widely accepted realization that an understanding of climate change (natural and human-forced) and its implications is absolutely critical to the future of society, ecosystems, the economy, and governance. As a consequence CCI continues to experience ever-broadening interaction with other disciplines, with other University of Maine researchers, academic and outreach units, and with local, national and international partners. Because climate change underpins the fabric of our society CCI faces rapidly emerging opportunities for application of its findings and expertise to critical issues including: climate change-induced hazards (e.g., severe storms, floods, sea level rise, coastal erosion, drought, heat waves), health threats (e.g., heat stress, drought/flood, disease, air pollution, storms), other economic and social challenges (e.g., water availability and quality, energy, food security, military security, civil unrest, agriculture, recreation, urbanization), and climate change-based decision-making by individuals, NGOs and governmental units.

C. Vision

The Climate Change Institute's vision for the future is summarized in the following statements:

1. Maintain and expand the Institute's role as a national and international leader in the "exploration and discovery" of the integrated physical, chemical, biological and social components of climate change research, education and outreach.
2. Continue to enhance the quality and expand the scope of the Institute's eight primary themes while continually evaluating the potential and necessity for change and additional themes in one of the world's most rapidly evolving security issues – climate change.
3. Expand upon the Institute's 40+ year, highly successful, role model status of shared faculty partnerships with academic units to build a fully coupled, world-class undergraduate and graduate climate change research and education program at the University of Maine.
4. Develop a point of coordination and an identifiable framework for University of Maine climate change research, education and outreach that includes Institute and non-Institute University of Maine partners so that the University of Maine's full climate change potential and value can be realized.

D. Status of Strategic Plan

CCI routinely develops 5-year plans. The laast was developed in 2011 and the most recent early in 2015. In concert with this CCI is participating in the Blue Sky Signature Research Program White Paper process. As a consequence CCI was selected as one of the University's Signature Research Programs and through this process our latest 5-year plan has been distilled into the University of Maine Signature Research Area Vision Statement (Appendix ii).

E. Administration and Staffing Structure (CCI Organizational Chart attached – Appendix A)

II. Serving Maine

A. Community Engagement

1. Climate and Adaptation (CLAS) conference for Maine communities (23 October 2014).
2. Numerous public lectures by all CCI faculty and any graduate students to NGOs, public schools, government.
3. Five-year update of *Maine's Climate Future* that provides a basis for Maine's (public, private, government) understanding of climate change and impacts.
4. Monitoring past and present state of Maine's lakes, forests, soils and coast to prepare Maine's people and their way of life for the future.
5. Making climate data accessible to the scientific community and public through CCI-produced innovative, highly transparent software and cyberinfrastructure that allows Mainers and the world to make informed decisions related to environmental change (eg., 10green™, Climate Reanalyzer™, p301, CLAS layers).
6. Informing Maine and the nation of health implications of their changing air quality.
7. Monitoring ice sheet and glacier volume changes to assess current and future sea level rise for coastal Maine's coastal societies and ecosystems.
8. Developing local to global scale climate model predictions to evaluate threats to Maine including: in-migration of biological agents such as Lyme tick and frequency of heat waves.
9. Predicting future wind speed distribution for planned deployment of offshore wind power to assure maximum efficiency of this remarkable Maine resource.
10. Establishing the intersection of climate and policy for Maine's natural resource industries, notably: lobster, forestry, agriculture and tourism.
11. Examining past and present Native community interactions with Maine's environment.
12. Developing climate and environmental outreach projects for K-12 students and teachers, the public and tourists through lectures, pamphlets, curricula and maps (eg., ECM, ITEST, Maine's Ice Age Trail).
13. Work with the Maine Office of Chief Medical Examiner and Department of Public Safety in death investigation, disaster response, and related policy analysis.
14. Inquiry into sustainability policy including analysis of efforts to balance social, ecological and economic sustainabilities.

B. Economic Development

1. CCI brings research funding into the State that supports students, technicians including analytical equipment, and fabrication of equipment by local contractors.
2. CCI's CLAS platform, Maine's Climate Future, and Climate Futures all provide potential drivers for economic planning at community to State levels.

C. Workforce Development

CCI employs technicians, contractors and students to conduct its research mission.

D. Collaborations with UMaine System Campuses

University of Maine – Presque Isle and the Maine School of Law

E. Collaborations with Other Outside Institutes/Organizations Related to Maine

1. ***Within the University of Maine*** - The Schools of Biology and Ecology, Computing and Information Sciences, Earth and Climate Sciences (half of SECS faculty are also CCI faculty and SECS offers undergraduate and graduate degrees in climate sciences), Marine Sciences, Forest Resources, Food and Agriculture, Policy and International Affairs (CCI and SPIA share an NSF IGERT that will support 25 PhD graduate students over five years – first ever to address abrupt climate change), Department of Anthropology (half of the Anthropology faculty are associated with CCI and they offer undergraduate and graduate degrees associated with climate science), the Honors College, LASST, the Department of Chemistry, the Department of Physics and Astronomy, the Hudson Museum, the Center for Research in STEM Education (RISE Center), the Foster Innovation Center.
2. ***Emerging Associations Within the University of Maine*** – examples include: climate and health with the School of Biology and Ecology and the National Center for Geographical Information and Analysis (NCGIA), environmental sensor development and data transmission with NCGIA and LAAST, innovations in past, present and future climate visualization with VEMI (Virtual Environment and Multimodal Interaction), Abrupt Climate Change, Business and Policy course with the Business School and the School for Policy and International Affairs, and a new joint Climate Change Institute, School of Earth and Climate Sciences, School of Biology & Ecology and Department of Anthropology Graduate Certificate in Interdisciplinary Climate Studies.
3. ***Within Maine*** - Bangor, Lewiston-Auburn and Portland Water Districts, the Department of Water Resources, the Maine Department of the Environmental Protection, the Maine Department of Transportation, the Maine Centers for Disease Control, the Maine Geological Survey, the Maine State Museum, the Lobsterman's Association, the Gulf of Maine Research Institute, The Island Institute, The Nature Conservancy, Audubon, Manomet Observatory, Conservation Law Foundation, Maine Natural Resources Council, Maine Physical Sciences Partnerships, Schoodic Education and Research Center, Acadia National Park, Unity College, College of the Atlantic, Maine Lakes Environmental Association, Kezar Lake Watershed Association, Acadia National Park, Big Reed Forest Reserve, Maine Natural History Observatory, Toothacher Pond Association, Maine Coastal Island Wildlife Reserve, Penobscot Bay Teacher's Collaborative, Preti Flaherty Law, MicMac Environmental Monitoring Laboratory, Maine Lung Association, Eastern Maine Medical Center, Maine Estuarine Research Institute.

F. Collaborations with Other Outside Institutes/Organizations Outside of Maine

1. ***Federal (examples)*** - Acadia National Park, US Department of Agriculture, US Forest Service, US Geological Survey, Oak Ridge Laboratory, National Center for Atmospheric Research, University Corporation for Atmospheric Research, National Weather Center, US Fish and Wildlife, Homeland Security.
2. ***US institutions (examples)*** - Dartmouth College, Harvard University, Lamont-Doherty Earth Observatory, Princeton University, University of Washington, University of Nebraska, University of Oklahoma, Appalachian State University,

University of Cincinnati, Texas Tech University, Kansas State University, University of Wisconsin, Brown University, University of Wyoming, Harvard Forest, University of Minnesota Natural Resources Institute, Minnesota Pollution Control Agency, Washington State University, Washington Central University, Konza Prairie Long-Term Ecological Research Station, McMurdo (Antarctica) Long-Term Ecological Research Station, American Museum of Natural History, Boston Museum of Science, University of California – Santa Cruz, Berkeley, Santa Barbara, Brigham Young University, Michigan Technical University, Woods Hole Oceanographic Institute.

3. ***International (examples)*** - Academic, governmental and non-governmental organizations in Australia, New Zealand, Canada, Brazil, Chile, Colombia, Argentina, Peru, India, Nepal, Czech Republic, Ecuador, China, South Korea, Tajikistan, Kazakhstan, England, Scotland, Ireland, Denmark, Switzerland, Germany, France, Italy, Spain, Sweden, Norway, Greenland, Iceland and most recently: association with the University of the Arctic consortium and the South Atlantic Environmental Research Institute (Falkland Islands).

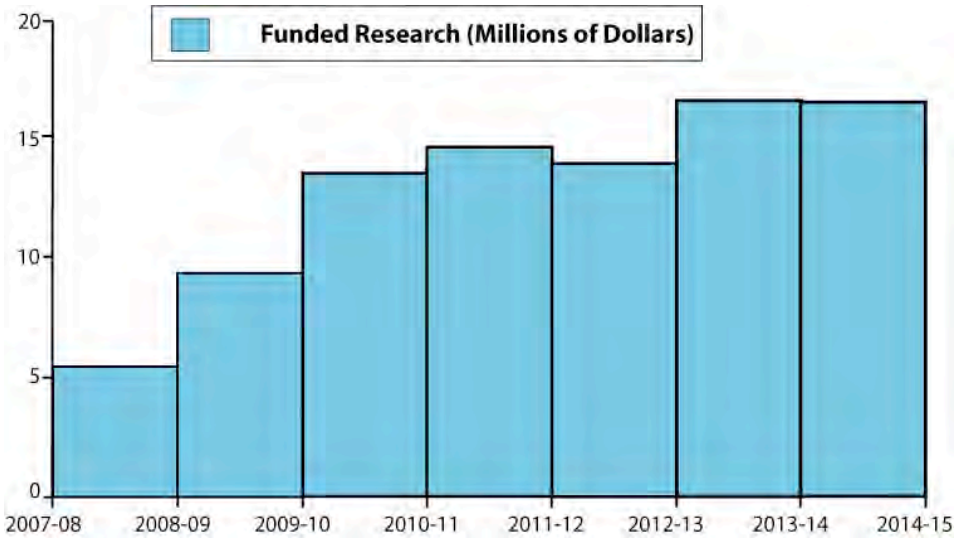
III. Financial Sustainability

A. E&G Support: Salary & Operating Support
E&G Funding for CCI Salaries* (minus fringe): $734,673
E&G Funding for CCI Operating: $16,780

B. MEIF Support
MEIF Funding for CCI Salaries* (minus fringe): $492,571
MEIF Funding for CCI Operating: $28,350

C. Research Funding: Submitted & Awarded, Trends (Appendix B)

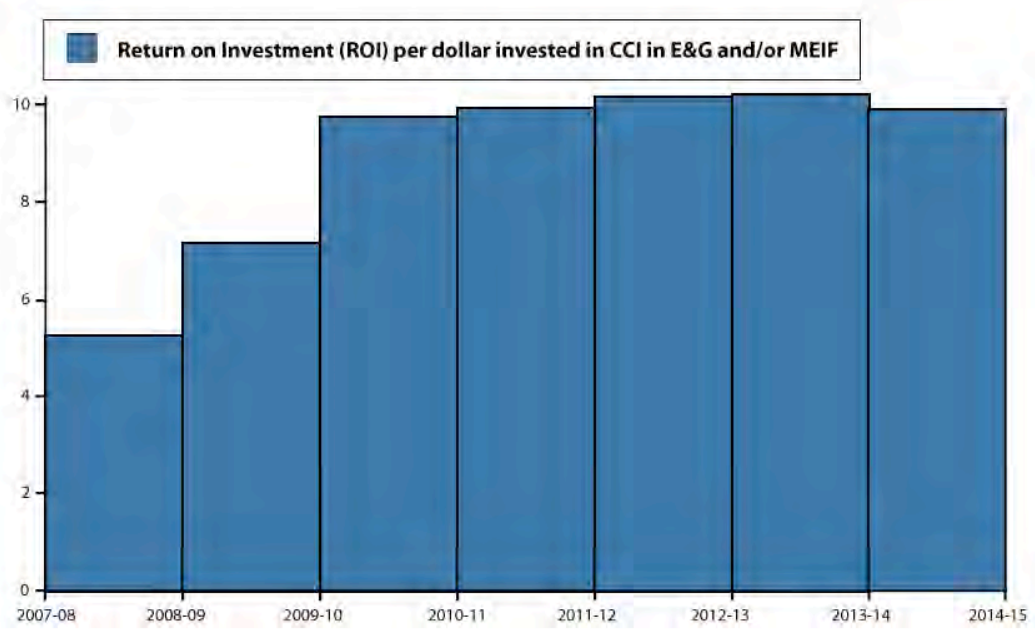
Proposal driven funds (in millions of dollars per year) raised by CCI members.



D. Brief Overview of Each Major New Award (Appendix C)

E. Return on Investment

FY 2015 ROI is $9.843 down from FY2014 ROI at $10.64 dollars per $1 invested in CCI MEIF and CCI E&G.



% SUCCESS RATE (based on ALL FY2015 submissions + continuation grants from BPL listing of current awards).

63 new grants/76 (63 [new, continuation, and supplemental awards] + 13 grants declined)
New = 10, Continuation = 53, Supplemental = 0

SUCCESS RATE: 82.89%

F. Revenue Centers

NA

G. Private Giving/Alumni Cultivation

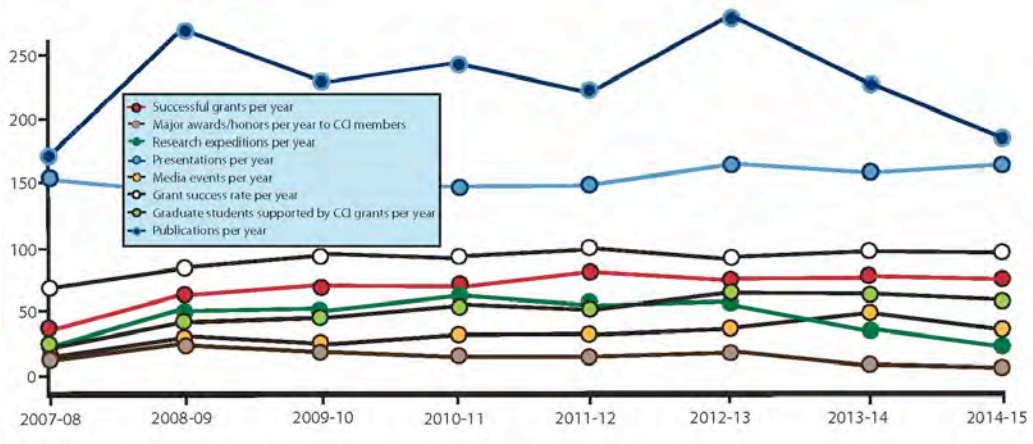
Dan & Betty Churchill Fund
The William Bingham Foundation
Muharram & Barbara Gokcen Fund
Plus several private donors

H. Initiatives to Increase Efficiency

CCI has discontinued base phone service for all CCI graduate students; toll calls related to research are debited to grants.

I. Other

II. Culture of Excellence



A. Faculty Achievements (e.g. awards, recognitions, prestigious appointments etc.)

Special Recognitions/Awards/Honors Received for Research, Scholarship, Creativity	
Denton, George	Distinguished Career Award; Division of Quaternary Geology and Geomorphology; Geological Society of America, Nov. 2015
Gill, Jacquelyn	Bangor Savings Banks/LoRusso Faculty Development Award, Jan. 2015
	Elected Vice President of Communications, International Biogeography Society
Koons, Peter	Elected Fellow, American Geophysical Union
Hall, Brenda	US Representative for SCAR
Mayewski, Paul	2015 Maine Magazine "Top 50 Mainers Making a Real Difference"
	Showtime's *Years of Living Dangerously* – 2014 Emmy Award Winner – Major Film Feature
	Victoria and Oxford University Film – *Thin Ice* – Baikal International Film Festival Winner – Major Film Feature
	2014 Aspen Faculty Pioneer Award – given to J. Mahon – Abrupt Climate Change, Business & Policy course – taught by J. Mahon, P. Mayewski, and H. Hastings.
	DeWitt Clinton High School (NYC est. 1987) Notable Alumni
	Honorary Member, University of Maine Class of 1944
Olsen, Brian	NSFA Faculty Outstanding Teaching Award
Sandweiss, Dan	Elected Northeast Regional Vice-President and Member of the Board of Directors, Phi Kappa Phi National Honor Society
	Elected Fellow of the American Association for the Advancement of Science (AAAS)
	Outstanding Faculty Member in Research and Creative Achievement – College of Liberal Arts & Sciences, 2015
Sorg, Marcella	Appointed Vice-Chair, National Institute of Standards, Organization of Scientific Area Committee.

B. Research and Scholarship Summary (e.g., publications, presentations, editorships, exhibits, etc.) (Appendix D)

C. Curricular Innovations/Integration with the UMaine Education Mission

CCI Graduate certificate in interdisciplinary climate studies approved by the Graduate School 2014, course credit goes to academic units

V. Student Engagement, Student Success

A. Undergraduate Student Research, Scholarship or Creative Activities

Undergraduate Student Research – Field Expeditions			
# Undergraduate Students	**Advisor**	**Date**	**Description**
1	Gill, Jacquelyn	June 2015	Field Expedition -Wind Cave National Park
1	Hall, Brenda	Feb. 2015	Field work in Falkland Islands
1	Hamilton, Gordon	Oct. – Nov. 2015	Glaciological Research – East Greenland
40	Northington, Robert	Aug. 2014	Schoodic Experience – Field Course
12	Zaro, Gregory	May – June 2015	Nadin Archaeological Project, Croatia
1	Zaro, Gregory	June – July 2015	Chan Chich Arachaeological Project, Belize

B. Undergraduate Student Awards
Harold W. Borns Symposium – Best Poster Award (2015) – 1st Place: Abigail Bradford

C. Graduate Student Research, Scholarship or Creative Activities
See Borns Symposium appendix of mini-papers – (Appendix E)

D. Graduate Student Awards
The Churchill Award for Outstanding Exploration (2015) – Ana Cecilia Mauricio
Harold W. Borns Symposium – Best Presentation Award (2015) – 1st Place: Benjamin Seliger; 2nd Place: Jennifer McCabe; 3rd Place: Jessica Scheick
CCI Student Outstanding Service Award (2015) – Charles Rodda
Grad. Expo (2015) - Climate Change Innovation Award – Binod Neupane
Grad. Expo (2015) – Natural Sciences Oral Competition – 1st place – Maureen Correll
Grad. Expo (2015) – PechKucha Competition – 1st place – Sky Heller; 2nd place – Maureen Correll
Richard J. Borden Award (Oct. 2014), Best Student Presentation, Society of Human Ecology 20th Annual Meeting – Samuel Belkap III

E. Retention and Graduation Numbers, Initiatives - n/a since CCI supports graduate students but they get degrees in associated academic units.

F. Degrees Granted - n/a since CCI supports graduate students but they get degrees in associated academic units.

G. Highlighted Student Profile: Charles Rodda (Appendix F)

VI. Preserving-Restoring Infrastructure

A. Renovation /Construction Projects Initiated/Completed
Considerable renovation to Sawyer 2nd floor (refurbishing for the new Sawyer Water Research Lab (SWRL)) under the dirction of J. Saros and parts of first floor. Details available on request.

B. Renovation/Construction Projects Planned for Coming Year (i.e., vetted with Facilities Management)

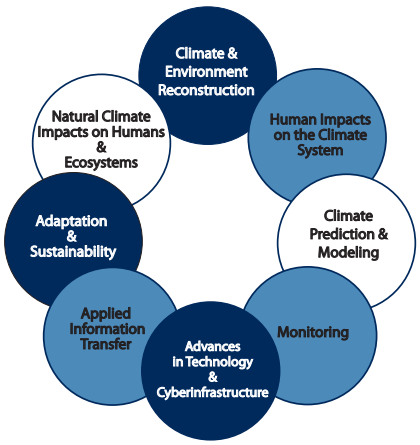
VII. Summary of Anticipated Challenges

For climate change and the Climate Change Institute at the University of Maine to continue to function at the cutting edge of climate change and continue to thrive and lead in the nation and the world requires the following:

- Continued growth in tenure track faculty positions shared between CCI and its legacy academic partners (School of Earth and Climate Sciences, Department of Anthropology, School of Biology and Ecology) and continued collaboration between CCI and cooperating faculty in several academic and research units such as: School of Computing and Information Sciences, the Department of Chemistry, School of Marine Sciences, School of Forest Resources.
- Addition to CCI of research faculty supported at least partially by E&G and/or MEIF with compensation for teaching.
- Expansion and/or addition of transformative new directions for CCI and climate change at the University of Maine including cyberinfrastructure with an emphasis on data integration, analysis and visualization.
- Resources to enhance outreach via CCI and CCI partners to address the increasing demand for climate information, mitigation support, and adaptation and sustainability strategies.

VIII. Summary of New Initiatives

1. Climate change and CCI are now a UM Signature Research program.
2. The Institute has eight major themes that together describe its breadth of contributions and linkages across the University of Maine and at state, national and international levels, and expectations for the future of CCI and climate change at the University of Maine. These eight themes represent the current evolution of the Institute's approach to the rapidly emerging understanding of climate change and the implications of change.

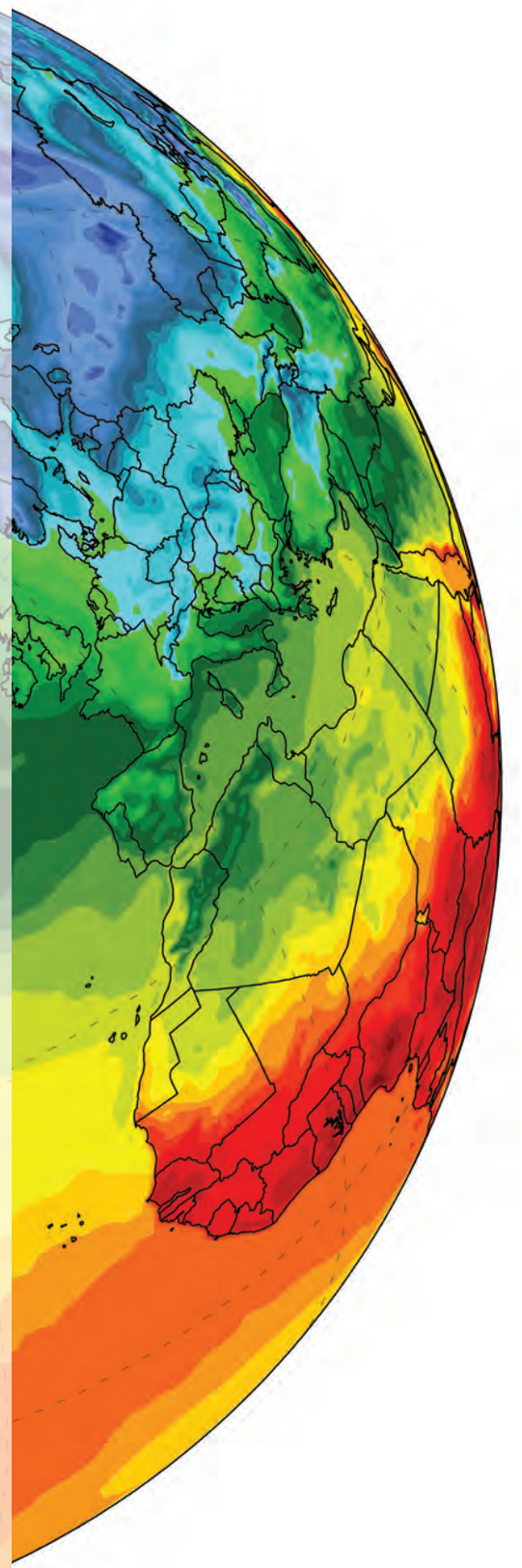


3. Joint CCI-School of Business course in "Abrupt Climate Change, Business and Policy".
4. Potential for future University programs, research and education emanating from the NSF IGERT A2C2 (Adaptation to Abrupt Climate Change) shared between CCI and School for Policy and International Affairs.

Climate Change Institute

The University of Maine's Climate Change Institute has a legacy of major contributions to the understanding of the physical, chemical, biological and social complexity of climate change and the application of these findings at local to international scales. Perhaps most notable is the Institute's role in the discovery and interpretation of abrupt climate change (ACC) – dramatic changes in temperature, precipitation and storm patterns that can occur in a matter of years and last decades to centuries. ACC events occur in the naturally forced climate system, but today human activity is accelerating and magnifying the role of these controls leading to modern day ACC events such as the fast decay of Arctic summer sea ice and the Antarctic ozone hole with consequences such as increased frequency and magnitude of extreme weather events.

CCI's unique perspective combines first-hand understanding of robust archives of past climate and the environment (e.g., ice cores, lake sediments, and human artifacts calibrated with instrumentally recorded data); a diverse array of environmental monitoring systems (e.g., weather, sea level rise, glacier dynamics, lake chemistry, coastal erosion); and in-house generated understanding of weather- to climate-scale descriptions of past, current and future conditions. This climate understanding coupled with local- to global-scale understanding of climate change impacts, vulnerabilities, assets and potential for innovative solutions and opportunities, significantly enhances the potential success of climate change driven planning outcomes, including guidance in climate adaptation, mitigation, sustainability, and resilience planning.



Framework Building: The Climate Futures Team

Key elements of the basic software for the Climate Futures Framework are already operational. In particular Climate Reanalyzer™ and 10green™ attract significant attention and use (>1000 hits/day, several peer reviewed scientific and public media publications by CCI and many other researchers).

CCI and its University of Maine partner the School of Policy and International Affairs are completing a National Science Foundation Integrative Graduate Education and Research Traineeship (IGERT) grant, the first of its kind, entitled: Adaptation to Abrupt Climate Change (A2C2). It is a doctoral training program for students in earth sciences, ecology, anthropology, archaeology, international affairs, and economics. A2C2 is designed to train the next generation of natural and social scientists to meet the critical societal challenge of human adaptation to abrupt climate change (ACC). A2C2 IGERT graduate fellows are trained by IGERT faculty to be experts and leaders on the issue of climate and abrupt climate change in their disciplinary field; to understand the dynamics of coupled natural and human systems in response to abrupt climate change; to conduct collaborative, interdisciplinary research across natural and social sciences; to develop innovative policy and management solutions from their research to foster resilience and adaptation; and to develop an international perspective on adaptation to abrupt climate change including national and international experiences.

Climate Futures will build a team based upon the interdisciplinary faculty interactions and graduate student training model successes learned and developed from A2C2 IGERT. The Climate Futures team will include:

(1) Climate Futures Team Oversight
Paul Mayewski (Director, Professor, CCI)

(2) CCI Generated Software Unit
Lead developer and enhancements leader, Sean Birkel (Research Asst. Professor, CCI) and post-doctoral fellow (TBD)

(3) Climate Futures Inputs Unit
Vulnerabilities, impacts and assets: CCI ecosystem and social science faculty team and graduate student (TBD)

Rates of change, magnitude, timing: CCI physical sciences faculty team and graduate student (TBD)

(4) Climate Futures Products Unit
Plausible scenario and applications: CCI business and economics faculty team and graduate student (TBD)

CLIMATE CHANGE INSTITUTE

For more information on how you can contribute contact:

Dr. Paul Andrew Mayewski, Director, Climate Change Institute
207.581.3019, paul.mayewski@maine.edu

1865 THE UNIVERSITY OF MAINE

Climate Futures

A Pathway

CLIMATE CHANGE INSTITUTE

climatechange.umaine.edu

Introduction

Climate change defines the 21st century in ways that we are only beginning to understand.

How can we plan for the future without understanding climate change impacts on human and ecosystem health, food systems, energy production, the economy, geopolitics, and the future of storms, floods, droughts, wildfires and other extreme events?

Climate Change

Climate and its building block, weather, extend from the uppermost reaches of Earth's atmosphere into the oceans, lakes, streams, soils, fields, forests, rocks and into our homes. Climate and weather have been molding the Earth's surface through long-term variations and catastrophic changes ever since Earth gained an atmosphere. Climate and weather have been feared and revered ever since humans emerged, and plants, animals and humans migrated, thrived, adapted, and ceased to exist in some cases in response to climate change. Climate change influences where we live, our health, our economy, our art and music, and our overall quality of life.

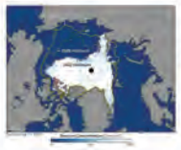
Over the last two decades, science has clearly demonstrated the realities of a changing climate and the highly significant role of human activity in these changes. With this realization, the White House, the Pentagon, and governments around the world understand that climate change is amongst the most serious and ever-present issues on the planet.

Climate Change is a Security Issue

Health (human and ecosystem)
Warming (heat stress, vector borne diseases)
Pollutants (respiratory, neurological, cancer)
Extreme events (drought, flooding, storms, heat stress)

Economy
Energy (consumption, renewable energy)
Technological advances
Redistribution of supply sources and mechanisms
Innovation opportunities
Globalization and regionalization

Catastrophes
Extreme events (drought, flooding, heat stress)
Food supply (physical and chemical impacts)
Climate change refugees
Response capability



Geopolitics
Ice free Arctic Ocean
Climate refugees from drought and storms
Water tower politics
Developed-developing country blame
Shifting agricultural resources

Climate Futures Requirements

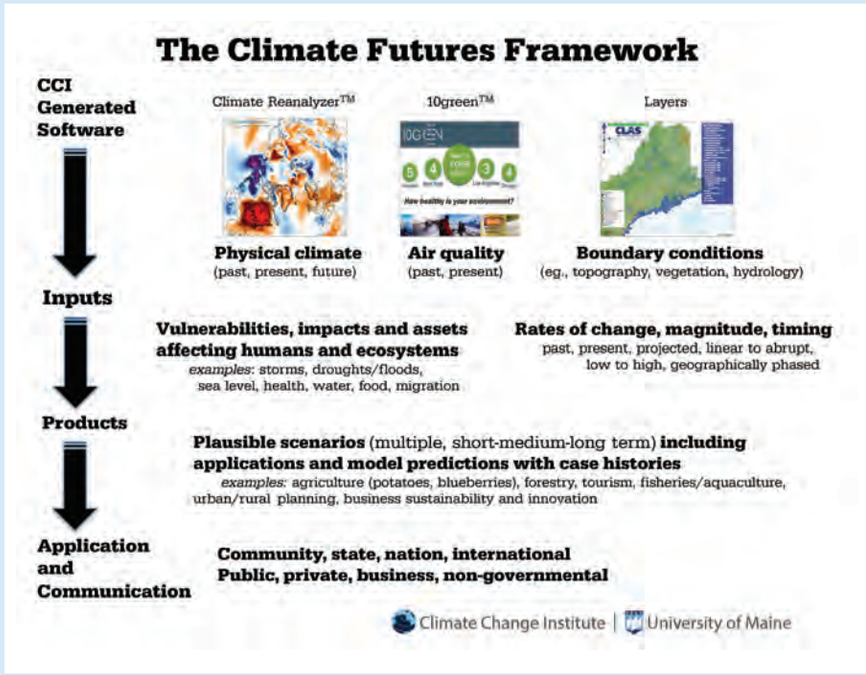
A transparent framework is needed for assessing impacts and addressing vulnerability in a changing climate where intended goals are: mitigation, adaptation, sustainability, resilience, opportunity, and entrepreneurship.

Thinking Outside the Box

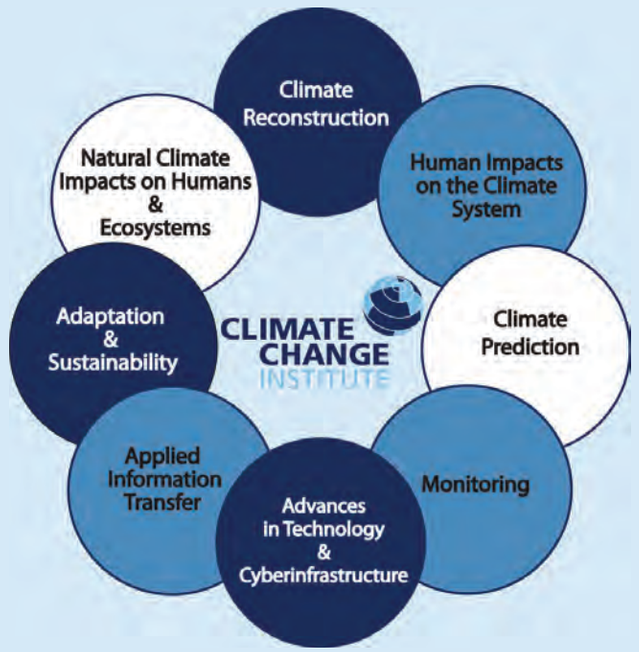
Climate prediction models are an essential element in planning for the impacts of climate change. However, existing climate models based on classic IPCC (Intergovernmental Panel on Climate Change) while essential stepping blocks, do not capture the full local- to regional-scale climate change known to exist in the past; nor do they capture the realities of non-linearities such as abrupt climate change (ACC) in the past and currently emerging climate system, or the full health consequences of changes in the chemistry of the atmosphere, and as a consequence the full range of plausible scenarios for future climate.

The Climate Futures Framework

The Climate Futures Framework offers a transformative mechanism and a platform for assessing and quantifying climate change, vulnerability, impacts, and opportunities based on classic IPCC and past climate analog change predictions, presented in the form of locale-specific plausible scenarios, that go beyond standard linear climate predictions.



Major themes that describe the breadth of CCI's contributions and abilities.



Academic Affairs Signature Area Vision for the Future
Fall 2014 – COVER SHEET – White Papers

I. Designation/Name of Area (Select one):

X Signature; Area name: Climate Change and the Climate Change Institute

II. Submitter information:

Lead Faculty:

Name: **Paul Andrew Mayewski** – Director, Climate Change Institute; Professor, School of Earth and Climate Sciences, School of Policy and International Affairs
Phone: 1-3019 E-mail: paul.mayewski@maine.edu

Name: **Jasmine Saros** – Associate Director, Climate Change Institute; Professor, School of Biology and Ecology; Director, A2C2 IGERT
Phone: 1- 2112 E-mail: jasmine.saros@maine.edu

Name: **Ivan J. Fernandez** – Professor, School of Forest Resources, Climate Change Institute, School of Food and Agriculture
Phone: 1-2932 E-mail: ivanjf@maine.edu

Name: **Gregory Zaro** - Chair of Anthropology, Associate Professor Department of Anthropology, Climate Change Institute
Phone: 1-1857 E-mail: gregory.zaro@maine.edu

Vision

What is climate change? We (humans, animals, plants) are all connected to, affected by and integrally involved in the climate system. Climate and its building block, weather, extend from the uppermost reaches of Earth's atmosphere into the oceans, lakes, streams, soil, fields, forests, rocks and into our dwellings. Climate and weather have been molding the Earth's surface through long-term variations and catastrophic changes ever since Earth gained an atmosphere some 4.5 billion years ago. Climate and weather have been feared and revered ever since humans emerged and plants, animals and human groups migrated, thrived, adapted and ceased to exist in response to climate change. It influences where we can live, our health, our economy, our art and music, and our overall quality of life. Controls on climate and weather, underlying mechanisms of change, human and ecological impacts and their implications cannot be defined by a simple disciplinary description. Rather, climate change calls for (if not demands) multi- and inter-disciplinary approaches that include physical, chemical, biological and social dimensions and feedbacks.

The climate and environment of Maine has changed dramatically in the last several thousand years. Melting ice sheets have forced the evolution of sea level, lakes and rivers; forests and animals have migrated into and out of the region; agriculture and industry have emerged; population distribution has changed; cultural patterns and socio-economic complexity have changed; energy and transportation needs have increased; air and water quality has changed; and Maine's interaction with national and global economies and the changing dynamics of security has intensified dramatically. Woven within all of the foregoing is climate change and the realization by the scientific community, the White House, the Pentagon, and govern-ments around the world that climate change is amongst the most serious and ever-present security issues on the planet (Figure 1). Assessing Maine's place in this security web is essential to planning Maine's future.

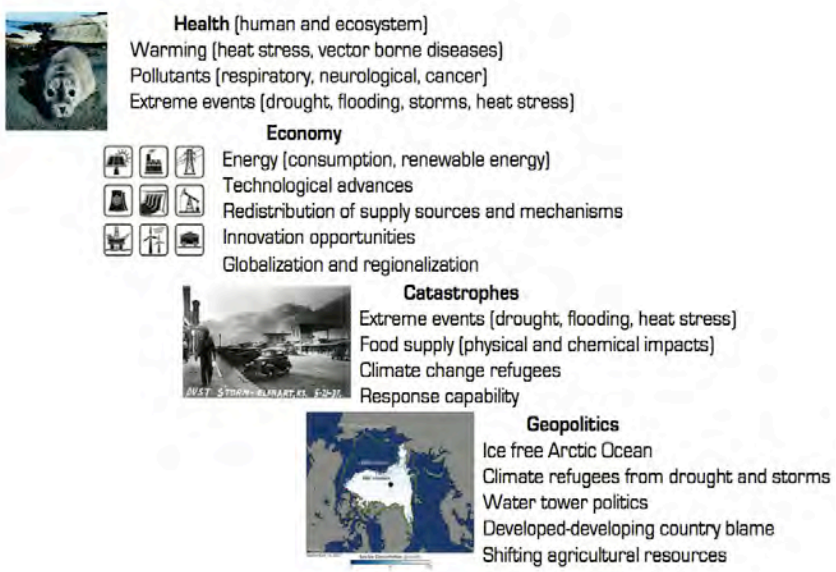


Figure 1. Climate change is a security issue.

Climate change defines the 21st century in ways we are only beginning to understand. How can Maine plan for the future without understanding its changing climate and environment and without understanding climate change impacts on human and ecosystem health, the economy, geopolitics, and the future of storms, floods, droughts, wildfires and other extreme events? The Climate Change Institute has a legacy of major contributions to the understanding of the physical, chemical, biological and social complexity of climate change and the application of these findings at local to international scales. Climate change has already impacted our lives dramatically and it will only continue to do so.

What is climate change at the University of Maine? Climate change is one of the primary signature research strengths of the University of Maine. It includes integrated undergraduate and graduate education and research opportunities and service products that are dedicated to improving the well being of the University, Maine, the nation and the world.

The Climate Change Institute's role as "nucleus" and "framework" for the University of Maine's climate change strength. The breadth of climate change cannot be captured within a single discipline or unit. That said a significant portion of the momentum for the growing reputation of the University of Maine in climate change has been leveraged from the international reputation of the research strengths of the Climate Change Institute. The Institute's historical and ongoing contributions have grown to be an integrating framework across many disciplines and units on Maine's flagship campus and beyond, encompassing undergraduate and graduate education, a broad array of research, and outreach to stakeholders and governments. The Climate Change Institute has emerged as the focal point for climate change at the University of Maine.

"Exploration and Discovery" is the Institute's slogan following the example of its Honorary Member, the great explorer Thor Heyerdahl, and the 40+ years of exploration and discovery by Institute members. The Institute fosters exploration, learning and discovery through excellence in faculty and graduate student research, addresses local through global needs through basic and applied research, and contributes research-based knowledge. The Institute is dedicated to improving the quality of life for people in Maine and around the world, and to promoting responsible stewardship of human, natural and financial resources, now and in the future.

The Institute has eight major themes (Figure 2) that together describe its breadth of contributions and linkages across the University of Maine and at state, national and international levels. These eight themes represent the current evolution of the Institute's approach to the rapidly emerging understanding of climate change and the implications of change.

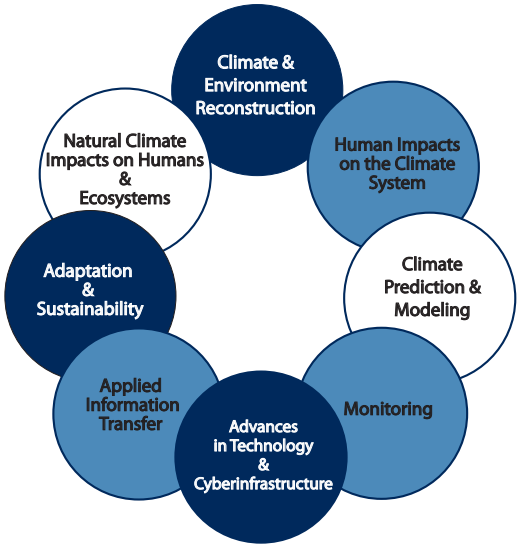


Figure 2. CCI themes.

Vision Summary for the Next Level of Excellence. The Climate Change Institute's vision for the future is summarized in the following statements:

1. Maintain and expand the Institute's role as a national and international leader in the "exploration and discovery" of the integrated physical, chemical, biological and social components of climate change research, education and outreach.
2. Continue to enhance the quality and expand the scope of the Institute's eight primary themes (Figure 2), while continually evaluating the potential for improving this approach by incorporating additional and revisiting existing themes for one of the world's most rapidly evolving security issues – climate change.
3. Expand upon the Institute's 40+ year, highly successful, role model status of shared faculty partnerships with academic units to build a fully coupled, world-class undergraduate and graduate climate change research and education program at the University of Maine.
4. Develop a point of coordination and an identifiable framework for University of Maine climate change research, education and outreach that includes Institute and non-Institute University of Maine partners so that the University of Maine's full climate change potential and value can be realized.

Needs and Justification to Achieve the Next Level of Excellence

1. *Graduate Fellowships and Post-doctoral Associates:* Following a long line of successful grant-funded support for graduate students by the Institute, the creation of prestigious Signature Graduate Fellowships will further sustain our ability to attract excellent graduate students who are vital to our research success. Funding for an Institute Post-doctoral Associate will also grow our program, as our grant-funded post-docs have often remained in the Institute and become Research Assistant Professors, expanding the breadth of our expertise.

2. *Increased Investment in Research:* Research programs in the Climate Change Institute are world renowned, and additional investment in infrastructure and personnel (eg., technicians) will grow our capacity. Institute researchers have worked hard to attract millions

of dollars of equipment from federal and private foundation support including technical expertise. However, we still have aging facilities and equipment that slows research progress, and lack the resources to nimbly invest in equipment as new methods and collaborations emerge.

3. *Return of Indirect Costs (IDC):* Widely recognized for many years is the advantage to the research mission for reinvestments through the return of indirect costs. This has been proposed in several University strategic plans, and other proposals such as the faculty incentive plan. A long-term guaranteed return of 40% IDC to 'soft-money' positions affiliated with the Climate Change Institute would be a significant incentive to build research expertise in this signature area. This is one of only a handful of areas at the university that has the critical mass and momentum to provide a high return on investment with this type of policy. The full 40% would be available only to research faculty who are not paid by University base funding, until such time that a broader university policy of indirect cost returns can be implemented.

4. *Shared Faculty Positions:* The Climate Change Institute has already established a remarkable record of success in additional shared faculty positions with academic units (notably Schools of Earth and Climate Sciences, Biology and Ecology, and Department of Anthropology). This has benefited programs in all participating units, and made the Institute a fertile framework for interdisciplinary initiatives that brings disparate units on campus together, and enhanced climate change science through academic units and institutes across campus. Using this model, the university should invest in 7-10 tenure-track, CCI shared faculty positions over the next five-year period. As with current shared positions, these should be positions providing linkages with other units heavily invested in the consequences of a changing climate for their students and stakeholders (e.g., Anthropology, Earth and Climate Sciences, Economics, Business, Computing and Information Sciences, Biology and Ecology, Food and Agriculture, Forest Resources, Marine Sciences, Policy and International Affairs, College of Engineering). CCI is currently in the process of developing its latest five-year plan including proposed shared positions. Once complete in early 2015 linkages will non-Institute University partners will be pursued.

5. *E3RB – The Extreme Environment Education and Research Building:* This facility is currently in final planning stages with expected construction Spring 2015. It will provide much needed space for staging of the Institute's ~40 expeditions per year and space and facilities for students to design innovative equipment for research in extreme environments. In addition E3RB will provide a space for the public to observe extreme environment research planning and facilities in a venue where student involvement can be highlighted.

6. *Climate Coordination and a Climate Coordination Office:* The University needs a point of departure on climate change that works to connect interested students, stakeholders, and the public to resources at the University that meet their needs on this subject, and a point of coordination for University planning on this issue, from curriculum development to large, multidisciplinary research initiatives. Such an entity would not be a required clearinghouse, but an advocate for new initiatives where it could be helpful. This could be built on and in coordination with the existing State Climatologist Office, and could include a broad range of outreach such as Maine Climate News, an ongoing Dashboard of environmental indicators for Maine, an information listing of climate change mitigation and adaptation efforts in Maine, and facilitate the university linkages to state agencies, industry, and municipalities on this subject. This office could also coordinate with the university point of contact for the USDA Northeast Climate HUB, housed in the Maine Agricultural and Forest Experiment Station. The office would require a full-time professional position (new hire) to carry out office day-to-day functions under the direction of a faculty supervisor.

7. *State Climatologist Office:* The University of Maine has been the home for the State Climatologist largely through in-kind support from the Climate Change Institute. Dr. George Jacobson contributed his time over six years through summer 2014, following several years of unpaid involvement by Dr. Greg Zielinski, and this fall Dr. Sean Birkel, a Research Assistant Professor without base funding, will assume the role of Maine State Climatologist. This position and associated travel throughout Maine should be funded from State and University base funding as outreach in the areas of Maine climate research and teaching, thereby stabilizing this critically important office in a fashion similar to other states. Dr. Birkel has been responsible for transformative climate change software that is used by researchers, the public and in many courses on this and other entities worldwide. The State Climatologist Office also offers Maine Climate News in partnership with Sea Grant and Cooperative Extension, which would continue and be integrated with the Climate Coordination Office.

8. *University-wide Climate Gen Ed Class*: As the signature programs develop, we would expect the evolution of various curricula across campus to build on these growing areas of strength and interest among our students. One component of this evolution could be to establish a general education course aimed at lower class levels (100-200) on Climate, Ecosystems and Society that provides core concepts, terminology, and an awareness of current events. We envision that this course will be developed in cooperation and administered through existing units represented within CCI. With appropriate resources, this could be developed into an on-line UMS, national and international-wide course offering. Graduate student support requested.

8.a (alternative or added to 8. above): *Establishing a Climate Gen Ed Category* in the form of Climate, Ecosystems, and Society that would broaden the existing Population and the Environment category, and could be fulfilled by any number of courses that would explicitly include these core concepts. Much like other Gen Ed categories, students would have a variety of options to fulfill this requirement, but not necessarily from a single course. The option, then, would be to have a number of courses that address these concepts in the context of a variety of curricular matters (8a), or a single course that tackles these core concepts specifically (8). Graduate student support requested.

9. *Graduate Study Certificates:* The Climate Change Institute recently initiated with approval by the Graduate School, a certificate program in Interdisciplinary Climate Studies. The Institute has the potential to pioneer additional certificate programs. Courses are and would be offered for credit through University academic units with impetus and oversight by the Institute.

Estimated Budget in addition to current E&G and MEIF support to CCI

Need	New MEIF/ year	Private Giving/ year	State	Federal/ year	UMS	E&G/ year	MEIF
1. Signature graduate & post-doc fellowships	250K	250K		>500K Note (1)			
2. Equipment and technical	150K			>500K Note (2)			
3, 40% return res. faculty Indirect						40% Note (3)	
4. shared tenure track Faculty (7-10)	450K					450K	
5. E3RB facility			500K Note (4)				
6. Climate coordination office	40K					40K	
7. State Climatologist	50K					50K	
8./8a University-wide Gen Ed						60K	
9. Graduate Study certificates						50K	

Note (1) based on federal funds currently raised by CCI in support of graduate students and post-docs.
Note (2) based on federal and private foundation funds currently raised for equipment.
Note (3) could result in considerable revenue to the University. 60% of something is better than 0% without Research Faculty.
Note (4) 500K already allocated for E3RB so this is not a new request. The building is planned for construction in Spring 2015.

APPENDIX A: ADMINISTRATION & STAFFING STRUCTURE

CLIMATE CHANGE INSTITUTE

ORGANIZATIONAL CHART

REVISED
8/10/2015

DIRECTOR
P. MAYEWSKI

ASSOCIATE DIRECTOR
J. SAROS

ASSISTANT DIRECTOR
B. LEE

POLICY ADVISORY COMMITTEE
D. BELKNAP (CHAIR, FY15)
G. DENTON (FY17)
D. SANDWEISS (FY17)
K. MAASCH (FY15)
I. FERNANDEZ (FY18)

PEER REVIEW COMMITTEE
G. HAMILTON (CHAIR, FY15)
J. KELLEY (FY15)
B. HALL (FY15)
B. ROBINSON (FY17)

GRADUATE COMMITTEE
K. KREUTZ (GRADUATE COORDINATOR, FY15)
B. HALL (FY18)
G. ZARO (FY17)
B. OLSEN (FY18)

ADMINISTRATION & OUTREACH
R. ADDESSI
M. SCHAUFFLER (RAsP)
M. SAROS (A2CA IGERT PROGRAM COORDINATOR)
S. BIRKEL (*MAINE STATE CLIMATOLOGIST*)

ANALYTICAL LABORATORY STAFF

S. SNEED D. INTRONE M. HANDLEY	IC, LA-ICP-MS STABLE ISOTOPE LABORATORY ICP-MS ARCHAEOLOGY LABORATORY

RESEARCH THEMES

	Physical & Chemical Climate Reconstruction	Glacial Geology & Climate Reconstruction	Paleoecology & Environmental Reconstruction	Anthropology & Archaeology	Glaciology	Marine Geology	Ecosystems & Environmental Change	Renewable Energy & Environmental Monitoring	Cyberinfrastructure	Climate Prediction & Modeling	Climate Change Impacts, Policy & Sustainability
THEME PRINCIPAL	P. MAYEWSKI (P) K. KREUTZ (P) D. MEESE (RP) N. BERTLER, (RAsP) W. SAYRE (AdP) A. SEIMON (AdP) J. SIMOES (AdP) D. DIXON (RAsP) S. BIRKEL (RAsP)	G. DENTON (P), (FD) B. HALL (P) H. BORNS, JR. (PE), (HD) G. BROMLEY (RAsP) A. PUTNAM (RA) R. HOOKE (CP)	J. SAROS (P) J. GILL (AsP) A. DIEFFENBACHER-KRALL (RAsP) A. NURSE (RS) C. STAGER (AdP) M. VANDERGOES (AdP) M. LAGERKLINT (RAsP)	D. SANDWEISS (P) B. ROBINSON (AP) G. ZARO (AP) M. SORG (RAP) A. KELLEY (RAP) D. SANGER (PE) D. KEEFER (AdP) M. NISBET (AdP) K. SOBOLIK (AdP) P. ROSCOE (CP) C. ISENHOUR (CAsP)	T. HUGHES (PE) G. OSWALD (RP) G. HAMILTON (AP) E. ENDERLIN (RAsP) W. SNEED (RA)	D. BELKNAP (CP) J. KELLEY (CP)	I. FERNANDEZ (CP) S. NORTON (CPE) B. MCGILL (CAP) A. PERSHING (CAP) B. OLSEN (AsP) M. SCHAUFFLER (RAsP)	M. PETERSON (CP) J. THALER (CP)	S. CHAWATHE (CAP) A. KURBATOV (RAP)	P. KOONS (P) K. MAASCH (P) F. CHAI (CP) J. FASTOOK (CP) S. JAIN (CAP)	G. JACOBSON (PE), (FD) R. KATES (PP) L. McNALLY (RAsP)
THEME SECOND	G. HAMILTON (AP) J. GILL (AsP) A. DIEFFENBACHER-KRALL (RAsP) A. KURBATOV (RAP) M. VANDERGOES (AdP) D. BELKNAP (CP) J. KELLEY (CP) I. FERNANDEZ (CP) A. NURSE (RS)	A. KELLEY (RAP)	D. SANDWEISS (P) K. SOBOLIK (AdP) G. JACOBSON (PE), (FD) R. DAVIS (PE) J. KELLEY (CP) S. NORTON (CPE) A. KELLEY (RAP) M. SCHAUFFLER (RAsP) B. OLSEN (AsP)	H. BORNS, JR. (PE), (HD) R. KATES (PP) D. BELKNAP (CP) J. KELLEY (CP) J. GILL (AsP)	P. KOONS (P) P. MAYEWSKI (P) H. BORNS, JR. (PE), (HD) B. HALL (P) K. KREUTZ (P) R. HOOKE (CP) J. FASTOOK (CP)	A. KELLEY (RAP)	J. SAROS (P) G. ZARO (AP) J. GILL (AsP) A. DIEFFENBACHER-KRALL (RAsP) L. McNALLY (RAsP) M. SORG (RAP) K. SOBOLIK (AdP) A. SEIMON (AdP) M. VANDERGOES (AdP) R. HOOKE (CP) J. KELLEY (CP) S. JAIN (CAP)	P. KOONS (P) P. MAYEWSKI (P) I. FERNANDEZ (CP) L. McNALLY (RAsP)	P. KOONS (P) P. MAYEWSKI (P) J. FASTOOK (CP)	P. MAYEWSKI (P) G. HAMILTON (AP) A. PERSHING (CAP) A. SEIMON (AdP) S. BIRKEL (RAsP)	G. ZARO (AP) P. ROSCOE (CP) I. FERNANDEZ (CP) J. KELLEY (CP) J. GILL (AsP) S. JAIN (CAP) S. CHAWATHE (CAP) A. PERSHING (CAP) M. SORG (RAP) B. OLSEN (AsP) M. NISBET (AdP) A. SEIMON (AdP)
	MS, PHD, POSTDOC	MS, PHD, POSTDOC	MS, PHD, POSTDOC	MS, PHD, POSTDOC	MS, PHD, POSTDOC	MS, PHD, POSTDOC	MS, PHD, POSTDOC	MS, PHD , POSTDOC	MS, PHD, POSTDOC	MS, PHD, POSTDOC	MS, PHD, POSTDOC
	J. Auger, MS - Quaternary T. Beers, MS - Earth Sciences S. Haines, MS - Quaternary B. Grigholm, PhD - Earth Sciences E. Korotkikh, PhD - Earth Sciences M. Potocki, PhD - Earth Sciences C. Rhodda, MS - Earth Sciences N. Spaulding, PhD - Earth Sciences N. Whitney, MS - Quaternary	C. King, PhD - Earth Sciences P. Strand, PhD - Earth Sciences	K. Boeff - MS - Quat. & Climate Studies R. Brown - MS - Ecology & Env. Scs D. Groff, PhD - Ecology & Env. Scs. R. Dicker, PhD - Ecology & Env. Scs. K. Hamley, MS - Quat. & Climate Studies A. Kireta - PhD - Ecology & Env. Scs. H. Malik, PhD - Ecology & Env. Scs. J. Martin, PhD - Ecology & Env. Scs.	W. Beckwith, MS - Quaternary S. Belknap, PhD - Antrop./Env. Pol. K. Bird, MS Quaternary A. Heller, PhD - Quaternary A. Mauricio, iPhD- Quaternary P. Pluta, MS - Quaternary	T. Godaire, MS - Quaternary L. Kaluzienski, MS - Earth Sciences B. Partan, MS - Earth Sciences J. Scheick, PhD - Earth Sciences	R. Arnold, MS - Earth Sciences E. Chandler, MS - Earth Sciences	E. Adams, PhD - Ecology & Env. Scs. B. Burpee, MS - Ecology & Env. Scs. M. Correll, PhD - Ecology & Env. Scs. M. Conway, PhD - Ecology & Env. Scs. M. Fuller, MS - Ecology & Env. Scs. L. Garey, MS - Ecology & Env. Scs. M. Gruselle, (PD) M. Jakubowski, MS - Plant, Soil & Env. Scs. B. Johnson, PhD - Forest Resources J. McCabe, PhD - Ecology & Env. Scs. R Northington (PD) K. Patel, PhD - Ecology & Env. Scs. A. Ren, PhD - Oceanography K. Ruskin, PhD - Ecology & Env. Scs. B. Seliger, PhD - Ecosystems & Env. Scs. K. Tanaka, PhD - Ecology & Env. Scs. N. Theodore, MS - Ecology & Env. Scs. K. Warner, PhD - Ecology & Env. Scs.	A. Demeo, iPhD - Ocean Engineering S. Winchenbach, iPhD - Ocean Engineering	E. Albert, PhD - Computer Science M. Royer, PhD - Computer Science	Y. Yang, MS - Quaternary	

Legend

P - Professor	CAP - Cooperating Associate Professor
AP - Associate Professor	CAsP - Cooperating Assistant Professor
AsP - Assistant Professor	CPE - Cooperating Professor Emeritus
PE - Professor Emeritus	PD - Post Doctoral Research Associate
PP - Presidential Professor	RS - Research Scientist
RP - Research Professor	RA - Research Associate
RAP - Research Associate Professor	AdP - Adjunct Professor
RAsP - Research Assistant Professor	HD - Honorary Director
CP - Cooperating Professor	FD - Former Director

APPENDIX B: RESEARCH FUNDING: SUBMITTED & AWARDED GRANTS - CLIMATE CHANGE INSTITUTE - FY 2015

LISTING INCLUDES ALL ACTIVE CCI GRANT AWARDS (ADDED IN AS CONTINUATION GRANTS)

Person	Title	Role	Unit_Name	RESP	SP_Name	FYSubmitted	Status	Sponsor Request	ProposalType
Birkel, S.	Glaciological and Mass Balance Modeling of Walker Basin, Nevada	PI	Climate Change Institute	1	US Dept of the Interior	2015	Funded	21,066.00	New
Birkel, S.	Regional climate modeling for future environment and species distribution in Sou	PI	Climate Change Institute	1	US Dept of Defense	2015	Pending	50,000.00	New
Birkel, S.	Generating Models through Synthesis	Co-PI (Capps)	Lead PI's Department	0.15	National Science Foundation	2015	Declined	449,916.00	New
Birkel, S.	Building Resilience Against Climate Effects (BRACE)	PI	Climate Change Institute		US Dept. of Health & Human Services		FundedC	10,000.00	Continuation
Birkel, S.	Coll. Res.: Response of the NW Greenland Cryosphere to Holocene Climate Change	PI	Climate Change Institute		National Science Foundation		FundedC	60,437.00	Continuation
Birkel, S.	Coll. Res.: Testing the Orbital Theory of Ice Ages	PI	Climate Change Institute		National Science Foundation		FundedC	21,450.00	Continuation
Birkel, S.	Glaciological and hydrological reconstruction of LGM and Termination (COMER)	PI	Climate Change Institute		Comer Science & Education		FundedC	25,261.00	Continuation
Birkel, S.	GreenTrACS: A Greenland Traverse for Accumulation and Climate Studies	PI	Climate Change Institute		National Science Foundation		FundedC	169,567.00	Continuation
Borns, H.	The Origin and Dynamics of an Ice Cap on the Continental Shelf off Western	PI	Climate Change Institute	1	National Geographic Society	2015	Pending	6,000.00	New
Chai, F.	Impacts of Population Growth on the San Francisco Bay and Delta Ecosystem Yr 2	PI	School of Marine Sciences	0.5	National Aeronautics & Space Administration	2015	Funded	145,300.00	Continuation
Chai, F.	Integrated Rapid-Response Observations and Ocean Ensemble Optimization Yr2	Co-PI (Xue)	School of Marine Sciences	0.5	US Dept of Commerce	2015	Funded	174,962.00	Continuation
Chai, F.	Towards early detection and forecasting of harmful algal blooms	Co-PI (Xue)	School of Marine Sciences	0.5	US Dept of Commerce	2015	Pending	179,948.00	New
Chai, F.	Influence of variability in circulation, production and trophic efficiency	PI	School of Marine Sciences	1	US Dept of Commerce	2015	Pending	231,699.00	New
Chai, F.	MRI Track 1: Acquisition of High Performance Computing to Model Coastal Response	Co-PI (Brady)	School of Marine Sciences	0.15	National Science Foundation	2015	Pending	266,309.00	New
Chai, F.	Synthesis, Assimilative Modeling, and Forecasting of West Coast Ocean Acidificat	PI	School of Marine Sciences	1	US Dept of Commerce	2015	Pending	295,386.00	New
Chawathe, S.	CDI-Type I: CiiWork: An Interactive Workbench for Integration	PI	Climate Change Institute		National Science Foundation		FundedC	451,742.00	Continuation
Denton, G.	Southern Context for the WAIS Divide Temperature Record	PI	Climate Change Institute	0.5	National Science Foundation	2015	Pending	399,952.00	New
Denton, G.	Quesada Fund: Furthering Gary Comer's Work	PI	Climate Change Institute		Quesada funde		FundedC	250,000.00	Continuation
Denton, G.	Putting the WAIS into Context	PI	Climate Change Institute		National Science Foundation		FundedC	379,130.00	Continuation
Denton, G.	The Last Glacial Termination in Southern Mid-Latitudes	PI	Climate Change Institute		National Science Foundation		FundedC	393,844.00	Continuation
Denton, G.	The Last Glacial Temination in the MacKenzie Valley	PI	Climate Change Institute		Comer Science & Education		FundedC	56,763.00	Continuation
Dieffenbacher-Krall, A.	Decadal Cycles in NAO Proxies from Northwest Iceland Lake and Soil Sediment	PI	Climate Change Institute		National Science Foundation		FundedC	64,249.00	Continuation
Dixon, D.	Collaborative Research: East Antarctica International Ice Sheet Traverse	PI	Climate Change Institute	1	National Science Foundation	2015	Pending	194,447.00	New
Enderlin, E.	Intra-annual Force Balance Analysis of Tidewater Glaciers Yr 1	PI	Climate Change Institute	0.95	National Aeronautics & Space Administration	2015	Funded	10,000.00	Continuation
Enderlin, E.	Intra-annual Force Balance Analysis of Tidewater Glaciers Yr 1 Inc 2	PI	Climate Change Institute	0.95	National Aeronautics & Space Administration	2015	Funded	60,046.00	Continuation
Enderlin, E.	Collaborative Research: Validation of Calving Laws for Greenland''s Tidewater Gl	PI	Climate Change Institute	1	National Science Foundation	2015	Declined	233,597.00	New
Enderlin, E.	Quantifying Greenland Iceberg Melt Rates	PI	Climate Change Institute		National Science Foundation		FundedC	172,372.00	Continuation
Fastook, J.	MRI: Development of a High Power, Large Antenna Array (CRESIS - UKANSAS)	Pi	Climate Change Institute		National Science Foundation		FundedC	150,315.00	Continuation
Hall, B.	Collaborative Research: The influence of past warm periods on Greenland glaciers	PI	Climate Change Institute	1	National Science Foundation	2015	Pending	288,277.00	New
Hall, B.	Sensitivity of the Antarctic Ice Sheet to Global Climate Change (Royal Society Range)	PI	Climate Change Institute		National Science Foundation		Funded C	354,181.00	Continuation
Hall, B.	Coll. Res.: Timing and Structure of the Last Glacial Maximum…S. Peru	PI	Climate Change Institute		National Science Foundation		Funded C	217,013.00	Continuation
Hall, B.	Coll. Res.: Exploring the Vulnerability of Southern Ocean Pinnipeds to Climate	PI	Climate Change Institute		National Science Foundation		Funded C	269,584.00	Continuation
Hall, B.	Coll. Res.: Assessing the Antarctic Contribution to Sea-Level Change (Hatherton)	PI	Climate Change Institute		National Science Foundation		Funded C	200,803.00	Continuation
Hall, B.	The Termination of the Last Ice Age in the Falkland Islands (NGS)	PI	Climate Change Institute		National Geographic Society		FundedC	20,625.00	Continuation
Hamilton, G.	Coll. Res.: Flow and Fracture Dynamics in an Ice Shelf Lateral (McMurdo Shear Zone)	PI	Climate Change Institute	0.75	National Science Foundation	2015	FundedC	357,356.00	Continuation
Hamilton, G.	Remote Sensing of Icebergs in Greenland''s Fjords and Coastal Waters	PI	Climate Change Institute	1	National Aeronautics & Space Administration	2015	Pending	90,000.00	New
Hamilton, G.	Spatial and Temporal Patterns in Submarine Melt Rates around Antarctica	PI	Climate Change Institute	0.5	National Science Foundation	2015	Pending	302,171.00	New
Hamilton, G.	Collaborative Research: 79 North Project - Oceanic and Glaciological Controls	PI	Climate Change Institute	1	National Science Foundation	2015	Pending	348,237.00	New
Hamilton, G.	Glaciological Analysis in Support of Greenland Activities (Army Greenland)	PI	Climate Change Institute		National Aeronautics & Space Administration		FundedC	24,013.00	Continuation
Hamilton, G.	Inland Migration of Crevasses on the Greenland Ice Sheet	PI	Climate Change Institute		National Science Foundation		FundedC	77,304.00	Continuation
Hamilton, G.	Linking Greenland Ice Sheet Mass Loss to Decadal Circulation Changes	PI	Climate Change Institute		National Aeronautics & Space Administration		FundedC	217,421.00	Continuation
Hamilton G.	Development & Deployment of an Autonomous Greenlan Outlet Glacier - Heising	PI	Climate Change Institute		Heising Simon Foundation		FundedC	558,718.00	Continuation
Jain, S.	British Council: “Ensemble Estimation of Flood Risk in A Changing Climate (EFRaC	Co-PI (Zou)	Lead PI's Department	0.3	British Council	2015	Pending	26,000.00	New
Jain, S.	Nonstationarity in the magnitude and seasonality of extreme precipitation	PI	Lead PI's Department	1	US Dept of Commerce	2015	Pending	62,179.00	New
Jain, S.	A MODEL FOR ENGAGING UNDERGRADUATE STUDENTS IN SCIENCE AND ENGINEERING	Co-PI (Musavi)	Lead PI's Department	0.08	National Science Foundation	2015	Declined	596,864.00	New
Kelley, A.	Lost to the Sea: Maine''s Ancient Coastal Heritage	PI	Lead PI's Department	1	US Dept of Commerce	2015	Pending	142,396.00	New
Kelley, J.	Building Resiliency Along Maine’s Bluff Coast	PI	Lead PI's Department	0.5	US Dept of Commerce	2015	Funded	31,047.00	New
Koons, P.	Collaborative Research: Influence of natural ice microstructure on rheology in g	Co-PI (Gerbi)	Lead PI's Department	0.15	National Science Foundation	2015	Funded	420,936.00	New
Koons, P.	Topographic Stress and Anisotrophy	PI			National Science Foundation	2015	Pending	140,942.00	New
Koons, P.	Coll. Res: Rivers, Faults, and Growing Mountains: Dynamic Feedback	PI			National Science Foundation		FundedC	169,044.00	Continuation
Koons, P.	Coll. Res: Modeling Sediment Production from Glaciers off the Alaska Peninsula	PI			National Science Foundation		FundedC	165,005.00	Continuation
Koons, P.	CDI-Type I: GPU-Accelerated Interactive Supercomputing for Climate Studies	Co-PI			National Science Foundation		FundedC	454,580.00	Continuation
Koons, P.	Coll. Res: St. Elias Erosion and Tectonics Project (STEEP)	PI			National Science Foundation		FundedC	167,318.00	Continuation

Kreutz, K.	Cordillera Darwin glacier and paleoclimate assessment	PI	Climate Change Institute	1	National Geographic Society	2015	Funded	11,952.00	New
Kreutz, K.	Geophysical Reconnaissance to Expand Ice Core Hydroclimate Reconstructions	PI	Climate Change Institute	1	National Science Foundation	2015	Funded	214,890.00	New
Kreutz, K.	REU Site: A multidisciplinary research experience on Denali glaciers, their land	PI	Climate Change Institute	0.6	National Science Foundation	2015	Declined	861,524.00	New
Kreutz, K.	SPICE Core Chronology & Climate Records Using Chemical & Micoparticle	PI	Climate Change Institute		National Science Foundation	2015	Funded	389,306.00	New
Kreutz, K.	Construction of a Continuous, High Resolution and Absolutely Dated Marine Chrono	PI	Climate Change Institute		National Science Foundation		FundedC	245,570.00	Continuation
Kreutz, K.	P2C2 CR: Reconstructing Central Alaskan Precipitation	PI	Climate Change Institute		National Science Foundation		FundedC	364,770.00	Continuation
Kurbatov, A.	Collaborative research: Tephrochronology of a South Pole ice core/2015438	PI	Climate Change Institute	0.8	National Science Foundation	2015	Pending	249,520.00	New
Kurbatov, A.	Mapping volcanic products in Greenland (VolcMap)	PI	Climate Change Institute	0.9	National Science Foundation	2015	Declined	334,828.00	New
Kurbatov, A.	Searching for Abrupt Climate Change Precursors Using Ultra High Resolution Ice Core	PI	Climate Change Institute		National Science Foundation		FundedC	796,560.00	Continuation
Kurvatov, A.	Coll. Res.: Developing an Antarctic Tephra Database for Interdisciplinary Paleoclimate	PI	Climate Change Institute		National Science Foundation		FundedC	365,096.00	Continuation
Mayewski, P.	Climate services contribution to the Strategic partnership CCAFS-USAID	PI	Climate Change Institute	0.2	CIAT- International Center for Tropical Agricult	2015	Funded	34,517.00	New
Mayewski, P.	Collaborative Research: Pleistocene/Holocene Climate Reconstruction (PAMIR)	PI	Climate Change Institute	1	National Science Foundation	2015	FundedC	590,831.00	Continuation
Mayewski, P.	Novel high resolution approach to Eemian layers in a Greenland ice core	PI	Climate Change Institute	0.55	National Science Foundation	2015	Pending	794,724.00	New
Mayewski, P.	Collaborative Research: Ultra-High-Resolution Investigations of High Andean Snow	PI	Climate Change Institute	0.45	National Science Foundation	2015	Declined	912,719.00	New
Mayewski, P.	Roosevelt Island Climate Evolution Project: US Deep Ice Core Glaciochemistry	PI	Climate Change Institute		National Science Foundation		FundedC	609,949.00	Continuation
Mayewski, P.	Arcadia Ice Core Proposal - Initiatives on the Science of the Human Past	PI	Climate Change Institute		Arcadia Fund		FundedC	358,897.00	Continuation
Mayewski, P.	Coll. Res.: Investgating Hypothesized Bolide Signatures	PI	Climate Change Institute		National Science Foundation		FundedC	33,587.00	Continuation
McGill, B.	Integrating Global Species Distribution Data Yr 4	PI	Senator George J. Mitchell C	1	National Aeronautics & Space Administration	2015	Funded	66,504.00	Continuation
McGill, B.	Collaborative Research: ABI Development: Creating a generic workflow	PI	Senator George J. Mitchell C	1	National Science Foundation	2015	Declined	250,261.00	New
McGill, B.	Change Analysis in Heterogeneous and Complex Datasets	Co-PI (Beard-Tisc	National Center for Geograp	0.1	National Science Foundation	2015	Pending	2,980,712.00	New
Norton, S.	LTREB: Renewal: Biogeochemical Mechanisms of Response Yr4	Co-PI (Fernandez	Lead PI's Department	0.25	National Science Foundation	2015	Funded	89,942.00	Continuation
Olsen, B.	Sharp-tailed Sparrow Reproductive Biology in an Ecological and Adaptive	PI	Climate Change Institute	1	National Science Foundation	2015	Pending	3,121.00	New
Olsen, B.	Tidal wetlands after Hurricane Sandy: baseline restoration assessment and future (NFW	PI	Climate Change Institute	1	US Dept of the Interior	2015	Funded	291,092.00	New
Olsen, B.	Collaborative Research: Dimensions: Phylogenetic, genetic, and environmental	PI	Climate Change Institute	0.34	National Science Foundation	2015	Declined	968,009.00	New
Olsen, B.	Ecological Resistance of Multiple Stressed Populations: The Response of Tidal Marsh	PI	Climate Change Institute		National Science Foundation		FundedC	279,336.00	Continuation
Olsen, B.	Schoodic Migratory Bird Monitoring (GOM 2013)	PI	Climate Change Institute		Schoodic Education & Res. Ctr.		FundedC	10,000.00	Continuation
Olsen, B.	Quantifying the Short-Term Impacts of Hurricane Sandy on Tidal Marsh Bird (SANDY1)	PI	Climate Change Institute		US Dept of the Interior		FundedC	565,463.87	Continuation
Olsen, B.	Resilience of Tidal Marsh Bird Community to Hurrican Sandy (SANDY2)	PI	Climate Change Institute		US Dept of the Interior		FundedC	1,409,127.00	Continuation
Pershing, A.	Coastal SEES (Track 2), Collaborative Research: Resilience and Adaptation Yr 2	Co-PI (Thomas)	School of Marine Sciences	0.28	National Science Foundation	2015	Funded	815,282.00	Continuation
Peterson, M.	Equine Response to Surface Changes	PI	Lead PI's Department	0.65	Grayson Jockey Club Research Foundation	2015	Pending	119,955.00	New
Putnam, A.	The Last Glacial Termination at the heart of Asia in the Mongolian Altai	PI	Climate Change Institute	1	The Comer Science and Education Foundation	2015	Funded	83,300.00	New
Putnam, A.	PIRE: Social-ecological adaptation to climate change in Northern Mongolia	PI	Climate Change Institute	1	National Science Foundation	2015	Pending	327,894.00	New
Roscoe, P.	Escaping The Matrix: An Ethnography of Appalachian Trail Culture	PI	Lead PI's Department	0.8	National Science Foundation	2015	Declined	153,787.00	New
Sandweiss, D.	Quantifying earthquake and tsunami hazard in the central Andean seismic gap	PI	Climate Change Institute	0.5	National Science Foundation	2015	Pending	74,228.00	New
Saros, J.	The Future of Four Seasons in Maine: A Scientist-Teacher-Student Yr 3 (Inc. 1)	Co-PI (Nelson)	Senator George J. Mitchell C	0.15	US Dept of Commerce	2015	Funded	21,506.00	Continuation
Saros, J.	Determining the Effects of Extreme Precipitation Events on Maine's Water	PI	Climate Change Institute	0.75	US Dept of the Interior	2015	Pending	32,161.00	New
Saros, J.	EPA IAG for Clean Air Act trends research, 2015-2016	Co-PI (Nelson)	Lead PI's Department	0	US Environmental Protection Agency	2015	Pending	53,350.00	New
Saros, J.	Assessing the Vulnerability of Drinking Water Resources to Extreme Precipitation	PI	Climate Change Institute	0.5	US Dept of Agriculture	2015	Pending	69,686.00	New
Saros, J.	The Future of Four Seasons in Maine: a Scientist-Teacher-Student Yr 2	Co-PI (Nelson)	Senator George J. Mitchell C	0.15	US Dept of Commerce	2015	Funded	78,773.00	Continuation
Saros, J.	Collaborative Research: Deciphering Climate-Driven Changes in Planktonic	PI	Climate Change Institute	0.8	National Science Foundation	2015	Declined	166,500.00	New
Saros, J.	Collaborative Research: Predicting the response of boreal lakes to climate chg.	PI	Climate Change Institute	1	National Science Foundation	2015	Declined	228,202.00	New
Saros, J.	Collaborative research: AON-SCALE (Arctic Observing Network	PI	Climate Change Institute	1	National Science Foundation	2015	Declined	413,568.00	New
Saros, J.	Collaborative Research: Investigating the Role of Atmospheric Deposition	PI	Climate Change Institute	0.7	National Science Foundation	2015	Declined	439,999.00	New
Saros, J.	IGERT: Adaptation to Abrupt Climate Change	PI	Climate Change Institute	0.4	National Science Foundation		FundedC	2,929,087.00	Continuation
Saros, J.	NRT: The Coastal Fuse Training Program - Preparing the next generation of engage	Co-PI (Zydlewski)	School of Marine Sciences	0.05	National Science Foundation	2015	Pending	2,999,986.00	New
Saros, J.	Deciphering the Ecology of Key Diatom Taxa to Understand (W. Greenland)	PI	Climate Change Institute		National Science Foundation		FundedC	353,980.00	Continuation
Saros, J.	Understanding Climate-Driven Change in Lake Habitat Structure (Isle Royal Nat. Park)	PI	Climate Change Institute		National Park Service		FundedC	18,065.00	Continuation
Saros, J.	Drinking Water Quality	PI	Climate Change Institute		WRRI - Dept of Interior		FundedC	35,900.00	Continuation
Saros, J.	Paleolimnological Investigation of Highland & Long Lakes	PI	Climate Change Institute		Lakes Env. Association		FundedC	9,500.00	Continuation
Schauffler, M.	Collaborative research to deepen students' discourse about data, graphs	PI	Center for Research in STEM	1	Spencer Foundation	2015	Pending	49,623.00	New
Zaro, G.	Urban Transformation and Landscape Change at the Nadin Archaeological Site	PI	Lead PI's Department	1	National Geographic Society	2015	Funded	24,660.00	New

TOTAL SUBMSSIONS INCLUDES FUNDED, PENDING, CONTINUATION, DECLINED & WITHDRAWN GRANTS - COUNT=104 **34,207,571.00**

APPENDIX C: BRIEF OVERVIEW OF EACH MAJOR NEW AWARD

(This listing includes only the listing of new grant awards for FY2015. A listing of continuing awards through FY2015 are included in the supplemental listing at the end of this document).

Project Title: Glaciological and Mass Balance Modeling of Walker Basin, Nevada
U.S. Department of Interior
$21,066
PI: Sean Birkel
This project involves coupling mass balance and regional climate models (run at UMaine) to hydrological models (run at UNR) of the Walker Basin, Nevada, and elsewhere in an effort to better understand changes in water resources through time. In this work, PI Birkel will produce climate boundary conditions needed for hydrological models run at UNR, and also provide assistance to UNR collaborators in using supercomputer facilities at UMaine, UNR, and the National Center for Atmospheric Research (NCAR). PI Birkel will also serve on the PhD committees for two UNR students who are involved in the Walker Basin project.

Project Title: Building Resiliency Along Maine's Bluff Coast
U.S. Dept. of Commerce
$31,047
PI: Joseph Kelley
This proposal anticipates significant involvement of NOAA's Office for Coastal Management Science and Geospatial Services Division -- working with Maine staff on a predictive model of bluff stability and landslide susceptibility under future sea-level rise and storm frequency scenarios. The work will occur in Casco Bay and coordinate with three communities experiencing significant bluff erosion and landslides.

Project Title: Collaborative Research: Influence of Natural Ice Microstructure on Rheology in General Shear: In-situ Studies in the Alaska Range
National Science Foundation
$420,937 (YR1, YR2, YR3)
PI: Peter Koons
Glacier and ice sheet mass balance is one of the highest impact components of climate change, due in large part to its affect on sea level. Both Greenland and Antarctica, as well as alpine glacier, discharge primarily though streaming flow, so the dynamics of that flow is central to the overall mass balance of the cryosphere. In glaciers and ice streams, the resistance to flow at the bed is important, but equally important is the internal viscous strength of the ice near the margins. In many cases, the lateral margins support >50% of the resisting stress. At present, there is moderate to high uncertainty of the factors controlling the viscous strength of streaming ice under natural conditions. We propose a plan to measure three-dimensional velocity, temperature, and microstructural parameters on Jarvis Glacier, in the eastern Alaska Range, in order to determine the relationship among microstructure, strain rate, and the constitutive laws necessary to numerically reproduce the observed kinematics. We will first use surface velocity measurements, knowledge of the glacier geometry derived from ground penetrating radar, and numerical modeling to identify a site for drilling. We will then collect surface-to-bed cores across lateral and vertical strain rate gradients. Velocity and temperature measurements derived from the boreholes will complement the surface measurements and allow us to produce a more

sophisticated three dimensional numerical model to test rheologic sensitivity within the study area. We will compare the microstructure (e.g. grain size distribution, crystallographic fabric) in the ice cores to the in-situ and modeled velocities and temperatures.

Project Title: Cordillera Darwin Glacier and Paleoclimate Assessment
National Geographic Society
$11,951
PI: Karl Kreutz
Reconstructions of regional and global climate change over the past 1000 years provide a valuable context for evaluating human impacts since the Industrial Revolution (~1850 AD). While we now recognize that there were large-scale warming (the Medieval Climate Anomaly, ~800–1300 AD) and cooling (the Little Ice Age, ~1300-1850 AD) events during the past millennium, our understanding of the causes and what triggered a transition between these events remains incomplete. For example, the behavior of two important components of the global climate system, the El Nino Southern Oscillation and the Southern Hemisphere westerly wind (SWW) system, is not well constrained for the past millennium adding significant uncertainty to model-based predictions of future climate evolution. Ice core records provide arguably the most robust method for reconstructing past behavior of the SWW system, but none exist within the core of the SWW zone (roughly 50°S). During March-April 2014, we propose to access two remote glacier sites in the Cordillera Darwin region of South America (Mt. Frances and Mt. Darwin) via sailboat which lie in the SWW zone. Using a combination of state-of-the-art geophysical and geochemical techniques, we will evaluate the potential of each site for future ice core recovery, as well as provide baseline glaciological data for a region undergoing significant recent warming. Our project is collaboration among scientists and students from the University of Maine, Universidad Catolica de Chile, Universidad de Chile, and Mr. Charles Porter, a renowned mountaineer and sailor (*note: Mr. Porter passed away after this proposal was submitted).

Project Title: Geophysical Reconnaissance to Expand Ice Core Hydroclimate Reconstructions in the Northeast Pacific
National Science Foundation
$214,890 (YR1, YR2, YR3)
PI: Karl Kreutz
Paleoclimate data from the Pacific basin show significant hydroclimate changes over the past millennium, possibly in response to changes in the mean state of the El Niño Southern Oscillation. One hypothesis invokes a change from a persistent La Niña-like state during the Medieval Climate Anomaly (MCA) to a persistent El Niño-like state during the Little Ice Age (LIA). A test of this hypothesis is to reconstruct and evaluate the spatial precipitation anomaly pattern in the Northeast Pacific across the MCA-LIA transition, because modern observations show an enhanced (weaker) coastal-inland precipitation gradient in the region during La Niña (El Niño) conditions. We therefore predict that the NE Pacific precipitation anomaly pattern will weaken across the MCA-LIA transition. For the past decade, we have been developing an ice core array in the NE Pacific that targets the two nodes of this precipitation dipole (i.e., St. Elias Range and Central Alaska), most recently (2013) with the recovery of two surface-to-bedrock 210-meter ice cores from Mt. Hunter (Denali National Park). To determine precipitation variability at the Mt. Hunter site over the past millennium, we rely on a suite of supporting

geophysical data to constrain glacier geometry, velocity, boundary conditions, and rheological properties in a 3-dimensional finite element numerical model. The combined observational and model datasets allow us to remove influences of ice flow (which causes layer thinning) and spatial variability in snow accumulation rate to reconstruct temporal precipitation variability from the two ice cores. In contrast to Mt. Hunter, little is known about the geophysical characteristics of the coastal St. Elias Range ice core sites (PR Col, NW Col, King Col on Mt Logan; and the Eclipse Icefield), which were drilled in 2002 prior to advances in geophysical techniques and numerical modeling capability. This lack of information will introduce error in any comparison of the St. Elias and Mt. Hunter accumulation records, and thus evaluation of the MCA-LIA transition hypothesis. We therefore propose to improve ice core-based accumulation records, and therefore hydroclimate reconstructions for the past millennium, in the NE Pacific through the collection of new geophysical data at existing ice core sites in the St. Elias Range. Our *objectives* are to: 1) develop bedrock topography maps of the Eclipse Icefield, King Col, and Mt. Logan summit plateau sites; 2) determine surface velocities at all sites; 3) map near-surface spatial accumulation rate patterns; 4) trace internal isochrones at all sites; 5) estimate ice deformation effects on layer thinning; 6) produce updated (to 2016) and corrected accumulation time series at all sites; and 7) compare corrected records from the Mt. Hunter and St. Elias sites to evaluate spatial precipitation patterns over the past millennium. Our research approach utilizes state-of-the-art ground penetrating radar (GPR), GPS, geochemical, satellite remote sensing, numerical modeling, and data synthesis techniques.

Project Title: SPICE Core chronology and Climate Records Using Chemical and Microparticle Measurements
National Science Foundation
$389,306 (YR1, YR2, YR3)
PI: Karl Kreutz

South Pole Ice Core (SPICE) Proposal Science Objectives.

Develop a high-precision timescale for the SPICE core with annual layer counting of major ion and microparticle concentrations through at least the Holocene, and volcanic SO_4 matching to the WAIS Divide timescale through the entire core, including the brittle ice zone from 8000-25,000 BP (~600-1250 m depth). **Intellectual merit**: A high-resolution timescale is essential for all other measurements from the core, including those in the high-value deglacial period represented by brittle ice. We propose to develop a continuous record of major ion concentration through the entire core using the same capillary IC technology throughout to avoid any inter-laboratory discrepancies. Our major ion analyses will include Na and Mg concentrations, which have been shown to have robust annual layers (e.g. Ferris et al., 2011), and SO_4^{2-}, a proxy for volcanic emissions. The annually layer-counted WAIS Divide ice core is regarded to have the most precise Antarctic ice core timescale, and will be used as a template for assigning ages to major volcanic eruptions below the annually layer counted portion of the South Pole record (c.f. Sigl et al., 2013). Our new 40 ky-long continuous SO_4 volcanic record will provide climate modelers with a volcanic aerosol climate forcing time series, and contribute to the work of collaborators investigating the geochemistry of South Pole volcanic tephra and the climatic response to major eruptions (see letter of support from N. Dunbar).

Extend the South Pole record of topical and local explosive volcanism from 2 ka to 40 ka by measuring high-resolution sulfate concentrations through the entire core, and microparticle concentration and size distribution in the Holocene and from ~20-40 ka (non-brittle ice).

Intellectual merit: Previous research, including by PI Cole-Dai and colleagues, has demonstrated that the South Pole provides an outstanding record of explosive volcanism because of its relatively high snow accumulation rate, precise timescale, and strong stratospheric-tropospheric exchange due to the polar vortex (Cole-Dai et al., 1997, 2009; Ferris et al., 2011; Budner and Cole-Dai 2003; Baroni et al., 2008; Delmas et al., 1992). We propose to extend the South Pole SO_4^{2-} record from 1830 BP (Ferris et al., 2011) to 40,000 BP through high-resolution ion chromatography analyses. This will provide an additional critical time series to assess the global volcanic aerosol forcing for paleoclimate modeling studies (Gao et al., 200?; Sigl et al. 2013), and to assess the spatial variability of volcanic SO_4^{2-} recorded in Antarctic ice cores to constrain eruption magnitude (e.g. Cole-Dai et al., 2009). In addition, recent research on the WAIS Divide core has demonstrated a difference in the particle size distribution of local vs. distant (e.g. tropical) eruptions, providing a new means of identifying source eruptions (Koffman et al., 2013). Our proposed measurements of microparticle concentration and size distribution will allow us to constrain paleoeruptions to either local and distant sources, and provide an opportunity to further evaluate the differences in gaseous and particulate volcanic emission transport from the source to Antarctica.

Establish the relative timing of climate variability at dust source regions including Patagonia and Australia over the past 40 ky by developing a record of South Pole dust flux based on continuous non-sea-salt calcium (nssCa) concentrations and laser particle counting.

Intellectual Merit: Changes in microparticle concentration and flux are primarily related to changes in conditions at the dust source. Previous research has demonstrated through Sr/Nd isotopic ratios that Patagonia and Australia are the primary dust source regions for Antarctica (see reviews by Fischer, 2007 and Kreutz and Koffman, 2013). A factor 2-4 higher dust emission during the last glacial period has been attributed to decreased vegetation and soil moisture, increased source wind speed (e.g. Mahowald et al., 2006) and gustiness (McGee et al., 2010), and local advances of wet-based glaciers and buildup of their outwash plains (Sugden et al., 2009). We will evaluate the hypothesis that circum-Antarctic atmospheric circulation changes induced relatively coherent changes in dust flux across Antarctica, as suggested by the synchroneity of the Dome C, Dronning Maud Land, and Siple Dome nssCa flux records on millennial timescales (Kreutz and Koffman, 2013). Confirmation of this hypothesis would indicate that climatic changes (e.g. precipitation, glacial activity, wind gustiness) were synchronous at disparate dust source regions in the Southern Hemisphere, requiring zonally symmetric atmospheric circulation changes.

Evaluate changes in the strength of the Westerly Wind Belt (WWB) and tropical Pacific (ENSO) forcing over the past 40 ky by developing a record of South Pole dust size distribution using continuous laser particle analyses. **Intellectual Merit:** While dust flux is related to emission rates from Australian and Patagonian sources, dust size distribution is interpreted as an indicator of atmospheric transport efficiency (Delmonte et al., 2002, 2005; Kok, 2011). Recent research by PI Kreutz and colleagues (Koffman et al., in review) has demonstrated that microparticle size distribution in the WAIS Divide core is related to the strength and position of the WWB. Koffman et al. hypothesize that the WBB is in turn responding to changing tropical Pacific SST related to the El Nino-Southern Oscillation (ENSO) and resulting atmospheric Rossby teleconnections. Air mass trajectory analyses indicate that South Pole air masses are sources from the same Amundsen-Bellingshausen Sea region as the WAIS Divide site. Thus, we hypothesize that South Pole microparticle size distribution will similarly respond to WWB strength and position, providing a 40 ky record of this dominant southern hemisphere climate

feature. Further, previous research indicates that the South Pole records changes in ENSO strength through its effect on Antarctic sea ice extent and resulting methanesulfonic acid (MSA) emissions from marine phytoplankton. Collaborator E. Saltzman proposes to analyze the SPICE core for MSA concentration, potentially providing two independent proxies (dust WWB proxy; MSA sea-ice proxy) of ENSO variability over the past 40 ky from the same core.

Project Title: Climate Services Contribution to the Strategic Partnership CCAFS-USAID on Climate Smart Agriculture in Feed the Future
CIAT (International Centre for Tropical Agriculture
$34,517
PI: Paul Mayewski
The Climate Change Institute (CCI) has a 42-year legacy of conducting transformational research in the physical, chemical, biological and social aspects of climate change science. Institute researchers have developed a global array of field studies coupled with state-of-the-art analytical instrumentation, and interpretational tools. Of specific interest to the proposed collaboration are the following Institute attributes: (1) experience in examining past, present and future climate allowing an "outside of the box" perspective; (2) *Climate Reanalyzer* (cci-reanalyzer.org) - CCI developed software that allows visualization and examination of modern and predicted climate data; and (3) regional climate modeling and scenario planning expertise.
Rationale and Scope: Mali has experienced considerable political unrest and economic challenges in recent years. Without adequate planning, the changing climate may exacerbate present and future social conflict. Preliminary investigation indicates ***a dramatic change in precipitation across Mali*** in the past three decades, wherein ***the populous southern half of the country has seen an annual precipitation deficit of nearly 50% on average*** between the periods 2002-2012 and 1979-2002 (figure 1). IPCC general circulation models (GCMs) predict that much of the arid and semi-arid subtropics will become increasingly drought stricken in a world of rising greenhouse gases. However, climate trajectories of specific regions such as Mali depend on many factors, including natural variability over timescales ranging from years (e.g., El Niño Southern Oscillation) to decades (e.g., Atlantic Multi-decadal Oscillation). While IPCC GCMs provide possible climate futures, reanalysis models and sparse African weather station data provide important historical context. Thus, we propose to examine both information frameworks in order to provide a reasonable estimate of what climate patterns the region may face in the future.

Project Title: Tidal Wetlands after Hurricane Sandy: Baseline Restoration Assessment and Future Conservation Planning
U.S. Department of the Interior
$291,092
PI: Brian Olsen
We propose a number of activities that would complement and build on existing work being conducted by the Saltmarsh Habitat and Avian Research Program (SHARP) to benefit the efforts of the NALCC to quantify ecological restoration and the resiliency of tidal marshes in response to Hurricane Sandy.
Determine how well planned tidal marsh restoration approaches work. SHARP has received funding to investigate the effects of planned restoration work on DOI lands using

standardized protocols that have been in place since 2011 and our database of ~1500 survey points with plant and bird data for 2011-14. Extending this work to restoration actions on non-DOI lands will increase sample sizes, broaden the study's geographic scope, involve a broader array of partners, and enhance our ability to make informed inferences about what works and what does not.

Generate baseline high-resolution elevation estimates, co-located with our vegetation and avian sampling locations, to track elevation change in areas with and without restoration work. SHARP has already collected elevation data using RTK methods at ~250 survey points in the southern portion of our study range. To provide an adequate baseline for assessing marsh elevation change throughout the region, we are seeking funds to extend this work to (a) Hurricane Sandy restoration and control sites, (b) ~twenty 5-15 ha study plots across six states, at which we are conducting detailed long-term demographic research, and (c) all as-yet unsampled survey points at which we have detailed vegetation data.

Generate a detailed regional data layer for high-/low-marsh. SHARP has already collected detailed information on vegetation at all of our survey points and done some preliminary work towards generating a regional data layer describing major plant communities. To provide an improved baseline for assessing future vegetation change, for modelling species distributions, and for identifying target areas for resiliency planning, we are seeking funds to extend this work by using existing vegetation protocols to describe plant communities in conjunction with all RTK points. This information will be used to ground-truth remote sensing data and interpolate across the entire region.

Project Title: <u>The Last Glacial Termination at the heart of Asia in the Mongolian Altai</u>
Comer Science and Education Fund
$83,300
PI: Aaron Putnam

The last glacial termination represents the last great global warming and the last time CO_2 rose by a substantial amount before the industrial period. And yet the role of CO_2 in causing the last great global warming is not certain. A solution to this problem could help us to hone our understanding of the sensitivity of atmospheric temperature to CO_2, as well as to inform our understanding of the processes that launch the earth out of an ice age. Here I propose to develop a ^{10}Be surface-exposure chronology of glacial landforms corresponding to the last deglaciation in the Mongolian Altai at the heart of Asia, Earth's largest and most populous continent. This chronology will document the reduction of glacier volume since the peak of the last ice age to today's conditions. This work will add a northern complement to our effort undertaken in Southern Hemisphere mid-latitudes. The results will provide a test of recent hypotheses for glacial terminations. They will also allow us to evaluate the relative roles of atmospheric CO_2, insolation forcing, and tropical Pacific sea-surface temperatures in driving Northern Hemisphere warming to completion during the last deglaciation.

Project Title: <u>Urban Transformation and Landscape Change at the Nadin Archaeological Site</u>
National Geographic Society
$24,660
PI: Gregory Zaro

Cities are a dominant factor in global environmental change today, but as a long-term process, urbanization has played a significant role in shaping our planet's landscapes and environments for

millennia, effectively creating anthropogenic landscapes. Recognition of this point opens the door for archaeological research to make significant contributions to contemporary urban/ecological issues while also generating cross-cultural knowledge about urbanism in the ancient, historic, and modern worlds. The proposed project is a field program of archaeological excavation and analysis at the Nadin archaeological site, a moderately-sized center in Croatiaís Ravni Kotari region along the Adriatic Sea. The site is situated near the 3,000-year-old city of Zadar, an important social and economic center in the region today but one that faces significant urban/ecological challenges over the coming century. With a nearly 2,500-year record of (possibly intermittent) occupational history, Nadin affords the opportunity to investigate the relationship between phases of urban growth and decline and broader changes in landscape and environment processes that persist around Zadar today. The proposed work will generate archaeological data related to urban form, spatial organization, economy, subsistence, and environment from the site's inception in the Iron Age (ca. 400 BC) to the present era. The proposed project will also work to more precisely delineate the site's chronology, an essential prerequisite to articulating changes in urban form with broader changes in landscape and environment. The results will help build a range of knowledge on human-environmental interactions in the Zadar region, offering deep-time perspectives on contemporary issues.

CONTINUING GRANT AWARDS – FY2015

Project Title: Building Resilience Against Climate Effects (BRACE)
ME Dept. of Health and Human Services
$10,000
PI: Sean Birkel

Project Title: Collaborative Research: Response of the Northwest Greenland Cryosphere to Holocene Climate Change
National Science Foundation
$60,437 (YR1, YR2, YR3)
PI: Sean Birkel

Project Title: Collaborative Research: A Test of the Orbital Theory of Ice Ages from Glacial Deposits in Southern South America
National Science Foundation
$21,450 (YR1, YR2, YR3)
PI: Sean Birkel

Project Title: Glaciological and Hydrological Reconstruction of LGM and Termination Climates in the Western U.S. and Central Asia
Comer Science & Education Foundation
$25,261
PI: Sean Birkel

Project Title: Collaborative Research: GreenTrACS: A Greenland Traverse for Accumulation and Climate Studies
National Science Foundation
$169,567 (YR1, YR2, YR3)

PI: Sean Birkel

Project Title: Impacts of Population Growth on the San Francisco Bay and Delta Ecosystem
National Aeronautics & Space Administration
$145,300
PI: Fei Chai

Project Title: Integrated Rapid-Response Observations and Ocean Ensemble Optimization
U.S. Department of Commerce
$174,962
PI: Fei Chai

Project Title: CDI-Type I: CiiWork: An Interactive Workbench for Integration, Exploration, and Analysis of Chronological Information
National Science Foundation
$451,742 (YR1, YR2, YR3)
PI: Sudarshan Chawathe

Project Title: Quesada Fund: Furthering Gary Comer's Work
Quesada Fund
$250,000 (Multiple Years)
PI: George Denton

Project Title: Putting the West Antarctic Ice Sheet into Context
National Science Foundation
$379,130 (YR1, YR2, YR3)
PI: George Denton

Project Title: The Last Glacial Termination in Southern Middle Latitudes
National Science Foundation
$393,844 (YR1, YR2, YR3)
PI: George Denton

Project Title: The Last Glacial Termination in the MacKenzie Valley
Comer Science & Education Foundation
$56,763
PI: George Denton

Project Title: Decadal Cycles in NAO Proxies from Northwest Iceland Lake and Soil Samples
National Science Foundation
$64,249 (YR1, YR2, YR3)
PI: Ann Dieffenbacher-Krall

Project Title: Intra-annual Force Balance Analysis of Tidewater Glaciers
National Aeronautics & Space Administration
$270,355 (YR1, YR2, YR3)
PI: Ellyn Enderlin

Project Title: Quantifying Greenland Iceberg Melt Rates
National Science Foundation
$172,086 (YR1, YR2, YR3)
PI: Ellyn Enderlin

Project Title: MRI - Development of a High-power, Large Antenna Array and Ultra-wideband Radar for a Basler for Sounding and Imaging of Fast-flowing Glaciers and Mapping Internal Layers
National Science Foundation
$150,315 (YR1, YR2, YR3)
PI: James Fastook

Project Title: Sensitivity of the Antarctic Ice Sheet to Global Climate Change
National Science Foundation
$354,181 (YR1, YR2, YR3)
PI: Brenda Hall

Project Title: Collaborative Research: Timing and Structure of the Last Glacial Maximum
National Science Foundation
$217,013 (YR1, YR2, YR3)
PI: Brenda Hall

Project Title: Collaborative Research: Exploring the Vulnerability of Southern Ocean Pinnipeds
National Science Foundation
$269,584 (YR1, YR2, YR3)
PI: Brenda Hall

Project Title: Collaborative Research: Assessing the Antarctic Contribution to Sea-level Change
National Science Foundation
$200,803 (YR1, YR2, YR3)
PI: Brenda Hall

Project Title: The Termination of the Last Ice Age in the Falkland Islands
National Geographic Society
$20,625
PI: Brenda Hall

Project Title: Collaborative Research: Flow and Fracture Dynamics in an Ice Shelf Lateral

National Science Foundation
$357,356 (YR1, YR2, YR3)
PI: Gordon Hamilton

Project Title: Glaciological Analysis in Support of Greenland Activities
National Aeronautics & Space Administration
$24,013
PI: Gordon Hamilton

Project Title: Inland Mitigation of Crevasses on the Greenland Ice Sheet
National Science Foundation
$77,304 (YR1)
PI: Gordon Hamilton

Project Title: Linking Greenland Ice Sheet Mass Loss to Decadel Circulation Changes
National Aeronautics & Space Administration
$217,421 (YR1, YR2, YR3)
PI: Gordon Hamilton

Project Title: Development & Deployment of an Autonomous Greenland Outlet Glacier
Heising Simon Foundation
$558,718 (YR1, YR2, YR3)
PI: Gordon Hamilton

Project Title: Collaborative Research: Rivers, Faults, and Growing Mountains: Dynamic Feedback between Crustal Deformation, Rock Strength, and Erosion
National Science Foundation
$169,044 (YR1, YR2)
PI: Peter Koons

Project Title: Collaborative Research: Modeling Sediment Production from Glaciers off the Alaska Peninsula during Quaternary Climate Oscillations
National Science Foundation
$165,005 (YR1, YR2)
PI: Peter Koons

Project Title: CDI-Type I: GPU-Accelerated Interactive Supercomputing for Climate Studies in the Northern Environment
National Science Foundation
$454,580 (YR1, YR2, YR3)
PI: Peter Koons

Project Title: Collaborative Research: St. Elias Erosion and Tectonics Project (STEEP)
National Science Foundation
$167,318 (YR1, YR2)
PI: Peter Koons

Project Title: Construction of a Continuous, High Resolution and Absolutely-Dated Marine Chronology from the Gulf of Maine during the Last Millennium
National Science Foundation
$245, 570 (YR1, YR2, YR3)
PI: Karl Kreutz

Project Title: P2C2 – Collaborative Research: Reconstructing Central Alaskan Precipitation
National Science Foundation
$364,770 (YR1, YR2, YR3)
PI: Karl Kreutz

Project Title: Searching for Abrupt Climate Change Precursors Using High Resolution Ice Core Analysis
National Science Foundation
$796,560 (YR1, YR2, YR3)
PI: Andrei Kurbatov and P.A. Mayewski

Project Title: Collaborative Research: Developing an Antarctic Tephra Database for Interdisciplinary Paleoclimate Research (AntT)
National Science Foundation
$365,096 (YR1, YR2, YR3)
PI: Andrei Kurbatov

Project Title: Collaborative Research: Pleistocene/Holocene Climate Reconstruction at Mid-Low Latitudes of the Northern Hemisphere Using a Pamir High Resolution Deep Ice Core
National Science Foundation
$590,831 (YR1, YR2, YR3)
PI: Paul Mayewski

Project Title: Roosevelt Island Climate Evolution Project: US Deep Ice Core Glaciochemistry
National Science Foundation
$609, 949 (YR1, YR2, YR3)
PI: Paul Mayewski and A. Kurbatov

Project Title: Arcadia Ice Core Proposal - Initiatives on the Science of the Human Past (Harvard University)
Arcadia Fund (Harvard University)
$358,897 (YR1, YR2, YR3)
PI: Paul Mayewski

Project Title: Collaborative Research: Investigating Hypothesized Bolide Signatures in Greenland Ice at the Younger Dryas Onset

National Science Foundation
$33,587
PI: Paul Mayewski

Project Title: Integrating Global Species Distribution Data
National Aeronautics & Space Administration
$66,504 (YR4)
PI: Brian McGill

Project Title: LTREB – Renewal: Biogeochemical Mechanisms of Response
National Science Foundation
$89,942 (YR4)
PI: Ivan Fernandez

Project Title: Ecological Resistance of Multiple Stressed Populations: The Response of Tidal Marsh Birds and Plants to Hurricane Sandy
National Science Foundation
$279,336 (YR1, YR2, YR3)
PI: Brian Olsen

Project Title: Schoodic Migratory Bird Monitoring
Schoodic Education and Research Center Institute
$10,000
PI: Brian Olsen

Project Title: Quantifying the Short-Term Impacts of Hurricane Sandy on Tidal Marsh Birds
U.S. Dept of Interior
$565,463 (YR1, YR2, YR3)
PI: Brian Olsen

Project Title: Resilience of the Tidal Marsh Bird Community to Hurricane Sandy
U.S. Dept of Interior
$1,409,127 (YR1, YR2)
PI: Brian Olsen

Project Title: Coastal SEES (Track 2), Collaborative Research: Resilience and Adaptation
National Science Foundation
$815,282 (YR1, YR2, YR3)
PI: Andrew Pershing

Project Title: The Future of Four Seasons in Maine
U.S. Department of Commerce
$100,279 (YR1, YR2, YR3)
PI: Jasmine Saros

APPENDIX D: RESEARCH & SCHOLARSHIP SUMMARY

PUBLICATIONS: ABSTRACTS/BOOKS/BOOK CHAPTERS/JOURNAL ARTICLES/POSTERS/PROCEEDINGS/TECHNICAL REPORTS

Name	Type	Status	Citation	Refereed	Category	GS	US
Belknap, Daniel F	Journal Article	Submitted	Wilson, K.R., Kelley, J.T., and Belknap, D.F., 2014 submitted, Fine-scale patterns in pool water level, temperature, and salinity, Wells, Maine, USA: Estuaries and Coasts	Yes	Basic	0	0
Belknap, Daniel F	Journal Article	Submitted	Plets, R.M.K., Callard, S.L., Cooper, J.A.G., Long, A.J., Quinn, R.J., Belknap, D.F., Edwards, R.G., Jackson, D.W.T., Kelley, J.T., Long, D., Milne, G.A., and Monteys, X., 2014 submitted, Late Quaternary evolution and sea-level history of a glaciated marine embayment, Bantry Bay, SW Ireland: Marine Geology	Yes	Basic	0	0
Belknap, Daniel F	Book Chapter	Accepted	Kelley, J.T., Belknap, D.F., and Walsh, J.A., 2014, Tidal flat-barrier spit interactions in a fetch-limited, macro-tidal embayment, Lubec, Maine, USA, In: Randazzo, G., Cooper, J.A.G., and Jackson, D., 2014, Gravel spits, Springer Publishing Company, Berlin, Germany, accepted and in press.	Yes	Basic	0	0
Belknap, Daniel F	Book Chapter	Submitted	Brothers, L.L., Legere, C., Hughes Clarke, J.E., Kelley, J.T., Barnhardt, W.A., Andrews, B.D., and Belknap, D.F., 2014, Pockmarks in Passamaquoddy Bay, New Brunswick Canada, In: Dowdeswell, J.A. Canals, M., Jakobsson, M., Todd, B.J., Dowdeswell, E.K., and Hogan, K. A., eds., Atlas of Submarine Glacial Landforms: Modern, Quaternary and Ancient, Geological Society, London, Memoirs, v. p. . accepted and in press	Yes	Basic	0	0
Belknap, Daniel F	Book Chapter	Submitted	Brothers, L.L., Legere, C., Hughes Clarke, J.E., Kelley, J.T., Barnhardt, W.A., Andrews, B.D., and Belknap, D.F., 2014, Pockmarks in Passamaquoddy Bay, New Brunswick Canada, In: Dowdeswell, J.A. Canals, M., Jakobsson, M., Todd, B.J., Dowdeswell, E.K., and Hogan, K. A., eds., Atlas of Submarine Glacial Landforms: Modern, Quaternary and Ancient, Geological Society, London, Memoirs, v. p. . accepted and in press	Yes	Basic	0	0
Belknap, Daniel F	Abstract	Published	Wilson, K.R., Belknap, D.F., Aman, J. and Miller, J., 2014, Linking patterns in European Green Crab abundance in three southern Maine salt marshes to observed changes in marsh morphology: New England Estuarine Research Society (NEERS), Groton, CT, October 16-18, p. 29. http://www.neers.org/documents/meeting_history/abstracts/F2014Abstracts.pdf	Yes	Basic	0	0
Belknap, Daniel F	Abstract	Published	Belknap, D.F. and Wilson, K.R., 2015, Invasive European Green Crabs: sudden increase in erosion potential on salt marshes in southern and central coastal Maine: Northeast Aquaculture Conference and Exposition and the Milford Aquaculture Seminar, Portland, ME, January 14-16.		Basic	0	0

Belknap, Daniel F	Abstract	Published	Belknap, D.F. and Kelley, J.T., 2015, Manifestation of bluff erosion in the transgressive stratigraphy of Maine estuaries: Geological Society of America Abstracts with Programs, v. 47, no. 1 (NE Section Meeting, Breton Woods, NH, March 23-25), Abstract 34-9, p. 86. https://gsa.confex.com/gsa/2015NE/webprogram/start.html	Yes	Basic	0	0
Belknap, Daniel F	Abstract	Published	Belknap, D.F. and Wilson, K.R., 2015, Effects of invasive Green Crabs on salt marshes in Maine: Geological Society of America Abstracts with Programs, v. 47, no. 1 (NE Section Meeting, Breton Woods, NH, March 23-25), Abstract 65-8, p. 127-128. https://gsa.confex.com/gsa/2015NE/webprogram/start.html	Yes	Basic	0	0
Belknap, Daniel F	Abstract	Published	Cronkite, E.M. and Belknap, D.F. 2015, New insights into the deglacial evolution of the New Meadows River, northeastern Casco Bay, Gulf of Maine: Geological Society of America Abstracts with Programs, v. 47, no. 1 (NE Section Meeting, Breton Woods, NH, March 23-25), Abstract 34-8, p. 86. https://gsa.confex.com/gsa/2015NE/webprogram/start.html	Yes	Basic	1	0
Belknap, Daniel F	Abstract	Published	Kelley, J.T. and Belknap, D.F., 2015, Twenty-five years of bottom mapping in Saco Bay, Maine: Geological Society of America Abstracts with Programs, v. 47, no. 1 (NE Section Meeting, Breton Woods, NH, March 23-25), Abstract 34-6, p. 86. https://gsa.confex.com/gsa/2015NE/webprogram/start.html	Yes	Basic	0	0
Belknap, Daniel F	Abstract	Published	Millette, P.M. and Belknap, D.F., 2015, Morphological and stratigraphic analysis of sedimentary deposits in New Sharon and Chesterville, Maine: Geological Society of America Abstracts with Programs, v. 47, no. 1 (NE Section Meeting, Breton Woods, NH, March 23-25), Abstract 12-5, p. 57. https://gsa.confex.com/gsa/2015NE/webprogram/start.html	Yes	Basic	1	0
Belknap, Daniel F	Abstract	Published	Wilson, K.R., Davey, E., Aman, J., Miller, J., and Belknap, D.F., 2015, European Green Crabs in Maine: trapping, peat stability measurements, and computer aided tomography of cores reveal marsh impacts: Geological Society of America Abstracts with Programs, v. 47, no. 1 (NE Section Meeting, Breton Woods, NH, March 23-25), Abstract 65-9, p. 128. https://gsa.confex.com/gsa/2015NE/webprogram/start.html	Yes	Basic	0	0
Belknap, Daniel F	Abstract	Published	Kelley, A.R., Kelley, J.T. and Belknap, D.F., 2015, Predictive model for submerged prehistoric sites: northern New England and Canadian Maritimes: Society of American Archaeology Annual Meeting, San Francisco, CA, April 15-19, Abstract 243, p. 528-529. http://www.saa.org/AbouttheSociety/AnnualMeeting/Abstracts2015/tabid/1518/Default.aspx	Yes	Basic	0	0
Belknap, Daniel F	Other	Published	Kelley, J.T., Belknap, D.F. and Mansfield, M.E., 2015, Encroachment of rising sea level upon raised freshwater wetlands, Lubec and Jonesport: Maine Geological Survey website, Geologic Site of the Month, January.	Yes	Basic	1	0

			http://www.maine.gov/dacf/mgs/explore/marine/sites/jan15.pdf				
Chai, Fei	Journal Article	Published	Xu, Y., K.A. Rose, F. Chai, F.P. Chavez, and P. Ayon (2015): Does spatial variation in environmental conditions affect recruitment? A study using a 3-D model of Peruvian anchovy. Progress in Oceanography, doi:10.1016/j.pocean.2015.04.013	Yes	Basic	1	0
Chai, Fei	Journal Article	Published	Ma, W., F. Chai, P. Xiu, H. Xue, J. Tian (2015): Simulation of export production and biological pump structure in the South China Sea. Geo-Marine Letters, 34:541-554. DOI 10.1007/s0036-014-0384-0.	Yes	Basic	1	0
Chai, Fei	Journal Article	Published	M. Gehlen, R. Barciela, L. Bertino, P. Brasseur, M. Butenschön, F. Chai, A. Crise, Y. Drillet, D. Ford, D. Lavoie, P. Lehodey, C. Perruche, A. Samuelsen (2015): Building the capacity for forecasting marine biogeochemistry and ecosystems: recent advances and future developments. Journal of Operational Oceanography, Vol. 7., No. 3, 171-190.	Yes	Basic	0	0
Chai, Fei	Journal Article	Published	Weber, E., Y. Chao, F. Chai, S. McClatchie (2015): Transport Patterns of Pacific Sardine Sardinops sagax Eggs and Larvae in the California Current System. Deep Sea Research 1, doi:10.1016/j.dsr.2015.02.012.	Yes	Basic	0	0
Chai, Fei	Journal Article	Published	Zhang, W., F. Chai, H. Xue, and Q. Ni (2015): Dynamical processes within an anticyclonic eddy revealed from Argo floats. Geophysical Research Letter, 42, 10.1002/2015GL063120.	Yes	Basic	1	0
Chai, Fei	Journal Article	Published	Mobley, C., F. Chai, P. Xiu, and L. Sundman (2015): Impact of improved light calculations on predicted phytoplankton growth and heating in an idealized upwelling-downwelling channel geometry. Journal of Geophysical Research – Oceans, 120, doi:10.1002/2014JC010588.	Yes	Basic	0	0
Chai, Fei	Journal Article	Published	Xiu, P. and F. Chai (2014): Variability of oceanic carbon cycle in the North Pacific from seasonal to decadal scales. Journal of Geophysical Research – Oceans. 10.1002/2013JC009505.	Yes	Basic	0	0
Chai, Fei	Journal Article	Submitted	Andrew P. Nosal, Yi Chao, John D. Farrara, Fei Chai, Philip A. Hastings (submitted): Olfaction contributes to pelagic navigation and homing in a coastal shark. Proceedings B of the Royal Society of London.	Yes	Basic	0	0
Chai, Fei	Journal Article	Submitted	Ke Huang, Sergio Derada, Huijie Xuea, Peng Xiu, Fei Chai, Qiang Xie, Dongxiao Wanga (submitted): 1/8º Coupled Biochemical-Physical Regional Indian Ocean Model: Physical Results and Validation. Ocean Dynamics.	Yes	Basic	1	0
Chawathe, Sudarshan S	Other	Published	Sudarshan S. Chawathe. Interactive Exploration of Time Lines from Ice Core Data Sets. Borns Symposium, April 2015.			0	0
Denton, George	Journal Article	Published	Kelley, S.E., Kaplan, M.R., Schaefer, J.M., Andersen, B.G., Barrell, D.J.A., Putnam, A.E., Denton, G.H., Schwartz, R., Finkel, R.C., Doughty, A.M., 2014, High-precision Be-10 chronology of moraines in the Southern Alps indicates	Yes	Basic	3	0

			synchronous cooling in Antarctica and New Zealand 42,000 years ago. Earth and Planetary Science Letters 405, 194-206.				
Denton, George	Journal Article	Published	Denton, G.H., 2014, Professor David E. Sugden--an appreciation. Antarctic Science 26, 603.	Yes	Basic	0	0
Denton, George	Journal Article	Published	Schaefer, J.M., Putnam, A.E., Denton, G.H., Kaplan, M.R., Birkel, S., Doughty, A.M., Kelley, S.E., Barrell, D.J.A., Finkel, R.C., Winckler, G., Anderson, R.F., Ninneman, U.S., Barker, S., Schwartz, R., Andersen, B.G., and Schuechter, C., 2015, The southern glacial maximum 65,000 years ago and its unfinished termination. Quaternary Science Reviews 114, 52-60.	Yes	Basic	3	0
Denton, George	Journal Article	Published	Doughty, A.M., Schaefer, J.M., Putnam, A.E., Kaplan, M.R., Denton, G.H., Barrell, D.J.A., Andersen B.G., Kelley, S.E., Finkel, R.C., and Schwartz, R., 2015, Mismatch of glacier extent and summer insolation in Southern Hemisphere mid-latitudes. Geology 43, 407-410.	Yes	Basic	2	0
Denton, George	Journal Article	Published	Strelin, J.A., Kaplan, M.R., Vandergoes, M.J., Denton, G.H., Schaefer, J.M., 2014, Holocene glacier history of the Lago Argentino basin, Southern Patagonian Icefield. Quaternary Science Reviews 101, 124-145.	Yes	Basic	0	0
Denton, George	Journal Article	Accepted	Moreno, P.I., Denton, G.H., Moreno, H., Lowell, T.V., Putnam, A.E., Kaplan, M.R., 2015, Radiocarbon chronology of the last glacial maximum and its termination in northwestern Patagonia. Quaternary Science Reviews, accepted.	Yes	Basic	0	0
Denton, George	Journal Article	Accepted	Hall, B.L., Denton, G.H., Heath, S.L., Jackson, M.S., Koffman, T.N.B., 2015, Accumulation and marine forcing of ice dynamics in the western Ross Sea during the last deglaciation. Nature Geoscience, accepted.	Yes	Basic	3	0
Enderlin, Ellyn	Journal Article	Published	Enderlin, E.M. & G.S. Hamilton, 2014. Estimates of iceberg submarine melting from high-resolution digital elevation models: Applications to Sermilik Fjord, East Greenland. J. Glaciol., 60(224), doi:10.3189/2014JoG14J085.	Yes	Applied	0	0
Enderlin, Ellyn	Abstract	Published	Enderlin, E. M., G. S. Hamilton, F. Straneo, & C. Cenedese, 2014. Submarine Melting of Icebergs from Repeat High-Resolution Digital Elevation Models. Eos Transactions AGU, Fall Meet. Suppl. Abstract C32B-03.		Applied	0	0
Fastook, James L	Journal Article	Published	J. P. Cassanelli, J. W. Head, and J. L. Fastook. Sources of water for the outflow channels on Mars: Implications of the Late Noachian “Icy High- lands” Model for melting and groundwater recharge on the Tharsis Rise. Planetary and Space Science, 108:54–65, doi:10.1016/j.pss.2015.01.002, 2015.	Yes		1	0
Fastook, James L	Journal Article	Published	J. L. Fastook and J. W. Head. Glaciation in the Late Noachian Icy High- lands: Ice accumulation, distribution, flow rates, basal melting and top- down melting rates and patterns. Planetary and Space Science, 106:82–98, http://dx.doi.org/10.1016/j.pss.2014.11.028, 2015.	Yes		0	0

Fastook, James L	Journal Article	Published	T. Hughes, A. Sargent, J. Fastook, K. Purdon, J. Li, J.-B. Yan, and S. Gogineni. Quantifying the Jakobshavn Effect: Jakobshavn Isbrae, Greenland, compared to Byrd Glacier, Antarctica. The Cryosphere Discuss., 8:2043–2118, doi:10.5194/tcd–8–2043–2014, 2014.	Yes		0	0
Fastook, James L	Journal Article	Published	A. Sargent and J. L. Fastook. A linear algorithm for solving non-linear isothermal ice-shelf equations. Geosci. Model Dev. Discuss., 7:1829–1864, doi:10.5194/gmdd–7–1829–2014, 2014.	Yes		0	0
Fastook, James L	Journal Article	Published	P. Schmidt, B. Lund, J-O. Näslund, and J. Fastook. Comparing a thermo-mechanical Weichselian Ice Sheet reconstruction to reconstructions based on the sea level equation: Aspects of ice configurations and glacial iso- static adjustment. Solid Earth, 5:371–388, doi:10.5194/se–5–371–2014, 2014.	Yes		0	0
Fastook, James L	Book Chapter	Submitted	H. Hargitai and J. Fastook. Dorsa Argentea Formation. Encyclopedia of Planetary Landforms, pages DOI 10.1007/978–1–4614–9213–9_459–1, 2014.	Yes		0	0
Fastook, James L	Abstract	Published	J. P. Cassanelli, J. W. Head, and J. L. Fastook. Sources of water for groundwater-fed outflow channels on Mars: Implications of the Late Noachian "Icy Highlands" model for melting and groundwater recharge on the Tharsis Rise. Lunar and Planetary Science Conference XLVI, (#1529), 2015.	Yes		1	0
Fastook, James L	Abstract	Published	J. L. Fastook and J. W. Head. Late Noachian Icy Highlands: Scenarios for top-down melting and volumes of meltwater. Lunar and Planetary Science Conference XLVI, (#1552), 2015.	Yes		0	0
Fastook, James L	Abstract	Published	J. L. Fastook and J. W. Head. Late Noachian Icy Highlands: Spatial distribution of top-down melting and volumes of meltwater for single- year warming events. Lunar and Planetary Science Conference XLVI, (#1555), 2015.	Yes		0	0
Fernandez, Ivan	Journal Article	Published	Morse, Jennifer, Jorge Duran, Fed Beall, Eric M. Enanga, Irena F. Creed, Ivan J Fernandez, Peter M. Groffman. 2015. Soil denitrification fluxes from three northeastern North American forests ranging in nitrogen availability. Oecologia 177:17-27.	Yes	Basic	1	0
Fernandez, Ivan	Journal Article	Published	Ross, D.S., S.W. Bailey, R.D. Briggs, J. Curry, I.J. Fernandez, G. Fredriksen, C.L. Goodale, P.W. Hazlett, P.R.l Heine, C.E. Johnson, J.T. Larson, G.B. Lawrence, R.K. Kolka, R. Ouimet, D. Paré, D. deB. Richter, C.D. Schirmer, and R.A. Warby. 2015. Inter-laboratory variation in the chemical analysis of acidic forest soil reference samples from eastern North America. Ecosphere 6(5):73. http://dx.doi.org/10.1890/ES14-00209.1.	Yes	Applied	0	0
Fernandez, Ivan	Journal Article	Published	Ohno, Tsutomu, Thomas B. Parr, Marie-Cécile Gruselle, Ivan J. Fernandez, Rachel L. Sleighter, and Patrick G. Hatcher. 2014. Molecular composition and biodegradability of soil organic matter: A case study comparing two New England forest types. Environ. Sci. Tech. 2014: 7229-7236.	Yes	Basic	0	0

Fernandez, Ivan	Book Chapter	Accepted	Norton, S. A., Kopácek, J., and Fernandez, I. J., 2014, in press, Acidification and Acid Rain: in Holland, H. D. and Turekian K. K. (eds.), Treatise on Geochemistry, 9, 2nd Edition, Chapter, Pergamon Press.	Yes	Applied	0	0
Fernandez, Ivan	Abstract	Published	Patel, Kaizad and Ivan Fernandez. Is there a changing climatology at the Bear Brook Watershed in Maine? Northeastern Ecosystem Research Cooperative Conference, Saratoga Springs, NY, March 2015.		Applied	1	0
Fernandez, Ivan	Abstract	Published	Tatariw C, JD MacRae, K Simon, IJ Fernandez, MC Gruselle. The effect of long term nitrogen deposition on structure and function of soil microbial communities. Northeastern Ecosystem Research Cooperative Conference, Saratoga Springs, NY, March 2015.	Yes	Applied	1	0
Fernandez, Ivan	Abstract	Published	Puhlick, Joshua J., Aaron R. Weiskittel, Ivan J. Fernandez, Shawn Fraver, Laura S. Kenefic, and Robert S. Seymour. Comparisons of carbon pools among alternative management regimes on the Penobscot Experimental Forest. New England Society of American Foresters Meeting. Fairlee, Vermont. March 24-27, 2015.		Applied	1	0
Fernandez, Ivan	Abstract	Published	Simon K.S., Mineau M.M., Rancatti R.R., Adams M.B., Fernandez I.J. and Norton S.A. Coupled biogeochemical cycling in watersheds subjected to chronic nitrogen enrichment and acidification. Joint Water Symposium of the New Zealand Hydrological Society, New Zealand Freshwater Sciences Society and the IPENZ Rivers Group. Blenheim, New Zealand, 27 November 2014	Yes	Applied	1	0
Fernandez, Ivan	Abstract	Published	Gruselle, Marie-Cecile, Ivan J. Fernandez, Kevin S. Simon and Stephen A. Norton. 2014. Soil 15N enrichment in a whole watershed 15N tracer experiment in New England forests. (Paper 130-3). Presented at the ASA-CSSA-SSSA International Meetings. Long Beach, California. November 2-5. ASA, CSSA, SSSA, Madison, WI.		Applied	0	0
Fernandez, Ivan	Abstract	Published	Salvino, Cayce, Ivan J. Fernandez, Marie-Cecile Gruselle and Jean MacRae. 2014. Is nitrogen cycling and bioavailability limited by phosphorus in northern New England forest soils? (Paper 412-5). Presented at the ASA-CSSA-SSSA International Meetings. Long Beach, California. November 2-5. ASA, CSSA, SSSA, Madison, WI.		Applied	1	0
Fernandez, Ivan	Abstract	Published	Munoz, Bethany L., Laura Kenefic, Aaron Weiskittel, Ivan Fernandez, Jeffrey Benjamin, and Shawn Fraver. 2014. Northern mixedwood forest productivity 50 years after whole-tree and stem-only harvesting. (Paper #111) National Convention of the Society of American Foresters, Salt Lake City, Utah.			1	0
Fernandez, Ivan	Abstract	Published	Puhlick, Aaron Weiskittel, Ivan Fernandez, Shawn Fraver, Laura Kenefic, and Robert Seymour. 2014. How silvicultural treatments and site quality affect carbon storage in a mixed species forest. (Paper #149) National Convention of the Society of American Foresters, Salt Lake City, Utah.		Applied	1	0

Fernandez, Ivan	Abstract	Published	Gruselle, Marie-Cécile, Ivan Fernandez, Kevin Simon, Stephen Norton. 2014. 15N enrichment of the forest floor after a whole watershed scale 15N tracer addition at a long-term forested paired watershed site in Maine, USA. BIOGEOMON 2014, The 8th International Symposium on Ecosystem Behavior. Bayreuth, Germany.		Applied	0	0
Fernandez, Ivan	Abstract	Published	Gruselle, M-C and Ivan J. Fernandez. 2014. Ecosystem Responses to a Unique Whole-Watershed Isotopic Tracer Experiment: Where did the 15N go? Oral presentation at the Harold W. Borns Jr. Symposium. University of Maine, Orono, ME. April 17-18, 2014.		Applied	0	0
Fernandez, Ivan	Abstract	Published	Patel, Kaizad, Ivan Fernandez. 2014. Climatic trends at the Bear Brook Watershed in Maine – Biogeochemistry of the vernal transition. BIOGEOMON 2014, The 8th International Symposium on Ecosystem Behavior. Bayreuth, Germany.		Applied	1	0
Fernandez, Ivan	Technical Report	Published	Fernandez, I.J., C.V. Schmitt, S. Birkel, E. Stancioff, A. Pershing, J.T. Kelley, J. Runge, G.L. Jacobson, and P.A. Mayewski. 2015. Maine's Climate Future: 2015 Update. Orono, ME: University of Maine. 24 pp. DOI: 10.13140/2.1.3356.4961	Yes	Applied	0	0
Gill, Jacquelyn	Journal Article	Published	Lawler, J. J., D. A. Ackerly, C. M. Albano, M. G. Anderson, S. Z. Dobrowski, J. L. Gill, N. E. Heller, R. L. Pressey, E. W. Sanderson, S. B. Weiss. 2015. The theory behind, and the challenges of, conserving nature's stage in a time of rapid change. Conservation Biology 29(3): 618-629.	Yes		0	0
Gill, Jacquelyn	Journal Article	Published	Gill, J. L., J. L. Blois, B. Benito, S. Z. Dobrowski, M. L. Hunter, J, .L. McGuire. 2015. A 2.5-million year perspective on coarse-filter strategies for conserving nature's stage. Conservation Biology 29(3): 640-648.	Yes		0	0
Gill, Jacquelyn	Journal Article	Accepted	Bakker, E.S., J.L. Gill, C.N. Johnson, F.W.M. Vera, C.J. Sandom, G.P. Asner, J.-C. Svenning. Combining paleo-data and modern exclosure experiments to assess the impact of megafauna extinctions on woody vegetation. (Accepted, Proceedings of the National Academy of Sciences.)				
Hall, Brenda	Journal Article	Submitted	Marra, K., Elwood Madden, M, Soreghan, G., and Hall, B., 2015. Physical and chemical weathering in stream sediments in the McMurdo Dry Valleys, Antarctica. Chemical Geology.	Yes	Basic	1	0
Hall, Brenda	Journal Article	Accepted	Garcia, J., Strelin, J., Vega, R., Hall, B., and Stern, C., 2015. Deglacial ice-marginal glaciolacustrine environments and structural moraine building in Torres del Paine, south Patagonia. Andean Geology, in press.	Yes	Basic	1	0
Hall, Brenda	Journal Article	Accepted	Hall, B., Denton, G., Heath, S., Jackson, M., and Koffman, T., 2015. Accumulation and marine forcing of ice dynamics in the western Ross Sea during the last deglaciation. Nature Geoscience, accepted.	Yes	Basic	3	0
Hall, Brenda	Journal Article	Submitted	Levy, L., Kelly, M., Lowell, T., Hall, B., Howley, J., and Smith, C., 2015. Coeval fluctuations of the Greenland Ice Sheet and a local glacier, central East	Yes	Basic	1	0

			Greenland, during late-glacial and early Holocene time. Geophysical Research Letters, in review.				
Hall, Brenda	Journal Article	Accepted	Bromley, G., Hall, B., Thompson, W., Kaplan, M., Garcia, J., and Schaefer, J., 2015. Late-glacial fluctuations of the Laurentide Ice Sheet in the White Mountains of Maine and New Hampshire. Quaternary Research, in press.	Yes	Basic	1	0
Hall, Brenda	Journal Article	Published	Marra, K., Elwood Madden, M., Soreghan, G., and Hall, B., 2015. BET surface area distributions in polar stream sediments: implications for silicate weathering in a cold-arid environment. Applied Geochemistry 52, 31-42.	Yes	Basic	1	0
Hall, Brenda	Journal Article	Published	Bromley, G., Winckler, G., Schaefer, J., Kaplan, M., Licht, K., and Hall, B., 2014. Pyroxene separation by HF leaching and its impact on helium surface-exposure dating. Quaternary Geochronology 23, 1-8.	Yes	Basic	0	0
Hall, Brenda	Journal Article	Published	RAISED Consortium, 2014. A community based reconstruction of Antarctic Ice Sheet deglaciation since the Last Glacial Maximum. Quaternary Science Reviews 100, 1-9.	Yes	Basic	0	0
Hall, Brenda	Journal Article	Published	Anderson, J., Conway, H., Bart, P., Kirshner, A., Greenwood, S., McKay, R., Hall, B., Ackert, R., Licht, K., Jakobsson, M., and Stone, J., 2014. Ross Sea paleodrainage and deglacial history during and since the LGM. Quaternary Science Reviews 100, 31-54.	Yes	Basic	0	0
Hall, Brenda	Abstract	Submitted	Brault, E., Koch, P., McCarthy, M., Hall, B., Hoelzel, A., Welch, A., and Nye, J., 2015. Shifts in the Ross Sea ecosystem during the mid-to-late Hoocene as indicated by bulk isotopic analyses of Antarctic seals. Marine Mammal Society Conference, San Francisco, CA	Yes	Basic	2	0
Hall, Brenda	Abstract	Submitted	Koch, P., Brault, E., Welch, A., Nye, J., Niven, L., Hall, B., Hoelzel, A., 2015. Assessing the vulnerability of Antarctic seals to environmental change: insights from studies of seal mummies. Society of Vertebrate Paleontologists, Dallas, TX.	Yes	Basic	2	0
Hall, Brenda	Abstract	Submitted	Welch, A., Irvine, A., Brault, E., Nye, J., Koch, P., Hall, B., Hoelzel, A., 2015. Temporal responses of a community of Antarctic seals to local environmental change. Ecological Society of America, Baltimore, MD.	Yes	Basic	2	0
Hall, Brenda	Abstract	Published	Funderburg, R., Elwood Madden, M., Young, J., Marra, K., Soreghan, G., Hall, B., 2014. Comparing reactive surface area of sediments in hot and cold arid climates. American Geophysical Union Annual Meeting, San Francisco, CA.	Yes	Basic	1	0
Hall, Brenda	Abstract	Published	Levy, L., Hammer, S., Kelly, M., Lowell, T., Hall, B., Howley, J., Wilcox, P., and Medford, A., 2014. Middle to late Holocene fluctuations of the Vindue Glacier, and outlet of the Greenland Ice Sheet, central East Greenland. American Geophysical Union, San Francisco, CA.	Yes	Basic	3	0

Hall, Brenda	Abstract	Published	Hillebrand, T., King, C., Stone, J., Hall, B., Conway, H., and Koutnik, M., 2014. late Quaternary history of Hatherton Glacier, Antarctica. 21st Annual WAIS meeting, Julian, CA.	Yes	Basic	2	0
Hall, Brenda	Abstract	Published	Hillebrand, T., Stone, J., Hall, B., King, C., and Koutnik, M., 2014. Late Quaternary ice elevations of Hatherton Glacier, Antarctica. Geological Society of America Annual Meeting, Vancouver, BC.	Yes	Basic	2	0
Hall, Brenda	Abstract	Published	Putnam, A., Schaefer, J., Denton, G., Kaplan, M., Koffman, T., Hall, B., Lowell, T., Barrell, D., Rowan, A., and Finkel, R., 2014. Two pulses of warming and extensive glacier recession at Southern Hemisphere middle latitudes during Heinrich Stadials 1 and 0. Geological Society of America annual meeting, Vancouver, BC	Yes	Basic	1	0
Hamilton, Gordon	Journal Article	Published	Enderlin, E.M and G.S. Hamilton. 2014. A novel method for deriving submarine melt rates in glacial fjords using repeat very high resolution stereo satellite images. Journal of Glaciology, 60(224), doi: 10.3189/2014JoG14J085	Yes	Basic	0	0
Hamilton, Gordon	Journal Article	Published	Sutherland, D.A., G.E. Roth, G.S. Hamilton, S.H. Mernild, L.A. Stearns, & F. Straneo. 2014. Quantifying flow regimes in a Greenland glacial fjord using iceberg drifters. Geophys- ical Research Letters, 41, 8411-8420, doi:10.1002/2014GL062256.	Yes	Basic	0	0
Hamilton, Gordon	Journal Article	Published	Stearns, L. A., G. S. Hamilton, C. J. van der Veen, D. C. Finnegan, S. O'Neel, J. B. Scheick, and D. E. Lawson (2015), Glaciological and marine geological controls on terminus dynamics of Hubbard Glacier, southeast Alaska, J. Geophys. Res. Earth Surf., 120, doi:10.1002/2014JF003341.	Yes	Basic	1	0
Hamilton, Gordon	Journal Article	Submitted	Weitz, N.A. and G.S. Hamilton (2015) Subglacial water distribution in the Byrd Glacier catchment, Antarctica, from a numerical model, Earth and Planetary Sciences Letters, submitted December 2014	Yes	Basic	1	0
Hamilton, Gordon	Journal Article	Submitted	Tielidze, L.G. and G.S. Hamilton (2015) A 53-year record of changes at Chalaati and Zopkhito glaciers, Central Causasus Mountains, Georgia, Journal of Glaciology, submitted March 2015	Yes	Basic	0	0
Hamilton, Gordon	Book Chapter	Published	Raup, B.H., S.J.S. Khalsa, R.L. Armstrong, W.A. Sneed, G.S. Hamilton, F. Paul, F. Cawkwell, M.J. Beedle, B.P. Menounos, R.D. Wheate, H.Rott, L. Shiyin, L. Xin, S. Donghui, C. Guodong, J.S. Kargel, C.F. Larsen, B.F. Molnia, J.L. Kincaid, A. Klein and V. Konovalovin (2014) Quality in the GLIMS Glacier Database, J. S. Kargel et al. (eds.), Global Land Ice Measurements from Space, Springer Praxis Books, 23 DOI: 10.1007/978-3-540-79818-7_2	Yes	Basic	1	0
Isenhour, Cynthia	Book	Published	Cindy Isenhour, Melissa Checker & Gary McDonogh (2015) Sustainability in the Global City: Myth and Practice. New York: Cambridge University Press. http://www.cambridge.org/us/academic/subjects/earth-and-environmental-science/environmental-policy-economics-and-law/sustainability-global-city-	Yes	Applied	0	0

			myth-and-practice				
Isenhour, Cynthia	Journal Article	Published	Isenhour, Cindy and Kuishuang Feng (2014) Decoupling and Displaced Emissions: On Swedish Consumers, Chinese Producers and Policy to Address the Climate Impact of Consumption. Journal of Cleaner Production. doi:10.1016/j.jclepro.2014.12.037 http://www.sciencedirect.com/science/article/pii/S095965261401333X	Yes	Applied	0	0
Isenhour, Cynthia	Journal Article	Published	Peterson, Nicole and Cindy Isenhour (2014) Moving Beyond the Legacy of the Rational Actor in Environmental Governance: An Introduction. Conservation & Society 12(3): 229-232. http://www.conservationandsociety.org/article.asp?issn=0972-4923;year=2014;volume=12;issue=3;spage=229;epage=232;aulast=Peterson	Yes	Basic	0	0
Isenhour, Cynthia	Journal Article	Published	Peterson, Nicole and Cindy Isenhour (2014) Moving Beyond the Legacy of the Rational Actor in Environmental Governance: An Introduction. Conservation & Society 12(3): 229-232. http://www.conservationandsociety.org/article.asp?issn=0972-4923;year=2014;volume=12;issue=3;spage=229;epage=232;aulast=Peterson	Yes	Basic	0	0
Isenhour, Cynthia	Journal Article	Submitted	Love, Thomas and Cindy Isenhour (ND) Introduction: Energy and Economy. Economic Anthropology. Under review.	Yes	Basic	0	0
Isenhour, Cynthia	Journal Article	Submitted	Shwom, Rachel, Cindy Isenhour, Aaron McCright, Rebecca Jordan & Jennifer Meta Robinson. (ND) Enhancing Climate Science Literacy through the Social Sciences. Submitted to Frontiers in Learning Research.	Yes	Applied	0	0
Isenhour, Cynthia	Book Chapter	Published	Melissa Checker, Gary McDonogh & Cindy Isenhour (2015) Introduction: Sustainability as Myth and Practice in the Global City. In Sustainability in the Global City, Isenhour et. al. eds. Cambridge University Press. Melissa Checker, Gary McDonogh & Cindy Isenhour. Introduction: Sustainability as Myth and Practice in the Global City. In Sustainability in the Global City, Isenhour et. al. eds. Cambridge University Press.	Yes	Applied	0	0
Isenhour, Cynthia	Book Chapter	Published	Isenhour, Cindy (2015) Green Capitals Reconsidered: The Carbon Emissions Associated with Urban Consumption. In Sustainability in the Global City, Isenhour, Checker & McDonogh, eds. Cambridge University Press. 2015 Isenhour, Cindy. Green Capitals Reconsidered: The Carbon Emissions Associated with Urban Consumption. In Sustainability in the Global City, Isenhour, Checker & McDonogh, eds. Cambridge University Press.	Yes	Basic	0	0
Isenhour, Cynthia	Book Chapter	Accepted	Isenhour, Cindy (ND) Sustainable Consumption and its Discontents. In Sustainability: Key Issues. Helen Kopnina and Eleanor Shoreman-Ouimet, eds. Earthscan Publishers.		Basic	0	0
Isenhour, Cynthia	Other	Published	Blackmer, Travis, George Criner, David Hart, Cindy Isenhour, John Peckenham, Chet Rock, Avinash Rude, and Linda Silka (2015) Solid Waste Management in Maine: Past, Present and Future. Mitchell Center White Paper.		Applied	2	0

			http://umaine.edu/mitchellcenter/files/2015/02/FINALSolid-Waste-Whitepaper-2.pdf				
Jain, Shaleen	Journal Article	Published	Hart, D. D., K. P. Bell, L. A. Lindenfeld, S. Jain, T. R. Johnson, D. Ranco, and B. McGill (2015), Strengthening the role of universities in addressing sustainability challenges: the Mitchell Center for Sustainability Solutions as an institutional experiment. Ecology and Society, 20, 2. doi: 10.5751/ES-07283-200204	Yes	Applied	0	0
Jain, Shaleen	Journal Article	Published	Dhakal, N., Jain, S., Gray, A., Dandy, M. and Stancioff, E. (2015), Nonstationarity in seasonality of extreme precipitation: A nonparametric circular statistical approach and its application. Water Resources Research. doi:10.1002/2014WR016399	Yes	Applied	0	1
Jain, Shaleen	Journal Article	Accepted	Beyene, M. and S. Jain (2015), Wintertime weather-climate variability and its links to early ice-out in Maine lakes. Limnology and Oceanography, accepted for publication, June 2015.	Yes	Applied	0	0
Jain, Shaleen	Journal Article	Accepted	Wahl, T., S. Jain, J. Bender, S. D. Meyers, and M. E. Luther (2015), Increasing risk of compound flooding from storm surge and rainfall for major US cities. Nature Climate Change, conditionally accepted, June 2015.	Yes	Applied	0	0
Jain, Shaleen	Book Chapter	Accepted	Jain, V., M. Beyene, S. Varay, and S. Jain (2015) Flood Hazard - types, processes and causative factors. In Encyclopedia of Natural Hazards. Taylor and Francis Publishers (in press).	Yes	Applied	1	0
Jain, Shaleen	Book Chapter	Accepted	Melis, T.S., W.E. Pine, J. Korman, M.D. Yard, S. Jain, and R.S. Pulwarty (2015), Using large-scale flow experiments to rehabilitate Colorado River ecosystem function in Grand Canyon: an adaptive climate-resilient strategy. In Western Water Policy and Planning in a Variable and Changing Climate, Miller, Hamlet, Kenney and Redmond (eds.), CRC Press, forthcoming.	Yes	Applied	0	0
Jain, Shaleen	Proceedings	Accepted	Musavi, M., C. James, A. Abedi, J. Castro, J. Vetelino, J. Peckenham, S. Jain, and J. Isherwood (2015), Engineering Solutions to Storm Water Problems Through Diverse Community Participation. Proceedings of IEEE Frontiers in Education conference.	Yes		0	0
Kelley, Alice	Abstract	Published	Kelley, A. and Sandweiss, D. 2014, THE ARCHAEOLOGICAL RECORD AS A PALEOCLIMATIC AND PALEOENVIRONMENTAL ARCHIVE, Geological Society of America Abstracts with Programs. Vol. 46, No. 6, p.52 https://gsa.confex.com/gsa/2014AM/webprogram/Paper249264.html	Yes		0	0
Kelley, Alice	Abstract	Published	Kelley, Alice R., Kelley, Joseph T., and Belknap, Daniel F., 2015, PREDICTIVE MODEL FOR SUBMERGED ARCHAEOLOGICAL SITES: Northern New England and Canadian Maritimes., Abstracts for the 80th Annual Meeting, Society for American Archaeology, San Francisco. http://www.saa.org/AbouttheSociety/AnnualMeeting/Abstracts2015/tabid/1518/	Yes		0	0

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Kelley, Alice	Abstract	Published	PLUTA, Paul M., , KELLEY, Alice R., QUILTER, Jeffrey, and SANDWEISS, Daniel H., 2015, FLUVIAL DEPOSITION, EL NIñO AND LANDSCAPE CONSTRUCTION AT SAN JOSé DE MORO AND HUACA DEL SOL, PERU, Geological Society of America Abstracts with Programs. Vol. 46, No. 6, p.53 https://gsa.confex.com/gsa/2014AM/webprogram/Paper248743.html			1	0
Kelley, Joseph	Book Chapter	Published	Hein, C.J., FitzGerald, D.M., Buynevich, I.V., Van Hereren, S. and Kelley, J.T. (2014). Evolution of paraglacial coasts in response to changes in fluvial sediment supply. In Martini, I.P. (ed.), Sedimentary Coastal Zones from High to Low Latitudes: Similarities and Differences. Geological Society of London Special Publication 388, http://dx.doi.org/10.1144/sp388.15.	Yes	Basic	0	0
Kelley, Joseph	Book Chapter	Published	Cheryl Hapke, Peter Adams, Jonathan Allan, Andrew Ashton, Gary Griggs, Monty Hampton, Joseph Kelley, and Adam Young, (2014), The rock coast of the USA, in Kennedy, D.M., Stephenson, W.J. and Naylor, L.A., (eds.), Rock Coast Geomorphology: A Global Synthesis - The USA, Geological Society of London Memoir 40, p. 137-154.	Yes	Basic	0	0
Kelley, Joseph	Book Chapter	Accepted	Kelley, J.T., Belknap, D.F., and Walsh, J.A. (2014), Tidal Flat-Barrier Spit Interactions in a Fetch-Limited, Macro-Tidal Embayment, Lubec, Maine, USA. In Randazzo, G., Cooper, J.A.G., and Jackson, D., 2014, Gravel spits, Springer Publishing Company, Berlin, Germany, accepted and in press.	Yes	Basic	1	0
Kelley, Joseph	Technical Report	Published	Fernandez, I.J., C.V. Schmitt, S. Birkel, E. Stancioff, A. Pershing, J.T. Kelley, J. Runge, G.L. Jacobson, and P.A. Mayewski. 2015. Maine's Climate Future: 2015 Update. Orono, ME: University of Maine, 24 p.		Applied	0	0
Koons, Peter	Journal Article	Published	Roy, S.G., Koons, P.O., Upton, P., Tucker, G.E. (2015). The influence of crustal strength fields on patterns and rates of fluvial incision. Journal of Geophysical Research: Earth Surface 120, 275-299, doi 10.1002/2014JF003281.	Yes		1	0
Koons, Peter	Journal Article	Accepted	N. Liu, P.O. Koons, Y.F. Zhu, J. Monk, S.G. Roy, B. Segee Graphics processing units (GPU) acceleration of the weather research and forecasting (WRF) model for hurricane Sandy	Yes		2	0
Koons, Peter	Journal Article	Submitted	Roy, S.G., Koons, P.O., Osti, B., Tucker, G.E., Upton, P. (2015). Multi-scale characterization of topographic anisotropy. Computers and Geosciences.	Yes		2	0
Koons, Peter	Journal Article	Submitted	Cooperation of tectonic and surface processes produces Earth's highest coastal mountains. (2015) Enkelmann, E., Koons, P.O., Pavlis, T.L., Hallet,B., Barker, A., Elliott, J., Garver, J.I., Gulick,S.P.S, Headley, R.M., Pavlis, G.L., Ridgway, K.D., Ruppert, N., van Avendonk, H. submitted; Nature 4/21/2015	Yes		1	0
Koons, Peter	Journal Article	Accepted	Comment on "Tectonic control of Yarlung Tsangpo Gorge Revealed by a Buried Canyon in Southern Tibet" Zeitler, P.K, Koons, P.O., Hallet, B. Meltzer, A.S.	Yes		0	0

			(2015); Accepted; SCIENCE 4/23/2015				
Koons, Peter	Journal Article	Submitted	Campbell, S; Arcone, S; Kreutz, K; McNeil, C; Conway, H; Braddock, S; Koons, P; Osterberg, E. 2014; SURFACE-BASED GROUND-PENETRATING RADAR PROFILES OF THE JUNEAU ICEFIELD: INTERPRETATION OF THE WINTER MASS BALANCE AND PREVIOUS YEAR'S SNOW HORIZON", GEOPHYSICS (submitted)	Yes		1	0
Koons, Peter	Abstract	Published	Roy, S.G., Koons, P.O., Tucker, G.E., Upton, P., Smith, S., Gerbi, C. (2014). Geomorphic responses to tectonic strain: the sensitivity of surface processes to crustal displacement, weakening, and comminution associated with brittle failure, Abstract presented at the 2014 Fall Meeting, AGU, San Fransisco, Calif. Dec.	Yes		1	0
Koons, Peter	Abstract	Published	Roy, S.G., Koons, P.O., Gerbi, C., Capps, D.K., Tucker, G.E., Rogers, Z.A. (2014). Building models in the classroom: taking advantage of sophisticated geomorphic numerical tools using a simple graphical user interface, Abstract presented at the 2014 Fall meeting, AGU, San Fransisco, Calif. Dec.	Yes		1	1
Kreutz, Karl	Journal Article	Published	WAIS Divide project members (C. Buizert, B. Adrian, J. Ahn, M. Albert, R.B. Alley, D. Baggenstos, T. K. Bauska, R.C. Bay, B.B. Bencivengo, C.R. Bentley, E.J. Brook, N.J. Chellman, G.D. Clow, J. Cole-Dai, H. Conway, E. Cravens, K.M. Cuffey, N.W. Dunbar, J.S. Edwards, J.M. Fegyveresi, D.G. Ferris, J.J. Fitzpatrick, T. J. Fudge, C.J. Gibson, V.Gkinis, J.J. Goetz, S. Gregory, G.M. Hargreaves, N. Iverson, J. Johnson, T.R. Jones, M.L. Kalk, M.J. Kippenhan, B.G. Koffman, K.J. Kreutz, T.W. Kuhl, D.A. Lebar, J.E. Lee, S.A. Marcott, B.R. Markle, O.J. Maselli, J.R. McConnell, K.C. McGwire, L.E. Mitchell, N.B. Mortensen, P.D. Neff, K.Nishiizumi, R.M. Nunn, A.J. Orsi, D.R. Pasteris, J.B. Pedro, E.C. Pettit, P.B. Price, J.C. Priscu, R.H. Rhodes, J.L. Rosen, A.J. Schauer, S.W. Schoenemann, P.J. Sendelbach, J.P. Severinghaus, A.J. Shturmakov, M. Sigl, K.R. Slawny, J.M. Souney, T.A. Sowers, M.K. Spencer, E.J. Steig, K.C. Taylor, M.S. Twickler, B.H. Vaughn, D.E. Voigt, E.D. Waddington, K.C. Welten, A.W. Wendricks, J.W.C. White, M. Winstrup, G.J. Wong, and T.E. Woodruff), 2015, Precise interpolar phasing of abrupt climate change during the last ice age, Nature, 520 (7549), 661-665.	Yes	Basic	2	0
Kreutz, Karl	Journal Article	Published	Zdanowicz, C., D. Fisher, J. Bourgeois, M. Demuth, J. Zheng, P. Mayewski, K. Kreutz, E. Osterberg, K. Yalcin, C. Wake, E. J. Steig, D. Froese and K. Goto-Azuma, 2014, Ice Cores from the St. Elias Mountains, Yukon, Canada: Their Significance for Climate, Atmospheric Composition and Volcanism in the North Pacific Region, Arctic, 67(5), 35-57.	Yes	Basic	0	0
Kreutz, Karl	Journal Article	Published	Osterberg, E.O., P.A. Mayewski, D.A. Fisher, K.J. Kreutz, K.A. Maasch, S. Sneed, and E. Kelsey, 2014, Mount Logan ice core record of tropical and solar influences on Aleutian Low variability: 500–1998 A.D., Journal of Geophysical Research, 119(19), 11,189–11,204, DOI: 10.1002/2014JD021847.	Yes	Basic	0	0

Kreutz, Karl	Journal Article	Published	Koffman, B.G., K. J. Kreutz, D. J. Breton, E. J. Kane, D. A. Winski, S. D. Birkel, A. V. Kurbatov, and M. J. Handley, 2014, Centennial-scale variability of the Southern Hemisphere westerly wind belt in the eastern Pacific over the past two millennia, Climate of the Past, 10(3), 1125-1144, doi:10.5194/cp-10-1125-2014.	Yes	Basic	3	1
Kreutz, Karl	Abstract	Published	Gilbert, L., Kreutz, K.J., and Gross, D., Earth Systems Thinking: An InTeGrate Module That Can Be Used In Any Course, Earth Educators Rendezvous, Boulder, CO, July 13-17, 2015.			0	0
Kreutz, Karl	Abstract	Published	Kreutz, K.J., Campbell, S., Osterberg, E., Wake, C.P., Winski,, D., Roy, S., Koons, P.O., Arcone, S.A., Geophysical Approaches to Improve Holocene Ice Core-Based Hydroclimate Reconstructions in the Northeast Pacific, American Geophysical Union Joint Assembly, Montreal, Canada, May 3-7, 2015.			0	0
Kreutz, Karl	Abstract	Accepted	Bradford, A., Campbell, S., Kreutz, K.J., Osterberg, E.O., Wake, C.P., Introne, D., Burrows, R., Capps, D., Detecting the effects of atmospheric rivers on glacier mass balance: a case study in Denali National Park, Alaska, American Geophysical Union Joint Assembly, Montreal, Canada, May 3-7, 2015.			0	0
Kreutz, Karl	Abstract	Published	Bradford, A., Campbell, S., and Kreutz, K.J., Detecting the effects of atmospheric rivers on glacier mass balance: Denali National Park, Alaska, University of Maine Center for Undergraduate Research Annual Showcase, Orono, ME, April 14, 2015.			0	0
Kreutz, Karl	Abstract	Published	Kreutz, K,J. and Campbell, S., Geophysical reconnaissance to expand ice core hydroclimate reconstructions in the Northeast Pacific, Climate Change Institute Borns Symposium, April 9-10, 2015.			0	0
Kreutz, Karl	Abstract	Published	Whitney, N., Wanamaker, A., Kreutz, K., Introne, D., and Griffin, S., Reconstructing Late Holocene hydrographic variability in the Western North Atlantic using oxygen isotopes from an annually resolved Arctica Islandica shell-based record, Northeast Geological Society of America meeting, Bretton Woods, NH, March 23-25, 2015.			0	0
Kreutz, Karl	Abstract	Published	Winski, D., Osterberg, E., Kreutz, K.J., Baum, M., Wake, C., and Campbell, S., Abrupt summer warming in the Alaska Range from melt layers in the Mt. Hunter ice core, Northeast Geological Society of America meeting, Bretton Woods, NH, March 23-25, 2015.			0	0
Kreutz, Karl	Abstract	Accepted	Campbell, S., Kreutz, K.J., Arcone, S., Braddock, S., Osterberg, E., and Koons, P., Determining winter mass balance and the previous year snowline position on the Juneau Icefield, Alaska using ground-penetrating radar, Northeast Geological Society of America meeting, Bretton Woods, NH, March 23-25, 2015.			0	0
Kreutz, Karl	Abstract	Published	Kreutz, K.J., Campbell, S., Osterberg, E., Wake, C., Winski, D., Roy, S., and Koons, P., Geophysical approaches to improve Holocene ice core-based			0	0

			hydroclimate reconstructions in the Northeast Pacific, Northeast Geological Society of America meeting, Bretton Woods, NH, March 23-25, 2015.				
Kreutz, Karl	Abstract	Published	McConnell, J.R., Arienzo, M., Chellman, C., Fritzsche, D., Kreutz, K.J., Kipfstuhl, S., Maselli, O., Nolan, M., Pasteris, D., Sigl, M., and Steffensen, J.P., Dust in the Arctic over the past millennium from a developing array of ice cores: Linkages to climate and land use, American Geophysical Union Fall Meeting, San Francisco, CA, Dec. 15-19, 2014.			0	0
Kreutz, Karl	Abstract	Published	Winski, D., Osterberg, E., Kreutz, K.J., Baum, M., and Wake, C.P., Melt layer stratigraphic evidence of increasing summer snow melt on Mt. Hunter, Alaska over the last 400 years, American Geophysical Union Fall Meeting, San Francisco, CA, Dec. 15-19, 2014.			0	0
Kreutz, Karl	Abstract	Published	Saylor, P., Osterberg, E., Kreutz, K.J., Wake, C. and Winski, D., A storm-by-storm analysis of alpine and regional precipitation dynamics at the Mt. Hunter ice core site, Denali National Park, Alaska, American Geophysical Union Fall Meeting, San Francisco, CA, Dec. 15-19, 2014.			0	0
Maasch, Kirk	Book	Published	H. W. Borns, Jr., K. A. Maasch (2015) Foot Steps of the Ancient Great Glacier of North America: A Long Lost Document of a Revolution in 19th Century Geological Theory, Springer International Publishing Switzerland, 202p.		Basic	0	0
Maasch, Kirk	Journal Article	Published	Osterberg, E. C., P. A. Mayewski, D. A. Fisher, K. J. Kreutz, K. A. Maasch, S. B. Sneed, and E. Kelsey (2014), Mount Logan ice core record of tropical and solar influences on Aleutian Low variability: 500–1998 A.D., J. Geophys. Res. Atmos., 119, 11,189–11,204, doi:10.1002/ 2014JD021847.	Yes	Basic	0	0
Maasch, Kirk	Journal Article	Published	B. Grigholm, Mayewski, P.A., Kang, S., Aizen,, V., Zhang, Y., Morgenstern, U., Kaspari, S., Takeuchi, N., Maasch, K.A., Birkel, S., Handley, M. and Sneed, S. (2015), Twentieth century dust lows and the weakening of the westerly winds over the Tibetan Plateau, Geophys. Res. Lett., 42, 2434–2441, doi:10.1002/2015GL063217.	Yes	Basic	1	0
Mayewski, Paul	Journal Article	Accepted	Aizen, V.B., Aizen, E.M., Takeuchi, N., Mayewski, P.A., Grigholm, B., Joswiak, D.R., Fujita, K., Nikitin, S., Nakawo, M. and Schwikowski, M., in press 2014, Abrupt and moderate climate changes at high mid-latitudes of Asia during the Holocene, Journal of Glaciology.	Yes	Applied	1	0
Mayewski, Paul	Journal Article	Accepted	Kang, S Schwikowski, M., Ren, J., Yao, T, Qin, D. and Mayewski, P.A., 2014, Decapitation of high-altitude glaciers on the Tibetan Plateau revealed by ice core tritium and mercury records, Cryosphere.	Yes	Applied	0	0
Mayewski, Paul	Journal Article	Accepted	Sneed, S.B., Mayewski, P.A., Sayre, W.G., Handley, M.J., Kurbatov, A.V., Taylor, K.C., Bohleber, P., Wagenbach, D., Erhardt, T., and Spaulding, N.E., 2015, New LA-ICP-MS cryocell and calibration technique for sub-millimeter analysis of ice cores, J. Glaciology 61 (226), 233-242.	Yes	Applied	1	0

			doi: 10.3189/2015JoG14J139				
Mayewski, Paul	Journal Article	Submitted	Alencar, A.S., Evangelista, H., Corrêa, S.M., Wainer, I., Jaña, R., Potocki, M., Kurbatov, A.V., Mayewski, P.A. and Simões, J.C., in review, A prospective analysis of VOC and aerosol compositions at Detroit Plateau, Antarctic Peninsula.	Yes	Applied	0	0
Mayewski, Paul	Journal Article	Published	Korotkikh, E. V., Mayewski, P.A., Dixon, D., Kurbatov, A.V., Handley, M.J., 2014, Recent increase in Ba concentrations as recorded in a South Pole ice core, Atmospheric Environment 89, 683-687.	Yes	Applied	2	0
Mayewski, Paul	Journal Article	Published	Pang, H., Hou, S., Kaspari, S. and Mayewski, P.A., 2014, Influence of regional precipitation patterns on stable isotopes in ice cores from the central Himalayas, The Cryosphere 8, 289-301. doi:10.5194/tc-8-289-2014	Yes	Applied	0	0
Mayewski, Paul	Journal Article	Submitted	Osterberg, E.C., Mayewski, P.A., Kreutz, K.J., Fisher, D.A., Maasch, K.A., Sneed, S.B., in review. Ice core record of Aleutian Low variability and tropical teleconnections since 500 AD, J. Geophys. Res.	Yes	Applied	0	0
Mayewski, Paul	Journal Article	Submitted	Jenkins, M., Kaspari, S., Kang, S., Grigholm, B. and Mayewski, P.A., in review, Black carbon concentrations from a Tibetan Plateau ice core spanning 1843-1982: Recent increases due to emissions and glacier melt.	Yes	Applied	1	0
Mayewski, Paul	Journal Article	Accepted	Zhang, Y.L., Kang, S.C., Grigholm, B., Zhang, Y.J., Kaspari, S., Morgenstern, U., Ren, J.W., Qin, D.H., Mayewski, P.A., Zhang, Q.G., Cong, Z.Y. and Chen, F., in press 2015, The 20th century warming preserved in a Mt. Geladaindong ice core, central Tibetan Plateau.	Yes	Applied	0	0
Mayewski, Paul	Journal Article	Published	Grigholm, B., Mayewski, P.A., Kang, S., Zhang, Y., Morgenstern, U., Schwikowski, M., Kaspari, S., Aizen, V., Aizen, E., Takeuchi, N., Maasch, K., Birkel, S., Handley, M., and Sneed, S., 2015, 20th Century Dust Lows and the Weakening of the Westerly Winds over the Tibetan Plateau. Geophysical Research Letters. DOI: 10.1002/2015GL063217	Yes	Applied	1	0
Mayewski, Paul	Journal Article	Published	Potocki, M. , Mayewski, P.A., Kurbatov, A.V., Dixon, D.A., Grigholm, B., Casassa, G., Zamora, R., Korotkikh, E., Handley, M., Introne, D. and Sneed, S., 2014, A new ice core from the Central Andes, (Tupungatito), Climate Change Institute Mini Paper, University of Maine. http://cci.siteturbine.com/uploaded_files/climatechange.umaine.edu/files/MiniPaperscombined.pdf		Applied	2	0
Mayewski, Paul	Journal Article	Submitted	Beers, T.M., Sneed, S.B., Mayewski, P.A. and Handley, M., in review, Triple junction and grain boundary influences on climate signals in polar ice.	Yes	Applied	1	0
Mayewski, Paul	Journal Article	Published	Albani, S., Mahowald, N.M., Winckler, G., Anderson, R.F., Bradtmiller, L.I., Delmonte, B., Francois, R., Goman, M., Heavans, N.G., Hesse, P.P., Hovan,	Yes	Applied	0	0

				S.A., Kohfeld, K.E., Lu, H., Maggi, V., Mason, J.A., Mayewski, P.A., McGee, D.M., Miao, X., Muhs, D.R., Otto-Bliesner, B.L., Perry, A.T., Pourmand, A., Roberts, H.M., Rosenbloom, N., Stevens, T. and Sun, J., 2014, 12,000 years of dust: the Holocene global dust cycle constrained by natural archives, Climate of the Past Discussions, 10, 4277-4363.				
Mayewski, Paul	Journal Article	Submitted	Beers, T.M., Mayewski, P.A., Bertler, N.A.N., Kurbatov, A., Dixon, D., Fudge, TJ, Auger, J., Birkel, S. and Handley, M., in review, 1150 year long ice core record of the Ross Sea Polynya, Antarctica.	Yes	Applied	2	0
Mayewski, Paul	Journal Article	Submitted	Tuohy, A., Bertler, N., Neff, P., Edwards, R., Emanuelsson, D., Beers, T. and Mayewski, P.A., in review, Transport and deposition of toxic metals to Roosevelt Island, Antarctica.	Yes	Applied	1	0
Mayewski, Paul	Journal Article	Submitted	Mayewski, P.A., Bertler, N., Birkel, S., Bracegirdle, T., Carleton, A., England, M., Goodwin, I., Kang, J-H., Kushner, P. Mayewski, P., Russell, J., Schneider, S., Turner, J. and Vellicogna, I., in review, Potential for Southern Hemisphere climate surprises.	Yes	Applied	0	0
Mayewski, Paul	Journal Article	Submitted	Bracegirdle, T.J., Bertler, N., Carleton, A.M., Ding, Q., Fogwill, J., Fyfe, J.C., Hellmer, H., Karpechko, A.Y., Kusahara, K., Larour, E., Mayewski, P.A., Meier, W.N., Polavni, L.M., Russell, J.L., Stevenson, S.L., Turner. A.J., van Wessem, J.M. and Wainer, I., in review, A multi-disciplinary perspective on climate model evaluation for Antarctica.	Yes	Applied	0	0
Mayewski, Paul	Journal Article	Submitted	Haines, S.A., Mayewski, P.A., Kurbatov, A.V., Sneed, S.B., Maasch, K.A., Bohleber, P.D., Spaulding, N.E. and Dixon, D.A., in review, Sub-seasonal reconstruction of an ice core recorded abrupt climate change transition 84.6ka years ago.	Yes	Applied	1	0
Mayewski, Paul	Journal Article	Submitted	Potocki, M., Mayewski, P.A., Kurbatov, A., Simoes, J.C., Dixon, D.A., Goodwin, I., Carleton, A.M., Handley, M.J., Jana, R. and Kortkikh, E., in review, Recent increase in Antarctic Peninsula ice core uranium concentrations.	Yes	Applied	2	0
Mayewski, Paul	Journal Article	Submitted	Haines, S. A., Mayewski, P.A., Kurbatov, A.V., Sneed, S.B., Maaasch, K.A., Bohleber, P.D., Spaulding, N.E. and Dixon, D.A., in review, Ultra-high resolution snapshots of three multi-decadal periods in an Antarctic ice core.	Yes	Applied	1	0
Mayewski, Paul	Journal Article	Accepted	Higgins, J.A., Kurbatov, A.V., Spaulding, N.E., Brook, E.J., Introne, D.S., Chimiak, L., Yan, Y., Mayewski, P.A. and Bender, M., in press 2015, Atmospheric composition 1 million years ago from blue ice in the Allan Hills, Antarctica, Proc. Nat. Acad. Sci.	Yes	Basic	0	0
Mayewski, Paul	Proceedings	Published	Haines, S., Mayewski, P.A., Kurbatov, A., Maasch, K. and Sneed, S., 2014, Investigation of Greenland and Antarctic ice core recorded abrupt climate change using ultra-high resolution laser sampling, Climate Change Institute Mini Paper, University of Maine. http://cci.siteturbine.com/uploaded_files/climatechange.umaine.edu/files/MiniPa		Applied	1	0

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Mayewski, Paul	Proceedings	Published	Beers, T.M., Mayewski, P.A., Kern, S., Birkel, S. and Dixon, D., 2014, A Ross Sea polyna proxy produced from the RICE ice core record, Roosevelt Island, Antarctica, Climate Change Institute Mini Paper, University of Maine. http://cci.siteturbine.com/uploaded_files/climatechange.umaine.edu/files/MiniPaperscombined.pdf		Applied	1	0
Mayewski, Paul	Proceedings	Published	Korotkikh, E., Mayewski, P.A., Handley, M. and Introne, D., 2014, A 1000-year high resolution record of climate variability developed from a South Pole ice core, Climate Change Institute Mini Paper, University of Maine. http://cci.siteturbine.com/uploaded_files/climatechange.umaine.edu/files/MiniPaperscombined.pdf		Applied	1	0
Mayewski, Paul	Proceedings	Published	Spaulding, N.E., Bohleber, P., Sneed, S.B., Wagenbach, D., Mayewski, P.A. and McCormick, M., 2014, Combining novel ice core analysis with ancient historical records: first results from Colle Gnifetti ice core project, European Alps, Climate Change Institute Mini Paper, University of Maine. http://cci.siteturbine.com/uploaded_files/climatechange.umaine.edu/files/MiniPaperscombined.pdf		Applied	0	0
Mayewski, Paul	Proceedings	Published	Rodda, C., Mayewski, P.A., Haines, S., Sneed, S., Introne, D., Seimon, A. and Baker, P., 2014, Paleoclimate reconstruction in the Peruvian Andes: Reconnaissance of a new field site, Climate Change Institute Mini Paper, University of Maine. http://cci.siteturbine.com/uploaded_files/climatechange.umaine.edu/files/MiniPaperscombined.pdf		Applied	2	0
Mayewski, Paul	Proceedings	Published	Potocki, M., Mayewski, P.A., Kurbatov, A.V., Dixon, D.A., Grigholm, B., Casassa, G., Zamora, R., Korotkikh, E., Handley, M. and Introne, D., 2015, Environmental records from Tupungatito ice core, Central Chilean Andes, Climate Change Institute Mini Paper, University of Maine.		Applied	3	0
Mayewski, Paul	Proceedings	Submitted	Korotkikh, E., Mayewski, P.A., Kurbatov, A. and Bertler, N., 2015, Developing an ultra-high resolution record of the last glacial-interglacial transition from the RICE ice core (Roosevelt Island, Antarctica), Climate Change Institute Mini Paper, University of Maine.		Applied	1	0
Mayewski, Paul	Proceedings	Published	Auger, J.D., Birkel, S.D., Maasch, K.A., Mayewski, P.A. and Schuenmann, K., 2015, A four-member monthly ensemble of 3rd generation climate reanalysis models, 1979-2013, Climate Change Institute Mini Paper, University of Maine.		Applied	1	0
Mayewski, Paul	Technical Report	Published	SCAR ACCE Advisory Group (Turner, J., Summerhayes, C., Sparrow, M., Mayewski, P.A., Convey, P., di Prisco, G., Gutt, J., Hodgson, D., Speich, S., Worby, T., Bo, S. and Klepikov, A., in press, Antarctic climate change and the environment – 2014 update, Antarctic treaty Meeting Report 2014.	Yes	Applied	0	0

Mayewski, Paul	Technical Report	Published	Fernandez, I.J., Schmitt, C.V., Birkel, S., Stancioff, E., Persing, A., Kelley, J.T., Runge, J., Jacobson, G.L. and Mayewski, P.A., 2015, Maine's climate Future: 2015 Update, Orono, Maine, University of Maine. http://climatechange.umaine.edu/research/publications/climate-future		Applied	0	0
Mayewski, Paul	Technical Report	Submitted	(1) Turner J, Barrand NE, Bracegirdle TJ, Convey P, Hodgson DA, Jarvis M, Jenkins A, Marshall GJ, Meredith MP, Roscoe HK, Shanklin JD, French J, Goosse H, Guglielmin M, Gutt J, Jacobs SS, Kennicutt MCI, Masson-Delmotte V, Mayewski P, Navarro F, Robinson S, Scambos T, Sparrow M, Speer K, Summerhayes CP, Klepikov AV, in review, Antarctic Climate Change and the Environment - An Update.	Yes	Applied	0	0
Mayewski, Paul	Editorial	Submitted	Mayewski, P.A. and Lyon, D.W., 2015, Maine is a leader in confronting climate change in the High North, Bangor Daily News OpEd.		Applied	0	0
Mayewski, Paul	Editorial	Submitted	Mayewski, P.A., 2015, Five reasons Maine should care about Arctic warming, invited article, Bangor Daily News.		Applied	0	0
McGill, Brian	Journal Article	Published	60. Dornelas, Maria, Nicholas J Gotelli, Brian McGill, Anne E. Magurran – "Overlooked local biodiversity loss – Response" (Science 2014 344(6 June) 1098-1099)	Yes		0	0
McGill, Brian	Journal Article	Published	Lammana, Christine?, Benjamin Blonder; Cyrille Violle; Nathan J. B. Kraft; Brody Sandel; Irena Simova; John C. Donoghueß; Jens-Christian Svenning; Brian McGill; Brad Boyle; Vanessa Buzzard; Steven Dolins; Peter M. Jørgensen; Aaron Marcuse-Kubitza; Naia Morueta-Holme; Robert K. Peet; William H. Piel; James Regetz; Mark Schildhauer; Nick Spencer; Barbara Theirs; Susan K. Wiser and Brian J. Enquist - "Functional trait space and the latitudinal diversity gradient" (Proceedings of the National Academy of Science in press)	Yes	Basic	0	0
McGill, Brian	Journal Article	Published	Blois, Jessica; Nicholas J. Gotelli, Anna K. Behrensmeyer, J. Tyler Faith, S. Kathleen Lyons,John W. Williams, Kathryn L. Amatangelo, Antoine Bercovici, Andrew Du, Jussi T. Eronen,Gary R. Graves, Nathan Jud, Conrad Labandeira, Cynthia Looy, Brian McGill, David Patterson,Richard Potts, Brett Riddle, Rebecca Terry, Anikó Tóth, Amelia Villaseñor and Scott WingJ. "A framework for evaluating the influence of climate, dispersal limitation, and biotic interactions using fossil pollen associations across the late Quaternary" (Ecography in press)	Yes	Basic	0	1
McGill, Brian	Journal Article	Published	Colgan, Charles; Malcolm Hunter, Brian McGill, Aaron Weiskittel, "Managing the middle ground: Forests in the transition zone between cities and remote areas" (Landscape Ecology in press)	Yes	Applied	0	0
McGill, Brian	Journal Article	Published	Lazarus, Elijah; Brian McGill – "Pushing the pace of tree species migration" – (PLOS One 2014 in press)	Yes	Applied	0	0

McGill, Brian	Journal Article	Published	Parmentier, Benoit; Brian McGill, Adam M. Wilson, James Regetz, Walter Jetz, Robert Guralnick, Mao-Ning Tuanmu, Natalie Robinson, Mark Schildhauer – "An assessment of methods and remotely sensed covariates for regional predictions of 1 km daily maximum air temperature" (Remote Sensing 2014 in press)	Yes	Applied	0	0
McGill, Brian	Journal Article	Published	Simova, Irena; Cyrille Violle; Nathan J.B. Kraft3; David Storch; Jens-Christian Svenning; Brad Boyle; John Donoghuea;; Peter Jørgensen; Brian J. McGill; Naia Morueta-Holme5; William H. Piel ; Robert K. Peet1; Jim Regetz; Mark Schildhauer; Nick Spencer; Barbara; Susan Wiser; Brian J. – "Shifts in trait means and variances in North American tree assemblages: species richness patterns are loosely related to the functional space" (Ecography 2014 in press)	Yes	Basic	3	0
McGill, Brian	Journal Article	Published	Morueta-Holmes, Naia; Enquist, Brian J; McGill, Brian J followed by 15 other members of BIEN working group and Jens-Christian Svenning – "Habitat area and climate stability determine geographic variation in plant species range sizes" (Ecology Letters)	Yes	Basic	1	0
McGill, Brian	Journal Article	Published	65. Benjamin Blonderß, Lindsey Sloatß, Brian J. Enquist, Brian McGill – "Separating Macroecological Pattern and Process: Comparing Ecological, Economic, and Geological Systems" (PLOS One 9(11): e112850. doi:10.1371/journal.pone.0112850)	Yes	Basic	2	0
McGill, Brian	Journal Article	Published	67. McGill, Brian J; Maria A Dornelas; Nicholas J Gotelli; Anne E. Magurran "15 forms of biodiversity trends in the Anthropocene" (Trends in Ecology and Evolution 2015 30(2):104-113)	Yes	Applied	0	0
McGill, Brian	Journal Article	Accepted	Parmentier, Benoit?; Brian McGill, Adam M. Wilson, James Regetz, Walter Jetz, Robert Guralnick, Mao-Ning Tuanmu, Mark Schildhauer – "Using multi-timescale methods and satellite-derived land surface temperature for the interpolation of daily maximum air temperature in Oregon" (International Journal of Climatology , 2015)	Yes	Applied	0	0
McGill, Brian	Journal Article	Published	McGill, Brian J – "Land use matters" (Nature 2015 520(April 2):38-39)	Yes	Applied	0	0
McGill, Brian	Journal Article	Published	Hart, D. D.; K. P. Bell; L. A Lindenfeld; S. Jain; T. R. Johnson; D. Ranco; and B. McGill. 2015. Strengthening the role of universities in addressing sustainability challenges: the Mitchell Center for Sustainability Solutions as an institutional experiment. Ecology and Society 20 (2): 4. [online]	Yes	Pedagogical	0	0
McGill, Brian	Journal Article	Accepted	72. Petchey, Owen; Mikael Pontarp; Thomas M. Massie; Sonia Kefi; Arpat Ozgul; MajaWeilenmann; Gian Marco Palamara; Florian Altermatt; Blake Matthews; Jonathan M.Levine; Dylan Z. Childs; Brian J.McGill; Michael E. Schaepman; Bernhard Schmid; Piet Spaak; Andrew P. Beckerman; FrankPennekamp; Ian S. Pearse - "The ecological forecast horizon, and examples of its uses and determinants" (Ecology Letters 2015 online early)	Yes	Basic	0	0

Northington, Robert	Journal Article	Published	Hershey, A.E., S.C. Whalen, J. Hart-Smith, M.C. Bostick, and R.M. Northington. Sediment methane flux, methane oxidation, and use of methane-derived carbon in arctic lake sediments. Limnology and Oceanography 60: 276-285.			1	1
Northington, Robert	Journal Article	Published	Currinder B., K. K. Cecala, R.M. Northington, and M.E. Dorcas. 2014. Response of stream salamanders to experimental drought in the southern Appalachian Mountains, USA. Journal of Freshwater Ecology, doi: 10.1080/02705060.2014.938135			0	1
Norton, Stephen	Journal Article	Submitted	Owen, R. B., Longcore, J. R., and Norton, S. A., 2014, Characteristics of Mineral Springs in Northern Maine, USA: Northeast Naturalist, 21, 146-153.		Basic	0	0
Norton, Stephen	Journal Article	Submitted	Kopácek, J., Hejzlar, J., Kana, J., Norton, S., and Stuchlík, E., 2015, Effects of acidic deposition on in-lake phosphorus availability: A lesson from lakes recovering from acidification. Environ. Sc. Tech., 49, 2895-2903.	Yes	Basic	0	0
Norton, Stephen	Book Chapter	Submitted	Norton, S. A., Kopácek, J., and Fernandez, I. J., 2014, Acidification and Acid Rain: in Holland, H. D. and Turekian K. K. (eds.), Treatise on Geochemistry,11, 379-414, London: Elsevier.	Yes		0	0
Norton, Stephen	Abstract	Submitted	Simon, K. S., Mineau, M. M., Rancatti, R. R., Adams, M. B., Fernandez, I. J., Norton, S. A., 2014, Coupled biogeochemical cycling in watersheds subjected to chronic nitrogen enrichment and acidification: New Zealand Freshwater Sciences Society.		Applied	1	0
Olsen, Brian	Journal Article	Published	Robertson, EP and BJ Olsen. 2014. Density, sex, and nest stage affect rail broadcast survey results. Journal of Wildlife Management. DOI: 10.1002/jwmg.769	Yes	Applied	1	0
Olsen, Brian	Journal Article	Published	Robertson, EP and BJ Olsen. 2015. (Cover Article) Behavioral plasticity for nest-building increases fecundity in marsh birds. The Auk: Ornithological Advances 132(1): 37-45. DOI: 10.1642/AUK-14-73.1.	Yes	Basic	1	0
Olsen, Brian	Journal Article	Published	Olsen, BJ, JD McCabe, EM Adams, DP Grunzel, and AJ Leppold. 2015. Matching ephemeral resources on autumnal stopover and the potential for mismatch. Pp. 163-176 in Phenological Synchrony and Bird Migration: Changing Climate and Seasonal Resources in North America (EM Wood and JL Kellermann, eds.). Studies in Avian Biology (v.47), CRC Press, Boca Raton, FL.	Yes	Basic	4	0
Olsen, Brian	Journal Article	Published	McCabe, JM, and BJ Olsen. 2015. Landscape-scale habitat availability, and not local geography, predicts migratory landbird stopover across the Gulf of Maine. Journal of Avian Biology 46:001-011. DOI: 10.1111/jav.00598	Yes	Basic	1	0
Olsen, Brian	Journal Article	Published	Batz, Z, BJ Olsen, J Dumont, F Dastoor, and MK Smith. 2015. Helping struggling students in introductory biology: a peer-tutoring program approach that improves performance, perception, and retention. CBE – Life Sciences	Yes	Pedagogical	2	0

			Education 14(2):ar16. DOI: 10.1187/cbe.14-08-0120				
Olsen, Brian	Journal Article	Accepted	Walsh, J, WG Shriver, BJ Olsen, KM O'Brien, AI Kovach. In Press. Phenotypic variation across and avian hybrid zone: implications for species conservation. The Auk: Ornithological Advances.	Yes	Basic	1	0
Olsen, Brian	Journal Article	Submitted	Adams, E and BJ Olsen. In Revision. Using a hierarchical modeling framework to estimate abundance and detection bias in surveys of migrating animals. Ecosphere.	Yes	Basic	1	0
Olsen, Brian	Journal Article	Submitted	Olsen, BJ, D Turcotte, JD McCabe, D Anderson. Invited Revision. Parallel patterns of urban boldness but divergence in territorial aggression among song sparrow populations. Behavioural Processes.	Yes	Basic	1	1
Olsen, Brian	Journal Article	Submitted	Grunzel, DP, BJ Olsen. Invited Revision. Longer distance migrant passerines are more averse to predation risk during migration. Behavioral Ecology & Sociobiology.	Yes	Basic	1	0
Olsen, Brian	Journal Article	Submitted	McCabe, JD, BJ Olsen. Invited Revision. Trade-offs between predation risk and foraging efficiency shape stopover communities of migrant landbirds. The Auk: Ornithological Advances.	Yes	Basic	1	0
Olsen, Brian	Journal Article	Submitted	Byrd, AJ, BJ Olsen, DC Evers. Invited Revision. A continental bioclimatic envelope validation using demographic information from a portion of the common loon range. Journal of Biogeography.	Yes	Basic	1	0
Olsen, Brian	Journal Article	Submitted	Davis, EW, B Rolek, BJ Olsen. Invited Revision. Arthropod availability predicts presence of the Bay-breasted Warbler during a breeding season without spruce budworm outbreak. Wilson Journal of Ornithology.	Yes	Basic	1	1
Olsen, Brian	Journal Article	Submitted	Perlut, N, C Smith, BJ Olsen, D Grunzel, T Lloyd-Evans, and T Dean. Invited Revision. A test of Bergman's rule: Black-capped Chickadees show latitudinal variation in wing length but not body mass across four degrees of latitude in eastern North America. Wilson Journal of Ornithology.	Yes	Basic	1	1
Olsen, Brian	Journal Article	Submitted	Ruskin, KJ, MA Etterson, TP Hodgman, BJ Olsen. Invited Revision. Non-adaptive differences in oviposition preferences of sister species: a case for neutral evolution. Behavioral Ecology and Sociobiology.	Yes	Basic	1	0
Olsen, Brian	Journal Article	Submitted	Wiest, WA, MD Correll, BJ Olsen, CS Elphick, TP Hodgman, DR Curson, and WG Shriver. Invited Revision. A regional monitoring framework for estimating the occurrence and abundance of tidal marsh birds in the Northeast USA. The Condor: Ornithological Applications.	Yes	Applied	2	0
Olsen, Brian	Journal Article	Submitted	Cattrano, K, N Perlut, BJ Olsen, and JD McCabe. In Review. Increased social information does not benefit body condition of long-distance migrants during migration stopover. Canadian Field Naturalist.	Yes	Basic	1	1

Olsen, Brian	Journal Article	Submitted	Kern, RA, BJ Olsen, WG Shriver. In Review. Influence of flooding and predation on tidal marsh sparrow nest-site niches. Journal of Avian Biology.	Yes	Basic	1	0
Olsen, Brian	Journal Article	Submitted	Ruskin, KJ, MA Etterson, TP Hodgman, A Borowske, JB Cohen, CS Elphick, CR Field, RA Kern, E King, A Kocek, AI Kovach, K O'Brien, N Pau, WG Shriver, J Walsh, BJ Olsen. In Review. Demographic analysis demonstrates contrasting abiotic and biotic stressors across a species range. Global Ecology and Biogeography.	Yes	Basic	6	0
Peterson, Michael	Journal Article	Published	Mahaffey, C. A., Peterson, M. L., Thomason, J. J. and McIlwraith, C. W., 2015, "Dynamic testing of horseshoe designs at impact on synthetic and dirt Thoroughbred racetrack materials". Equine Veterinary Journal. doi: 10.1111/evj.12360	Yes	Applied	1	0
Peterson, Michael	Journal Article	Published	Chris W. Rogers, Charlotte F. Bolwell, Erica K. Gee, Michael L. Peterson, C. Wayne McIlwraith, "Profile and Surface Conditions of New Zealand Thoroughbred Racetracks", Journal of Equine Veterinary Science, Vol. 34, No. 9, September 2014, pp 1105–1109	Yes	Applied	0	0
Peterson, Michael	Journal Article	Published	Moorman, Valerie J., Raoul F. Reiser II, Christie A. Mahaffey, Michael L. Peterson, C. Wayne McIlwraith, Christopher E. Kawcak, "Use of an inertial measurement unit to assess the effect of forelimb lameness on three dimensional hoof orientation in horses at a walk and trot" Am J Vet Res., Vol 75, No. 9, 2014, pp. 800-808.	Yes	Applied	1	0
Peterson, Michael	Journal Article	Submitted	Lin, L; Peterson, M L; Greenberg, A R, "Use of the ultrasonic slow wave to identify pore closure caused by deposition of a polymeric surface layer", Insight - Non-Destructive Testing and Condition Monitoring, Volume 56, Number 4, 2014 , pp. 183-188(6), http://dx.doi.org/10.1784/insi.2014.56.4.183	Yes	Applied	1	0
Robinson, Brian S	Journal Article	Submitted	Robert C. Ingraham, Brian S. Robinson, Kristin D. Sobolik, and A. Sky Heller, Returning Their Bones to the Sea? Specialized Processing of Seals in the Late Ceramic Period on Machias Bay, Eastern Maine, Journal of Island and Coastal Archaeology	Yes		2	0
Robinson, Brian S	Technical Report	Accepted	Robinson, Brian and Kendra Bird (2014) Long Point Archaeological Survey, Machiasport, Maine. Submitted to Maine Coast Heritage trust September September 14, 2014, following a week long survey by UMaine field school students in July, 2014.			1	0
Robinson, Brian S	Other	Published	Robinson, Brian and Alice Kelley, 2015 Late Pleistocene Epoch and Paleoindian Occupation, Bookplate in Historical Atlas of Maine, edited by Stephen J. Hornsby and Richard W. Judd, University of Maine Press			0	0
Robinson, Brian S	Other	Published	Sanger, David, and Brian S. Robinson 2015 Early and Middle Archaic Period, 9,500-6,000 BP. Bookplate in Historical Atlas of Maine, edited by Stephen J.			0	0

			Hornsby and Richard W. Judd, University of Maine Press.				
Robinson, Brian S	Other	Published	Brian S. Robinson and David Sanger, 2015 Late Archaic Period, 6,000-3,000 BP. Bookplate in Historical Atlas of Maine, edited by Stephen J. Hornsby and Richard W. Judd, University of Maine Press.			0	0
Robinson, Brian S	Other	Submitted	Sanger, David, and Brian S. Robinson 2015 Ceramic Period, 3,000-400 BP. Bookplate in Historical Atlas of Maine, edited by Stephen J. Hornsby and Richard W. Judd, University of Maine Press.			0	0
Roscoe, Paul B	Journal Article	Published	2014, A Changing Climate for Anthropological and Archaeological Research? Improving the Climate Change Models. American Anthropologist 116:535-548.	Yes	Applied	0	0
Roscoe, Paul B	Journal Article	Published	2014, The End of War in Papua New Guinea: 'Crime' and 'Tribal Warfare' in Post-colonial States. Anthropologica 56:327-339.	Yes	Basic	0	0
Roscoe, Paul B	Book Chapter	Accepted	The Emergence of Sociopolitical Complexity: The Evidence from Contact-era New Guinea. In Feast, Famine, or Fighting: Multiple Pathways to Social Complexity, Richard J. Chacon and Rubén G. Mendoza, eds. New York and Philadelphia: Springer. In press.	Yes	Basic	0	0
Roscoe, Paul B	Book Chapter	Accepted	War and the Food Quest in Small-Scale Societies: Settlement Pattern Formation in Contact-Era New Guinea. In The Archaeology of Food and Warfare: Food Insecurity in Prehistory, Amber M. Vanderwarker and Gregory D. Wilson, eds. New York and Philadelphia: Springer. In press.	Yes	Basic	0	0
Roscoe, Paul B	Book Chapter	Accepted	Ethnographic Gifts: Some Cautions on the Use of Ethnographic Analogies from Contemporary Cultural Anthropology. In Fremdheit – Perspektiven auf das Andere, Tobias L. Kienlin, ed. Köln: Kölner Beiträge zu Archäologie und Kulturwissenschaften. In press.	Yes	Basic	0	0
Roscoe, Paul B	Book Chapter	Accepted	Trading off Food and Military Security in Contact-Era New Guinea. In The Give and Take of Sustainability: Anthropological Perspectives, Michelle Hegmon, ed. Cambridge University Press, under contract.	Yes	Applied	0	0
Roscoe, Paul B	Other	Accepted	Participant Observation. In Vocabulary for the Study of Religion. Robert Segal and Kochu von Stuckrat, eds. Leiden: Brill. In press.	Yes	Basic	0	0
Roscoe, Paul B	Other	Published	2014 Review of The Haus Tambaran of Bongiora: A View from Within of the Tambaran and Yam Cults of the Abelam in the East Sepik Province of Papua New Guinea, by Godfried Johan Marie Gerrits. Antropunti Documents. Lugano: Museo delle Culture di Lugano. The Contemporary Pacific 26:574-576.		Basic	0	0
Roscoe, Paul B	Other	Accepted	Review of: Alex Golub, 2014. Leviathans at the Gold Mine: Creating Indigenous and Corporate Actors in Papua New Guinea. Durham and London: Duke University Press. Journal of International and Global Studies. In press		Basic	0	0

Roscoe, Paul B	Other	Accepted	Initiation Rites. In The Wiley-Blackwell Encyclopedia of Gender and Sexuality Studies, Nancy Naples, Maithree Wickramasinghe, and Angela Wong Wai Ching, eds. In press.	Yes	Basic	0	0
Roscoe, Paul B	Other	Accepted	Positivism. In Wiley-Blackwell International Encyclopedia of Anthropology, Michelle McFadden, ed. In press.	Yes	Basic	0	0
Sandweiss, Dan	Book	Under Contract	Prieto, G.O. and D.H. Sandweiss (eds.) under contract Maritime Communities of the Ancient Andes. University of Florida Press.	Yes	Basic	0	0
Sandweiss, Dan	Journal Article	Published	Reitz, E.J., S.D. deFrance, D.H. Sandweiss, and H. McInnis 2015 Flexibility in Southern Peru Coastal Economies: A Vertebrate Perspective on the Terminal Pleistocene/Holocene Transition. Journal of Island and Coastal Archaeology 10. DOI: 10.1080/15564894.2014.934492	Yes	Basic	0	0
Sandweiss, Dan	Journal Article	Published	Rademaker, K., G. Hodgins, K. Moore, S. Zarrillo, C. Miller, G.R.M. Bromley, P. Leach, D.A. Reid, W. Yépez Álvarez, and D.H. Sandweiss, 2014 Paleoindian Settlement of the High-Altitude Peruvian Andes. Science 346:466-469.	Yes	Basic	0	0
Sandweiss, Dan	Journal Article	Accepted	Sandweiss, D.H. in press Comentario a Luis A. Borrero: Con lo mínimo: los debates sobre el poblamiento de América del Sur. Intersecciones en Antropología.		Basic	0	0
Sandweiss, Dan	Book Chapter	Accepted	Sandweiss, D.H. In press Zooarchaeology in the 21st Century: Comments on the Contributions. In Climate Change and Past Human Responses: An Archaeozoological Perspective, ed. by G. Monks. Vertebrate Paleobiology and Paleoanthropology Series. New York: Springer.	Yes	Basic	0	0
Sandweiss, Dan	Book Chapter	Accepted	Sandweiss, D.H. In press Climate, Catastrophe and Culture in the Ancient Americas: the case of the Pacific Coast. In UNESCO HEADS (Human Evolution: Adaptations, Dispersals and Social Developments) 5 World Heritage Papers, ed. by N. Sanz.		Basic	0	0
Sandweiss, Dan	Book Chapter	Published	Sandweiss, D.H., 2014 CARAL Early Monumental Centre in Peru. In Cities That Shaped the Ancient World, ed. by J.J. Norwich, pp. 198-203. London and New York: Thames & Hudson.		Basic	0	0
Sandweiss, Dan	Other	Accepted	Review of: The Ancient Central Andes, by Jeffrey Quilter (Routledge, 2014). For Latin American Antiquity.		Basic	0	0
Saros, Jasmine	Journal Article	Published	Rose, K.C., Hamilton, D.P., Williamson, C.E., McBride, C.G., Fischer, J.M., Olson, M.H., Saros, J.E., Allan, M.G. & N. Cabrol. 2014. Light attenuation characteristics of glacially-fed lakes. Journal of Geophysical Research: Biogeosciences 119: 1446-1457.	Yes	Basic	0	0
Saros, Jasmine	Journal Article	Published	Saros, J.E. & N.J. Anderson. 2015. The ecology of the planktonic diatom Cyclotella and its implications for global environmental change studies.	Yes	Basic	0	0

			Biological Reviews 90: 522-541.				
Saros, Jasmine	Journal Article	Published	Slemmons, K.E.H., Saros, J.E., Stone, J.R., McGowan, S., Hess, C.T. & D. Cahl. 2015. Effects of glacier meltwater on the algal sedimentary record of an alpine lake in the central US Rocky Mountains. Journal of Paleolimnology 53: 385-399.	Yes	Basic	2	0
Saros, Jasmine	Journal Article	Published	Solomon, C.T., Jones, S.E., Weidel, B.C., Buffam, I., Fork, M.L., Karlsson, J., Larsen, S., Lennon, J.T., Read, J.S., Sadro, S. & J.E. Saros. 2015. Ecosystem consequences of changing inputs of terrestrial dissolved organic matter to lakes: current knowledge and future challenges. Ecosystems 18: 376-389.	Yes	Basic	0	0
Saros, Jasmine	Journal Article	Published	Demi, L.M., Simon, K.S., Anderson, D., Coghlan, S.M., Saros, J.E. & R. Saunders. 2015. Trophic status may influence top-down effects of anadromous alewife (Alosa pseudoharengus) in lakes. Hydrobiologia DOI 10.1007/s10750-015-2264-7	Yes	Basic	1	0
Saros, Jasmine	Journal Article	Published	Daggett, C.T., Saros, J.E., Lafrancois, B.M., Simon, K.S. & A. Amirbahman. 2015. Effects of increased concentrations of inorganic nitrogen and dissolved organic matter on phytoplankton in boreal lakes with differing nutrient limitation patterns. Aquatic Sciences, DOI 10.1007/s00027-015-0396-5	Yes	Basic	1	0
Sorg, Marcella	Journal Article	Published	Varghese, E, MA Abate, L Hu, J Kaplan, J Kraner, DL Long, M Sorg, A Mock, M Greenwald, T Andrew (2015) Characterization of diphenhydramine-related accidental overdose deaths. Academic Forensic Pathology 5(1):105-115.	Yes	Basic	1	0
Sorg, Marcella	Journal Article	Published	Crist, T, MH Sorg (2014) Adult scurvy in New France: Samuel de Champlain's 'mal de la terre' at St. Croix Island, 1604. International Journal of Paleopathology 5:95-105.	Yes	Basic	0	0
Sorg, Marcella	Book Chapter	Submitted	Crist, T, MH Sorg (submitted 2014) Autopsy and colonial experience with mass fatality in New France during the winter of 1604-1605. In K Nystrom, Ed. The Bioarchaeology of Dissection and Autopsy in the United States. Springer.	Yes	Basic	0	0
Sorg, Marcella	Technical Report	Published	Sorg, Marcella H. (2014) Patterns and trends of drug abuse in Maine: 2013 and Early 2014. Community Epidemiology Work Group, National Institute on Drug Abuse. http://www.drugabuse.gov/sites/default/files/maine2014.pdf		Applied	0	0
Sorg, Marcella	Technical Report	Published	Sorg, Marcella H. (2014) Drug Abuse Patterns and Trends in Maine –Update: January 2014. National Institute on Drug Abuse, Community Epidemiology Work Group Meeting Report. http://www.drugabuse.gov/about-nida/organization/workgroups-interest-groups-consortia/community-epidemiology-work-group-cewg/meeting-reports/highlights-summaries-january-2014/maine		Applied	0	0
Zaro, Gregory D	Journal Article	Submitted	Houk, Brett A. and G. Zaro (in review). Lithic production and domestic economy in an ancient Maya neighborhood at Chan Chich, Belize. Research	Yes	Basic	0	0

			Reports in Belizean Archaeology 12, in review.				
Zaro, Gregory D	Journal Article	Submitted	Herndon, Kelsey E., G. Zaro, B.A. Houk, D. Sandrock, A. Booher, E. Vasquez (in review). Investigating urban form and kingship: Preliminary Results of the 2014 Chan Chich Archaeological Project. Research Reports in Belizean Archaeology 12, in review.	Yes	Basic	4	0
Zaro, Gregory D	Technical Report	Published	Houk, Brett A. and G. Zaro (2014). An introduction to the 2014 season of the Chan Chich Archaeological Project and the Belize Estates Archaeological Survey Team. In Papers of the Chan Chich Archaeological Project, Number 8, edited by B.A. Houk, pp. 1-19. Texas Tech University, Lubbock, TX.		Basic	0	0
Zaro, Gregory D	Technical Report	Published	Herndon, Kelsey E., G. Zaro, B.A. Houk, S. Mitchell, and E. Gallis (2014). The 2014 excavations of the Chan Chich Dynastic Architecture Project. In Papers of the Chan Chich Archaeological Project, Number 8, edited by B.A. Houk, pp. 31-68. Texas Tech University, Lubbock, TX.			1	0
Zaro, Gregory D	Other	Published	Houk, Brett A. and G. Zaro (2015). The Chan Chich Archaeological Project field manual (First Edition). Papers of the Chan Chich Archaeological Project, Number 9. Texas Tech University, Lubbock, TX.		Basic	0	0

PRESENTATIONS: INTERNATIONAL/NATIONAL/REGIONAL/STATE/LOCAL

Name	Date	Scope	Description	GS	US
Belknap, Daniel F	01-15-15	Regional	Belknap, D.F. and Wilson, K.R., 2015, Invasive European Green Crabs: sudden increase in erosion potential on salt marshes in southern and central coastal Maine: Northeast Aquaculture Conference and Exposition and the Milford Aquaculture Seminar, Portland, ME, January 14-16.	0	0
Belknap, Daniel F	10-08-14	State	Impact of invasive European Green Crab on salt marshes of southern Maine. Green Crab Investigators Summit Meeting, University of Southern Maine, Portland. Organized by Hilary Neckles, U.S. Geological Survey. 20 invited participants.	0	0
Belknap, Daniel F	02-20-15	State	Invited Talk, Geoarchaeology of Beach Ridges and Coastal Change in Northwestern Peru, Colby College Geology Department	0	0
Belknap, Daniel F	03/24/15	Regional	Belknap, D.F. and Kelley, J.T., 2015, Manifestation of bluff erosion in the transgressive stratigraphy of Maine estuaries: Geological Society of America Abstracts with Programs, v. 47, no. 1 (NE Section Meeting, Breton Woods, NH, March 23-25), Abstract 34-9, p. 86. https://gsa.confex.com/gsa/2015NE/webprogram/start.html	0	0
Belknap, Daniel F	03/25/15	Regional	Belknap, D.F. and Wilson, K.R., 2015, Effects of invasive Green Crabs on salt marshes in Maine: Geological Society of America Abstracts with Programs, v. 47,	0	0

			no. 1 (NE Section Meeting, Breton Woods, NH, March 23-25), Abstract 65-8, p. 127-128. https://gsa.confex.com/gsa/2015NE/webprogram/start.html		
Belknap, Daniel F	03/24/15	Regional	Cronkite, E.M. and Belknap, D.F. 2015, New insights into the deglacial evolution of the New Meadows River, northeastern Casco Bay, Gulf of Maine: Geological Society of America Abstracts with Programs, v. 47, no. 1 (NE Section Meeting, Breton Woods, NH, March 23-25), Abstract 34-8, p. 86. BELKNAP PRESENTED BECAUSE STUDENT COULD NOT ATTEND DUE TO ILLNESS https://gsa.confex.com/gsa/2015NE/webprogram/start.html	1	0
Chai, Fei	03/2015	State	Natural and Artificial Iron Fertilization in the Ocean	0	0
Chai, Fei	03/2015	International	Natural and Artificial Iron Fertilization in the Gulf of Alaska	0	0
Chai, Fei	03/2015	International	1) Natural and Artificial Iron Fertilization in the Gulf of Alaska 2) Marine Science Research and Education at University of Maine	0	0
Chai, Fei	03/2015	International	Modeling impacts of mesoscale eddies on biogeochemical processes in the South China Sea	0	0
Chai, Fei	01/2015	International	Natural and Artificial Iron Fertilization in the Gulf of Alaska	0	0
Chai, Fei	11/2014	State	1) Natural and Artificial Iron Fertilization in the Gulf of Alaska 2) Marine Science Research and Education at University of Maine	0	0
Chai, Fei	10/2014	Regional	1) Natural and Artificial Iron Fertilization in the Gulf of Alaska 2) Marine Science Research and Education at University of Maine	0	0
Chai, Fei	10/2014	Regional	1) Natural and Artificial Iron Fertilization in the Gulf of Alaska 2) Marine Science Research and Education at University of Maine	0	0
Chai, Fei	09/2014	National	1) Natural and Artificial Iron Fertilization in the Gulf of Alaska 2) Marine Science Research and Education at University of Maine	0	0
Chai, Fei	10/2014	International	Incorporating optics into physical and biological modeling	0	0
Chai, Fei		International	Integrating Marine and Social Sciences and Ocean Education: A few Stories from the Gulf of Maine for Improving Sustainable Use of Marine Resources	0	0
Chai, Fei	03/2015	State	Natural and Artificial Iron Fertilization in the Ocean	0	0
Chawathe, Sudarshan S	015-04-09		Interactive Exploration of Time Lines from Ice Core Data Sets.	0	0
Denton, George	October, 2014	International	The role of mountain glaciers in determining the cause of abrupt climate events	0	0

Denton, George	October 31, 2014	International	The origin of the last termination	0	0
Enderlin, Ellyn		International	Submarine Melting of Icebergs from Repeat High-Resolution Digital Elevation Models	0	0
Enderlin, Ellyn		International	APECS: A Network for Polar Early Career Scientist Professional Development	0	0
Enderlin, Ellyn		Regional	Comparative Force Balance Analysis: Helheim Glacier, Greenland & Columbia Glacier, Alaska	0	0
Fernandez, Ivan	6/15/2015	Regional	Fernandez, Ivan J. Invited Speaker – "Maine's Climate Future 2015: Our Climate and Why It Matters. Wild Blueberry Summer Field Day and Meeting. Wild Blueberry Research and Extension Facility, Jonesboro, Maine.	0	0
Fernandez, Ivan	6/23/2015	Regional	Fernandez, Ivan J. Invited Presentation and Tandberg Discussion, "Maine's Climate Future". University of Maine Cooperative Extension Talking with UMaine Researchers Series. Orono, Maine. 6/23/2015.	0	0
Fernandez, Ivan	June 12, 2015	Regional	Fernandez, Ivan J. Invited Panelist, "What the Data Tells Us" – Maine's Economy & Climate Change: Challenges and Opportunities. Envision Maine. Brunswick, Maine. June 12, 2015.	0	0
Fernandez, Ivan	May 26, 2015	Regional	Fernandez, Ivan J. Invited Speaker. "Maine's Climate Future 2015 – What it means for Maine". Bangor Rotary Club. Bangor, Maine. May 26, 2015.	0	0
Fernandez, Ivan	May 21, 2015	Regional	Fernandez, Ivan J. Invited Speaker: "Climate Impact on Northern New England". 23rd Annual Tri-State Association of School Business Professionals. Portand, Maine. May 21, 2015.	0	0
Fernandez, Ivan	May 14, 2015	Regional	Fernandez, Ivan J. Invited Presenter. "Pollen as an Indicator of Ecological Health". The Council of State and Territorial Epidemiologists – Pollen Summit. Portland, Maine. May 14, 2015.	0	0
Fernandez, Ivan	April 14, 2015	Regional	Fernandez, Ivan J. Maine's Changing Climate and Effects. Invited Speaker – NOAA Climate Adaptation for Coastal Communities Workshop. Wells National Estuarine Research Reserve. Wells, Maine. April 14, 2015.	0	0
Fernandez, Ivan	March 21, 2015	Regional	Fernandez, Ivan J., Caitlin Cleaver, Caroline Noblet, and Matthew Chatfield. Climate Change in Maine. Invited presentations and panelists for the first annual Maine Science Festival, Bangor, Maine. March 21, 2015.	0	0
Fernandez, Ivan	3/7/2015	Regional	Fernandez, Ivan J. – Participant and Invited Speaker "Maine's Climate Future: 2015 Update" at Farming in the Face of Climate Change, The Maine Organic Farmers and Growers Spring Growth Conference, Unity, Maine. 3/7/2015.	0	0
Fernandez, Ivan	10/25/2014	Regional	Fernandez, Ivan J. 2014. Invited Speaker: Maine's Energy and Climate Future, Building Sustainable Communities: International, National and Local Perspectives.	0	0

			Estia's 11th Annual Conference. University of Maine, Orono. October 25.		
Fernandez, Ivan	10/23/2014	Regional	Fernandez, Ivan J. 2014. Invited Speaker: Maine's Climate Future 2014: Our Physical and Chemical Climate, Ecosystems and Vulnerability. Conference on Climate Adaptation and Sustainability (CLAS), Building a Framework and Platform for Climate Adaptation and Sustainability Planning for Maine Communities. University of Maine, Orono. October 23.	0	0
Gill, Jacquelyn	8/12/2014	National	Ecological novelty in space and time: Pattern, process and the drivers of late-glacial no-analog plant associations	0	0
Gill, Jacquelyn	10/25/2014	Local	How to create a novel ecosystem in two easy steps: abrupt climate change, Pleistocene extinctions, and no-analog plant associations	0	0
Hall, Brenda	Sept. 2014	International	The last glacial maximum and deglaciation in the Ross Sea sector of Antarctica. Comer Abrupt Climate Change Meeting, Soldiers Grove, WI	9	0
Hall, Brenda	Sept. 2014	International	Deglaciation of Cordillera Darwin during Heinrich Stadial 1	1	1
Hamilton, Gordon	10/1/2014	Other/Special	Understanding Greenland's Coupled Ice Sheet-Atmosphere-Ocean System: Recent Progress	0	0
Hamilton, Gordon	12/8/14	International	"Glacier-ocean interactions in Greenland - a review"	0	0
Hamilton, Gordon	1/14/15	Other/Special	Novel studies of Greenland's icebergs - insights into submarine melting, melange dynamics and fjord circulation	0	0
Hamilton, Gordon	3/24/15	International	Recent changes in Northeast Greenland	1	0
Isenhour, Cynthia	Nov 1, 2014	International	Sustainable Consumption in the City: On Socially Embedded Exchange. http://scorai.org/eugene-2014/	0	0
Isenhour, Cynthia	December 2014	International	When the Best Intentions Backfire: Wicked Rebound, Carbon Leakage and Climate Change. https://aaa.confex.com/aaa/2014/webprogram/start.html	0	0
Isenhour, Cynthia	April 2015	State	"What is the Problem?": How Divergent Time Scales Shape the Definition of Problems in Maine's Materials Management Systems http://www.mrra.net/wp-content/uploads/2015/04/2015-Conference-Registration-Brochure.pdf	1	0
Isenhour, Cynthia	February 2015	Local	Materials Management through Sustainable Consumption https://vimeo.com/119473563	0	0
Isenhour, Cynthia	April 2015	International	Climate Mitigation and the Hope of Technological Progress http://econanthro.org/meetings/2015-sea-annual-meeting/	0	0
Jain, Shaleen	October 14-15,	International	Water Management and Policy Innovations in a Changing Climate: Integration of	0	0

	2014		Resource, Hazard and Stewardship Considerations		
Jain, Shaleen	October 27 - 29, 2014	International	Extreme hydroclimatic events and Environmental Quality: Use-inspired characterization of change, thresholds, and transitions.	0	0
Jain, Shaleen	Dec. 15 – 19, 2014	National	Nirajan Dhakal and Shaleen Jain, Detection of nonstationarity in seasonality of extreme precipitation using a new statistical approach.	0	0
Jain, Shaleen	Dec. 15–19, 2014	National	Beyene, M. and S. Jain, Lake Systems in Transition: Effect of Hydro-climatic Dynamics on the Lake Socio-ecological Systems in Maine and their Thresholds.	0	0
Jain, Shaleen	Dec. 15 – 19, 2014	National	Jain, S., T. S. Melis, and D. Topping, Deciphering Paria and Little Colorado River flood regimes and their significance in multi-objective adaptive management strategies for Colorado River resources in Grand Canyon.	0	0
Jain, Shaleen	17-19 June 2015	International	Jain, S., and S. R. Jain, Hydroclimatic change and nonstationarity: Data- and model-based exploratory analyses.	0	0
Jain, Shaleen	June 23-26, 2015	International	Jain, S., Water allocation policy in Maine	0	0
Kelley, Alice	October 19, 2014	National	The Archaeological Record as a Paleoclimatic and Paleoenvironmental Archive. Introductory paper to a session co-chaired with Daniel Sandweiss. https://gsa.confex.com/gsa/2014AM/webprogram/Paper249264.html	0	0
Kelley, Alice	April 15, 2015	National	Predictive Model for Submerged Prehistoric Sites: Northern New England and Canadian Maritimes. http://www.saa.org/AbouttheSociety/AnnualMeeting/Abstracts2015/tabid/1518/Default.aspx	0	0
Kelley, Joseph	0/20-2014	International	Kelley, J.T., Cooper, J.A.G., and Sorrell, L., 2014, Reconnaissance Ground penetrating radar studies of raised shorelines in Donegal, Republic of Ireland. Geological Society of America Abstracts with Programs, v. 46, #6, p. 287.	1	0
Kelley, Joseph	7/1/2014	International	Kelley, J.T., Cooper, J.A.G., and Sorrell, L., 2014, Ground penetrating radar studies of raised shorelines in Donegal. UK Sea Level IGCP/INQUA CMP working group field meeting, Cork, Republic of Ireland Abstracts/Program, p. 14, 7-1-14.	1	0
Kelley, Joseph	3/24/2015	Regional	Belknap, D.F., and Kelley, J.T., 2015, MANIFESTATION OF BLUFF EROSION IN THE TRANSGRESSIVE STRATIGRAPHY OF MAINE ESTUARIES. Northeast Section, Geological Society of America Abstracts with Programs. https://gsa.confex.com/gsa/2015NE/webprogram/Paper251687.html	0	0
Kelley, Joseph	3/24/2015	Regional	Kelley, J.T., Belknap, D.F. andd Lee, K.W., 2015, TWENTY-FIVE YEARS OF BOTTOM MAPPING IN SACO BAY, Northeast Section, Geological Society of America Abstracts with Programs. https://gsa.confex.com/gsa/2015NE/webprogram/Paper253433.html	1	0

Kelley, Joseph	7/16/2015	Regional	The Geological history of Frenchman Bay, Maine https://www.youtube.com/watch?v=g0lrTuK_URk	0	0
Kelley, Joseph	2/1/2014	Regional	Partners of Frenchman Bay, Sea-level rise and its impact on Frenchman Bay, Mount Desert Biological Laboratory, Bar Harbor, 2-1-14. https://www.youtube.com/watch?v=qzLs724ylLU	0	0
Kelley, Joseph	10/10/2015	University	University of New Hampshire Center for Coastal and Ocean Mapping, Geology of the seafloor of the Maine inner continental shelf, 10-10-14 http://ccom.unh.edu/seminars?page=2	0	0
Kreutz, Karl	May 20, 2014	Local	Roads Scholar workshop, Denali Education Center	0	0
Kreutz, Karl	Oct. 19, 2014	Local	Maine Audubon Board of Trustees retreat	0	0
Kreutz, Karl	Nov 5 2014	Local	UNAVCO workshop - Field education and Support by the UNAVCO GAGE Facility	0	0
Kreutz, Karl	Dec 17 2014	International	Cold and Arid Regions Engineering and Environment Research Institute, Lanzhao, China	0	0
Kreutz, Karl	Mar 25 2015	Regional	Northeast GSA meeting	0	0
Kreutz, Karl	May 6 2015	International	AGU Joint Assembly, Montreal	0	0
Maasch, Kirk	12/17/2014	National	Effects of Extratropical Cyclone Frequency and Intensity on mass balance of the Greenland Ice Sheet http://abstractsearch.agu.org/meetings/2014/FM/GC21C-0560.html	1	0
Maasch, Kirk	12/12/2014	International	Antarctic cold-air mesocyclones: Reconciling satellite-image derived inventories with reanalyses and meso-scale model output	0	0
Maasch, Kirk	3/24/2015	International	Southern hemisphere polar lows	0	0
Maasch, Kirk	4/10/2015	State	Foot Steps of the Ancient Great Glacier of North America: A Long Lost Document of a Revolution in 19th Century Geological Theory https://www.youtube.com/watch?v=xoeu1YAzdb8	0	0
Mayewski, Paul	20 May 2014	International	Arctic challenges, Leadership in the Arctic Conference, Maine National Guard meeting, Bangor	0	0
Mayewski, Paul	14 July 2014	International	Climate and civilization, Harvard, Cambridge, Mass.	0	0
Mayewski, Paul	16 July	Local	Climate instability, Marine Estuarine Research Institute, Blue Hill, Maine	0	0
Mayewski, Paul	22 July 2014	Local	Keynote UM Class of 44, Climate change, University of Maine	0	0
Mayewski, Paul	7 August 2014	International	Central Andean glaciers – changes in mass and pollutant levels, AngloAmerican	0	0

			Corporation, Santiago, Chile		
Mayewski, Paul	12 August 2014	Local	Climate change keynote, George Stevens academy, Blue Hill, Maine	0	0
Mayewski, Paul	23 August 2014	International	State of the Antarctic and Southern Ocean climate system, AntClim21 SCAR Meeting, Auckland, New Zealand	0	0
Mayewski, Paul	4 September 2014		Journey Into Climate, Penn State University	0	0
Mayewski, Paul	10 Sept 2014	Local	Climate change and sustainability, invited class talk Resource Economics, UMaine	0	0
Mayewski, Paul	12 Sept 2014	Local	Keynote Abrupt climate change for Cohort 3 IGERT entering class	0	0
Mayewski, Paul	17 Sept 2014	Local	Climate instability, Wells National Estuarine Research Reserve, Wells, Maine	0	0
Mayewski, Paul	14 October 2014	International	Climate change in the Persian Gulf, bu Dhabi, Arab Emirates.	0	0
Mayewski, Paul	23 October 2014	National	Chief organizer, host and moderator, Climate Adaptation and Sustainability Conference, University of Maine	0	0
Mayewski, Paul	24 October 2014	State	Climate Instability, Colby College, Maine	0	0
Mayewski, Paul	3 November 2014	International	Abrupt climate change in the Arctic and implications for the Northern Hemisphere, Arctic Council, Reykyavik, Iceland	0	0
Mayewski, Paul	4 December 2014	Regional	Climate change overview for Environmental Sustainablity Committee, Museum of Science Boston, I attended as a newly invited member and gave a keynote talk.	0	0
Mayewski, Paul	11 December 2014	International	Antarctic climate models and past climate, AntClim21 SCAR meeting, San Francisco	0	0
Mayewski, Paul	20 January 2015	International	CCI and the Falkand Islands South Atlantic Environmental Research Institute, Stanley, Falkland Islands	0	0
Mayewski, Paul	22 January 2015		The Westwind Expedition and climate of the South Atlantic, Stanley, Falkland Islands	0	0
Mayewski, Paul	18 March 2015	Local	CCI signature program presentation to UM Alumni and Foundation staff	0	0
Mayewski, Paul	19 March 2015		CCI signature program presentation to UM Development staff	0	0
Mayewski, Paul	26 March 2015	Local	Maine’s climate future, Brooklin Library, Brooklin, Maine	0	0
Mayewski, Paul	8 April 2015	Regional	Climate change and leadership, Dickinson College keynote for school, Carlisle, PA	0	0
Mayewski, Paul	21 April 2015		Climate change and Maine, Maine Emergency Preparedness Agency, Augusta, Maine	0	0

Mayewski, Paul	27 April 2015		Climate change in central Asia, UNESCO Paris, France	0	0
Mayewski, Paul	4 May 2015	International	Climate Futures, NYC	0	0
Mayewski, Paul	12 May 2015	Local	Maine's climate future, George Stevens Academy full day talks and QandA, Blue Hill, Maine	0	0
McGill, Brian	July 2014	International	Session organizer - Predicting Diversity Across Scales	0	0
McGill, Brian	August 2014	International	Geographic variation in the factors controlling plant species ranges across the New World	1	0
McGill, Brian	August 2014	University	How do leaf traits differ in their patterns of variation across scales?	1	0
McGill, Brian	August 2014	International	Variation in population dynamics across a species range - good bet hedging populations have highest average abundance	0	0
McGill, Brian	August 2014	International	Scientific communities, scientific discussions and social media	0	0
McGill, Brian	January 2015	National	Three unusual view of community assembly	0	0
McGill, Brian	March 2015	National	Getting serious about a top down view of community assembly	0	0
McGill, Brian	March 2015	National	The next 25 years of Ecology	0	0
McGill, Brian	April 2015	National	Getting serious about a top down view of community assembly	0	0
McGill, Brian	April 2015	National	Getting serious about a top down view of community assembly	0	0
Northington, Robert	May 26, 2015	Other/Special	Methane and sulfate in lakes of southwestern Greenland	0	0
Northington, Robert	April 15, 2015	Local	Patterns in lake-water methane across southwestern Greenland	0	0
Northington, Robert	April 9, 2015	Local	Biogeochemical patterns in lakes across southwestern Greenland.	0	0
Northington, Robert	January 29, 2015	Local	Thermal patterns in lakes across southwestern Greenland.	0	0
Northington, Robert	December 15, 2014	International	Patterns and changes in dissolved organic carbon (DOC) across lakes in southwestern Greenland.	0	0
Northington, Robert	November 8, 2014	Local	International Fieldwork in Greenland	2	0
Norton, Stephen	June 2015	International	*Jacobson, G. L., Norton, S. A., Grimm, E., 2015, Lund University, Lake Tulane, Florida – Controls on mercury in a 60,000 year sediment record	0	0
Olsen, Brian	March 2015	Regional	Olsen, AA, AR Taylor, J Lively, EM Hausrath, BJ Olsen, D Cardace. March 2015. Chemical signatures of biological impacts on serpentinite weathering.	1	0

Olsen, Brian	October 2014	Regional	Benvenuti, BA, AI Kovach, DM Burdick, JB Cohen, CS Elphick, TP Hodgman, KM O'Brien, BJ Olsen, WG Shriver. October 2014. Floating habitat islands for saltmarsh-nesting birds.	1	0
Olsen, Brian	October 2014	Regional	Elphick, CS, BJ Olsen, and WG Shriver. Session Organizers. October 2014. The Saltmarsh Habitat and Avian Research Program (SHARP): progress to date and future expansion south.	0	0
Olsen, Brian	October 2014	Regional	Hodgman, TP, B Benvenuti, A Borowske, JB Cohen, M Conway, MD Correll, CS Elphick, CR Field, T Freiday, L Garey, RA Kern, E King, A Kocek, AI Kovach, BJ Olsen, S Roberts, KJ Ruskin, E Shelly, WG Shriver, J Walsh, WA Wiest. October 2014. SHARP: The Saltmarsh Habitat and Avian Research Program.	15	0
Olsen, Brian	October 2014	Regional	Elphick, CS, JB Cohen, MD Correll, CR Field, TP Hodgman, AI Kovach, BJ Olsen, WG Shriver, and WA Wiest. October 2014. Using the SHARP sampling framework to quantify the effects of Hurricane Sandy on coastal marshes and the efficacy of post-Sandy restoration actions.	3	0
Olsen, Brian	October 2014	Regional	Shriver, WG, WA Wiest, MD Correll, BJ Olsen, CS Elphick, TP Hodgman, JB Cohen, and CR Field. October 2014. The SHARP sampling framework: inventory and monitoring of tidal marsh birds in the Northeast.	3	0
Olsen, Brian	October 2014	Regional	Olsen, BJ, KJ Ruskin, CR Field, A Borowske, JB Cohen, CS Elphick, TP Hodgman, RA Kern, E King, A Kocek, AI Kovach, WG Shriver, J Walsh. October 2014. The demography of tidal marsh birds: regional patterns and the implications for conservation.	5	0
Olsen, Brian	October 2014	Regional	Kovach, AI, J Walsh, KM O'Brien, BJ Olsen, WG Shriver, JB Cohen, CS Elphick, TP Hodgman. October 2014. Using genetic tools to inform conservation of Saltmarsh and Nelson's Sparrows in BCR30.	1	0
Olsen, Brian	September 2014	International	Olsen, BJ, RM Danner, WG Shriver, JR Walters, and R Greenberg. September 2014. Tradeoffs between migration distance and seasonal survival in migratory songbirds.	0	0
Olsen, Brian	September 2014	International	Adams, EM,and BJ Olsen. September 2014. Effects of changing global climate, local weather, and habitat on songbird migratory phenology and abundance.	1	0
Olsen, Brian	September 2014	International	Walsh, J, AI Kovach, RJ Rowe, BJ Olsen, and WG Shriver. September 2014. Exogenous selection in an avian hybrid zone: inferences from genotype-habitat associations and ecological niche models.	1	0
Olsen, Brian	September 2014	International	Grunzel, DP and BJ Olsen. September 2014. Longer distance migrant passerines are more averse to predation risk during fall migration.	1	0
Olsen, Brian	September 2014	International	Correll, M, BJ Olsen, TP Hodgman, W Wiest, WG Shriver. September 2014. A regional change comparison of obligate and non-obligate birds in tidal marshes of	2	0

			the North Atlantic.		
Olsen, Brian	September 2014	International	Ruskin, KJ, MA Etterson, BJ Olsen, TP Hodgman, CS, Elphick, AI Kovach, WG Shriver, A Borowske, CR Field, RA Kern, J Walsh, E King. September 2014. Latitudinal trends in Saltmarsh Sparrow (Ammodramus caudacutus) nest failure from competing risks.	5	0
Olsen, Brian	September 2014	International	McCabe, JD and BJ Olsen. September 2014. The interaction between risk avoidance and foraging quality on the stopover habitat use of migrant landbirds.	1	0
Olsen, Brian	August 2014	International	Ruskin, KJ, BJ Olsen, TP Hodgman, MA Etterson. August 2014. Differences in Saltmarsh and Nelson's sparrow oviposition preference are not adaptive: a case for neutral evolution.	1	0
Olsen, Brian	October 2014	Other/Special	"Evolutionary Succession". (one-hour seminar)	3	0
Robinson, Brian S	March 22, 2015	State	What can we learn from Maine's Eroding Native American Shell Middens?	0	0
Robinson, Brian S	April 30, 2015	International	Brian Robinson, Sky Heller and Rob Ingraham. Maritime Culture Patterns and Animal Symbolism in Eastern Maine	1	0
Robinson, Brian S	October 2014	Regional	Brian Robinson and Rob Ingraham, Shell Middens, Subsistence and Oral Traditions in Machias, Maine.	0	0
Robinson, Brian S	July 17, 2014	State	Machias Bay and the Long Point Archaeological Survey	0	0
Robinson, Brian S	April 23, 2015	Local	Machias Bay, Petroglyphs and Modern Connections	0	0
Roscoe, Paul B	December 2014	International	Measurement, Mysticism, and Climate Change Models	0	0
Roscoe, Paul B	April 2015	International	The Morphology of 'Honest' Signals in Contact-era New Guinea	0	0
Roscoe, Paul B	April 2015	International	The Social Life of Defense in Contact-era New Guinea	0	0
Sandweiss, Dan	August 6, 2014	International	Discussant (in Spanish). Simposio Internacional "Los Orígenes de la Civilización en el Perú: nuevas perspectivas ante nuevos descubrimientos", Lima, Peru.	0	0
Sandweiss, Dan	August 8, 2014	International	El Asentamiento Temprano de la Costa Occidental de Sud América. Simposio 'Colonización Prehispánica en las Américas', Interamerican Studies Biennial Congress, Lima Peru.	0	0
Sandweiss, Dan	August 20, 2014	International	Ocupación temprana de la Costa Central Andina. Primer Congreso Nacional de Arqueología Peruana, Lima, Peru.	0	0
Sandweiss, Dan	October 19, 2014	International	Fluvial Deposition, El Niño and Landscape Construction At San José De Moro and Huaca Del Sol, Peru (Paul M. Pluta, Alice R. Kelley, Jeffrey Quilter, and Daniel H. Sandweiss). Geological Society of American Annual Meeting.	1	0

Sandweiss, Dan	December 11, 2014	International	Speaker at roundtable on “Are basic marine resources a necessary condition for maritime development?” Océanides Conference THE INFLUENCE OF THE SEA ON HISTORY, A voyage to the heart of the Antiquity & the Middle-Ages. Paris, France.	0	0
Sandweiss, Dan	February 26, 2015	Regional	Human Ecodynamics of Early Settlement on the Central Andean Coast. Yale University.	0	0
Sandweiss, Dan	April 6, 2015	International	El Período Lítico (Arcaico Temprano). Encuentro “Avances en la Investigación del Perú Prehispánico, Un Estado de la Cuestión”, sponsored by the Peruvian Ministry of Culture. Cusco, Peru.	0	0
Sandweiss, Dan	April 18, 2015	International	Floods, Famines, and Fagan: Recent Research on El Niño in the Age of Andean States and Empires. In Symposium on Engaging with the Public and the Past: The Archaeological Legacy of Brian Fagan. Society for American Archaeology Annual Meeting, San Francisco, CA.	0	0
Sandweiss, Dan	April 29, 2015	Regional	Advice for the 10 Percent. Keynote speech. Phi Kappa Phi induction ceremony, University of Maryland Eastern Shore.	0	0
Sandweiss, Dan	May 21, 2015	Local	Nature's Naughty Child: El Niño in Peruvian Prehistory. Bangor Foreign Policy Forum.	0	0
Saros, Jasmine	October 2014	Regional	J.E. Saros. Declining water clarity in Acadia National Park: a new approach to understanding recent changes.	0	0
Saros, Jasmine	March 2015	Other/Special	J.E. Saros. Reconstructing lake thermal structure in a changing climate	0	0
Saros, Jasmine	May 2015	International	Kireta, A.R., J.E. Saros & E.D. Reavie. Climate change and Great Lakes water quality: response to past and present warming.	1	0
Saros, Jasmine	May 2015	State	Warner, K.A., M.F. Teisl & J.E. Saros. Assessing the economic vulnerability of Maine's drinking water resources to extreme precipitation events.	1	0
Saros, Jasmine	March 2015	State	Warner, K.A., M.F. Teisl & J.E. Saros. Assessing the ecological and economic vulnerability of Maine's drinking water resources to extreme precipitation events.	1	0
Saros, Jasmine	February 2015	International	J.E. Saros, R.M. Northington, H. Malik & N.J. Anderson. Linking experimental and paleolimnological approaches to decipher climate-induced changes in west Greenland lakes.	1	0
Saros, Jasmine	February 2015	International	Strock, K.E., J.E. Saros, M.B. Edlund & D.R. Engstrom. Response of boreal lakes to changing wind strength: coherent long-term changes in physical lake habitat but varying short-term effects on primary producers.	0	0
Saros, Jasmine	February 2015	International	B. Burpee, R.M. Northington, K. Simon & J.E. Saros. Within-lake potential for microbial degradation of DOC in Arctic lakes of southwestern Greenland	1	0

Saros, Jasmine	December 2014	International	Saros, J.E., R.M. Northington, H. Malik & N.J. Anderson. Deciphering the ecology of key diatom taxa to understand climate-induced changes in west Greenland lakes over the Holocene.	1	0
Saros, Jasmine	December 2014	International	R.M. Northington, C.L. Osburn, N.J. Anderson & J.E. Saros. Patterns and changes in dissolved organic carbon (DOC) across lakes in southwestern Greenland	0	0
Saros, Jasmine	December 2014	International	B.T. Burpee, R.M. Northington, K.E. Simon & J.E. Saros. Dissolved organic carbon degradation in response to nutrient amendments in southwestern Greenland lakes	1	0
Saros, Jasmine	October 2014	International	Saros, J.E., W. Gawley, N. Theodore, C. Wigdahl-Perry, A. Reischauer & S. Wiggin. A new site: Jordan Pond, Acadia National Park, USA.	1	0
Sorg, Marcella	August, 2014	National	Sorg, Marcella H. and Jamie A. Wren Identifying Antemortem Injury and Disease from the Skeleton	1	0
Sorg, Marcella	September, 2014	National	Sorg MH et al. Postmortem opioid levels, co-intoxicant presence, and decedent characteristics in accidental, single-opioid deaths in West Virginia and northern New England	1	0
Zaro, Gregory D	April 25, 2015	National	Zaro, Gregory, M. Celhar, A. Cuka, J. Faricic, and D. Vujkovic (2015). Urbanization and landscape change along Croatia's Adriatic coast: Articulating the ancient, historic, and modern worlds. Paper presented at the Association of American Geographers' Annual Meeting, Chicago, IL, April 21-25, 2015.	0	0

CONFERENCES/SYMPOSIA/MEETINGS ATTENDED: INTERNATIONAL/NATIONAL/REGIONAL/STATE/LOCAL

Name	Date	Scope	Conference	Location	GS	US
Belknap, Daniel F	10/04/14	State	Green Crab Investigators meeting	University of Southern Maine, Portland, ME	0	0
Belknap, Daniel F	January 14-16, 2015	Regional	Northeast Aquaculture Conference and Exposition and the Milford Aquaculture Seminar	Portland, ME	0	0
Belknap, Daniel F	March 23, 2015	Regional	Northeast Section Meeting, Geological Society of America Annual Meeting https://gsa.confex.com/gsa/2015NE/webprogram/start.html	Bretton Woods, NH	1	0
Belknap, Daniel F	10/04/14	State	Green Crab Investigators meeting	University of Southern Maine, Portland, ME	0	0
Chawathe, Sudarshan S	2015-04-09--10		Borns Symposium		0	0

Enderlin, Ellyn	12/14/2014	International	American Geophysical Union Annual Meeting	San Fransisco, California	0	0
Enderlin, Ellyn	04/16/2015	Regional	New England Glaciology Meeting	Woods Hole, Massachusetts	0	0
Gill, Jacquelyn	July 20-25, 2014	International	Unifying Ecology Across Scales http://www.grc.org/programs.aspx?year=2014&program=unifying	Biddeford, Maine	1	0
Gill, Jacquelyn	August 10 - 15	National	Ecological Society of America Annual Meeting http://esa.org/am/	Sacramento, CA	0	0
Hall, Brenda	Sept. 2014	International	Comer Abrupt Climate Change Conference	Soldiers Grove, WI	0	0
Hamilton, Gordon	9/18/14-9/19/14	National	NSF Workshop on Geodetic Instrumentation for Polar Environments	Washington, DC	0	0
Hamilton, Gordon	9/24/14-9/25/14	International	Planning workshop for R/V Polarstern cruise, NE Greenland 2016	Copenhagen, Denmark	0	0
Hamilton, Gordon	12/8/14-12/10/14	International	International Workshop on Ice-Ocean Interactions	Bremerhaven, Germany	0	0
Hamilton, Gordon	3/23/15-3/25/15	International	International Arctic Science Committee workshop on Arctic Glaciology	Obergurgl, Austria	0	0
Isenhour, Cynthia	October 2014	State	Maine Municipal Association Annual Meeting https://www.memun.org/	Augusta	1	0
Isenhour, Cynthia	October 2014	State	Climate Adaptation and Sustainability Conference http://climatechange.umaine.edu/maine_clas_conference	UMaine, Wells Conference Center	1	1
Isenhour, Cynthia	February 2015	State	Working Stakholder Meeting: The Future of Materials Management in Maine http://umaine.edu/mitchellcenter/files/2015/02/FINALSolid-Waste-Whitepaper-2.pdf	Augusta	2	0
Kelley, Alice	October 19-22, 2014	International	Annual Meeting Geological Society of America http://community.geosociety.org/gsa2014/home	Vancouver, BC, Canada	0	0
Kelley, Alice	Oct 30-Nov 1, 2014	Regional	Annual Meeting Eastern States Archaeological Federation http://esaf-archeology.org/2014_ESAF_Program.pdf	Solomons, Maryland	0	0
Kelley, Alice	March 23-25, 2015	Regional	Northeast Section - Geological Society of America http://www.geosociety.org/Sections/ne/2014mtg/	Bretton Woods, NH	0	0
Kelley, Alice	April 15-19, 2015	National	Annual Meeting Society for American Archaeology http://www.saa.org/AbouttheSociety/AnnualMeeting/2015Program/tabid/1519/Default.aspx	San Francisco, CA	0	0

Koons, Peter	12/2014		American Geopysical Union Annual Fall Meeting	San Francisco	2	0
Koons, Peter	5/2014		Community Surface Dynamics Modeling System		0	0
Kreutz, Karl	Nov 5 2014	National	UNAVCO workshop	Boulder, CO	0	0
Kreutz, Karl	Dec. 17 2014	International	CARRERI workshop	Lanzhao, China	0	0
Kreutz, Karl	March 25, 2015	Regional	Northeast GSA meeting	Bretton Woods, NH	0	0
Kreutz, Karl	May 6, 2015	International	AGU Joint Assembly	Montreal, Canada	0	0
Maasch, Kirk	4/9/2015-4/10/2015	State	Harold W. Borns Symposium http://climatechange.umaine.edu/harold_w_borns_symposium1	Orono, ME	6	0
McGill, Brian	June 2014	International	Evolution of Terrrestrial Ecosystems	Smithsonian	0	0
McGill, Brian	July 2014	International	Gordon Conference on Unifying Ecology Across Scales	Biddeford Maine	0	0
McGill, Brian	August 2014	International	Ecological Society of America	Sacramento, CA	1	0
McGill, Brian	August 2014	International	25 Years in Ecology	Minas Gerais, Brazil	0	0
McGill, Brian	October 2014	International	Biodiversity Change	sDiv Leipzig Germany	0	0
McGill, Brian	December 2014	International	Observing Biodiversity from Space - NASA	NCEAS Santa Barbara, CA	0	0
McGill, Brian	May 2015	International	Biodiversity change	Vancouver, Canada	0	0
McGill, Brian	June 2015	International	Measuring biodiversity correctly	sDiv Leipzig Germany	0	0
Northington, Robert	26-29 May, 2015	Other/Special	Kangerlussuaq- A Research Synthesis	Shropshire, United Kingdom	0	0
Northington, Robert	9-10 April, 2015	Local	Harold W. Borns, Jr. Symposium	Orono, ME	0	0
Northington, Robert	Dec/ 14-19, 2014	International	American Geophysical Union	San Francisco, CA	0	0
Olsen, Brian	October 2014	Regional	Joint Conference of the Northeast and Southeast Partners in Flight.	Virginia Beach, Virginia	4	0
Olsen, Brian	September 2014	International	Joint Meeting of the American Ornithologists' Union, Cooper Ornithological Society, and the Society for Canadian Ornithology.	Estes Park, Colorado	5	0
Robinson, Brian S	April 30- May 1, 2015	International	Canadian Archaeological Society annual meeting. in, April 30, 2015	St. John's, Newfoundland	0	0

Robinson, Brian S	October, 2014	Regional	Eastern States Archaeological Federation annual meeting 2014	Solomons, Maryland	0	0
Roscoe, Paul B	2014-15		SEE UNDER PRESENTATIONS		0	0
Sandweiss, Dan	July 10-11, 2014	Regional	Annual Retreat, RS Peabody Museum of Archaeology Advisory Committee	Martha's Vineyard, MA	0	0
Sandweiss, Dan	August 6, 2014	International	Simposio Internacional "Los Orígenes de la Civilización en el Perú: nuevas perspectivas ante nuevos descubrimientos"	Lima, Peru	1	0
Sandweiss, Dan	August 8, 2014	International	Simposio 'Colonización Prehispánica en las Américas', Interamerican Studies Biennial Congress	Lima, Peru	0	0
Sandweiss, Dan	August 20, 2014	International	Primer Congreso Nacional de Arqueología Peruana	Lima, Peru	2	0
Sandweiss, Dan	October 2-4, 2014	National	Phi Kappa Phi National Honor Society Vice President Training and Board Meeting	Baton Rouge, LA	0	0
Sandweiss, Dan	October 14-15, 2014	International	Climate Change and the Future of Water	Emirates Center for Strategic Studies and Research, Abu Dhabi, Uniter Arab Emirates	0	0
Sandweiss, Dan	October 19, 2014	International	Geological Society of American Annual Meeting	Vancouver BC, Canada	1	0
Sandweiss, Dan	November 5, 2014	Regional	RS Peabody Museum of Archaeology Advisory Committee Meeting	Andover, MA	0	0
Sandweiss, Dan	November 12-15, 2014	National	Society for American Archaeology Board Meeting	Manchester, NH	0	0
Sandweiss, Dan	December 11-12, 2014	International	The Influence of the Sea on History, A voyage to the heart of the Antiquity & the Middle-Ages. Océanides.	Paris, France	0	0
Sandweiss, Dan	February 13-14, 2015	International	American Association for the Advancement of Science Annual Meeting and New Fellows Induction	San Jose, CA	0	0
Sandweiss, Dan	March 19-21, 2015	National	Phi Kappa Phi National Honor Society Board Meeting	Baton Rouge, LA	0	0
Sandweiss, Dan	April 6-10, 2015	International	Avances en la investigación del Perú Prehispánico, un estado de la cuestión. Peruvian Ministry of Culture	Pisac, Peru	0	0
Sandweiss, Dan	April 15-19, 2015	International	Society for American Archaeology Annual Meeting	San Francisco, CA	0	0
Sandweiss, Dan	May 1, 2015	Regional	RS Peabody Museum of Archaeology Advisory Committee Meeting	Andover, MA	0	0
Sandweiss, Dan	May 14, 2015	Local	SPIA (School of Policy and International Affairs) Board Meeting	Washington, DC	0	0

Sandweiss, Dan	May 1, 2015	Regional	RS Peabody Museum of Archaeology Advisory Committee Workshop	Andover, MA	0	0
Sandweiss, Dan	June 4-5, 2015	Regional	Annual Retreat, RS Peabody Museum of Archaeology Advisory Committee	Orono, ME	0	0
Sorg, Marcella	August, 2014	National	New England Seminar in Forensic Medicine	Waterville, ME	1	0
Sorg, Marcella	September, 2014	National	National Association of Medical Examiners	Portland, Or	0	0
Sorg, Marcella	November, 2014	Regional	State Mass Fatality/Disaster Training	Portsmouth, NH	0	2
Sorg, Marcella	December, 2014	National	National Violent Death Reporting System Reverse Site Visit	Atlanta, GA	0	0
Sorg, Marcella	February, 2015	National	Annual Meeting of the American Academy of Forensic Sciences	Orlando, FL	1	0
Sorg, Marcella	February, 2015	National	NIST Organization of Scientific Area Committees	Orlando, FL	0	0
Zaro, Gregory D	April, 2015	National	Association of American Geographers Annual Meeting	Chicago, Illinois	0	0
Zaro, Gregory D	January 2015	National	Archaeological Institute of America Annual Meeting	New Orleans, Louisiana	0	0
Zaro, Gregory D	February 2015	Other/Special	Council of Colleges of Arts and Sciences Chairs Seminar	Washington D.C.	0	0
Zaro, Gregory D	April 2015	Local	Climate Change Institute Borns Symposium	UMaine	35	0
Zaro, Gregory D	June, 2015	International	Landscapes, Movements, and Narratives	Zadar, Croatia	1	12

RESEARCH EXPEDITIONS & FIELD TRIPS

Name	Date	Description	GS	US
Belknap, Daniel F	June, 2014	Alaska trip: Palmer Tsunami Warning Center, glaciated terrains in SE Alaska, road trip from Palmer to Fairbanks, return through Denali National Park.	0	0
Belknap, Daniel F	Summer and Fall 2014	Monthly research monitoring of Sea Grant Green Crab stations in marshes and tidal flats of Damariscotta, Harpswell, Yarmouth and Wells, Maine.	1	0
Belknap, Daniel F	June-August, 2014	Setup and conducting of Multibeam Sonar surveys of Sebasticook Lake, in support of Robin Arnold MS Thesis	1	0
Belknap, Daniel F	August 21-22	New Meadows River, seismic reflection profiling aboard R/V Mud Queen. MS Thesis research of Eliza Cronkite.	1	0
Denton, George	January-March 2015	Field research on the glacial and climate history of the Southern Alps of New Zealand	2	0

Enderlin, Ellyn	10/10/2015	Conduct ~1 month of field work collecting GPS and ice-penetrating radar observations on the McMurdo Shear Zone, West Antarctic Ice Sheet, Antarctica.	0	0
Enderlin, Ellyn	07/08/2014	Conduct ~2 weeks of field work in SE Greenland, including installation of an automated weather station, GPS deployment on Helheim Glacier, and servicing of a time-lapse camera.	0	0
Gill, Jacquelyn	October 15-18	Visited La Brea tarpits to investigate collections, acquire samples, and develop a research proposal.	0	
Gill, Jacquelyn	December 4-22, 2014	Falkland islands expedition to core peats and other records of past ecological and climate change. Supported graduate research.	2	0
Hall, Brenda	12/1/14-1/25/15	Field work at Hatherton Glacier, Transantarctic Mountains	2	0
Hall, Brenda	9/14	Field work in Maine	0	0
Hall, Brenda	2/18/15-3/12/15	Field work in the Falkland Islands.	0	1
Hamilton, Gordon	7/7/14-7/18/14	Glaciological Research in East Greenland	1	1
Hamilton, Gordon	10/7/14-11/14/15	Glaciological Research in Antarctica	1	0
Kelley, Alice	August 10-21, 2014	Geoarchaeological Field Work, North Coast of Peru	1	0
Kreutz, Karl	March 4-13, 2015	Cordillera Darwin, Argentina, glaciological exploration	0	0
Northington, Robert	August 13-23, 2014	Co-led expedition to Kangerlussuaq, Greenland with Dr. Jasmine Saros	2	0
Northington, Robert	August 28, 2014	Taught a field course as part of the SBE Schoodic Experience	0	40
Roscoe, Paul B	January 2015	Trip to tour temples and palaces of Vietnam and Cambodia; observations of daily life in both countries	0	0
Sandweiss, Dan	July 31-August 23, 2014	PHEP (Peruvian Human-Ecodynamics Project) field work in northern Peru on El Niño prehistory, landscape transformation, and mitigation. UMaine team members included Alice Kelley (Earth and Climate Sciences) and Ana Cecilia Mauricio (grad student).	1	0
Saros, Jasmine	June 1-29, 2014	Fieldwork in Kangerlussuaq, Greenland to conduct whole lake experiment with two graduate students, one postodoc, and one pre-tenure faculty member from UMaine	2	0
Saros, Jasmine	August 13-21, 2014	Fieldwork in Kangerlussuaq, Greenland to finish whole lake experiment with one graduate student and one postdoc	1	0
Saros, Jasmine	August 24-Sept 2, 2014	Fieldwork in Beartooth Muontains, Montana to assess glacial chemistry with one graduate student and one collaborator	1	0
Saros, Jasmine	January 12-18, 2015	Fieldwork in Bariloche, Argentina to conduct paleolimnology study with new collaborator	1	0
Zaro, Gregory D	May/June/July 2015	Nadin Archaeological Project, Croatia	0	12
Zaro, Gregory D	June/July 2014	Chan Chich Archaeological Project, Belize	0	1

OTHER INDICATORS

Name	Description
Belknap, Daniel F	Frequent requests by e-mail and phone to answer research-related questions by professionals and general public.
	Meeting with US Geological Survey and twelve other coastal ecologists and biologists to discuss sudden impact of invasive green crabs - November, 2014.
Gill, Jacquelyn	1) Planned a research trip to the Falkland Islands for December 2014, to conduct paleoecology research with graduate students Catherine Hamley and Dulcinea Groff. The students organized a crowd-funding campaign to raise $10,000 to fund this research. 2) I re-visited the La Brea Tarpits/Page Museum to plan an NSF proposal with Jessica Blois at UC Merced on the community paleoecology of the last 60,000 years at the site (my focus will be on vegetation). 3) Begun steps towards applying for a NSF-EAR Facilities and Instrumentation grant and an MRI internal application to seek funding for developing organic stable isotope analysis capacity on campus.
Koons, Peter	Several invited Keynotes at International meetings to present this theory
Mayewski, Paul	Developing "Climate Futures" described in another part of this report
Zaro, Gregory D	Croatia project is interdisciplinary, internationally collaborative, and integrates undergraduate education (ANT477) with an extramurally funded field research program (National Geographic Society)

MEDIA PRESENTATIONS CREATED

Name	Type	Description	GS	US
Mayewski, Paul	Bosotn Globe interview	Extreme weather	0	0
Mayewski, Paul	UM Media interview for You Tube	Extreme weather	0	0
Mayewski, Paul	Conference Organizer and host	Climate adaptation and Sustainability	0	0
Mayewski, Paul	Representative	Arctic Council meeting, Reykyavik, Iceland	0	0
Mayewski, Paul	Maine Calling	Cliamte chnage QandA	0	0
Mayewski, Paul	Film segment	Climate change in Nepal	0	0

Mayewski, Paul	Representative	British Embassy meetings in the Falkland Islands	0	0
Mayewski, Paul	Representative	CCI Signature Program, Maine State House	0	0
Mayewski, Paul	Film	“Years of Living Dangerously” Emmy Award Winner 2014 featuring Paul Mayewski, available on Showtime and Netflix	0	0
Mayewski, Paul	Film	Featured in "Thin Ice" award winning movie	0	0
Mayewski, Paul	Portland Herald	Maine and the Arctic	0	0
Mayewski, Paul	Men's Journal Magazine	Patagonia's glaciers and warming	0	0
Mayewski, Paul	Bangor daily News	Arctic warming article	0	0
Mayewski, Paul	Representative	UNESCO meeting Paris - addressing climate change in central asia	0	0

SERVICE – TO PROFESSION/DEPARTMENT/COLLEGE/UNIVERSITY SYSTEM/STATE GOVERNMENT AGENCIES/GENERAL PUBLIC & LOCAL COMMUNITIES/PRE-K-12 EDUCATION

To Profession:

Name	Type	Description
Belknap, Daniel F	Advisory Board	Wells National Estuarine Research Reserve, Laudholm Farm, Wells, ME. Member of Reserve Management Authority. Quarterly meetings and frequent e-mail interactions on policy and management.
Belknap, Daniel F	Advisory Board	Chairman of Research Advisory Committee, Wells National Estuarine Research Reserve, Wells, ME. Annual meetings with Research Director and seven other prominent regional scientist to provide advice on research directions.
Chai, Fei	Advisory Board	International Advisory Committee for the State Key Lab at the Xiamen University, China
Chai, Fei	Conference Section Chair	Third International Symposium Effects of Climate Change on the World’s Oceans in Santos, Brazil
Chai, Fei	Editorial Board	Biogeosciences.
Chai, Fei	Editorial Board	Acta Oceanologica Sinica.
Chai, Fei	Program Committee Member	The in situ iron studies (ISIS) Consortium
Chai, Fei	Editorial Board	Journal of Oceanography

Chai, Fei	Advisory Board	serve on NERACOOS Board and attending the annual meeting
Chai, Fei	Advisory Board	represent UMaine to serve on the Consortium for Ocean Leadership
Chai, Fei	Grant Review Board Member	Served on NOAA Kanuss Fellows selection committee.
Chai, Fei	Grant Review Board Member	Served on NSF Chemical Oceanography Proposal review panel
Chawathe, Sudarshan S	Professional Association Committee	IEEE Intellectual Property Committee.
Chawathe, Sudarshan S	General/Other	Standards-setting committee for Java exam at Excelsior College
Denton, George	Advisory Board	Advisory Committee to Comer Science and Education Foundation
Enderlin, Ellyn	Conference Section Chair	Co-convener of poster and oral presentations on ice-ocean interactions at the American Geophysical Union Annual Meeting.
Enderlin, Ellyn	Professional Association Committee	Council member for the Association of Polar Early Career Scientists (APECS).
Enderlin, Ellyn	Professional Association Officer	United States national committee co-chair for the Association of Polar Early Career Scientists (USAPECS).
Enderlin, Ellyn	Editorial Board	Review editor for Frontiers in Cryospheric Sciences.
Fernandez, Ivan	General/Other	Member – Planning Committee for Acadia National Park Science Symposium (2013 - 2016)
Fernandez, Ivan	General/Other	Member - State of Maine Board of Certification for Geologists and Soil Scientists (1993 – present)
Fernandez, Ivan	General/Other	University of Maine Representative to the USDA Northeast Climate Hub
Fernandez, Ivan	Program Committee Chair	Chair, Clean Air Scientific Advisory Committee, US Environmental Protection Agency, Science Advisory Board. 2015-2018.
Fernandez, Ivan	Advisory Board	External Science Advisor, Hubbard Brook Ecosystem Study, New Hampshire. 2013-2016.
Gill, Jacquelyn	Professional Association Officer	Paleoecology Section Chair, Ecological Society of America
Gill, Jacquelyn	Professional Association Committee	International Quaternary Association Early Career Research Congress
Gill, Jacquelyn	Panel Chair	ESA Symposium Chair and Moderator: Symposium 18: Island Biogeography, from the Oceans to the Sky: Recent Advances and an Emerging Synthesis
Gill, Jacquelyn	Editorial Board	Ecography Subject Editor
Gill, Jacquelyn	Editorial Board	Open Quaternary: Founding editor of a new open access peer-reviewed journal
Gill, Jacquelyn	Curatorial Activities	Supervising the organization, identification, and cataloging of the Biology Department's skull collection.
Gill, Jacquelyn	Professional Association Officer	Vice President of Communications, International Biogeography Society Meeting

Hall, Brenda	General/Other	Reviewer for grant proposals from the National Science Foundation (~10), National Geographic Society (1), and the American Philosophical Society (3).
Hall, Brenda	General/Other	Reviewer for ~20 papers per year from a wide variety of journals.
Hall, Brenda	General/Other	US Representative for Geosciences to SCAR (Scientific Committee on Antarctic Research)
Hamilton, Gordon	Advisory Board	NASA: Operation IceBridge advisory board
Hamilton, Gordon	Panel Chair	US CLIVAR working group on Greenland Ice Sheet - Ocean Interactions
Isenhour, Cynthia	Advisory Board	Society for Economic Anthropology Board of Directors (2014 - 2017)
Isenhour, Cynthia	Conference Chair/Co-Chair	Conference Co-Chair: Sustainable Consumption Action and Research Initiative International Conference (June 2016)
Isenhour, Cynthia	Advisory Board	Sustainable Consumption Action and Research Initiative
Isenhour, Cynthia	General/Other	Peer Review: Political and Legal Anthropology Review (S15), American Anthropologist (S15), Journal of Cleaner Production (F14), International Journal of Consumer Research (F14)
Jain, Shaleen	Editorship	Journal of Water and Climate
Jain, Shaleen	Grant Review Board Member	National Science Foundation, Directorate for Computer and Information Science and Engineering, June 2015.
Jain, Shaleen	Conference Section Chair	Session Co-chair, "Knowledge Translation: Mobilizing Environmental Data and Modeling for Uncertain and Changing Decision and Policy Contexts" at American Geophysical Union Fall Meeting 2014 Session, San Francisco, California, December 15-19, 2014.
Kelley, Alice	Advisory Board	Member: Society for American Archaeology's Climate Change Strategies Task Force
Kelley, Alice	Advisory Board	Organizing Team Member: IHOPE (Integrated History and Future of People on Earth) Threats to Global Heritage
Kelley, Alice	Conference Section Chair	Co-chaired session, Archaeological Record as a Paleoenvironmental and Paleoclimatic Archive, 2014 Annual Meeting, Geological Society of America
Kelley, Joseph	Editorial Board	Journal of Coastal Research (Coastal Education and Research Foundation)
Kelley, Joseph	General/Other	Western Carolina Program for the Study of Developed Shorelines Fellow
Kelley, Joseph	Advisory Board	Hudson Museum Board of Overseers, University of Maine
Kelley, Joseph	Advisory Board	Chancellor's Advisory Committee on Promotion and Tenure
Kelley, Joseph	Professional Association Committee	Planning Group for meeting on Presumpscot Formation
Kreutz, Karl	Panel Chair	U.S. Ice Core Working Group
Kreutz, Karl	Advisory Board	Ice Drilling Program Office

Kreutz, Karl	Editorial Board	Scientific Reports (Nature Publishing Group)
Kreutz, Karl	Conference Section Chair	Northeast GSA meeting session chair
Maasch, Kirk	Program Committee Member	University Corporation for Atmospheric Research, Member's Nominating Committee
Maasch, Kirk	Program Committee Member	University Corporation for Atmospheric Research, Membeship Committee
Mayewski, Paul	Advisory Board	Member, Environmental Sustainability Committee, Boston Museum of Science (2014-present)
Mayewski, Paul	Advisory Board	Member Maine Delegation to the Arctic Circle Meetings, Reykyavik, Iceland (2014)
Mayewski, Paul	Advisory Board	Advisory Board, Maine North Atlantic Development Office (2014-present)
Mayewski, Paul	Advisory Board	Advisory Board, World Ocean Observatory (W2O) (2014-present)
Mayewski, Paul	Advisory Board	Advisory Board, Marine Environmental Research Institute (MERI) Center for Marine Studies (2009-present)
McGill, Brian	Editorial Board	Frontiers in Ecology & Environment
McGill, Brian	Conference Section Chair	GRC Conference on Unifying Ecology Across Scales Section Chair
McGill, Brian	General/Other	One of 3 co-bloggers on leading blog in academic ecology. Reached 1,000,000th page view this year. Many postings receive 1000+ readers on topics as diverse as surviving your comprehensive exam to what is wrong with academic publishing.
Northington, Robert	Conference Section Chair	American Geophysical Union (AGU) Annual Meeting December 15-19, 2014, San Francisco, CA Session Title: Carbon in the Arctic
Olsen, Brian	General/Other	“Sparrows of the Salt Marsh” list-serve moderator, 91 members (’09 – present)
Olsen, Brian	General/Other	“Coastal Wetlands International Working Group” list-serve moderator, 34 members from four continents (’10 – present)
Olsen, Brian	Advisory Board	Member of the Consulting Scientific Board for the Schoodic Bird Ecology Lab at the Schoodic Education and Research Center, Acadia National Park, Winterport, Maine.
Olsen, Brian	Advisory Board	Vice Chair of the Board of Directors of the Biodiversity Research Institute
Olsen, Brian	Professional Association Committee	American Ornithologists' Union, "Early Professionals Committee" ('12 to present)
Sandweiss, Dan	Professional Association Officer	Regional Vice President (Northeast), Phi Kappa Phi National Honor Society (elected office)
Sandweiss, Dan	Professional Association Officer	Board of Directors, Phi Kappa Phi National Honor Society (elected office)
Sandweiss, Dan	Professional Association Officer	Board of Directors, Society for American Archaeology (elected office)
Sandweiss, Dan	Advisory Board	Chair, RS Peabody Museum of Archaeology Advisory Committee

Sandweiss, Dan	Advisory Board	Board Member, Maine Chapter of the Fulbright Association
Sandweiss, Dan	Editorship	Founding Editor, Andean Past (Cornell Latin American Studies Program)
Sandweiss, Dan	Editorship	Joint Editor for Archaeology and Patrimony, Chungará Revista de Antropología Chilena
Sandweiss, Dan	Editorial Board	Editorial Board Member, Latin American Antiquity (published by the Society for American Archaeology)
Sandweiss, Dan	Editorial Board	Editorial Board Member, Journal of Island and Coastal Archaeology (Taylor and Francis)
Sandweiss, Dan	Program Committee Member	Organizing Committee, Society for American Archaeology's Second Conferencia Intercontinental (Lima, Peru, August 2014) and Third Conferencia Intercontinental (Oaxaca, Mexico, August 2016)
Sandweiss, Dan	Program Committee Member	Scientific Advisory Committee for the Congreso Nacional de Arqueología (Perú)
Sandweiss, Dan	Program Committee Member	Scientific Advisory Committee for the 4th Southern Deserts Conference
Sandweiss, Dan	Professional Association Committee	Chair, Society for American Archaeology Task Force on Climate Change
Sandweiss, Dan	Professional Association Committee	Annual Meeting Presentation Task Force, Society for American Archaeology
Sandweiss, Dan	Professional Association Committee	Board liaison to following Society for American Archaeology groups: International Government Affairs Committee, Government Affairs Committee, Island and Coastal Archaeology Interest Group, Prehistoric Mines and Quarries Interest Group, Geoarchaeology Interest Group, BLM RMP Task Force
Sandweiss, Dan	Professional Association Committee	Doctoral Dissertation Grant Development Committee, Phi Kappa Phi
Sandweiss, Dan	General/Other	I operate an Andean Studies email information distribution list.
Sandweiss, Dan	General/Other	Review of Mario Rivera for Professorship Renewal, Universidad de Magallanes, Punta Arenas, Chile
Sandweiss, Dan	General/Other	Review of Michael R. Waters for University Distinguished Professor of Anthropology and Geography at Texas A&M University
Saros, Jasmine	Editorial Board	Associate editor of Hydrobiologia, handled 15 manuscripts
Saros, Jasmine	Conference Section Chair	Organized a special session for the Association for the Sciences of Limnology & Oceanography in Granada, Spain
Saros, Jasmine	Grant Review Board Member	Served on NSF PCE panel, reviewed 15 proposals
Sorg, Marcella	Professional Association Committee	Vice-Chair, Crime Scene/Medico-legal Death Investigation Subcommittee, Organization of Scientific Area Committees, National Institute of Standards efforts to develop professional standards for all of the forensic sciences nationally.
Zaro, Gregory D	Grant Review Board Member	Council for International Exchange of Scholars Fulbright Anthropology Peer Review Committee, 2014
Zaro, Gregory D	Advisory Board	Invited Member of Steering Committee for the 4th Southern Deserts Conference “Quaternary Evolution of Desert Landscapes and Peoples,” November 10-14, 2014, Mendoza, Argentina.

Zaro, Gregory D	Conference Chair/Co-Chair	Organizing Committee Member for the International and Interdisciplinary Conference "Movements, Narratives, and Landscapes," June 5-7, 2015, Zadar, Croatia.
Zaro, Gregory D	Advisory Board	Board member, Maine Fulbright Association, 2015
Zaro, Gregory D	Professional Association Officer	President, Phi Kappa Phi Collegiate Honors Society, Chapter 1, University of Maine, 2014-2015

To Department:

Name	**Descripton**
Belknap, Daniel F	Member - Peer Review Committee Member - Petrologist-Mineralogist Position Search Committee
Chai, Fei	serve as the Director for the School of Marine Sciences, any thing I do on daily basis is all related to better serve the faculty, students, and staff in the SMS
Chawathe, Sudarshan S	Committees of the School of Computing and Information Science (SCIS), University of Maine. * Curriculum * CS graduate * Labs * Web and Marketing * CS PEER
Denton, George	Policy Advisory Committee to Climate Change Institute I raised money for a chaired professorship in the School of Earth and Climate Science
Fastook, James L	Cirriculum, Graduate and Peer Committees
Fernandez, Ivan	-Peer Committee: Climate Change Institute -Peer Committee: School of Forest Resources -Chair - School of Forest Resources Director Selection Committee -Member - Steering Committee: Climate Change Institute A2C2 IGERT -Member - Recruiting Committee: Climate Change Institute A2C2 IGERT -Graduate Faculty -Building Manager, Potato Storage Building
Gill, Jacquelyn	SBE Speakers Committee Working group for CCI Ecosytems Subarea 5-year-plan
Hall, Brenda	Member of Peer Review Commitee (both SECS and CCI) Member of Graduate Committee (SECS and CCI) Participated in joint peer review committees with SBE
Hamilton, Gordon	Chair, Peer review committee (Climate Change Institute) Co-Chair, ad hoc Website committee (Climate Change Institute)

Isenhour, Cynthia	Graduate Coordinator; Graduate Program Committee Chair
Jain, Shaleen	Graduate Program Coordinator, September 2014 -- present
Kelley, Alice	School of Earth and Climate Sciences Golden Undergraduate Coordinator
Kelley, Joseph	Chair, Peer Review Committee, School of Earth and Climate Sciences Peer Review Committee, Climate Change Institute
Kreutz, Karl	CCI Graduate Coordinator CCI Graduate Board Representative CCI graduate committee, chair SECS Peer Review Committee, chair SECS strategic planning committee CCI Churchill Fund committee
Maasch, Kirk	Climate Change Institute Policy Advisory Committee
Mayewski, Paul	Director, Cliamte Change Institute
McGill, Brian	SBE Peer Committee SBE Vector Disease Search Committee
Northington, Robert	Ecology Graduate Curriculum Committee
Norton, Stephen	Mentoring students
Olsen, Brian	SBE Undergraduate Curriculum Committee Member (EES representative) Member, SBE Animal Graduate Student Award Committee (Spring 2014) EES Graduate Faculty Council (Fall 2012 to present) Faculty Advisor to the UMaine Birding Club (Spring 2015 to present) CCI Graduate Student Committee (Fall 2014 to present) SBE Policy Advisory Committee (Fall 2014 to present) Chair, Mammalogy and Mammalian Health Search Committee
Robinson, Brian S	Policy Advisory Committee (PAC), Anthropology Department (2013-2015) Peer Review Committee for Climate Change Institute (2013-2015)
Roscoe, Paul B	Chair, Reappointment Committees for Drs Cynthia Isenhour and Christine Beitl Anthropology PAC
Sandweiss, Dan	For Climate Change Institute: Organizer, Ice-age Breaker Event Organizer, Borns Symposium Chair, CCI Awards Committee Co-chair, Churchill Exploration Fund Selection Committee Member, Policy Advisory Committee

Saros, Jasmine	Member of SBE Graduate Committee
Zaro, Gregory D	*Borns Symposium Awards Committee, Climate Change Institute, University of Maine *Graduate Committee, PhD program in Anthropology and Environmental Policy, Department of Anthropology, University of Maine *Graduate Committee, MS program in Quaternary and Climate Studies, Climate Change Institute, University of Maine

To College:

Name	**Descripton**
Belknap, Daniel F	Boat Safety Committee member
Chai, Fei	serve on the NSFA Executive Committee
Fastook, James L	External Peer review for promotion to full professor New Media
Jain, Shaleen	College of Engineering Graduate Committee Member College of Engineering Graduate Fellowship Awards Committee
Kelley, Alice	Natural Sciences, Forestry, and Agriculture Undergraduate Curriculum Committee Member
Koons, Peter	Faculty Awards Committee Geddes Simpson Award Committee
Kreutz, Karl	SECRL advisory board (recently disbanded) Center for Undergraduate Research Faculty Fellow
Norton, Stephen	Mentoring students
Sandweiss, Dan	Member, SPIA (School of Policy and International Affairs) Advisory Board (ex officio)
Zaro, Gregory D	*Department of Art and Art History Chair Search Committee, University of Maine *College of Liberal Arts and Sciences Promotion and Tenure Committee

To University:

Name	**Descripton**

Belknap, Daniel F	Cooperating Curator, Hudson Museum Member - Dean Dana Humphrey review committee, Spring, 2015
Chai, Fei	serve on University Research Committee.
Chawather Sudarshan S	Faculty Senate. 9/2006–present. University Club, University of Maine Member, Executive Committee. (Vice-president, 2008--2009; President 2009--2010)
Fernandez, Ivan	-Member: President's Roundtable -University of Maine Representative to the National Park Service North Atlantic Coastal Cooperative Ecosystem Studies Unit (2005-present) -Advisory Board: Environmental Chemistry Laboratory (2004-present) -Member Project Advisory Team: Signs of the Seasons: A Maine Phenology Project
Gill, Jacquelyn	Supervising the organization and cataloging of the Biology skull collection (e.g., tracking down permits, identification, etc.).
Hamilton, Gordon	Faculty Senate Faculty Senate Subcommittee on Research and Scholarship Institutional Representative to the University of the Arctic
Isenhour, Cynthia	Graduate Board
Jain, Shaleen	Co-chair, University Teaching Council, September 2014 -- present Member, Graduate Broad Executive Committee Chair, Financial Sustainability Subcommittee, Graduate School Strategic Planning Process Member, ADVANCE Rising Tide Center Career Awards Committee Mentor, ADVANCE Rising Ride Center Faculty Mentorship Program Invited Panelist, CAREER Proposal Writing Workshop, ADVANCE Rising Ride Center Member, Promotion and Tenure Peer Committee, Mitchell Center for Sustainability Solutions Promotion and Tenure Application Internal Reviewer, University of Maine Faculty Member Applications (3)
Kelley, Alice	Member, Cultural Affairs Committee Cooperating Coordinator, Hudson Museum
Kelley, Joseph	Chancellor's Advisory Committee on Promotion and Tenure
Kreutz, Karl	Grad expo judge, April 3 2014
Maasch, Kirk	UMaine Academic Representative to University Corporation for Atmospheric Research (UCAR) Member, Hudson Museum Advisory Board
Mayewski, Paul	Member VPR Director's committee Member VPR University Research Council Member VPR Indirect Overhead Return Committee Chair VPR Research Faculty Committee

Olsen, Brian	Admitted Student Open House Presentations (Feb. & April) UMaine ADVANCE: Rising Tide Advocates
Peterson, Michael	Faculty Senate President
Robinson, Brian S	Faculty Senate: Chair of Program Creation and Reorganization Review Committee (PCRRC) 2013-2015 CUGR Fellow member
Roscoe, Paul B	Search committee for Associate Vice President for Research and Graduate Studies
Sandweiss, Dan	Chief Cooperating Curator, Hudson Museum Board of Cooperating Curators Member, IGERT Internship Committee
Saros, Jasmine	Associate Director, Climate Change Institute Director, Sawyer Water Research Laboratory Faculty Fellow
Sorg, Marcella	Committee member: Task force to evaluate role of Center for Research and Evaluation Committee member: Task force to implement National Council of Research Administrators (NCURA) review of research infrastructure at UMaine--recommendations regarding Risk.
Zaro, Gregory D	*Hudson Museum Cooperating Curator

To University System:

Name	**Description**
Chawathe, Sudarshan S	2008--present. UMS Information Security Governance Council.
Jain, Shaleen	Promotion and Tenure Application Internal Reviewer, University of Southern Maine Faculty Member Application (1)

To State Legislature:

Name	**Description**

Chai, Fei	help to coordinate a group of state legislators to visit the University of Maine
Isenhour, Cynthia	Helped to organize a working meeting of nearly 40 stakeholders from throughout the state (including several members of the Joint Standing Committee on the Environment and Natural Resources) to discuss the future of waste and materials management in Maine.
Kelley, Joseph	Met with State Legislators 3 times on mining issues
Olsen, Brian	"Hall of Flags" presentation to legislature on my research program - Spring 2015
Sorg, Marcella	Provided data to Maine Drug Enforcement Agency on fentanyl abuse and fentanyl related deaths, which was used in testimony regarding a proposed new bill defining penalties for fentanyl possession and trafficking.

To State Government Agencies:

Name	**Description**
Fernandez, Ivan	-Maine State Board of Certification for Geologists and Soil Scientists – Augusta, Maine (1992 to present) -Ongoing collaboration with Maine CDC, Maine DOC, and others in Maine climate change adaptation initiatives
Kelley, Alice	Maine State Police and Maine Coroner's Office: Geological advice and search for bodies.
Norton, Stephen	Research with Department of Environmental Protection
Robinson, Brian S	Maine Historic Preservation Commission, Board member, (1997-2014).
Sorg, Marcella	Responding to requests for data and interpretation of data regarding drug abuse, particularly drug related mortality: --Office of Substance Abuse --Office of Attorney General --Maine Drug Enforcement Agency

To General Public/Local Community:

Name	**Description**
Fernandez, Ivan	- I continue to participate in, and represent the University in, climate change adaptation initiatives in Maine. - Member Sustaining Climate Change Adaptation for Maine Project (SCAMP)

	- Member, Visioning Committee for Maine Climate Summit
Gill, Jacquelyn	Filed in First Peoples, a PBS documentary. Blogging for The Contemplative Mammoth (>115,000 hits since October 2013), Twitter account with >6100 followers.
Isenhour, Cynthia	Programming board of the Maine Science Festival. Helped to organize: 1) Downtown "Science Around Town" Scavenger Hunt; 2) Event at the Penobscot Theatre entitled "Science in Film: The Good, The Bad & the Ugly"; and 3) Event at the Charles Inn entitled "Science on Tap: Sex, Drugs and Rock n' Roll" Organized "Human Dimensions of Climate Change" Film Festival (March 2015) including three films and Discussants. The three films each attracted between 30 and 40 people.
Jain, Shaleen	Invited Participant, STEM, Sustainability and State Policy (S3) and the Maine Climate Change Table Joint Meeting, Topsham, Maine, July 8, 2014.
Kreutz, Karl	Maine Audubon board of trustees
Norton, Stephen	Two public talks on local geology
Robinson, Brian S	Maluhsi-hikon Petroglyph Foundation, Board member, Director, Donald Soctomah (2008-2014). Maine Historic Preservation Commission, Board member, (1997-2014). The MAPI Field School is a community outreach program of the University of Maine (2005-present)
Sandweiss, Dan	Board member, Bangor Foreign Policy Forum Board member, Maine Chapter of the Fulbright Association
Sorg, Marcella	Responding to requests for data and interpretation of data regarding drug abuse, particularly drug related mortality: --Media outlets (e.g., Bangor Daily News) --Community overdose prevention (e.g., Kennebec and Somerset County) --Law enforcement (e.g., York County Sheriff's Office) Volunteering my time to manage forensic anthropology component of regional disaster drill at Pease Airforce Base in Portsmouth, NH.

To Pre-K - 12 Education:

Name	**Description**
Chawathe, Sudarshan S	12/1999–present. Intel Science Talent Search Science Service. Judge 2000–present; evaluator 1999–2000. Judging the week-long Science Talent Institute and evaluating entries for the Science Service's Intel Science Talent Search (formerly, the Westinghouse Competition). 10/2006--present. "Classbooks": A Web-based data management system for tracking student reading and outcomes, currently used in a 1st grade class at the Newport Elementary School (RSU 19).

Enderlin, Ellyn	Judge of 8th-grade science fair presentations at the Etna-Dixmont school. Guest speaker at Ellsworth High School ("A Crash Course in Glaciology").
Fernandez, Ivan	As noted elsewhere, we have developed K-12 curriculum materials on Nitrogen in Watersheds used by high school science teachers and students in 3 states. I have also been directly involved with Old Town High School teachers and students with their implementation of these programs. This past year we carried out a new initiative on snowmelt working with multiple high schools and teachers throughout Maine.
Gill, Jacquelyn	PhD student Jeff Martin led an activity for CCI's Climate Science Day (October, 2014).
Hall, Brenda	Visits to K-12 classrooms to talk about science; answer letters from schoolchildren while in field.
Hamilton, Gordon	Mentor for the Schoodic Institute's "Maine Snowpack Learning Project"
Isenhour, Cynthia	Programming committe of the Maine Science Festival. Collaborated on planning for several events, displays designed for K-12 audience.
Jain, Shaleen	Collaborative research meetings with Mr. Cary James and Mr. John Cangelosi, Bangor High School, Bangor, Maine.
Kreutz, Karl	Stillwater Montessori School, Passport to the World Camp, Antarctic Science, June 27, 2013
Northington, Robert	March 21, 2015- Served as a judge at the Maine State Science Fair in Bangor
Olsen, Brian	Classroom demonstration of "active learning in a lecture setting" for 8 high school teachers
Sorg, Marcella	--Two presentations on forensic sciences associated with the Maine Science Festival. --Presentation on forensic anthropology for United Technologies Center

Service – Manuscripts/Proposal Reviewed

Name	Manuscripts	Proposals	Description
Belknap, Daniel F		2	US-Israel Binational Science Foundation NSF Ocean Sciences Postdoctoral Fellowships
Denton, George	5	4	For Nature, Science, Quaternary Science Reviews, and the National Science Foundation
Fastook, James L	7	4	Manuscripts: Interaction of ice sheets and climate during the past 800 000 years, Climate of The Past Hesperian polythermal glaciation in Isidis Planitia, Mars, 1: Ice sheet dynamics and thermal regime inferred from landform assemblage, Earth and Planetary Science Letters A stabilized finite element method for calculating balance velocities in ice sheets, Geoscience Model Development Widespread, rapid grounding line retreat of Pine 2 Island, Thwaites, Smith and Kohler glaciers, West 3 Antarctica from 1992 to 2011, Geophysical Research Letters

			Supporting Information for ”Volume of Martian mid-latitude glaciers us- ing inverse methods”, Geophysical Research Letters Flow dynamics of Byrd Glacier, East Antarctica, Journal of Glaciology Modelling the evolution of the Antarctic Ice Sheet since the last inter-glacial, The Cryosphere Proposals: Tidal Modulation of Ice-Shelf Flow: A Viscoelastic Model of Ross Ice Shelf, NSF CAREER: Sediment deposits from the last deglaciation as a constraint on the subglacial hydrology of modern ice sheets, NSF Combined data and model constraints on deglaciation of the Ross Sea Embayment, NSF Greenland Ice Sheet Sensitivity to Subdecadal and Decadal Climate Vari-ability, NSF
Fernandez, Ivan			I periodically review manuscripts for a wide range of journals in natural and environmental sciences as well as proposals for the National Science Foundation, the US Department of Agriculture and the US Environmental Protection Agency.
Gill, Jacquelyn	5	2	Manuscripts reviewed for PLOS ONE, Quaternary Research, Quaternary Science Reviews, Quaternary Geochronology, and Global Change Biology. External reviewer for NSF proposals (GEO-SGP and OPUS).
Hall, Brenda	20	14	I regularly review proposals for various government and non-government agencies and societies and review papers for a wide variety of journals.
Hamilton, Gordon	10	5	Manuscript reviews for Science (1), Nature (1), Nature Geoscience (1), Journal of Glaciology (2), The Cryosphere (3), Geophysical Research Letters (1), Remote Sensing of the Environment (1) Proposal reviews for NSF (3), NASA (1), UK NERC (1)
Isenhour, Cynthia	4	0	Political and Legal Anthropology Review (S15), American Anthropologist (S15), Journal of Cleaner Production (F14), International Journal of Consumer Research (F14)
Jain, Shaleen	5	3	Proposal Reviewer, Hudson River Foundation Proposal Reviewer, US Geological Survey, National Institute for Water Resources Grant Program Manuscript Reviewer for Journal of Geophysical Research, Water Resources Research, Journal of Hydrology.
Kelley, Alice	2	0	Manuscript: Original and 2nd review of an article about GPR investigations of a monumental structure and tombs in Chile for Chungara: Revisita de Anthropologia Chilena
Kelley, Joseph	8	2	Geomorphology (2), Marine Geology (3), Columbia University Press, Sedimentology, Journal of Coastal Research, National Environment Research Council (UK), Continental Shelf Research
Koons, Peter	3	6	I generally review 3 proposal for NSF Tectonics each 6 month round as well as proposals from NSF Geochemistry and Petrology, Geomorphology and Surface Dynamics, Geophysics.

			During the past year I reviewed manuscripts from Nature, Nature Geoscience and Science.
Kreutz, Karl	12	6	Casey et al. 2014 – South Pole site selection, Annals of Glaciology (original and revised versions) Zhang et al. 2015 – Annals of Glaciology >10 manuscripts handled as editor for Scientific Reports Australian Antarctic Division, Project 4294 Fellowship: International collaboration for ice core dating by high-resolution ice core melting, PI: R. Edwards NSF Antarctic Earth Science program, Review of Gooseff and Lyons "Collaborative Research: What controls daily patterns of dissolved solute concentrations in Antarctic streams? Evaluating flowpath, transport, thermodynamic, & biological hypotheses" NSF Antarctic Earth Science program, Review of Jackson and Davila, "COLLABORATIVE RESEARCH: Perchlorate in the Antarctica Dry Valleys: Life and Times of an Extreme Oxyanion in an Extreme Environment" UK NERC – Frey et al., East Antarctic ozone reconstruction Oct. 2014 NSF Arctic Natural Sciences, Review of Rupper et al., "Collaborative Proposal: Crevasse Zones: Important players in the formation and advection of temperature ice in glaciers and ice sheets" National Geographic, Review of Borns and Fastook, "The Origin and Dynamics of an Ice Cap on the Continental Shelf off Western Ireland"
Maasch, Kirk	5	1	Geophysical Research Letters, Journal of Geophysical Research, NSF
Mayewski, Paul	5	4	Related to climate change, ice cores, chemistry of the atmosphere
McGill, Brian	40	1	Peer reviewed ~40 articles including for Science, Nature, PNAS
Northington, Robert	2	1	Peer Reviewer for manuscripts submitted to the International Review of Hydrobiology and Limnology and Oceanography
Norton, Stephen	4	2	Four for referred journals in geochemistry One proposal for NSF One proposal for the Czech Republic
Olsen, Brian	3	0	Animal Behaviour (1), Biol J of the Linnean Society (1), Ecology (1)
Roscoe, Paul B	4	1	Manuscripts: Journal of Anthropological Archaeology; Anthropological Method and Theory; American Ethnologist; Oceania Proposals: NSF Archaeology Directorate
Sandweiss, Dan	10	6	Manuscripts: Antiquity 1 Estudios Atacameños 1 The Holocene 1 Journal of Field Archaeology 1 Journal of Island and Coastal Archaeology 2 Latin American Antiquity 1

			Routledge 1 (book proposal) Science 1 University of New Mexico Press 1 (complete edited book ms) Grants: CONICYT (Chile) 2 FONDECYT (Chile) 1 National Geographic 3
Saros, Jasmine	8	2	Reviewed manuscripts for 8 different journals, including Journal of Phycology, Journal of Paleolimnology, and Arctic, Antarctic and Alpine Research. Reviewed proposals for the NSF Arctic Program.
Zaro, Gregory D	2	20	Manuscripts: Climate of the Past (1); Chungara (1) Proposals: Fulbright (19); National Science Foundation (1)

Service – Television/Radio/Newspaper Interviews

Name	**Description**
Chai, Fei	3
Fernandez, Ivan	I have provided input to several news stories on climate change in Maine.
Gill, Jacquelyn	Hemlock decline research project reported on MPBN, ABC Channel 7, Associated Press, WABI Channel
Hall, Brenda	A description of our research appeared in the Penguin News (Stanley, Falkland Islands). I was also interviewed by students from the Medill School of Journalism at Northwestern University and an article appeared on their website.
Kreutz, Karl	National Park Service
Northington, Robert	09/15/2014-Fox 22/ABC 7 News Bangor, "U. Maine Studying Hemlock Die-off," Jaclyn Cangro 08/18/2014-UMaine News, "Past, present hemlock declines focus of UMaine research project" 07/03/2014-Field Notes, Polar Field Services Newsletter, "Pics from the Field: SolarBee in southwestern Greenland"
Olsen, Brian	• "Animal Homes: Location, Location, Location". PBS: Nature. First aired 15 April 2015 (minute 12:27). http://video.pbs.org/video/2365462046/ • "UMaine biologist studies Superstorm Sandy impact on tidal marshes". Beth Staples. UMaine press release reprinted in numerous outlets including: FEMA News Today, The Working Waterfont, Bangor Daily News, GoInfraGreen, Wopular, Maine Environmental News. 4 December 2014. • "Looking SHARP: Students, salt marshes, and that elusive sparrow". Charlotte Murtishaw. USFWS Northeast Blog. August 7th, 2014.
Peterson, Michael	♣ Belmont Stakes contenders to gallop on track primed to curb career-ending injuries, By ROBIN TOPPING, May 30, 2015, Newsday, http://www.newsday.com/sports/horseracing/belmont-stakes-contenders-to-gallop-on-track-primed-to-curb-career-ending-injuries-1.10490073 ♣ Pimlico crews manage dry week, stormy forecast to keep a fast track for Preakness, Scott Dance, May 15, 2015, The Balitimore Sun, http://www.baltimoresun.com/sports/horse-racing/preakness/bs-md-preakness-dry-track-20150511-story.html ♣ Scratching the surface: US racing looks to track conditions to lower injury rates, Daniel Ross, theguardian.com, Tuesday 23 September 2014, http://www.theguardian.com/sport/2014/sep/23/racing-racetrack-surfaces-horse-deaths

	♣ Understanding track bias, By Mick Peterson, Thoroughbred Racing Commentary, July 12, 2014, https://www.thoroughbredracing.com/articles/track-bias ♣ Can Manufacturing Principles Help Build A Safer Racetrack? Teresa Genaro, www.Forbes.com, 6/30/2014, http://www.forbes.com/sites/teresagenaro/2014/06/30/can-manufacturing-principles-help-build-a-safer-racetrack/ ♣ Belmont Park, Site of Failed Triple Crowns, Requires an Army of Caretakers, By Melissa Hoppert, http://www.nytimes.com/2014/06/06/sports/belmont-stakes-site-of-failed-triple-crowns-requires-an-army-of-caretakers.html?emc=eta1
Robinson, Brian S	Participated in MCHT conservation video entitled "Connecting Land & Spirit" Link: http://www.mcht.org/video/index.php
Sorg, Marcella	Interview regarding forensic work for Maine Campus

SPECIAL PUBLIC SERVICE RECOGNITION/AWARDS/HONORS RECEIVED

Hall, Brenda	US Representative for SCAR
Olsen, Brian	NSFA Faculty Outstanding Teaching Award

Other: (e.g. special contacts)

Name	**Description**
Fastook, James L	External Review or Letters of Recommendation: Promotion to Full Professor Recommendation for Joel T. Harper Department of Geosciences University of Montana Promotion to Docent for Nina Kirchner at Stockholm University
Fernandez, Ivan	- I continue to be involved in state-level activies regarding climate change adaptation across multiple natural resource based sectors of the Maine economy. This is a continuation of my involvement in the Maine Climate Change Stakeholder Adaptation Process. - The Bear Brook Watershed in Maine project has its own web site: http://www.umaine.edu/bbwm/ with real-time stream monitoring in collaboration with the US Geological Survey: http://waterdata.usgs.gov/me/nwis/uv/? site_no=01022294&PARAmeter_cd=00065,00060 and is also a participant in the emerging Smart Forests initiative: http://smartforests.org/
Hamilton, Gordon	External PhD examiner for Nolwenn Chauce, University of Wales-Aberystwyth, UK, January 2015
Olsen, Brian	Adjunct Researcher at the Schoodic Institute and member of the Consulting Scientific Board for the Schoodic Bird Ecology Lab at Acadia National Park, Winterport, Maine. Vice Chair of the Board of Directors of the Biodiversity Research Institute

Sorg, Marcella	Providing data and interpretation of data regarding Maine state drug abuse, especially drug related mortality for: U.S. Drug Enforcement Agency; U.S. High Intensity Drug Trafficking Association

APPENDIX: F – GRADUATE STUDENT RESEARCH, SCHOLARSHIP OR CREATIVE ACTIVITIES

A Four-Member Monthly Ensemble of 3rd Generation Climate Reanalysis Models, 1979-2013

Jeff D. Auger[1], Sean D. Birkel[1], Kirk A. Maasch[1, 2], Paul A. Mayewski[1, 2], Keah Schuenemann[3]

1. *Climate Change Institute, University of Maine.*
2. *School of Earth and Climate Sciences, University of Maine.*
3. *Earth and Atmospheric Sciences, Metropolitan State University of Denver.*

Abstract: We are developing and evaluating a global monthly ensemble (1979-2013) of the current leading reanalysis models, NCEP CFSR, ECMWF ERA-Interim, JMA JRA-55, and NASA MERRA.

Reanalysis models are numerical frameworks that reproduce past atmospheric conditions from periodic input of meteorological station, radiosonde, and satellite measurements (Kobayashi et al., 2014; Rienecker et al., 2011). The 3rd and latest generation global reanalysis models include NCEP Climate Forecast System Reanalysis (CFSR; Saha et al., 2010), ECMWF Reanalysis Interim (ERA-I; Dee et al., 2011), Japanese Meteorological Agency 55-Year Reanalysis (JRA-55, Kobayashi et al., 2014), and NASA Modern-Era Retrospective Analysis for Research and Applications (MERRA; Rienecker et al., 2011). Each of these model frameworks use different horizontal and vertical grid resolutions and different data assimilation methods (Table 1). Third generation reanalyses are considered to be more reliable than previous versions for their improved physics and integration of satellite data. Despite the robustness of CFSR, ERA-I, JRA-55, and MERRA, each model has strengths and weaknesses that result in different estimates of past weather. We are combining these latest reanalysis models into a four-member monthly ensemble 1979-2013 (GEN3-ENS) in an attempt to improve solution realism.

	CFSR	ERA-I	JRA-55	MERRA
Horizontal Resolution	0.5	0.75	0.562	0.5 x 0.667
Vertical Levels	64	60	60	72
TOA	0.266	0.1	0.10	0.01
Data Assimilation	3DVAR	4DVAR	4DVAR	GOES IAU

Table 1. Reanalysis datasets used. Horizontal resolution in degrees. Top of atmosphere (TOA) in hPa.

In what is the initial phase of work, we have begun plotting surface variables in order to assess how each member departs from the reanalysis ensemble average (e.g., Figure 1). Our analysis thus far indicates that individual ensemble members have correlation coefficients > 0.96 but regionally there are biases. Work is ongoing. When complete, the GEN3-ENS methodology and evaluation will be published, and data files will be made available to the broader climate research community.

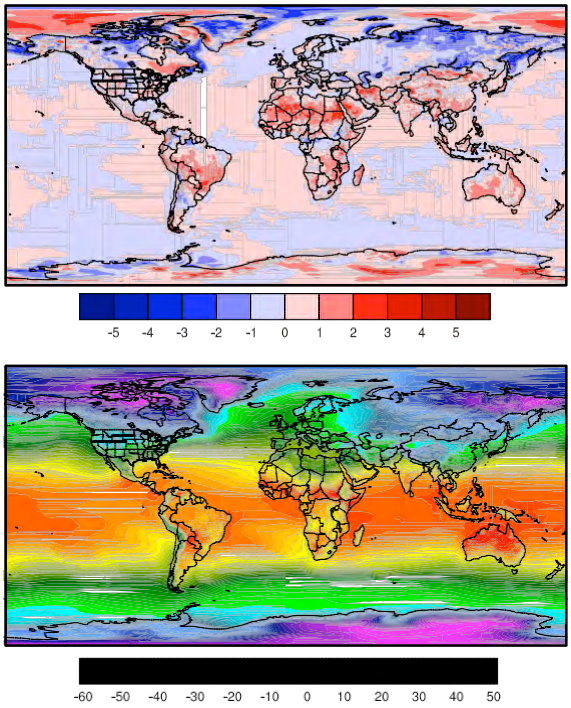

Fig. 1. Plot showing surface temperature from GEN3-ENS subtract CFSR (top) and GEN3-ENS (bottom). February 1990.

Acknowledgements: This work is supported by NSF award PLR-1417640 (GreenTRACS) to Dr. Sean Birkel.

Bibliography:

Dee, D. [and others], The ERA-Interim reanalysis: configuration and performace of the data assimilation system. *Quart. J. Royal Met. Soc.* 137 (2011): 553-597.

Kobayashi, S., [and others], The JRA-55 Reanalysis: General Specifications and Basic Charateristics. *J. Met. Soc. Japan* 93 (2015): 440.

Saha, S., [and others], The NCEP Climate Forecast System Reanalysis. *Bull. Amer. Met. Soc.* 91 (2010): 1015-1057. I.

Reinecker, M. [and others], MERRA: NASA's Modern-Era Retrospective Analysis for Research and Applications. *J. Clim.* 24 (2011): 3624-3648.

Providing Marine Harvesters with Tools to Handle a Rapidly Changing Ocean

Samuel L. Belknap III[1, 2], Teresa R. Johnson[3], Samuel P. Hanes[2]

1. *Climate Change Institute, University of Maine.*
2. *Department of Anthropology, University of Maine.*
3. *School of Marine Sciences, University of Maine.*

Abstract: The rapid rate of environmental change occurring in the Gulf of Maine, coupled with the depletion of marine stocks from overfishing and ecological change, highlights the need for marine harvesters to reduce their vulnerability to potential future changes through diversification. Aquaculture is often presented as an appropriate means of diversification. To this end, a series of aquaculture training courses designed for marine harvesters have been delivered in several Maine towns to help facilitate potential adaptation efforts. Social science research is being done in conjunction with these efforts to improve harvester's successful transition to aquaculture.

Project Goals

The goal of this project is to provide marine harvesters with the skills and information needed for the practice of aquaculture. Due to the rate of change experienced in the Gulf of Maine (GoM) over the past decade,[1] and especially over the last several years (**Figure 1),** Maine fishermen are being encouraged to reduce their vulnerability to such changes by diversifying their businesses through aquaculture.

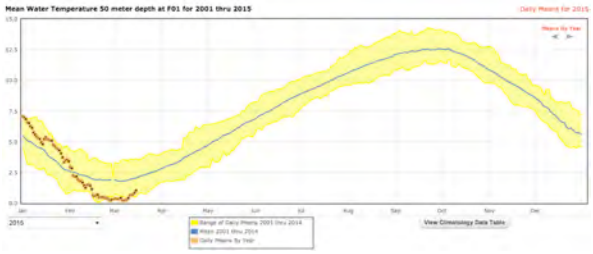

Figure 1. 2015 temperature profile for GoM. Temperature ranges is already 7.5°C.

Aquaculture differs from wild harvest in the same manner as a farming differs from a hunting and gathering. Transitioning between the two necessitates an education in the technical aspect of husbandry and a cultural shift from harvesting. In 2015 municipal employees from the towns of Brunswick and Harpswell worked with various groups to develop and deploy an 8-week aquaculture-training program. This program is designed to give wild harvesters the information necessary to consider an aquaculture business and the skills required to start one.

[1] Record, N 2014. Maine waters warming fast, *Bigelow Laboratory for Ocean Sciences Transect* 6:8-9.

The research component of this project involves: identifying potential barriers to the successful adoption of aquaculture, assessing general attitudes towards aquaculture, and an overall assessment of the course itself. These will help tailor future classes and can potentially facilitate harvester's successful transition to aquaculture.

Image 1. Harvesters from Harpswell and Brunswick learn about bivalve biology and ecology.

Initial Results

A total of 18 fishermen enrolled in the course. Several harvesters have expressed pursuing Limited Purpose Aquaculture leases with the majority of the class indicating they were likely to be involved in aquaculture in the future. Several barriers have been identified including: information deficits, application logistics and community interactions. Classes provide an excellent model for training other harvesters to deal with future changes in the GoM.

Acknowledgements: National Sea Grant Award #NA10OAR4170081; Team members: Dana Morse, Sebastian Bell, Dick Clime, Sarah Redmond Chris Davis, Dan Devereaux, Darcie Couture. NSF Adaptation to Abrupt Climate Change IGERT program grant DGE-1144423.

Erosion and Migrating Shell Middens on Machias Bay

Kendra D. Bird[1, 2], Brian S. Robinson[1, 2]

1. *Climate Change Institute, University of Maine.*
2. *Department of Anthropology, University of Maine.*

Abstract: Erosion-based loss of coastal archaeological sites on Machias Bay complicates coordination of prehistoric living areas with changing styles of rock art spanning 3000 years. Analysis of shifting shell middens and sub-midden living areas at Holmes Point West will increase understanding of what has been lost and relationships between diverse cultural activities.

The University of Maine archaeological field school has been excavating two sites on Machias Bay, working with the Passamaquoddy tribe to correlate living areas and activities with 3000 years of rock art on the bay (Soctomah 2009). A major problem is that time and sea-level rise have significantly eroded the shoreline (Shipp 1989), causing site loss and an inland migration of more recent sites as a direct consequence of erosion.

Work has focused on a small, weakly-stratified shell midden at the Holmes Point West site. Artifacts of both indigenous and European origin occur throughout much of the midden, suggesting the possibility that it dates perhaps only a few centuries prior to the arrival of Europeans. However, artifacts and features below the midden have been dated to at least 2400 years ago.

Previous work in the region suggests that house floors were often located behind associated shell middens (Sanger and Chase 1983). Given the presence of cultural material dating to the Early Woodland period, but with no corresponding shell midden, our problem is to understand what has been lost to erosion, and precisely how the shell midden has migrated over old living floors. A series of floors, fire hearths, and animal bone deposits have been excavated at the base of the shell midden; these appear to have been covered by shell shortly after their deposition. A workshop of densely-scattered lithic tool debris may provide a key to how the activity areas overlap. Radiocarbon samples are being prepared from precisely correlated events as determined via assistance from Andrew Heller's analysis of microstratigraphy.

Cataloging of the recovered archaeological materials from the last three field seasons has proven a substantial task that must be completed before the spatial analysis of artifact activities can commence. The artifacts recovered have included rare stone tool fragments originating in northern Labrador, as well as a considerable amount of lithic material from the Minas Basin region in Nova Scotia. Refining the dating and stratigraphy associated with these artifacts will help us understand how these cultural materials and events relate to one another, as well as their relationship with the nearby concentration of Passamaquoddy rock art.

The analysis of the artifacts excavated in the 2014 field season is currently in progress. These excavations were designed and executed specifically to address the previously-identified problems of overlapping and shifting features.

Acknowledgements: Maine Academic Prominence Initiative (MAPI), Passamaquoddy Tribal Historic Preservation Office, Climate Change Institute, University of Maine Department of Anthropology.

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Sanger, David and Thomas Chase. "An Introduction to the Roque Island Group, Maine." Paper presented to the Canadian Archaeological Association, April 1983.

Shipp, R. Craig. "Late Quaternary Sea-Level Fluctuations and Geologic Evolution of Four Embayments and Adjacent Inner Shelf along the Northwestern Gulf of Maine." PhD diss., University of Maine, 1989.

Soctomah, Donald (ed.) *Petroglyph Management Plan for Machias Bay: Protection and Documenting the Uniqueness of Machias Bay*. Passamaquoddy Tribal Historic Preservation Office. Report submitted to the National Park Service, 2009.

Implications of Heterogeneous Strain Weakening of Bedrock Underlying the Highly Active Glacio-tectonic System of Coastal Alaska

Annie Boucher[1], James O'Neil[1], Peter Koons[1, 2]

1. *School of Earth and Climate Sciences, University of Maine.*
2. *Climate Change Institute, University of Maine.*

Abstract: Glacial erosion formulations include tools to model glacial erosion and sediment output, but use an oversimplified homogeneous strength model for the underlying bedrock. By measuring fracture density and material cohesion in profiles across regional fault zones, we are constraining actual bedrock strength calculations, and will use these to model more realistic erosion rates.

We examine the interactions between tectonics, climate, and erosion, and how these factors create and control topography. The St. Elias Region of Alaska is an area of active tectonics and heavy precipitation, resulting in rapid orogenic uplift and erosion (Koons et al., 2013).

Traditional glacial erosion models are based on ice thickness and velocity, but do not take into account bedrock cohesion. Current fluvial erosion models show that erosion rates vary across orders of magnitude based on non-linearities in the erodibility due to material strength variation of the bedrock. (Roy et al., 2015). We hypothesize that with similarly heterogeneous bedrock cohesion, similar ranges of erosion rates as a function of material strength exist in glacial erosion rates.

To quantify the strength of the bedrock, we use a Geologic Strength Index (GSI) that uses both fracture density and weathering to estimate cohesion. (Hoek and Brown, 1997).

We measured fracture density in bedrock outcrops near the Fairweather Fault in Yakutat Bay and near off-shoots of the Denali Fault in the Eastern Alaska Range. Near the Fairweather Fault, the bedrock was highly fractured. It had a GSI rating of very poor surface quality and disintegrated/foliated structure (~15, Fig. 1). Further from the faults, the bedrock was substantially less fractured. It had a GSI rating of fair surface quality and blocky structure (~60, Fig. 2). We hypothesize that glacial erosion has proceeds more quickly in fault controlled valleys, removing less cohesive bedrock. This forms a positive feedback mechanism: the glacier removes the weaker rock, channelizing glacier flow into fault-controlled valleys, and the valleys are subject to increased glacier flow and erosion.

In 2015 we will collect data in recently deglaciated valleys of the Juneau Icefield in southeast Alaska. The area is subject to a simpler tectonic regime, but similar erosion processes.

Fig. 1. Bedrock in fault zone with low cohesion.

Fig. 2. Non-Fault damaged bedrock with high cohesion.

Acknowledgements: Funding for this research is from the Churchill Fund and the NSF.

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Hoek, E., Brown, E.T. 1997, Practical Estimates of Rock Strength. Int. J. Rock Mech. Min. Sci., 34,8: 1165-1186.

Koons, P.O., et al. 2013, Tectonic Aneurysms and Mountain Building. *in* Shroder, J.F. and Owen, L.A., eds., Treatise on Geomorphology, Vol. 5, Tectonic Geomorphology. San Diego, Academic Press, p. 318-349.

Roy, S., et al. 2015. The influence of crustal strength fields on patterns and rates of fluvial incision. Journal of Geophysical Research: Earth Surface

Detecting the Effects of Atmospheric Rivers on Glacier Mass Balance in Denali National Park, Alaska

Abigail A. Bradford[1], Seth W. Campbell[1,2], Karl J. Kreutz[1,2], Erich C. Osterberg[3], Cameron P. Wake[4], Douglas Introne[1,2], Sean D. Birkel[1,2], Kirk A. Maasch[1,2], Robert A. Burrows[5] and Denny Capps[5]

1. *School of Earth and Climate Sciences, University of Maine.*
2. *Climate Change Institute, University of Maine.*
3. *Dartmouth College.*
4. *University of New Hampshire.*
5. *National Park Service, Denali National Park.*

An atmospheric river made landfall over Alaska on January 23, 2014. This system advected moisture and heat from the Pacific Ocean east of Hawaii to Alaska over the course of two days causing anomalously high temperatures, heavy rainfall, avalanching, and disruption of human infrastructure (NCDC, 2014). There likely was also rainfall at higher elevations, which would cause a significant change in the mid-winter energy and mass balance of regional glaciers.

To investigate whether there is a detectable physical and chemical signature of the atmospheric river event in Central Alaska glaciers, we collected geophysical and geochemical data on the Ruth, Kahiltna, and Mt. Hunter Plateau Glaciers during May, 2014. High-frequency (400 MHz) ground penetrating radar (GPR) transects over a total of 10 Km were collected on the Ruth Glacier to determine the spatial continuity of an ice layer potentially created by the event. Two snowpits on the Ruth Glacier (1.2 and 3.5 meter depths), one on the Kahiltna Glacier (3 m depth), and one on the Mt. Hunter Plateau (4.05 m depth) were sampled for $\delta^{18}O$ and δD analysis.

Based on simple isotope fractionation modeling, we hypothesize that moisture from the atmospheric river event would be isotopically heavy relative to typical mid-winter precipitation in the area. We observe a positive $\delta^{18}O$ deviation in the Mt. Hunter and eastern Ruth Amphitheater snowpits at 3-3.5 meter depth, which given estimated snow accumulation rates may be consistent with the river event.

We will discuss ongoing statistical comparison of snowpit physical and isotope data, processing and interpretation of the GPR data, and detailed time-series analysis of the river event using climate reanalysis and station data.

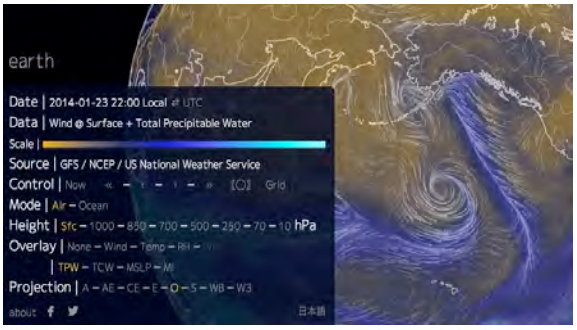

Fig.1. This image displays the total precipitable water and winds associated with the atmospheric river event of January 23, 2014, which extended from near the Hawaiian Islands to Alaska (Beccario, 2014).

Acknowledgements:

I would like to thank Dan and Betty Churchill for their generous donation, which supported the field work associated with this project. I am very grateful to you for providing me with that invaluable experience.

I would also like to thank the Center for Undergraduate Research (CUGR) for funding this research and its dissemination.

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Beccario, Cameron. “Wind and TPW, 1/23/2014”, earth ::, 2014, http://earth.nullschool.net/#2014/01/24/0000Z/wind/surface/level/overlay=total_precipitable_water/orthographic=-159.52,29.69,362.

NCDC (National Climatic Data Center), “Quality Controlled Local Climatological Data”, 01/2014, Talkeetna Airport, AK, NOAA, http://cdo.ncdc.noaa.gov/qclcd/QCLCD.

Bacterial Nutrient Limitation in Arctic Lakes of Southwest Greenland

Benjamin Burpee[1], Kevin Simon[2], Robert Northington[1], Jasmine Saros[1]

1. *Climate Change Institute, University of Maine.*
2. *University of Auckland, New Zealand.*

Abstract: Nutrient dynamics of Southwest Greenland's Arctic lakes may be changing in response to inputs from permafrost thaw. In order to elucidate biological nutrient demands across these lakes, the activities of bacterial enzymes (EEAs) involved in nutrient acquisition were determined. We found that certain EEAs are tightly correlated to dissolved organic matter (DOM) concentration, suggesting DOM as a potential nutrient source. This study will be important to determine what factors influence the diverse nutrient dynamics across these study lakes.

Arctic lakes in Southwest Greenland exhibit dynamic and variable nutrient patterns across the landscape. The region is underlain by continuous permafrost. The lakes are mostly closed-basin and low in biological productivity. These lakes are chemically dilute, and so they are very sensitive to small changes in nutrient concentrations. Changes in inputs from landscape permafrost thaw may be affecting nutrient dynamics.

Bacterial EEA is a sensitive way to measure biological nutrient demands. Enzymes are excreted to degrade organic substances into simple molecules that can be transported across bacterial cell membranes. They are produced to scavenge for nutrients that are otherwise unavailable. Therefore, nutrient limitation patterns can be inferred from activities of enzymes specific to acquisition of carbon (C), nitrogen (N), or phosphorus (P).

The objective of this study was to determine 1) environmental factors associated with bacterial EEAs in Southwest Greenland Arctic lakes, and 2) relationships between EEAs and lake nutrient dynamics.

Enzyme activities specific to C, N, and P acquisition significantly increased from the spring to summer months in 2013. This may be due to changes in bacterial demand for nutrients, or may simply reflect an increase in bacterial biomass.

Lake EEA results from spring and summer 2013 also indicated greater bacterial phosphorus demand (inferred via alkaline phosphatase, AP activity) with increasing lake DOM (measured as DOC; Figure 1). Conductivity (lake salinity) and the concentration of total nitrogen (TN) covaried positively and significantly with DOC and AP activity as well.

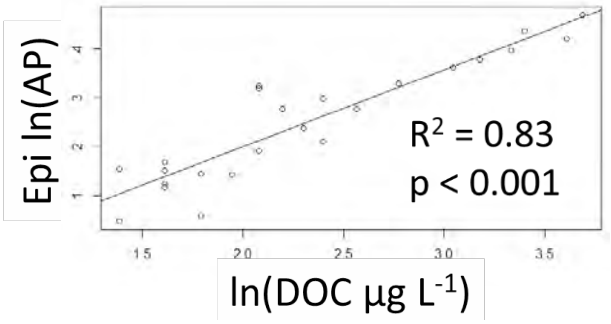

Fig. 1. Bacterial P demand correlated with DOC.

Interactions between enzyme activities can provide important information about bacterial investment in nutrient acquisition. When these interactions were analyzed, we found that bacterial investment in N acquisition relative to that for P (inferred via EEA ratios) was negatively correlated to DOM ($R^2 = 0.58$, $p < 0.001$).

It is possible that these data are suggesting that DOM is an important N source. Alternatively, DOM could contain significant quantities of organically-bound P that are only available via enzymatic breakdown. Further research will elucidate DOM characteristics and will determine how enzymes respond to lake chemistry.

Acknowledgements: Funding for this project was provided by the Dan and Betty Churchill Exploration Fund, the NSF Arctic Program, and the University of Maine's Graduate School Government.

Interactive Exploration of Time Lines from Ice Core Data Sets

Sudarshan S. Chawathe[1,2]

1. *Climate Change Institute, University of Maine.*
2. *School of Computing and Information Science, University of Maine.*

Abstract: Time lines are derived from ice core data typically by counting layers or peaks in sequences of measured values. This work (in progress) explores the extent to which automation and interactive exploration may assist this task.

Introduction: The primary goal of this work is to partly automate the task of deriving time lines from ice core, and similar, data sets by using methods from pattern detection, machine learning, and optimization. A secondary goal is quantifying the robustness of time lines, both human- and machine-derived. In essence, time lines are derived from ice core data typically by counting layers or peaks in numerical sequences. There are, of course, several subtleties that require expert knowledge and a variety of scientific and background information, so that the task is unlikely yield to full automation. However, it is interesting to consider to what extent automation may assist.

Methods: We classify methods for automation-assisted exploration of timelines into four levels: Level 1 method detect peaks automatically as a function of a few key parameters. These parameters include height above background level, height above a windowed average, width of the averaging window, and minimum distance from neighboring peaks. Level 2 methods are essentially Level 1 methods augmented with sensitivity analysis. A time line that is robust over large variations of parameter values is likely to be preferable to one that is very sensitive to those values. Level 3 methods are based on a comprehensive computation of solutions over all combinations of parameter values within some ranges. To ensure computational tractability, such methods must avoid exhaustive computations using inferencing. Level 4 methods use quality metrics to define and compute optimal solutions. An important complementary task for all levels, possibly except 4, is the presentation of the methods' outputs in a form that is easily comprehended by a human expert. For example, Level 3 methods conceptually produce a timeline for each point in a large multidimensional space. Segmenting and projecting that space into two, or possibly three, dimensions is important for effective presentation.

Implementation: The implementation builds on work on data-stream processing in order to process large data sets with high throughput and low memory footprint. Processing data in a streaming manner means that operations on data are limited to those that can be performed by storing only a fixed (independent of data size and characteristics), and typically small, amount of auxiliary data while reading the source data only once in a linear manner. A related but distinct technique that is also helpful, especially for interactive exploration that may need only a small portion of the entire conceptual output, is that of lazy evaluation. Evaluating data transformations lazily means that operations are evaluated only when the resulting values are needed for output to the user or some user-discernible side-effect. As a trivial illustrative example, consider computing the prime factorization of a list of a million very large numbers, followed by printing the 10th element of that list. Lazy evaluation will result in only one number (the 10th) being factored.

Evaluation: We evaluate the methods using two classes of criteria. The first class focuses on computing performance, using metrics such as running time, response time, memory footprint. scale-up to larger data, and scale-out to multiple cores. The second class focuses on effectiveness of the methods using metrics such as similarity to time lines generated by human experts, internal consistency, and robustness.

Acknowledgements: This work was motivated by suggestions from Andrei Kurbatov and benefited from detailed discussions with Nicole Spaulding (but all errors are mine) and was supported in part by US NSF grant EAR-1027960.

Specialist Avifaunal Collapse in Northeastern Tidal Marshes

Maureen Correll[1,2,3], Whitney Wiest[4], Thomas P. Hodgman[5], Greg Shriver[4], Chris Elphick[6], and Brian J. Olsen[1,2,3]

1. *Climate Change Institute, University of Maine.*
2. *School of Biology and Ecology, University of Maine.*
3. *Adaptation to Abrupt Climate Change (A2C2) IGERT Program.*
4. *University of Delaware.*
5. *Maine Department of Inland Fisheries and Wildlife.*
6. *University of Connecticut.*

Abstract: Tidal marshes of the northeastern United States are particularly vulnerable to sea-level rise due to their placement along the coast. Here we quantify trends in bird populations within tidal marshes from Maine to Virginia and show significant decline in specialist species over time, while generalist populations remain stable over the same time period.

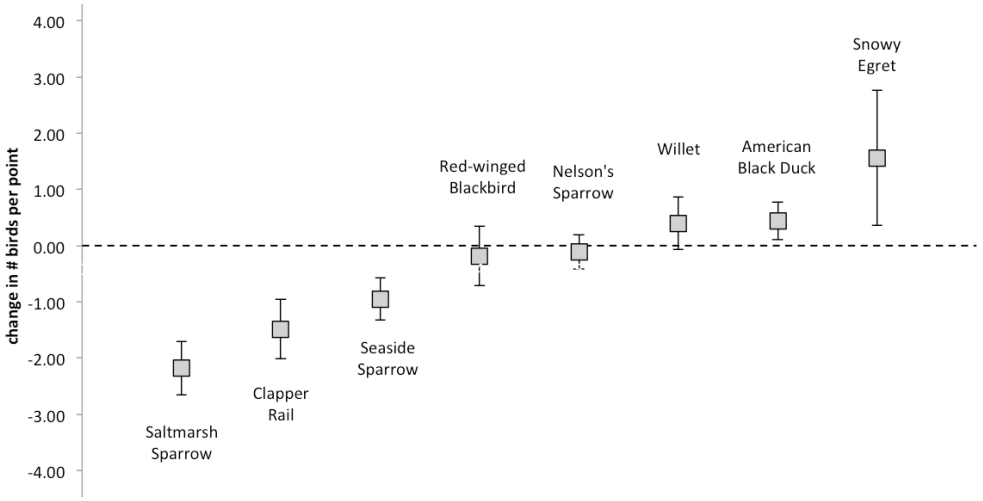

Figure 1. Trends in birds observed per survey point between Maine and Connecticut, 1997 - 2012, organized by species and degree of specialization. Error bars indicate standard error.

Tidal marshes along the Northeastern seaboard of the United States support a significant portion of the world's vertebrate endemics to this habitat. Tidal-marsh specialist birds such as the saltmarsh sparrow (Ammodramus caudacutus) are especially at risk of habitat loss due to sea-level rise (Greenberg et al 2006). Generalists such as the red-winged blackbird (Agelaius phoenicius) may respond differently than their obligate counterparts to climate change due to their supplemental use of non-tidal habitat for breeding and foraging grounds. Collaborators within the Saltmarsh Habitat and Avian Research Program (SHARP) conducted bird surveys at 1700 points over the 2011 and 2012 breeding seasons in tidal marshes between Maine and Virginia. We compared these data to historical bird surveys conducted within the same study area between 1997 and 2000 to identify hotspots of change in our focal species. Overall, we detected decreases in the tidal marsh habitat specialists such as the saltmarsh sparrow, seaside sparrow, and clapper rail, but detected no change in birds that use tidal marshes as their primary but not exclusive breeding habitat, such as the Nelson's sparrow, willet, and American black duck. Tidal marsh generalists did not show any positive or negative changes over the same time period.

Acknowledgements: Thank you to SWG, MDIFW, USFWS, NSF, MAWS, and GSG.

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Abrupt Climate Change Effects on Lake Level and Diatom Habitat Modeling of Southwest Greenland Lakes

Rachel A. Dicker[1, 2], Jasmine E. Saros[1, 2]

1. Climate Change Institute, University of Maine.
2. School of Biology and Ecology, University of Maine.

Abstract: The 20,000 lakes in Southwest Greenland that are relatively untouched by anthropogenic disturbance are ideal locations for climate change studies. Diatoms preserved in sediments from these lakes indicate a record of recent variability. To interpret these changing signals, we are using diatom habitat models that show how diatom assemblages respond to changes in regional water balance.

Lake level change is influenced by several variables, many of which fluctuate naturally, but are also amplified by climate change. Changes in temperature and precipitation affect moisture balance, and effects of glacial meltwater, snowmelt, and permafrost can alter water depth. These drivers of lake level depth can influence planktic vs. benthic (P:B) diatom habitat.

Fossil diatom assemblages from dated sediment cores give information about past regional climate changes. Marked changes in diatom community structure have occurred in Arctic lakes over the past 150 years, but diatom assemblages from SW Greenland do not follow similar patterns of variability (Perren et al. 2009). Between 1999 and 2013 sampling events, distinct differences were observed in P:B diatom assemblages of SW Greenland lakes. These differences could be an indication of lake level variation as a result of rapid climate change. The rapid shift to warmer Arctic conditions in 2007 (Zhang et al. 2008) is encompassed within these sampling dates, and our goal is to determine whether diatom assemblages were affected by moisture balance changes during this period of abrupt climate change.

Diatom analysis is currently being performed on a 15-cm sediment core from SS32, a nunatak lake in SW Greenland, and ^{210}Pb dating of the core has been completed. Using a 3D visualization software called Surfer®, we have modeled expected P:B habitat ratios for chosen lake levels of SS32 (Figure 1). The P:B habitat model for SS32 will be compared to the diatom relative abundance data for this lake to evaluate efficacy of the model, and these results will help guide future diatom habitat modeling efforts. The more we understand about interactions between diatom community structure and climate, the better equipped we will be to interpret climate signals embedded in diatom assemblages.

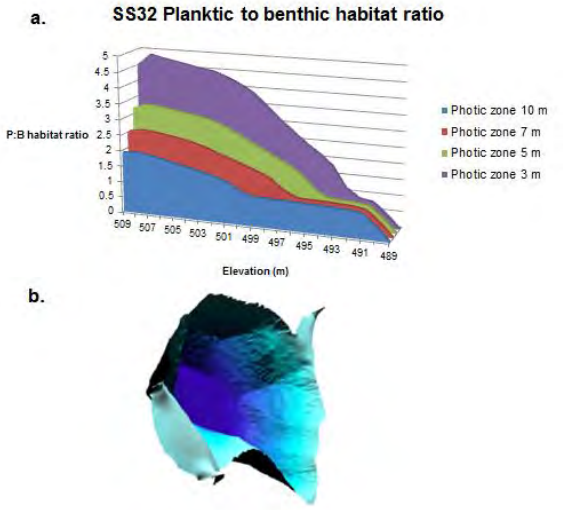

Fig. 1. P:B habitat model (a) and 3D surface map (b) of SS32 in Southwest Greenland.

Acknowledgements: This research was supported by the US National Science Foundation Adaptation to Abrupt Climate Change IGERT program grant DGE-1144423.

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Termination 1 Glacier Fluctuations in Mackenzie Stream Valley, New Zealand

Colin W. Dowey[1,2], George H. Denton[1,2], Joerg M. Schaefer[3,4], Aaron E. Putnam[1,4], David J. A. Barrell[5], Courtney C. King[1,2], Peter D. Strand[1,2], Ann V. Rowan[6], Robert Finkel[7], Rosanne Schwartz[4]

1. *Climate Change Institute, University of Maine.*
2. *School of Earth and Climate Sciences, University of Maine.*
3. *Department of Earth and Environmental Sciences, Columbia University.*
4. *Lamont-Doherty Earth Observatory, Columbia University.*
5. *GNS Science, New Zealand.*
6. *Sheffield University, United Kingdom.*
7. *Department of Earth and Planetary Sciences, University of California, Berkeley.*

Abstract: Beryllium-10 surface-exposure dates of boulders from Mackenzie Stream valley reveal rapid and extensive deglaciation in the early stages of Termination 1 (18.5 to 16.9 ka), a late-glacial readvance that culminated at ~14 ka, and net glacier retreat from ~14 to ~12 ka.

Existing records of glacier retreat in the Southern Alps of New Zealand during Termination 1 (18-11 ka) are in conflict. Three moraine chronologies show rapid collapse of large ice tongues beginning at ~17.7 ka (Putnam et al., 2013a, Putnam et al., 2013b, Strand, 2014). In contrast, a fourth moraine chronology suggests that near-glacial conditions persisted in the Southern Alps until 15 ka, perhaps indicating that glacier-marginal lakes, rather than climate warming enhanced the retreat of large ice tongues (Rother et al., 2014). Determining the precise timing and character of glacier retreat in the Southern Alps is necessary in order to assess potential drivers of Termination 1 climate shifts in the Southern Hemisphere mid-latitudes.

We present a record of glacier retreat in Mackenzie Stream valley, a steep alpine valley in the Ben Ohau Range that excludes the formation of an ice-marginal lake. The record is based on glacial-geomorphologic mapping and 39 ^{10}Be surface-exposure dates of the mapped deposits.

Constructional glacial landforms in Mackenzie Stream valley are limited to Last Glacial Maximum moraine ridges at the mouth of the valley and late-glacial moraine ridges preserved in two cirques at the valley head. The outermost sampled moraine at the valley mouth dates to ~18.5 ka and provides a maximum-limiting age for the onset of glacier retreat. Inboard, a low-relief recessional moraine dates to 16.9 ± 0.7 ka. In the eastern upper catchment, five boulder-rich late-glacial ridges mark a re-advance that culminated at ~14 ka followed by net glacier retreat until 12 ± 0.2 ka.

Eight erratic boulders less than 280 meters outboard of the ~14 ka moraine ridge are indistinguishable in age from the recessional moraine at the valley mouth. These dates indicate that the snowline rose to at least ~14 ka levels by ~16.8 ka.

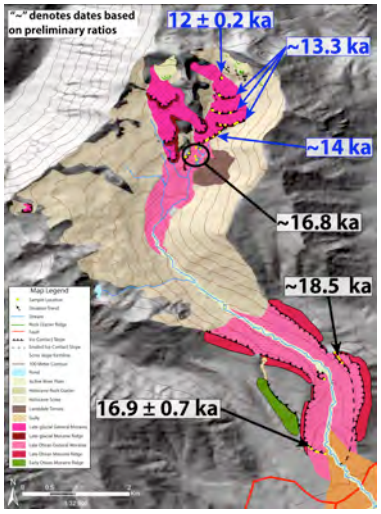

Fig. 1. Geomorphic map of Mackenzie Stream valley.

Acknowledgements: We thank the Gary C. Comer Science and Education Foundation, the NSF, and the Quesada Family Foundation for support.

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Iceberg Melting in Two Greenland Glacial Fjords

Ellyn M. Enderlin[1, 2] and Gordon S. Hamilton[, 2]

1. *Climate Change Institute, University of Maine.*
2. *School of Earth and Climate Sciences, University of Maine.*

Abstract: Icebergs calved from marine-terminating outlet glaciers draining the Greenland ice sheet act as distributed freshwater sources to Greenland's glacial fjords and surrounding ocean basins. Although changes in the freshwater fluxes from icebergs can potentially impact fjord stratification and circulation, in turn influencing the dynamic contribution of Greenland outlet glaciers to sea level rise, iceberg freshwater fluxes have not been quantified. Here we estimate iceberg freshwater fluxes in Sermilik Fjord, East Greenland, and in Ilulissat Fjord, West Greenland, from 2011-2013 using repeat very high-resolution digital elevation models (DEMs).

As icebergs transit glacial fjords, they produce freshwater via surface and submarine melting. Assuming that surface melting scales with air temperatures, surface melting can easily be estimated using surface air temperature observations from nearby weather stations or from reanalysis models. The magnitude of submarine melting is strongly dependent on the temperature of the water and the velocity of the water with respect to the submerged ice face (Jenkins, 2011) but hydrographic observations for Greenland's glacier fjords are quite sparse due to logistical constraints.

In order to estimate iceberg freshwater fluxes and area-averaged melt rates, we constructed a time series of very high-resolution digital elevation models (DEMs) from stereo pan-chromatic imagery collected by the WorldView satellites. Temporal differences in iceberg surface elevation are used to estimate changes in iceberg volume over time (i.e., volume fluxes). Volume fluxes are converted to freshwater fluxes and area-averaged melt rates by assuming icebergs have a constant density and cylindrical shape below the waterline.

Here we derive freshwater fluxes for 18 icebergs in Sermilik Fjord, East Greenland, during the 2011-2013 boreal summers, and for 33 comparably sized icebergs in Ilulissat Fjord, West Greenland, during March-April 2011 and July 2012. We find that iceberg melt rates for Sermilik Fjord are in good agreement with simulated melt rates along the vertical terminus of Helheim Glacier in winter, i.e. when melting at the glacier front is not enhanced by subglacial discharge, providing an independent validation of our technique. The good agreement between large iceberg melt rates and the simulated glacier melt rate also suggests that iceberg melt rates can be used as a proxy for glacier melt rates.

We also find that variations in freshwater fluxes from icebergs are primarily related to differences in the submerged area of individual icebergs (Fig. 1), which is consistent with theory. The freshwater flux dependence on submerged area, suggests that changes in the characteristics of icebergs (size/shape/keel-depth) calved from a tidewater glacier will alter the magnitude and distribution of meltwater fluxes within the fjord, which may in turn influence fjord circulation and the heat content delivered to the glacier terminus.

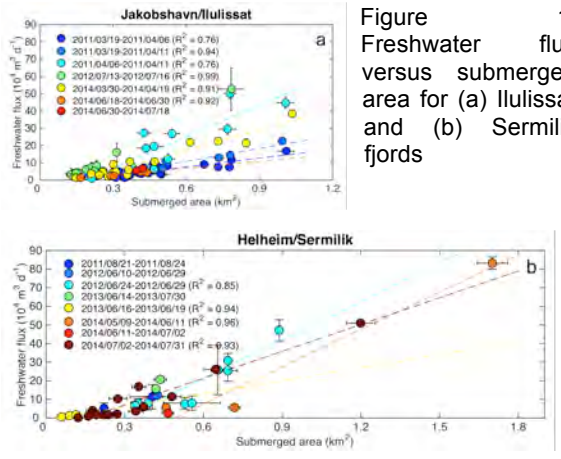

Figure 1: Freshwater flux versus submerged area for (a) Ilulissat and (b) Sermilik fjords

Acknowledgements: Project funded by NSF grant ANS1417480.

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A Vernal Transition on the Move in Terrestrial Ecosystems in Maine

Ivan J. Fernandez[1,2,3]

1. *School of Forest Resources, University of Maine.*
2. *Climate Change Institute, University of Maine.*
3. *School of Food and Agriculture, University of Maine.*

Abstract: Climatic warming increases the length of the growing season, and changes the timing of snowmelt in terrestrial ecosystems, referred to as the vernal transition. Research is developing to both define the complexities of the vernal transition, and to evaluate the implications of these changes for the sequence of interacting chemical, physical and biological processes that follow the transition to a snow-free system.

Increasing average annual temperatures have resulted in a lengthening of the snow-free season resulting in an earlier spring in the northeastern U.S. by 1-2 weeks over the past century (1,2). A series of studies are developing to better understand the implications for these changes in the vernal transition for Maine. This research includes monitoring, snow removal experiments, K-12 citizen science and laboratory studies. Figure 1 demonstrates the abrupt transition that takes place in the physical environment upon snowmelt.

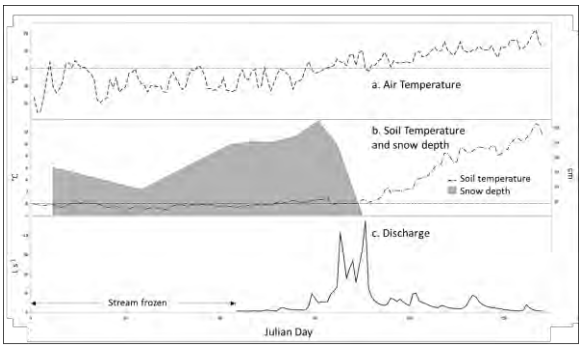

Fig. 1. Daily averages at the Bear Brook Watershed in Maine (BBWM) for the year 2014 to date – air temperature (4a), soil temperature and snowpack depth (4b), and East Bear stream discharge (4c) (3).

The rapid transition from a snowpack to direct insolation results in rapid soil warming, accelerated hydrology, increases in soil microbial dynamics with subsequent rapid acceleration in carbon (C) and nitrogen (N) cycling, followed by a sequence of phenological events such as the initiation of root growth followed by aboveground vegetation changes and associated changes in fauna. Decreased snow cover in winter leads to colder soils, so warming results in more soil freezing, creating an interesting paradox as a consequence of a warming climate (4). This area of research draws on the integration of biogeochemistry and ecosystem phenology, with a particular emphasis on understanding asynchronies that may be emerging with a shifting seasonality.

Acknowledgements: This research is supported by the Maine Agricultural and Forest Experiment Station and the National Science Foundation.

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Testing for Biotic Feedbacks in Tidal-marsh Community Stability in the Face of Sea-level Rise

Laura Garey[1], Brian Olsen[1], Tom Hodgman[2]

1. *School of Biology & Ecology, Climate Change Institute, University of Maine.*
2. *Bird Group, Maine Department of Inland Fisheries and Wildlife.*

Abstract: The persistence of insectivorous birds in tidal marshes is unlikely in the face of current rates of sea-level rise. It is unclear, however, how their loss will influence the broader tidal marsh ecosystem. In the summer of 2014, we conducted predator-removal experiments in Northeastern tidal marshes to test if the exclusion of avian predators would result in a measurable trophic cascade. Birds are considered important top predators in marsh food webs, and we report the changes in both invertebrate abundance and plant biomass as measures of direct and indirect effects of excluding avian predators in a terrestrial food web.

Introduction:

Tidal-marsh songbirds face an imminent threat of extinction this century with sea-level rise. The effects of losing these species from the marshes are unclear. Food webs shape the structure of ecological communities through direct and indirect interactions. The loss of an invertebrate predator, like these birds, can therefore trickle down to the plant community by influencing when and where herbivores forage and the magnitude of herbivory damage to the plant (Greenberg et al., 2000). Further, the ability of tidal marshes to maintain elevation in the face of sea-level rise, however, is partially determined by the production of plant biomass (Donnelly & Bertness, 2001). Birds are important predators in some ecosystems, and their presence can be positively related to plant biomass (Mäntylä et al. 2011). Removing avian predators from this system may alter plant biomass through indirect species interactions (a trophic cascade) and thereby affect the resiliency of tidal marshes to climate change. To test the impact of the sparrow's absence in local food webs, we constructed avian exclosures in eight tidal-marsh systems along the Northeastern Coast. We measured temporal changes to invertebrate communities after excluding avian predators. For evidence of trophic cascades, we measured vegetation biomass. In addition, we conducted the exclosure experiments across a latitudinal gradient to provide insight into food-web dynamics across a spatial cline.

Acknowledgements: Funding for my research has been provided by the U.S. Fish & Wildlife Service and the University of Maine.

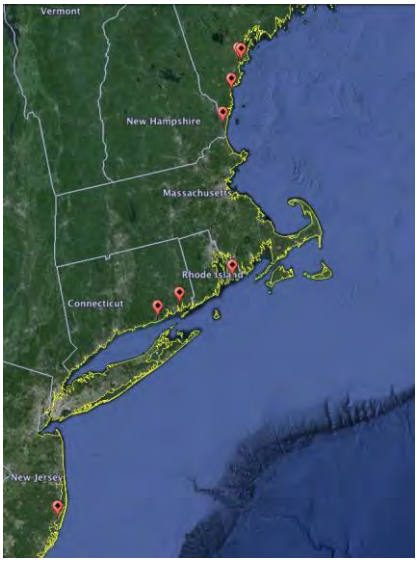

Figure 1. Location of avian exclosures. Image by GoogleEarth

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A Mouse's Eye View of Rancho La Brea: Assessing Millennial-scale Community Stability Using Highly-Resolved Mammal and Vegetation Food Webs

Jacquelyn Gill[12], Jessica Blois[3], Justin Yaekel[3], John Harris[4]

1. *Climate Change Institute, University of Maine.*
2. *School of Biology and Ecology, University of Maine.*
3. *School of Natural Sciences, UC Merced.*
4. *Page Museum, Los Angeles, California*

Abstract: Present-day communities are changing in many ways: local populations are lost to human land use or climate change, the increasing rarity of the earth's largest species is leading to a "trophic downgrading" of the planet's biodiversity, and novel communities and ecosystems are forming. Understanding drivers and responses of in-progress biodiversity changes is difficult without adequate baselines. We are identifying small mammal and vegetation components of the Rancho La Brea tar pits for integration into multi-trophic paleo food webs. These analyses will not only permit exploration of paleo food web structure and dynamics, but will allow verification of the dynamical predictions against known future extinctions in the ecosystem.

How stable are food webs through time?

We propose to reconstruct changes in the composition and structure of a tightly coupled component of the ecological network (large to small mammals and vegetation) in California across the late Quaternary (<60,000 years). This project adds value to the extensive existing records of mega carnivores and megaherbivores at one of the most significant paleontological sites in the world, by 1) providing a better understanding of the full biodiversity in the region around Rancho La Brea during the late Quaternary and 2) generating useful datasets that can be mobilized to put ongoing single-species research in a broader ecological context.

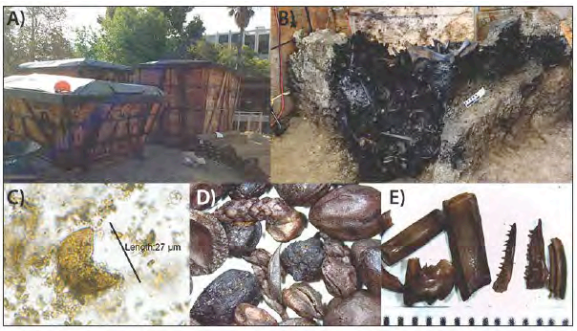

Figure 1. Boxes (A), In-process excavation (B), pollen (C), plant macrofossils (D), and small mammals (E) from Project 23.

The Bayesian framework developed for this proposal can be applied to both paleo and modern food webs to facilitate integration of multiple proxies that better characterize areas of certainty and uncertainty in understanding past ecological interactions. By exploring the structure and stability of food webs through time, we will determine cross-trophic linkages in a system that has previously focused extensively on the upper trophic levels of communities.

By predicting the likely responses of species to global changes, then testing these predictions using the known megafaunal extinction events across the Pleistocene-Holocene transition, we will improve understanding of the importance of intact ecological networks for the vulnerability and/or resilience of taxa in a tropically downgraded Anthropocene.

The first three contributions alone will significantly advance understanding of both paleontological methods as well as provide insight into the paleoecological structure of a site of international importance. The final contribution will connect the findings from the fossil record with understanding of how present-day ecosystems may change given current and future global change. This project also represents the first characterization of paleovegetation and small mammal communities at Rancho La Brea, and includes a citizen science component involving middle school classrooms.

Examining the Relationship Between Surface Albedo and Glacier Mass Balance in the Central Alaska Range

Timothy P. Godaire[1], Elizabeth A. Burakowski[2], Karl J. Kreutz[1,3], Gordon S. Hamilton[1,3], Seth W. Campbell[3,4], Dominic Winski[5], Sean D. Birkel[1], Cameron P. Wake[6], Erich C. Osterberg[5], Bradley R. Markle[7]

1. *Climate Change Institute, University of Maine.*
2. *National Center for Atmospheric Research, Boulder, CO.*
3. *Department of Earth Sciences, University of Maine.*
4. *Cold Regions Research & Engineering Lab, Hanover, NH.*
5. *Department of Earth Science, Dartmouth College.*
6. *Institute for the Study of Earth, Oceans, and Space, University of New Hampshire.*
7. *Department of Earth & Space Sciences, University of Washington.*

Abstract: In-situ albedo measurements from our 2013 field season on the Kahiltna Glacier (Denali National Park, AK) validate the use of satellite-derived albedo values. We examine the relationships between surface albedo and glacier mass balance.

Surfaces with high reflectance values within the cryosphere such as seasonal snowpack, glacial snow and ice, and sea ice play a vital role in the global climate system and in the energy budgets of the world's glaciers. Changes in reflectance may induce feedbacks resulting in fluctuations of glacier mass balance. My objective is to understand glacier response to climate forcing by using surface albedo as a proxy for mass balance.

To understand the relationship between surface albedo and mass balance, we used an ASD. Inc. FieldSpec4 spectroradiometer to measure incoming radiation, outgoing surface reflectance and optical grain size on the Kahiltna Glacier for seven days during our 2013 field season in Denali National Park.

We derive surface albedo using the Moderate Resolution Imaging Spectroradiometer (MODIS) MCD43A3 data product, a 16-day composite with 500 meter resolution. Comparison of the MCD43A3 albedo to the ASD FieldSpec4 data shows a strong correlation. This strong correlation between satellite imagery and in situ data suggests that the satellites accurately capture what we see and measure in the field. Therefore we are using the MODIS data to characterize changes in albedo across the glacier for the previous 14 years. Preliminary results support possible detection of volcanic activity (i.e. 2009 Redoubt eruption) and changes in glacier mass balance through changes in the glacier's surface albedo.

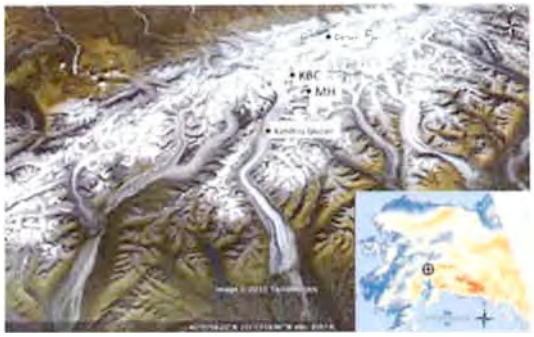

Fig. 1. Google Earth image of study locations: Kahiltna Base Camp (KBC- 2105 masl), and Mount Hunter (MH- 3910 masl). Kahiltna Glacier and Mount McKinley (Denali) also noted. Insert map (from Campbell et al., 2012) shows the Central Alaska Range (circle-plus symbol) on a DEM of Alaska (red is high elevation).

Acknowledgements: Funding from US National Science Foundation- Office of Polar Programs award 1203838 to K. Kreutz. Logistical support provided by: Denali National Park, Talkeetna Air Taxi, and CPS Polar Services.

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20th Century Trends in Anthropogenic Pollutants Over Central Asia.

Bjorn Grigholm[1,2], Paul A. Mayewski[1,2], Vladimir Aizen[3], Karl Kreutz[1,2], Cameron Wake[4], Elena Aizen[3], Shichang Kang[5]

1. *Climate Change Institute, University of Maine.*
2. *Department of Earth Sciences, University of Maine.*
3. *Department of Geography, University of Idaho.*
4. *Department of Earth Sciences, University of New Hampshire.*
5. *Institute of Tibetan Plateau Research, Chinese Academy of Sciences, China.*

Abstract: Concentration trends and enrichment/excess calculations from Asian Ice Core Array suggest 20th century increases in anthropogenic lead, cadmium, copper nitrate, sulfate and chloride.

High-resolution records from the Asian Ice Core Array (AICA) have provided detailed 20th century glaciochemical time-series. Ice core records covering the past several hundred years have allowed the investigation and assessment of the evolution of anthropogenic pollutants at high-elevation sites across central Asia. Chemical concentrations, EOF analyses, crustal enrichment and excess calculations were used to identify potential anthropogenic inputs. Trace element and major soluble ion analysis suggest that rises in the anthropogenic inputs of nitrate (NO_3^-), sulfate (SO_4^{2-}), chloride (Cl^-), lead (Pb), cadmium (Cd) and copper (Cu) began to rise during the 1950s-1960s in regions of central Asia.

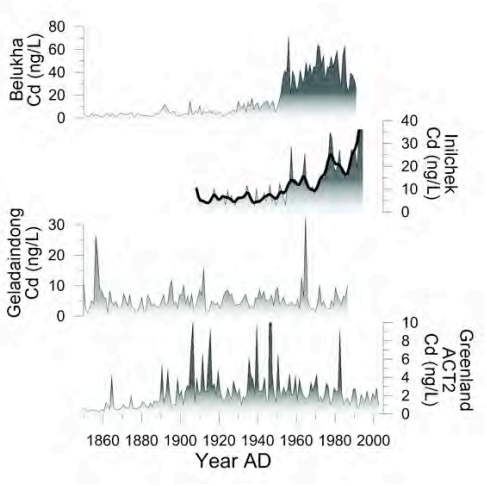

Fig. 1 Cadmium records from Asia and Greenland

This time period corresponds to large rapid increases in local and regional agriculture, industry and population. Northern AICA sites (Belukha and Inilchek) display pollutant trends similar to the growth and collapse of the Soviet Union and potentially the expansion of industry in western China. These regional characteristics of Asian ice cores suggest that the variability of anthropogenic pollutants over the Tibetan Plateau have been controlled by economic production (growth/retraction) rather than by any air quality legislature, as evidenced in European and North American ice cores [1,2].

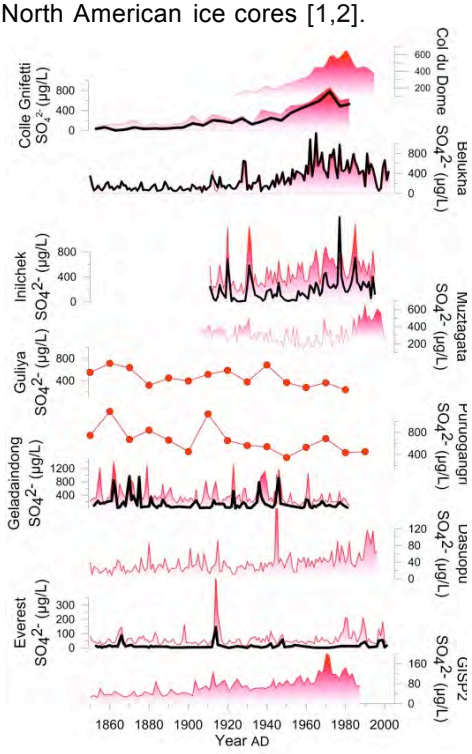

Fig. 2 Sulfate records from the Northern Hemisphere

Acknowledgements:

NSF ATM-0754644 NSF, P2C2-1401899 and NSF A2C2 IGERT DGE-1144423.

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Climate Change in the Falkland Islands: A New Paleoclimate Proxy?

Dulcinea V. Groff[1, 2], Jacquelyn L. Gill [1,2]

1. *Climate Change Institute, University of Maine.*
2. *School of Biology and Ecology, University of Maine.*

Abstract: Paleoenvironmental reconstructions facilitate tests of the associations between past ecosystem dynamics and past climate changes. We propose a pilot study to develop a novel proxy to reconstruct precipitation and temperature using the stable isotope ($\delta^{18}O$, δD, and $\delta^{13}C$) values of alpha cellulose tissue of preserved tussac grass (*Poa flabellata*) leaf material from Volunteer Point, Falkland Islands. A modern validation study will be used to calibrate tussac grass as a novel proxy reconstructing paleoclimates from preserved leaves in peat. This information will provide insight into how seabird populations and associated tussac grass communities responded during past climate changes in the Falkland Islands.

Research description:

Various proxy records indicate southern hemisphere westerly winds gradually strengthened over the last 3,000-5,000 years and are currently as intense as they were during the last glacial maximum and the Little Ice Age [1]. Westerly wind fluxes show a reduction during the early Holocene and preceding the Little Ice Age [1]. Latitudinal shifting and wind strength of the Westerlies influence both marine and terrestrial ecosystems. The variation in zonal wind speeds and southerly shifting of the Southern Hemisphere westerly wind belt will be characterized using isotopic compositions of precipitation. Decreases in $\delta^{18}O$ are hypothesized to relate to increases in mean annual precipitation, corresponding with increases in zonal wind speed and southerly shifting of the Southern Hemisphere westerly wind belt [2].

Preserved tussac grass (*Poa flabellata*) leaves are ubiquitous in a sediment column taken from Volunteer Point, Falkland Islands in 2014. We propose a study to develop a new proxy using tussac grass as a regional climate record for past precipitation and temperature. $\delta^{18}O$, δD, and $\delta^{13}C$ values recorded in the cellulose of plant tissues vary among plant species in the way they record precipitation and temperature [3]. A modern calibration study will evaluate how modern tussac grasses record temperatures and precipitation using $\delta^{18}O$, δD and $\delta^{13}C$ analyses. Few paleoenvironmental reconstructions exist for the Falkland Islands. The application of tussac grass as a proxy for reconstructing paleoclimate parameters in the Falkland Islands can be used across its geographic extent, including Tierra del Fuego and South Georgia, the locations of important wildlife habitat utilizing tussac grasslands today. This information will provide valuable associations between past ecosystem dynamics and advance our understanding of past climate changes and the biological responses of seabirds and tussac grass.

Acknowledgements: I gratefully thank the Climate Change Institute, NSF A2C2 IGERT Fellowship, Dan and Betty Churchill Exploration Fund for research travel, the South Atlantic Environmental Research Institute and crowd funding from 189 public donations.

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Sub-Seasonal Reconstruction of an Ice Core Recorded Abrupt Climate Change 84.6 ka Transition

Skylar A. Haines[1], Paul A. Mayewski[1, 2],Andrei V. Kurbatov[1, 2], Sharon B. Sneed[1], Kirk A. Maasch[1, 2], Pascal D. Bohleber[1], Nicole E. Spaulding[1], Daniel A. Dixon[1]

1. *Climate Change Institute, University of Maine.*
2. *School of Earth and Climate Sciences, University of Maine.*

Abstract: In this paper we offer the first sub-seasonal view of a glacial age abrupt climate change event. We focus on the abrupt ~84.6 ka climate transition from cold stadial to warmer interstadial conditions originally captured in the Greenland Ice Sheet Project 2 (GISP2) ice core records for stable water isotopes, soluble major ion records (IC), laser light scattering (LLS), and electrical conductivity measurements (ECM). We utilize the ultra-high resolution capabilities of newly developed laser ablation- inductively couple plasma-mass spectrometry (LA-ICP-MS; 121 µm sampling resolution) system capable to conduct a multi-parameter glaciochemical analysis on the oldest section of an ice core thus far accomplished utilizing this technique. Major findings include: (1) Mean summer and winter accumulation rates nearly double (2) timing of chemical proxies for atmospheric circulation shows iron is more likely to peak earlier annually during the transition and interstadial and (3) high levels of iron deposition continue past the point where calcium, potassium and sodium substantially decrease in concentration. Because we find iron may be more marine in source during the transition and interstadial than during the stadial, we postulate a change in ocean circulation as a major driver in the climate transition, potentially driven by changes in the hemispheric wind field.

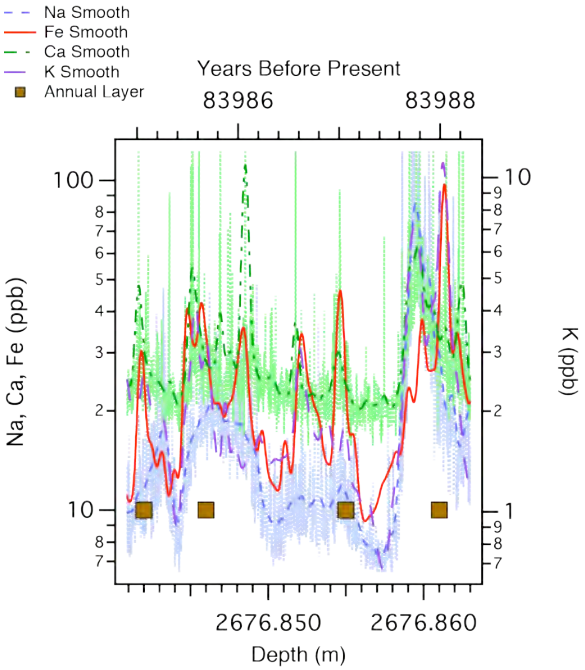

Figure 1. Annual layer counting example taken from sample D (see figure 2 for location in GISP2 ice core archive). A ~3 cm section shown for sodium (blue), calcium (green), and iron (red) plotted on left axis scale. Potassium (purple) plotted on the right axis scale. Brown boxes are annual layer picks, centered on winter/spring season maxima. 5 years are shown.

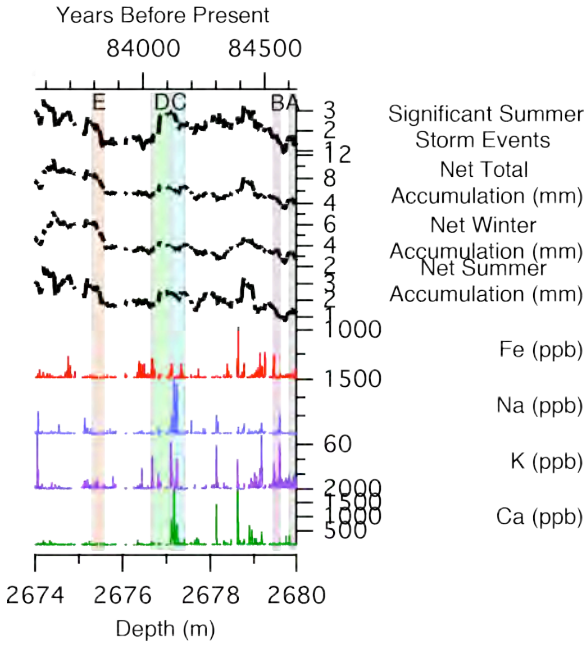

Figure 2. Seasonal and "storm scale" results (top 4 time series) plotted with LA-ICP-MS results (bottom 4 time series). 30-point (30 years) moving average smooth shown on top 5 time series. LA-ICP-MS results shown with 200-point binomial smooth. Shown in highlighted color are the 5 sample intervals used in study: A, B, C, D, and E, highlighted in grey, purple, blue, green and orange, respectively

Acknowledgements: NSF grant ARC-1203640

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Recent Changes in the Northeastern Sctor of the Greenland Ice Sheet

Gordon S. Hamilton[1, 2]

1. *Climate Change Institute, University of Maine.*
2. *School of Earth and Climate Sciences, University of Maine.*

Abstract: The northeastern sector of Greenland has hitherto not experienced the profound changes in ice dynamics observed elsewhere around the margin of the ice sheet. A new analysis of satellite remote sensing datasets shows increasing evidence of important changes underway in the ocean and coastal margins of the ice sheet. A rapid deglaciation of NE Greenland has significant consequences for global sea level.

The northeastern sector of Greenland has so far not experienced the profound series of changes observed elsewhere around the margin of the ice sheet. One explanation is the presence of relatively cold ocean waters in the nearby Fram Strait, far removed from the warming waters of the subpolar gyre that are hypothesized to have provided the forcing for the changes observed elsewhere around Greenland. However, recent observations suggest that this relatively stable situation might not persist.

The Northeast Greenland Ice Stream (NEGIS) is the dominant feature in this sector of the ice sheet. This corridor of fast flow extends nearly all the way to the ice divide and feeds ice from the interior into three marine-terminating glaciers: Nioghalvfjerdsfjorden (79N), Zachariae Isstrøm (ZI), and Storstrømmen. NEGIS sits in a trough that is below sea level far inland of the current grounding line, making is particularly susceptible to rapid retreat and dynamic thinning. The floating ice shelves of 79N and ZI provide resistance to the inland ice and might play a critical role in preventing grounding line retreat. Thus there is great interest in characterizing the behavior of these ice shelves.

ZI's floating tongue recently completed its total disintegration and inland ice is now terminating directly into open water. The ice shelf collapse occurred progressively over the last decade, probably in response to a combination of ocean and atmospheric forcing (note the extensive melt ponds in Figure 1).

79N's floating tongue remains intact, but recent work (Sneed, 2013 PhD thesis) shows a modest increase in submarine melt rates over the last 15 years. Sustained thinning might cause the ice shelf to retreat from its current pinning points.

Taken together, these observations point to an increasing pace of change in the northeastern sector of the Greenland Ice Sheet. Continued grounding line retreat of ZI coupled with a similar retreat of 79N may expose a substantial portion of Greenland to rapid deglaciation.

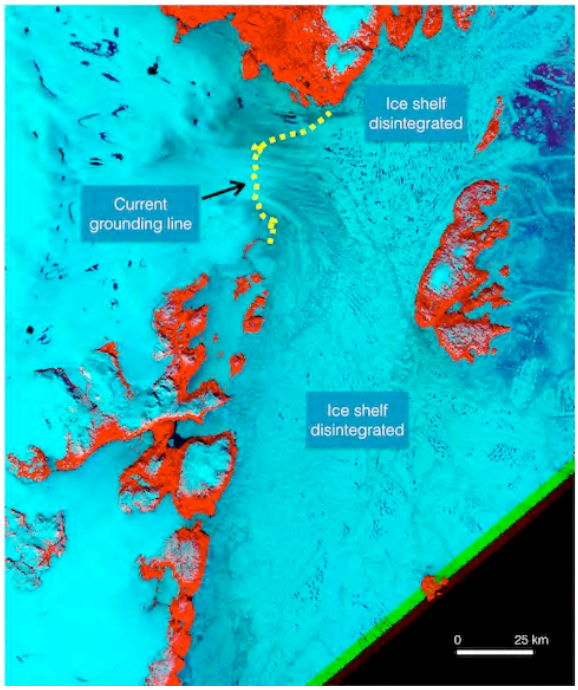

Fig. 1. Portion of a Landsat TM satellite image acquired in 1998, showing ZI's extensive floating tongue. Disintegration of the ice shelf in the last ~5 years has caused the terminus to retreat to the position shown by the dashed yellow line.

Humans and the Falkland Islands Wolf: Investigating the Origins of an Extinct Endemic Canid

Kit Hamley[1], Jacquelyn Gill[1, 2], Dan Sandweiss[1, 3]

1. *Climate Change Institute, University of Maine.*
2. *School of Biology and Ecology, University of Maine.*
3. *Department of Anthropology, University of Maine.*

Abstract: This project aims to determine if there was a human presence in the Falkland Islands prior to European arrival in the eighteenth century and to assess the potential link between humans and the arrival time of the Falkland Islands Wolf to the islands.

The Falkland Islands Wolf (FIW), or "warrah," (*Duscicyon australis*) was the only terrestrial mammal native to the Falkland Islands when Europeans arrived in the seventeenth century. The lack of definitive evidence of a pre-European human presence, coupled with the expansive channel separating the islands from mainland South America, raises questions about how and when the extinct, endemic *D. australis* arrived in the islands. Two competing theories seek to explain the presence of *D. australis* on the Falklands: 1) the FIW crossed a hypothetical ice bridge at the Last Glacial Maximum when sea levels would have been lower than present day, and 2) prehistoric humans traveling from southern South America brought *D. australis* to the Falklands via canoes (Austin et al., 2013; Buckland and Edwards, 1998).

To date, there is little archaeological evidence indicating a pre-European human presence in the Falklands; however, there is anecdotal evidence of prehistoric artifacts, such as stone tools and dug-out canoes, being found throughout the islands. Furthermore, there is archaeological evidence from South America to substantiate a close link between humans and *D. australis*' closest relative, *Duscicyon avus* (Prates, 2014). Due to the harsh environment of the interior of the Falklands, pre-European humans would have likely situated themselves along the coast where they would have had easy access to a robust supply of marine resources. It is here that they would have likely left behind shell middens, stone or bone tools and flakes, or large pieces of charcoal.

Aside from finding definitive archaeological evidence of a pre-European presence in the Falklands, charcoal records could also provide a promising way forward in resolving this debate. When humans first arrive in a location, background charcoal levels have been shown to increase by as much as an order of magnitude in many island systems (Burney et al., 1994). By establishing background charcoal levels from lake and peat cores collected from the islands, we hope be able to detect the timing of initial human arrival. Furthermore, new radiocarbon dates from several fossil FIW individuals will provide a minimum arrival time for *D. australis* to the islands. Additionally, morphometric analyses of *D. australis* and *D. avus* bones will elucidate whether these sister taxa show evidence of domestication. Together, these data will help to resolve an ongoing debate about the arrival of the warrah, its relationship to humans, and the broader paleoecology of the Falklands.

Acknowledgements: We would like to thank Dan and Betty Churchill for their support in making this project a possibility as well as the many donors who supported our crowdfunding campaign through experiment.com.

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Institutional Responses to Climate Change and the Reproduction of Social Vulnerability in Hampton Roads, Virginia

Jamie A. R. Haverkamp[1, 2]

1. *Department of Anthropology, University of Maine.*
2. *Climate Change Institute, University of Maine.*

Abstract: This paper presents research results from a case study investigating institutional responses to climate change within the urban coastal context of Hampton Roads, Virginia. Through the lens of political ecology, I investigated the socio-political landscape in which institutional adaptation activities (e.g. planning and decision-making) are unfolding, seeking to understand how the needs of the previously identified most vulnerable social groups to climate change impacts were being addressed. Data gathered from semi-structured interviews with key institutional actors, direct participant observation at regional adaptation forums, and content analyses of local and federal adaptation planning documents, produced empirical evidence that regional adaption planning efforts are producing and reproducing social vulnerability to climate change for the region's most vulnerable, the poor. This paper suggests that the reproduction of the vulnerability of the poor to climate change impacts is constructed through dominant institutional attitudes of fear, insecurity, and uncertainty and their materialization in processes of inclusion and exclusion, institutional discourse, and prioritization and allocation of adaption projects.

As the biophysical effects of anthropogenic climate change enter into a socially stratified world - altering assets, meaning, and security - how a place or person experiences climate change will uniquely vary over space and time. This paper presents a case study investigating the social process of adaptation in Hampton Roads - a politically and geographically defined region of coastal Virginia comprised of 16 municipalities.

Through the lens of political ecology (Agrawal et al. 2012), this research gives acute attention to issues of scale, equity, and ethics while investigating institutional (government and NGO) actor perceptions, discourse, and decision-making in response to climate-related flooding risks from storm surge, sea level rise, and heavy precipitation storms. Although flooding risks are not new to Hampton Roads, the frequency and intensity of flooding events have been increasing as a direct result of three factors: 1) the biophysical effects of climate change (warming of surface water temperatures and sea level rise), 2) the local geomorphology (shallow slope and land subsidence), and 3) the human impacts of urbanization and population growth within the region (Kleinosky et al. 2007).

Due to differentially experienced climate change impacts across Hampton Roads, coupled with the deeply stratified social landscape, vulnerabilities to climate impacts are disproportionately experienced among the residents of Hampton Roads.

I argue with empirical findings that institutional responses to climate change are re-producing existing social inequalities, further hindering the adaptive capacity of the most at-risk population segments in this region. This primary finding is understood through triangulation of research results. Institutional attitudes of fear, uncertainty and insecurity emerged through direct observation and interview methods as dominant institutional attitudes. When linking these attitudes to Schwartz's value theory, I suggest that institutional attitudes are driving adaption decisions that prioritize maintaining the status quo and protecting the economically productive sectors of Hampton Roads, while disregarding the risks posed to the region's most vulnerable population segments– the poor.

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Currents of the Past: Archaeological Evidence for Past Changes in Fish Ecology in the Gulf of Maine - Update

A. Sky Heller[1, 2], Brian S. Robinson[1, 2]

1. *Department of Anthropology, University of Maine.*
2. *Climate Change Institute, University of Maine.*

Abstract: This project focuses on previously unexplored small fish remains from a series of rare Archaic-period shell midden archaeological sites along the Gulf of Maine. We are currently gathering archaeological and comparative samples to investigate a possible abrupt change in Gulf of Maine currents – and associated changes in fish populations – at approximately 3,800 B.P. corresponding with the disappearance of swordfish (*Xiphias gladius*) remains archaeologically.

The Late Archaic period saw one of the most pronounced changes in Gulf of Maine fisheries ecology when at approx. 3800 B. P. swordfish abruptly disappear from the archaeological record. The presence of swordfish is assumed to signal a period of warmer sea surface temperatures within the Gulf of Maine, possibly due to a shift in the Gulf Stream and an interruption of the cold-water Labrador current (Sanger 1988). Five endangered coastal archaeology sites from Frenchman Bay in Maine to the Hampton Estuary in New Hampshire preserve archaeological evidence of this possible change from warm to cold water marine fish communities *that may be the reverse of modern trends toward warmer environmental conditions*, and the associated cultural reactions. We are exploring this possible change, the degree to which it was expressed, and its broader effects on fisheries and fish ecology.

We have identified and sampled critical archaeological strata from the surviving portions of the Waterside archaeological site in Sorrento, ME. Our understanding of this site has been greatly increased by the work of Andrew Heller on a micromorphology sample taken during the 2013 field season and analyzed over the past year. We have also begun processing samples retrieved during the 1970s excavations of the Turner Farm site on North Haven Island, ME. Our 2015 field season will focus on excavations at the Nevin and Seabrook Marsh sites.

To maximize identification of fish species, including those not now native to the Gulf of Maine, we use fine mesh screen samples, virtually unexplored for the Late Archaic period. Lab analysis is ongoing with the help of undergraduate Joseph Goodin who is currently preparing comparative samples donated by the

Fig. 1. Three-spined stickleback from UMaine collection and stickleback pelvic spine and articulated pelvic bone (inset) from the 1975 excavations at Seabrook Marsh.

SBE preserved fish collection. These samples include species, such as bay anchovy, not currently common in the Gulf of Maine, but considered likely to have been present during warmer conditions in the past.

Acknowledgements: We would like to thank the Archaeological Conservancy for permission and support of our investigations at the Waterside Shellheap, the Maine State Museum for allowing us access to the Turner Farm samples, and SBE for the generous donation of comparative samples to our lab. This research was supported by the US National Science Foundation Adaptation to Abrupt Climate Change IGERT program grant DGE-1144423.

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Eco-evolutionary Responses of Spatially Structured Species Experiencing Climatic Changes

Jared J. Homola[1], Michael T. Kinnison[1], Cynthia S. Loftin [2]

1. *School of Biology and Ecology, University of Maine.*
2. *U.S. Geological Survey, Maine Cooperative Fish and Wildlife Research Unit, University of Maine.*

Abstract: Climate change often results in maladaptation of species, consequently reducing their likelihood of persistence. However, biological adaptation to altered conditions is capable of occurring at rates fast enough to prevent extinction (i.e., evolutionary rescue). Current evolutionary rescue theory rarely considers the roles of spatial population structuring and landscape heterogeneity. To address this shortcoming, we are combining empirical estimates of population connectivity for two spatially structured species with agent-based simulation modeling to identify rates and types of climate change that influence the likelihood of species persistence.

Environmental change can influence species in many ways. For instance, climate change often leads to habitat alterations that can decrease individual fitness, consequently reducing the likelihood of population persistence. However, populations are sometimes capable of adapting to altered environments at a rate fast enough to avoid extirpation (i.e., evolutionary rescue; Gomulkiewicz and Holt 1995). The likelihood of evolutionary rescue occurring is influenced by the rate of environmental change, as well as the population's degree of maladaptation that exists following the change.

Existing evolutionary rescue models typically focus on only a single population, however, and the role of spatial factors, such as complex population structure and l andscape heterogeneity, in determining population persistence is neglected. Spatially structured species are commonly composed of many subpopulations that are adapted to their local conditions. Therefore, when climatic changes occurs across a large area that encompasses multiple subpopulations, persistence likelihood may be increased by the movement of individuals from habitats to which they have become poorly adapted into habitats that recently have become more suitable. Alternatively, excessive exchange of individuals among subpopulations during periods of environmental stability may result in the introduction of maladaptive genetic variants into otherwise stable subpopulations.

We are pairing empirical analyses of subpopulation connectivity across a c omplex, heterogeneous landscape with agent-based simulation modeling to identify climate change thresholds that influence likelihood of species and population persistence. Estimates of subpopulation connectivity are based on landscape genetic analyses of Maine's spatially structured vernal pool amphibian species. Preliminary analyses suggest that individual movement among nearby subpopulations is asymmetrical and variable among subpopulation pairs. These estimates of subpopulation connectivity will be used to inform agent-based models that will be de signed to simulate environmental change across realistic heterogeneous landscapes. Using this approach, we will identify the maximum rate of climate change that can occur which allows for population persistence. Scenarios of spatially heterogeneous climate change will also be analyzed. Understanding the interplay between ecological processes such as individual movement and a daptive evolutionary processes will be es sential for identifying suitable biodiversity conservation strategies as climate change continue to progress.

Acknowledgements: This research is supported by the US National Science Foundation Adaptation to Abrupt Climate Change IGERT program grant DGE-1144423, US National Science Foundation project grant 1313627, the US Geological Survey, and the University of Maine.

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Visible Tephra in the RICE Ice Core

Donna A. Kalteyer[1], Andrei V. Kurbatov[1], Martin Yates[2], Christopher Gerbi[2], Nelia W. Dunbar[3], Thomas Beers[1], Paul A. Mayewski[1, 2]

1. *Climate Change Institute, University of Maine.*
2. *School of Earth and Climate Sciences, University of Maine.*
3. *New Mexico Institute of Mining and Technology.*

Abstract: Geochemical composition of eight visible tephra layers from Roosevelt Island Climate Evolution (RICE) project ice core were measured using SEM and Microprobe (EMPA) instruments. The geochemical fingerprint of the 1252 C.E. tephra particles (based on the WAIS Divide ice core time scale) from the depth of 165 meters was correlated with the tephra found in four other Antarctic ice cores: Siple Dome, WAIS Divide, Taylor Dome, and Talos Dome, providing the RICE project with an age set point. The majority of the layers composition point to local Antarctic sources, but two layers are geochemically similar to South American volcanic centers.

Introduction: Glaciochemical records developed from polar ice cores reveal information about how global volcanism interacts with the climate system (Hammer, 1980; Zielinski, 2000). By geochemically "fingerprinting" the tephra particles, source volcanic centers can be determined (see recent review by Lowe, 2011). In the RICE ice core, eight visible tephra layers were sampled between depths of 165-730 meters, and geochemical composition was determined using a combination of SEM and EMPA analyses.

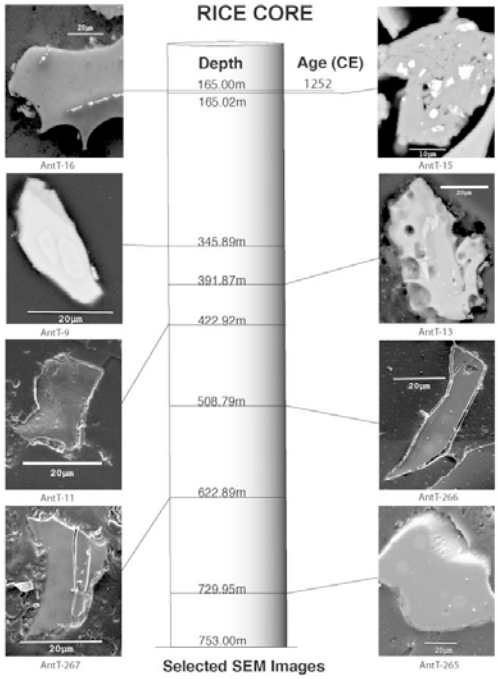

Fig. 1. Schematic of RICE ice core tephra depths.

Methods: Tephra bearing ice samples were rapidly melted under clean room conditions, filtered through 0.4µm Whatman Millipore polycarbonate isopore™ membrane filter. Tephra samples were prepared utilizing a modified tephra mounting method.

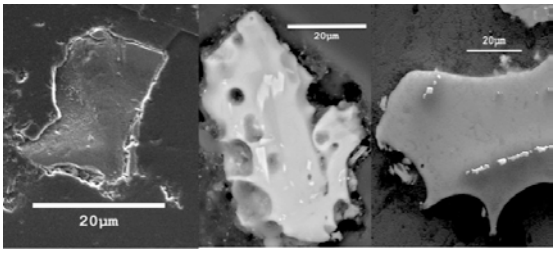

Fig. 2. Examples of RICE tephra images captured by Tescan Vega XMU SEM.

We correlated the RICE 165m layer (AntT-16) with tephra layer in Siple, Taylor, WAIS, and Talos. We also find that two layers are geochemically similar to South American volcanic sources (RICE 423m and 392m, AntT-11 and 13, respectively). Future work on the RICE project includes processing and analyzing non-visible tephra layers that are most likely affiliated with large eruptions from tropical volcanic centers.

Conclusion: Tephrochronology of the RICE ice core expands the developing Antarctic framework, required to better understand the interaction between local and global volcanism with the climate system.

Acknowledgements: Nancy A.N. Bertler, Peter Neff, Rebecca Pyne, and Andrea Tuohy for tephra samples. NSF Polar Program grant numbers ANT-1142007 and ANT-1042883.

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Determining Surface and Basal Crevasse Extent across the McMurdo Shear Zone through GPS and GPR Surveys

Lynn Kaluzienski[1, 2], Gordon Hamilton[1, 2], Peter Koons[1, 2], Steven A. Arcone[3]

1. *Climate Change Institute, University of Maine.*
2. *School of Earth and Climate Sciences, University of Maine.*
3. *Cold Regions Research and Engineering Laboratory, New Hampshire.*

Abstract: Preliminary analysis of ground penetration radar and global positioning satellite data suggests the accumulation of basal freeze-on at ~160 m depth. Hyperbolic diffractions within the basal regime indicate heavy fracturing and crevassing. A visual correlation between surface and basal crevassing may indicate a similar formation process within both the firn and basal regimes.

Introduction:

The McMurdo Shear Zone (SZ) is a 5-10 km section of heavily crevassed ice along part of the western margin of Antarctica's largest ice shelf, the Ross Ice Shelf (RIS). Most of the shearing within this area is caused by heavy rifting as ice flows past Minna Bluff.

Methods:

During our 2014 field season, 29 GPS stations were surveyed within a 5 km x7 km grid across the McMurdo SZ. In addition, a lightweight, mobile robot towed two GPR units of 200MHz and 400MHz frequencies at near constant speed. The robot traveled orthogonal to ice flow over 100 transects to cover a 5.7 km x 5 km grid across the width of the shear zone.

Results and Conclusions:

Analysis of the GPS data reveals a sharp velocity gradient across the shear zone with velocities increasing ~240 m/yr +/- 50 m/yr from east to west.

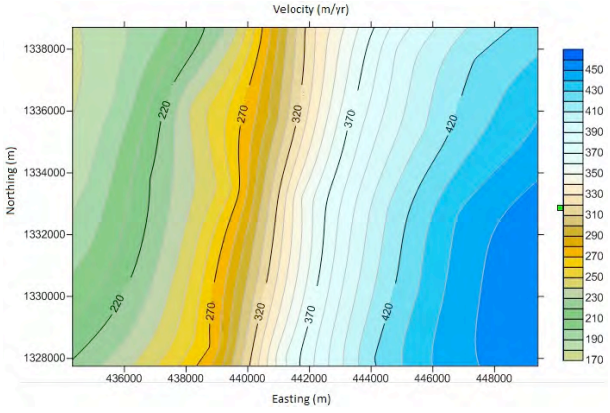

Fig. 1. Contour plot of GPS-derived velocity.

Orthometric heights were used to estimate a total ice shelf thickness of ~254 m assuming hydrostatic equilibrium.

400MHz range GPR profiles provide preliminary imaging of crevassing in the upper firn layer as well as folded and faulted stratigraphy. The 200MHz profiles reveal a sharp reflection at ~160 m depth that we interpret to be a meteoric-basal ice interface. Hyperbolic diffractions along this interface indicate fracturing and basal crevassing. A visual correlation between surface and basal crevassing may indicate a similar formation process within both the firn and basal regimes. One possible explanation is that basal marine ice may be rheologically weaker due to salt inclusion and thus shears more easily than meteoric ice. Another common hypothesis for basal crevasse formation is that their formation occurs at the grounding line. (Van der Veen, 1998) If this is the case, then these basal crevasses are not a result of lateral shearing but rather are inherited from upstream grounding line dynamics. In-depth analysis of the data, such as tracking crevasses between transects as well as coupling these signature with GPS-derived strain rates, may shed future light into their origin.

Acknowledgements:

This research was funded by an Antarctic Glaciology grant from the National Science Foundation.

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Timing of the Last Glacial Maximum of Hatherton Glacier in the Lake Wellman region, Darwin Mountains, Antarctica

Courtney King[1,2], Brenda Hall[1,2], John Stone[3], Trevor Hillebrand[3]

1. *Climate Change Institute, University of Maine.*
2. *School of Earth and Climate Sciences, University of Maine.*
3. *Earth and Space Sciences, University of Washington.*

Abstract: During the Last Glacial Maximum (LGM), the Antarctic Ice Sheet grounded across what today is the Ross Sea. This grounded Ross Sea ice buttressed outlet glaciers flowing seaward from East Antarctica through the Transantarctic Mountains, causing them to thicken. Ice-dammed ponds formed alongside the margins of the thickened outlet glaciers. The Hatherton and Darwin glaciers formed one of these outlet systems that drained through the Transantarctic Mountains and into the Ross embayment. From the Lake Wellman area alongside lower Hatherton Glacier, we collected samples of fossil algae that grew in ice-marginal ponds. The resultant radiocarbon dates bracket the LGM moraine limit, indicating that the maximum ice extent was achieved 9-10 ka.

Far south in the Transantarctic Mountains, the timing of the maximum of Reedy Glacier varies along its longitudinal profile: near the glacier mouth it occurred ~14-17 ka, in contrast, near the glacier head, the LGM dates to 7-9 ka (Todd et al. 2010). The difference in timing of the maximum ice extent is attributed to a grounded Ross Sea ice sheet causing the buttressing effect that produced a wave of thickening up glacier (Todd et al. 2010). A similar history is suggested for the Hatherton-Darwin outlet system (Bockheim et al. 1989), located adjacent to Byrd Glacier, the largest outlet glacier in the Transantarctic Mountains. The drainage of Byrd Glacier makes up nearly a quarter of the catchment in the Ross embayment, and due to the proximity of the Hatherton-Darwin system to Byrd, the history of the grounded Ross Sea ice sheet can be studied using the drift deposits in nearby ice-free valleys that formerly contained thickened glacial ice.

Previous studies of Hatherton-Darwin system are in conflict regarding the timing and extent of the ice maximum. Radiocarbon ages of algae samples of fossil algae from relict lake deposits indicate that the maximum at the Lake Wellman region occurred 10.5 ka (Bockheim et al. 1989). A recent study used surface exposure-age dating to determine the chronology of ice history at the same site and postulated that the limit previously identified as the LGM, the Britannia limit, likely reflects a composite of multiple advances ranging from 20-400 ka and that the Hatherton limit, located within ~50 m of the present level of Lake Wellman, approximately 200 m below the Britannia limit, is the maximum ice extent of the last glacial period. This alternative maximum located just above present lake level is based on two erratics that yielded exposure ages of ~15 ka and ~19 ka (Storey et al. 2010).

Our study presents new data from the Lake Wellman area. We mapped the Britannia and Hatherton glacial deposits and collected algae that grew in ice-marginal ponds dammed by a former, thicker Hatherton Glacier. Radiocarbon dates of these algal samples collected within the drift deposits provide a chronology for the deposits. Samples that bracket the Britannia limit produced an age range of ~9-10 ka, which is in close agreement with the results from the earliest previous study in the area (Bockheim et al. 1989).

Acknowledgements: This project is funded by the NSFgrant #1246170.

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How Resource Availability Affects Diatom Response to Warming in the Great Lakes

Amy Kireta[1, 2], Jasmine Saros[1]

1. *Climate Change Institute, University of Maine.*
2. *School of Ecology and Environmental Sciences, University of Maine.*

Abstract: We are investigating the extent to which major changes in Great Lakes diatom algae in past decades are driven by rising temperatures. We are examining modern and fossil diatoms from Lake Erie and Lake Superior to compare warming effects in systems with different nutrient status. We hypothesize that diatom changes in a system with limited nutrient resources (i.e. Superior) will be primarily driven by indirect responses to warming, such as changing lake thermal structure.

Introduction:

The surface temperatures in the Great Lakes have been increasing faster than air temperatures in the region [1], but the effects of these changes on lake biota remain unclear. Moreover, climate effects in systems ranging from nutrient-limited Lake Superior to nutrient-rich Lake Erie are likely to be different, as has been documented for community responses in marine systems with different resources [2]. Diatoms, microscopic algae with glass-like cell walls, respond quickly to environmental changes, leave sedimentary fossils, and are ideal organisms for studying biological responses to climate change. We will investigate how recent diatom changes are related to warming in Lakes Erie and Superior and how the effects of warming differ between these systems. We will compare modern diatom changes to those occurring during the Medieval Warm Period (950-1250 CE) for a historical context of climate-related diatom changes.

Objective:

An understanding of the biological responses to shifting climate in the Great Lakes will provide insight to the health and resilience of the ecosystem. We hypothesize that diatom communities experiencing constrained resource availability will show a more indirect response to warming climate. We would expect warming water may directly affect diatoms in a nutrient-rich system, primarily by increasing abundance. However, shifts in the lake thermal structure and mixing, an indirect response to rising temperatures, will be an important driver of community changes in both systems (see Fig. 1 for a project overview).

Methods:

We will isolate and identify diatom species from previously collected sediment cores from Lake Erie and Lake Superior and compare with diatom data from modern monitoring studies from both lakes. We will relate diatom community changes to physical lake changes caused by warming with various statistical techniques.

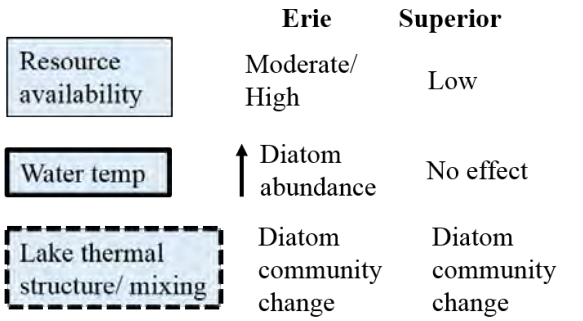

Figure 1. A comparison of Lakes Erie and Superior in terms of nutrient availability, as well as expected diatom responses to direct warming effects (bold box), and indirect warming effects (dashed box).

Acknowledgements: This project is funded by the National Science Foundation Adaptation to Abrupt Climate Change IGERT program grant DGE-1144423.

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Developing an Ultra- High-Resolution Record of the Last Glacial-Interglacial Transition from the RICE ice Core (Roosevelt Island, Antarctica)

Elena Korotkikh[1,2], Paul A. Mayewski[1,2], Andrei Kurbatov[1,2], Nancy Bertler[1,3]

1. *Climate Change Institute, University of Maine.*
2. *School of Earth and Climate Sciences, University of Maine.*
3. *Antarctic Research Centre, Victoria University of Wellington.*

Abstract: The objective of this project is to develop an ultra-high resolution record of Na, Ca and Fe from the deep section of RICE ice core using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS). The analyzed section will cover the last glacial-interglacial transition, and the resulting data will help in understanding how fast climate changes occurred during the transition.

The RICE (Roosevelt Island Climate Evolution) project is an international partnership seeking to understand past, present, and future changes of the Ross Ice Shelf, a major drainage pathway of the West Antarctic Ice Sheet. The RICE deep ice core record will provide high- resolution data to investigate regional (West Antarctica) and global climate fluctuations.

A 764 m deep ice core was recovered during the 2011/12 and 2012/13 Antarctic field seasons. Ice core sections from a deep part (672 – 699 m) are being analyzed in the W.M. Keck Laser Ice Facility in the Climate Change Institute using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS). This section is of particular interest because it covers the transition from the last glacial to interglacial period.

Ice core analysis by LA-ICP-MS provides ultra-high sampling resolution (<10 micrometers), which is much higher than traditional core processing using continuous flow analysis (~1cm/sample). Such high-resolution data will make it possible to determine individual storm events in the ice core record (Fig.1). It also will allow identification of annual layers, valuable in validating the depth/age scale for the deep part of the RICE ice core.

We expect to capture in great detail evidence of climate fluctuations and determine how abruptly climate changes occurred during the glacial-interglacial transition.

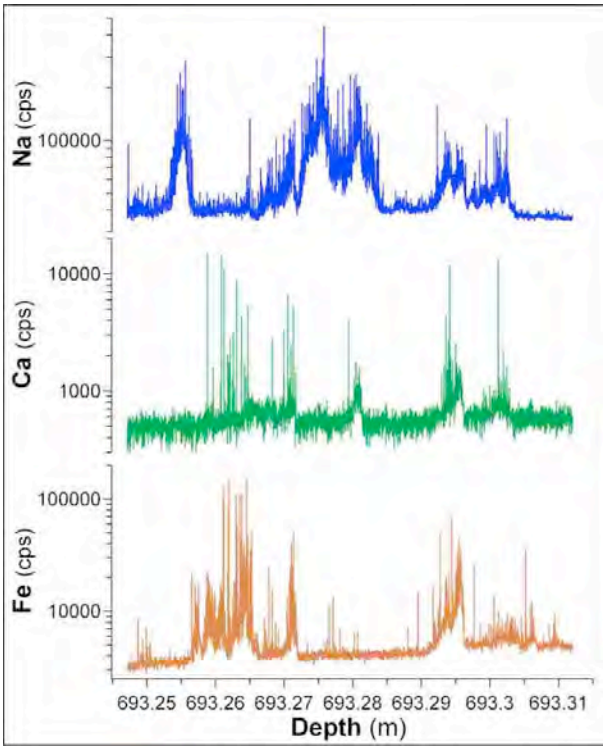

Fig. 1. RICE LA-ICP-MS Na (blue), Ca (green) and Fe (brown) intensities in counts per second.

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Geophysical Reconnaissance to Expand Ice Core Hydroclimate Reconstructions in the Northeast Pacific

Karl Kreutz[1,2] and Seth Campbell[2,3]

1. *Climate Change Institute, University of Maine.*
2. *School of Earth and Climate Sciences, University of Maine.*
3. *U.S. Army Cold Regions Research and Engineering Laboratory.*

Abstract: By advancing the development of a spatial-temporal network of ice core accumulation records covering the past millennium in the NE Pacific, our proposed research will foster a greater understanding of regional hydrologic response to the coupled ENSO system. Our ability to do so relies on detailed geophysical investigation of relevant ice core sites, an approach that can be utilized in other regions to develop similar spatial-temporal networks.

Paleoclimate data from the Pacific basin show significant hydroclimate changes over the past millennium, possibly in response to changes in the mean state of the El Niño Southern Oscillation. One hypothesis invokes a change from a persistent La Niña-like state during the Medieval Climate Anomaly (MCA) to a persistent El Niño-like state during the Little Ice Age (LIA). A test of this hypothesis is to reconstruct and evaluate the spatial precipitation anomaly pattern in the Northeast Pacific across the MCA-LIA transition, because modern observations show an enhanced (weaker) coastal-inland precipitation gradient in the region during La Niña (El Niño) conditions. We therefore predict that the NE Pacific precipitation anomaly pattern will weaken across the MCA-LIA transition. For the past decade, we have been developing an ice core array in the NE Pacific that targets the two nodes of this precipitation dipole (i.e., St. Elias Range and Central Alaska), most recently (2013) with the recovery of two surface-to-bedrock 210-meter ice cores from Mt. Hunter (Denali National Park). To determine precipitation variability at the Mt. Hunter site over the past millennium, we rely on a suite of supporting geophysical data to constrain glacier geometry, velocity, boundary conditions, and rheological properties in a 3-dimensional finite element numerical model. The combined observational and model datasets allow us to remove influences of ice flow (which causes layer thinning) and spatial variability in snow accumulation rate to estimate temporal accumulation variability from the two ice cores. In contrast to Mt. Hunter, little is known about the geophysical characteristics of the coastal St. Elias Range ice core sites (PR Col, NW Col, King Col on Mt Logan; and the Eclipse Icefield), which were drilled in 2002 prior to advances in geophysical techniques and numerical modeling capability. This lack of information will introduce error in any comparison of the St. Elias and Mt. Hunter accumulation records, and thus evaluation of the MCA-LIA transition hypothesis. Our goal is to improve ice core-based accumulation records, and therefore hydroclimate reconstructions for the past millennium, in the NE Pacific through the collection of new geophysical data at existing ice core sites in the St. Elias Range. Our *objectives* are to: 1) develop bedrock topography maps of the Eclipse Icefield, King Col, and Mt. Logan summit plateau sites; 2) determine surface velocities at all sites; 3) map near-surface spatial accumulation rate patterns; 4) trace internal isochrones at all sites; 5) estimate ice deformation effects on layer thinning; 6) produce updated (to 2016) and corrected accumulation time series at all sites; and 7) compare corrected accumulation records from the Mt. Hunter and St. Elias sites to evaluate spatial precipitation patterns over the past millennium. Our research approach utilizes state-of-the-art ground penetrating radar (GPR), GPS, geochemical, satellite remote sensing, numerical modeling, and data synthesis techniques.

Acknowledgements: We thank NSF for ongoing support of this research program.

Deciphering the Mechanisms Behind Climate-Driven Changes in the Relative Abundances of the Diatom *Cyclotella*

Heera I. Malik[1], Jasmine E. Saros[1]

1. *Climate Change Institute and School of Biology and Ecology, University of Maine.*

Abstract: Several mechanisms have been suggested for the increase in relative abundance of *Cyclotella* across many lakes in the northern hemisphere. However, the actual mechanisms responsible for these changes are still not evident. The primary goal of this study is to decipher those mechanisms behind the climate-driven changes in the relative abundance of *Cyclotella*.

Diatoms are a group of phytoplankton commonly observed in almost every aquatic ecosystem. Recent surveys across many lakes have reported a sudden increase in the relative abundance of the small size diatom, *Cyclotella*, which is thought to be a key indicator species of warming across lakes in arctic, alpine, and boreal regions[1,2,3]. The potential mechanisms forthis expansion have been associated with **direct climate** impacts through temperature[1] or **indirect climate** impacts through interactive effects of water column stability, i.e. mixing depth (light), and nutrients[2].

The primary objective of this project is to investigate the interactive effects of temperature, light and nutrients on *Cyclotella* abundances and growth rates. To do so, we conducted (2x2x2) factorial design experiments in-lakes with 2 different levels of temperature, high (11-13°C) and low (7- 8°C); along with 2 different levels of light, high (60% of ambient PAR) and low (25% of ambient PAR); and two levels of nutrients, with nutrients (Nitrogen 8 µM and Phosphorous 1 µM) and without nutrients as controls in Lake SS903 and SS32. The secondary objective is to determine how the structure of phytoplankton communities alters the response of *Cyclotella stelligera* to abiotic factors. In the same set of experiments we analysed the response of *Cyclotella stelligera* one with phytoplankton assemblages dominated by diatoms, and one dominated by other phyla, as it was a common species in both lake. We found variability in the responses of *Cyclotella* taxa to interactive effects of temperature, light and nutrients. Each species responded differently to tested variables. In high temperature treatments with high light and nutrients addition, *Cyclotella stelligera* cell densities increased in a diatom-dominated lake and decreased in a phytoplankton dominated lake. This study will provide more ecological information for key species to improve our ability to assess non- synchronous changes across these systems.

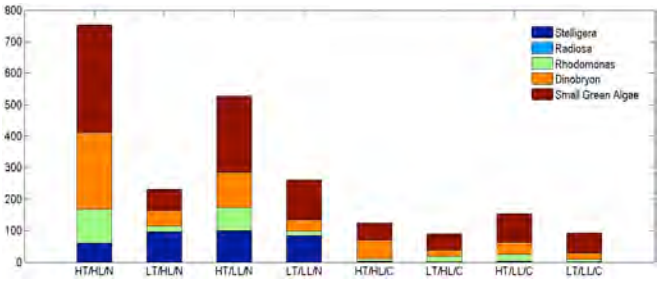

Fig1. Response of *Cyclotella stelligera* in a phytoplankton dominated lake, under high temperature (HT), low temperature (LT), high light (HL), low light (LL), nutrients (N) and control (C).

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Shrinking *Bison*: A Story of Body Size Adaptation to Abrupt Climate Change and Adaptation to Modern Bison Production

Jeff M. Martin[1, 2, 3], Jacquelyn Gill [2, 3]

1. *Ecology and Environmental Sciences Program, University of Maine.*
2. *School of Biology and Ecology, University of Maine.*
3. *Climate Change Institute, University of Maine.*

Abstract: Why are bison diminishing in body size and what effects does it have on the private bison ranch production industry? *Bison* body sizes have been shrinking due to climate change over the last 40,000 years, with an abruptly accelerated rate of shrinking in the last 14,000 years. This is evident from comparisons of modern, recent, and fossil *Bison* calcanei and crania from across the contiguous United States.

Bison survived the late Pleistocene megafaunal extinction when mammoths and other megafauna did not. Each animal has a unique suite of physiobiological characters that allows for adaptation or resilience to a range of climatic drivers, encoded in their respective genotypes.

Today, *Bison bison* are the largest native land mammal in North America at 1000 kg, but ~8,000 years ago, *Bison antiquus* (Figure 1, top right) was twice as large by mass.

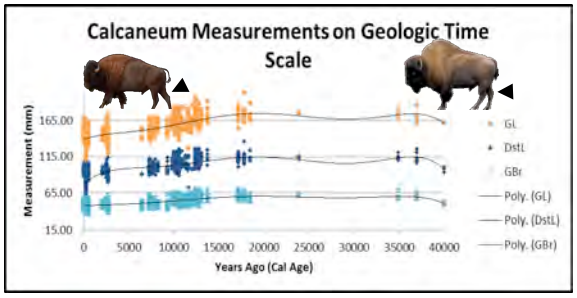

Figure 1. Thirty-four hundred *Bison* calcaneum measurements from 40,000 years ago (right, *Bison antiquus*) to today (left, *Bison bison*). Black arrows indicate the anatomical position of the calcaneum.

One of the most important bones in any animal, especially mammals, is the calcaneum; it provides the foundation and articulation of the ankle for the foot during movement (Figure 1, black arrows).

Previous studies (Craine 2013; Hill, Hill, and Widga 2008) have noted a diminution in body size of mammals and bison since the late Pleistocene. For this study, we integrate the paleontological, archeological, and modern zoological records for an interdisciplinary analysis approach.

Preliminary findings indicate that bison have shrunk due to climate change, moreover, were accelerated by human predation around 14,000 years ago when *Homo* arrived in North America. Though, there are large data gaps spatiotemporally, hopefully, these will be filled as the study progresses.

Future work will shed light on which variables are the most significant in controlling observed the shrinking effect, i.e. – human hunting, abrupt changes in temperature and precipitation, etc. These results will inform sustainable policies and regional management plans to for the bison industry to prepare to become more resilient to abrupt climate change for the future.

Acknowledgements:

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Los Morteros: Early Monumentality and Environmental Change in the Chao Valley, North Coast of Peru

Ana Cecilia Mauricio[1]

1. *Climate Change Institute, University of Maine.*
   Department of Anthropology, University of Maine.

Abstract: Geoarchaeological excavations at Los Morteros and the Pampa de las Salinas Archaeological Complex have uncovered a unique example of pre-pottery monumental architecture dating more than 5000 yrs. BP. The history of this site was closely related to local landscape and environmental transformations.

Los Morteros is a mound-shaped archeological site located on the lower Chao Valley, north coast of Peru (Fig. 1). Previous excavation in the late 1970's considered this site to be a natural mound with some superficial use by pre-pottery people (Cardenas 1999). GRP explorations by a team from the University of Maine in 2006 and 2010 identified evidence of architecture underlying thick layers of eolian sand that currently cover the site (Sandweiss et al. 2010).

Geoarchaeological excavations carried out in 2012-13 have uncovered different phases of occupation of Los Morteros that include adobe-brick monumental structures (Fig. 2) and a Late Preceramic stone architecture. Recently obtained radiocarbon dates place these phases of the site between cal. 5700 and 5100 BP.

Fig. 1. Location of the Chao Valley on the Peruvian territory.

Fig. 2. Aerial photo of the adobe-brick architecture at Los Morteros, Chao Valley, North Coast of Peru.

Acknowledgements: NSF Project "Long-Term Human Ecodynamics in Coastal Peru", the National Geographic Society-Waitt Grants Program, Churchill Exploration Fund, Instituto Francés de Estudios Andinos (IFEA), the Graduate Student Government, FERCO International Fund.

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Using Agent-Based Models to Understand the Impacts of Weather Patterns on Songbird Migration Across The Atlantic Flyway

Jennifer McCabe[1, 2]

1. *Climate Change Institute, University of Maine.*
2. *School of Biology and Ecology, University of Maine.*

Abstract: The scope and scale of bird migration covers the planet and involves feats of navigation and physical endurance. Through cross-breeding and orientation studies in captivity, it is clear that the controls on migratory behaviors and migratory direction is, at least in part, genetically determined. Young birds migrating for the first time regularly choose seasonally appropriate directions in captivity that are consistent with migratory routes used in the wild. The direction of flight during migration, however, should be impacted strongly by wind conditions. Under certain scenarios, a bird's heading may be relatively unimportant in determining its flight trajectory, particularly among songbirds that weigh only a few grams. Nevertheless, no study has compared the relative importance of genetically controlled orientation versus climatological drivers on the evolution and maintenance of migratory routes.

Through bird banding projects and stable isotope analysis from feathers, we know that songbirds migrating south along the Atlantic flyway in fall originate from as far north and west as Alaska. A central question of migratory route ecology and evolution is why these birds cross the continent instead of joining the Pacific or Central flyways. My dissertation explores two hypothesized origins of the evolution and maintenance of the circuitous Atlantic flyway: 1) The Atlantic flyway is the resultant vector between the instinctual southern orientation of individual birds and the prevailing westerly winds of North America or 2) The Atlantic Flyway is the result of a more complex genetic program, whereby individuals orient southeast across Canada until arriving at the Atlantic coast and then turn south-southwest following the coastline (Fig. 1).

Currently, I am collaborating with Bipush Osti, an UMaine computer sciences graduate student to create agent-based atmospheric models of bird migration. These models allows us to give the "agents" (birds) a breeding location, migratory direction, and an atmospheric field in which to migrate using high-resolution, 3-Dimensional, continuous atmospheric data from the National Center for Atmospheric Research. The model will describe the migratory path of birds with various orientation vectors, and will allow us to see if one, or both of the orientation scenarios create realistic migratory routes. We will also test whether orientation or wind or both are necessary to explain the major flyway boundaries and the known speciation events that have occurred along these boundaries. We will also validate these models by comparing their predictions to migratory bird use of habitat on the ground in Maine at both the site and regional scales. This modeling approach will allow us to test underlying assumptions of the field of migration ecology and to increase our understanding of the evolution and maintenance of migration routes in North America in relation to weather patterns.

With projected changes in weather patterns through climate change we expect to see changes in bird migration patterns. Using the validated migration model we will also model future migration patterns along the Atlantic flyway under various climate change scenarios.

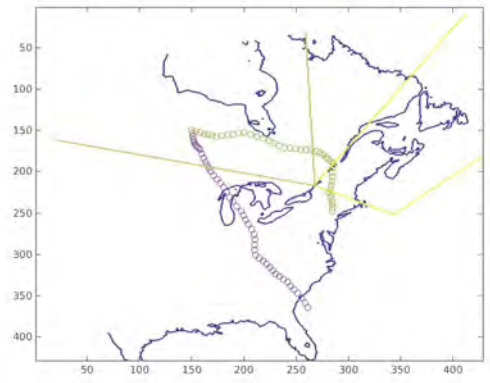

Fig 1. Ten-day test of the two hypothesis; purple bird represents the "southern orientation" hypothesis, the green represents the "complex genetic program" hypothesis.

Acknowledgements: Thank you to Bipush Osti, Peter Koons, and Sean Birkel for their continued support with this project.

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Release of Legacy Persistent Organic Pollutants (POPs) in Glacial Outflows and Mitigating Their Effect on Downstream Communities

Kimberley Rain Miner[1,2]

1. *Climate Change Institute, University of Maine.*
2. *School of Earth and Climate Sciences, University of Maine.*

Abstract: During the period of 1950-1970 persistent organic pollutants such as DDT, dioxin and PCB were released in the atmosphere and distributed through precipitation onto glaciers around the world. Recent abrupt climate change is increasing the melt rate of many glaciers, potentially introducing the toxins to the watersheds at unknown rates. Studies have shown the existence of legacy pollutants in glacial ice, however neither the impact nor quantity of these toxins on downstream populations has been assessed. If these pollutants are released at toxic levels it will be necessary to create mitigation plans to lower their impact.

Since the late 1990s, researchers studying deposition of Persistent Organic Pollutants (POPs) into alpine watersheds have noticed a new mechanism of pollution introduction. Previously, atmospheric deposition and deposition through precipitation and runoff were considered to be the primary pollution sources. The impacts of this deposition were most clearly mapped in polar regions (Blais et al., 2001), correlating increase of POPs with altitudinal snow deposition. Recent studies (Bogdal et al., 2009), however, noted another correlated source of POPs in Europe, glacial melting.

Researchers have shown that the variety of human chemical use in the 20th century has been recorded within glaciers through atmospheric deposition (Wania et al., 1996). Specifically, residual chemicals from global use over the past 100 years have been dispersed through atmospheric circulation and deposited to glaciate in high alpine areas during precipitation events (Wang et al., 2010). This has made many high alpine ecosystems a reservoir of legacy pollutants. As increasing atmospheric warming continues to decrease glacial mass balances globally, these toxins will be released into the downstream communities (Blais et al., 2001).

Many of the legacy pollutants trapped within glaciers are of the dioxin or polychlorinated biphenyl (PCB) class. A highly carcinogenic and toxic class of chemicals, the side effects in humans are severe and well documented (Lawn et al., 1988). These chemicals have been outlawed in developed nations since the 1970s, but the residual chemical deposition captured in the ice are a significant human health concern. Even though ingestion of these chemicals pose significant human health risks, impacts on downstream ecosystems has not been assessed.

By developing criteria to determine which glaciers have the potential to be sources of toxins, this study will allow researchers globally to assess human health risks (Figure 1). Glacial and watershed modeling, combined with sampling at specific case study sites will allow us to determine the quantity and toxicity of these pollutants and develop mitigation strategies.

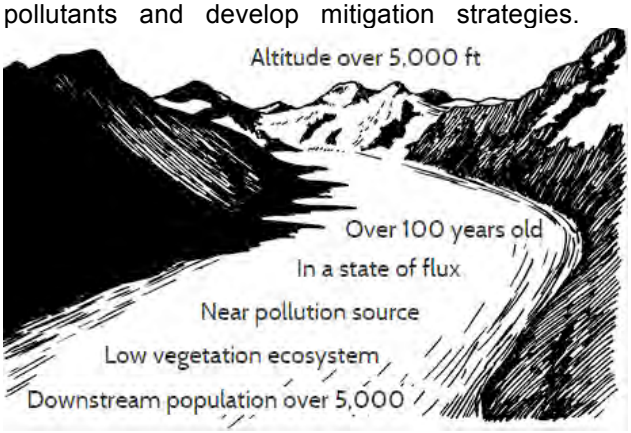

Figure 1. Conditions that indicate a glacier may be capable of distributing persistent organic pollutants

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Biogeochemical Patterns in Lakes Across Southwestern Greenland

Robert M. Northington[1,2] and Jasmine E. Saros[1,2]

1. *Climate Change Institute, University of Maine.*
2. *School of Biology and Ecology, University of Maine.*

Abstract: In a rapidly changing Arctic, alterations to the landscape can have significant influences on key biogeochemical cycles. We examined changes to lake methane emissions as they related to increases in sulfate deposition over southwestern Greenland. Although no major relationships were found, these results suggest ample resources for both methane production and sulfate oxidation in this region in the future.

Introduction:
The Arctic is warming at a faster rate than any point in the past. Altered biogeochemical cycles are an important outcome of a rapidly altered landscape induced by climate change. In addition, positive feedbacks to climate change occur through enhanced emissions of greenhouse gases (CO_2 and CH_4) from warming tundra (Isaksen et al. 2011). Longer, warmer growing seasons may also alter the vegetative composition of tundra and influence microbial degradation of organic matter in soils and lakes.

High levels of biogenic sulfate have also been noted in Arctic Canada and Northern Greenland over the last decade (Sharma et al. 2012), coinciding with sea ice loss. While the relationship between sulfate and organic carbon is unclear, sulfate can affect soil organic matter in temperate regions. Given the increased importance of both of these processes over the past decade, we chose to examine the relationship between carbon and sulfate cycling in Arctic lakes in southwestern Greenland. In the summer of 2014, we surveyed 18 lakes near Kangerlussuaq, Greenland, along a western transect away from the ice sheet for basic water chemistry (nutrients, dissolved ions) and water-column methane samples.

Results and Discussion:
Across all lakes, there was no significant relationship between sulfate and methane (Fig. 1). This differs with other studies (e.g. Winfrey and Zeikus 1977), which found an inverse relationship from sulfate reducers outcompeting methanogens for acetate and free hydrogen (Winfrey and Zeikus 1977). Given increases in shrub tundra in this region of Greenland, and the potential for different types of organic compounds to be delivered from the landscape in the future, it is likely that both sulfate oxidation and methanogenesis will increase in the future.

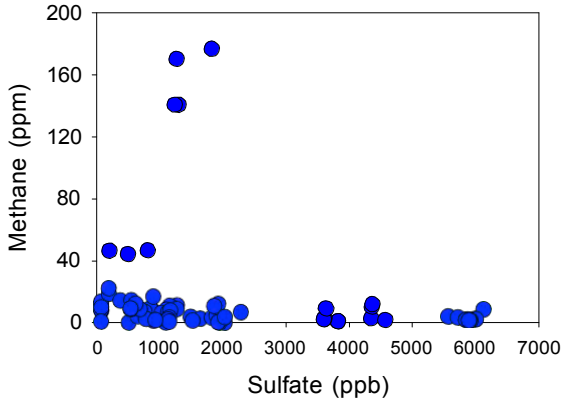

Fig. 1. The relationship between sulfate and methane in southwest Greenland lakes.

Acknowledgements: This study was supported by NSF-Arctic 1203434 to J.E.S., along with support from the Climate Change Institute.

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Using Graphical Processing Unit (GPU) for Agent-Based Bird Migration and Landscape Anisotropy Modeling

Bipush Osti [1]

1. Department of Electrical and Computer Engineering, University of Maine.

Abstract: Simulations that require large data take up a really long time to run which makes it impractical as it significantly slows the progress of any research project. Using CUDA (Compute Unified Device Architecture) for the GPU can make the code run in parallel and can reduce the time taken by the simulations. The speedup achieved using CUDA is orders of magnitude more than that achieved when using a 'serial' code or when the code is not parallelized. This paper briefly explains the use of CUDA to try and solve two important problems related to Earth Sciences and Climate dependent bird migration.

I work with Sam Roy, a PhD student in Earth Sciences to create a topographic anisotropy model. Landscape anisotropy or directional dependency of topography provides valuable information about the underlying tectonic setting therefore anisotropy computation is an important step forward in answering some important questions in geology.

Variogram maps are used for anisotropy calculation for each point in an elevation grid.The variogram maps generate variance of elevation between the current point in question and points around it in multiple scales.The total number of points in the grid can be upwards of 100,000.For the map of the South Island of New Zealand that was used in the project the total grid points were 600,000. Using the unparallel version of the code even if the calculation for each point took about 6 milliseconds the total time would be 10 hours.CUDA was used to parallelize the code and reduce the total execution time taken by the simulation.

The CUDA implementation considered each elevation point in the grid to be a single 'thread' that runs parallel to each other.Thread in computer programming stands for independent computations and all the threads run parallel to each other at approximately the same time. As calculation for each point in this example as mentioned earlier takes about 6 milliseconds and all the threads or points are calculated almost simultaneously, the total time is reduced to roughly about 6 milliseconds. This allows the user to check for differences by using various input without having to wait for hours.

I work with Jennifer McCabe, a PhD student from the School of Biology and Ecology to create an agent based model for North American migrating birds. The model has birds moving in 2D space and their flight path is affected by weather factors like wind, precipitation and pressure. The birds are known to have a sense of migratory direction and the main aim of this project is to determine the relative influences of this innate sense of direction and the weather factors on the flight paths of the birds.

This project is ongoing and the code has not yet been parallelized however a plan to implement CUDA has been formalized. As with the anisotropy project the individual particles for which computation is to be performed is considered as a thread.Topographic anisotropy had each elevation data point as a thread but in this case each bird will be considered as a single thread. CUDA works best when there are no data dependencies, or when a thread does not depend on the other's result. Anisotropy naturally does not have any dependencies between elevation points. In the case of the agent based model the interactions between the birds are not considered which also makes the threads independent of each other.

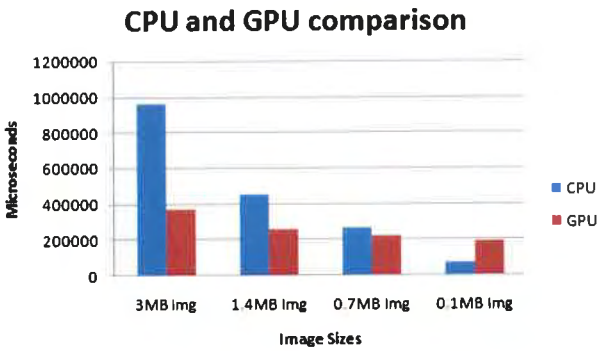

Figure 1: CPU vs GPU time for blurring images of various sizes.(From http://blog.refu.co/?m=201208)

Acknowledgement:
Thank you to Jennifer McCabe,Dr.Peter Koons and Dr.Sean Birkel for their continued support with this project.

Test Using UAV Gathered Imagery to Measure Supraglacial Lake Depths

Benjamin W. Partan[1]

1. *School of Earth and Climate Sciences, University of Maine.*

Abstract: Understanding glacial hydrology is important for understanding glacial dynamics. Supraglacial lakes are the most studied hydrological feature due to being able to be resolved in satellite imagery. Using a small UAV to collect high resolution imagery could be a low cost, efficient method for mapping, estimating volumes and discharge rates for meltwater. This project will test data collected from a UAV against existing methods of measuring lake depths from satellite imagery and physical soundings.

Supraglacial lakes are the most studied glacial hydrological feature by remote sensing due to their size being able to be resolved in satellite imagery. The drainage of supraglacial lakes in Greenland is known to correlate with increases in glacial velocity (Lampkin, 2014). The lakes often drain through moulins (Box, 2007) that offer a direct route to the englacial and subglacial hydrological systems. Several studies successfully looked at supraglacial lake bathymetry (Sneed 2007, Sneed 2011 and Box 2007) using reflectance.

Unmanned Aerial Vehicles (UAV) or Unmanned Aircraft Systems (UAS) are starting to play an important role in the remote sensing of glaciers. With advances in electronics, software and manufacturing components, UAVs are becoming less expensive, smaller and more powerful. Satellites provide images of wide areas in multiple bands but at the expense of spatial resolution and sampling frequency since they are on fixed orbits. Traditional fixed and rotor aircraft can provide higher resolution imagery of smaller areas when needed but are expensive to operate. A small UAV can fly at altitudes similar to that of a fixed wing or rotor aircraft providing high resolution images at very low cost, and surveys can be conducted on an as-needed basis.

This project will collect data flying UAVs over supraglacial lakes on the Juneau Icefield in Alaska using visible and near infrared spectrum cameras. Depths derived from these images will be compared to those obtained using the reflectance method from satellite imagery. Physical soundings will also be taken. The remotely derived depths will be compared to the physical soundings and the error will be characterized.

Acknowledgements: Thank you to the Churchill Exploration Fund for providing travel funds.

Thanks to the Juneau Icefield Research Program for use of its facilities. Thanks to Dr. Gordon Hamilton and Dr. Karl Kreutz both at University of Maine Orono, Dr. Allen Pope at UC Boulder, Paul Illsley at Nova Scotia Community College and Dr. James Partan at Woods Hole Oceanographic Institute for help with the design of the experiment.

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Environmental Records from the Tupungatito Ice Core (Central Chilean Andes)

Mariusz Potocki[1, 2], Paul A. Mayewski[1, 2], Andrei V. Kurbatov[1], Daniel A. Dixon[1, 2], Bjorn Grigholm[1, 2], Gino Casassa[3], Rodrigo Zamora[4], Elena Korotkikh[1, 2], Michael Handley[1], Douglas Introne[1]

1. *Climate Change Institute, University of Maine.*
2. *Department of Earth Sciences, University of Maine.*
3. *Geoestudios, Puente Alto, Santiago, Chile.*
4. *Centro de Estudios Cientificos, Valdivia, Chile.*

Abstract: A 61 m ice core extracted from Tupungatito Glacier in 2012 reveals the history of environmental change in the Central Chilean Andes.

Future climate change in the arid Central Andes will have dramatic impacts on humans and ecosystems. Presently, the regional retreat of most alpine glaciers and increases in population, industry, and agriculture are beginning to generate unsustainable conditions for future demands on water resources (Engle et al., 2011). In addition, relatively limited seasonal precipitation in the Central Andes and declines in glacier-source water resources may magnify the regional impacts of the El Niño/La Niña phenomenon. Instrumental records of climate and environmental variability over the Central Andes are sparse and rarely extend to higher elevations. However, ice cores from the tropics and mid-latitude glaciers can provide high-resolution records of past climate dynamics and chemistry of the atmosphere ranging from seasonal to millennia time-scales (Ginot et al., 2006).

Tupungatito glacier receives the majority of its precipitation from frontal systems that develop in the Pacific Ocean and travel eastward. The region receives 80-90% of its annual precipitation from May through September. This part of Central Chilean Andes is a main source of water for Santiago and surrounding regions. (pers. comm. Jorge Carrasco Cerda, 2012).

On the basis of borehole measurements, the temperature of the Tupungatito glacier at 10m depth is approximately -15.5 ^{o}C assuring a well-preserved record. It suggests that surface melting is not common. However, lab observations reveal distinct thin (up to 8 cm) melt features in the core. Preliminary analysis reveals excellent, well-preserved annual signals in oxygen isotopes and an mean annual accumulation rate of ~0.50 m w.eq.

Trace metal analysis reveals pronounced enhancement in concentrations attributed to emissions of heavy and trace metals to the atmosphere from human activities in this part of South America, including non-ferrous metal mining and smelting, industry, agriculture, construction and large-scale land use (Nriagu and Davidson, 1986). Furthermore, it is observed that atmospheric pollution for heavy metals is not limited to Pb and Cu, but also affects several other metals such as As and Cd. Pronounced enhancements of elements like As have been observed during the last few decades in Tupungatito record. The enhancements have been attributed to the emissions of heavy metals into the atmosphere from human activities in Southern America, especially from Cu mining (Planchon et al., 2002).

Decrease in As concentration was observed in the 1990s in response to the introduction of environmental regulations enacted to reduce As emissions from the copper industry in Chile. The observed decrease suggests that governmental pollution regulations are effective in reducing air pollution at both the regional and global level (Hong et al., 2012).

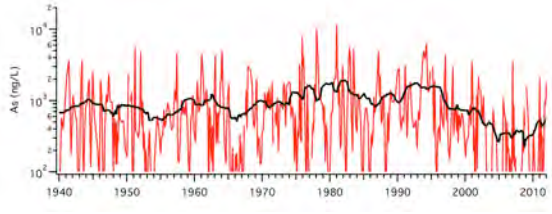

Fig 1. As concentration (ng/L) time series developed from the Tupungatito 2012 ice core.

Acknowledgements: The Garrand Family, Portland, Maine.

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Modeling the Shoaling of the Hypoxic Boundary in the Central and Southern California Current Region

Alice Ren[1,2], Fei Chai[1, 2]

1. *Climate Change Institute, University of Maine.*
2. *School of Marine Sciences, University of Maine.*

Abstract: While observations have indicated that the hypoxic boundary in the Central and Southern California Current Region has shoaled in the past 30 years, there is still debate as to why the increasing hypoxia in the water column has occurred. We use a coupled physical-biogeochemical model of the California Current Region to understand the mechanisms driving the changing dissolved oxygen levels

Introduction:

The California Current Region is the region associated with the California Current, a broad, relatively weak, eastern boundary current that flows equatorward on the west coast of the United States from Oregon to Baja, California. The California Current Region is an upwelling system. Equatorward winds produce Ekman transport away from shore which promotes upwelling of cold, nutrient-rich waters along the coast.

Due to upwelling, there is always some level of hypoxia at depth in the Central and Southern California Current regions. However, recent analysis of data indicates that the upper boundary of the hypoxic layer has shoaled in the past 30 years (Bograd et al. 2008). The level of low oxygen or hypoxic water (defined as under 60 µmol/kg or 2 ml/L) has increased its upper bound and is found at shallower depths and lighter isopycnals. A following study suggested that changing water mass properties of the California Current could account for the changing dissolved oxygen levels (Bograd et al. 2014). However, increased upwelling strength due to strengthening along-shore winds (Bakun 1990) or increased local biological respiration could also impact dissolved oxygen levels.

Methods:

We use a model of physical circulation, biological activity, and biogeochemistry for the Pacific Basin to test the different mechanisms for the dissolved oxygen changes in the water column. The physical circulation is governed by a ROMS ocean model with 12.5 km-resolution. The biology of phytoplankton, zooplankton, and the cycling of nutrients is governed by the CoSINE model based off of the work by Chai et al. (2002).

Results:

The model run for 1991-2010 reproduces a decline in the coastal dissolved oxygen over the time period that matches observations indicating a shoaling of the hypoxic boundary. The investigation of water mass variability, changing tilt of isopycnals, and local changes in respiration will suggest leading mechanisms for the cause of the observed increasing hypoxia in the water column.

Discussion:

The modeling research is important for determining how the region may respond to global warming including feedback mechanisms that are not in current global climate prediction models.

Acknowledgments: This research was supported by the US National Science Foundation Adaptation to Abrupt Climate Change IGERT program grant DGE-1144423.

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Micromorphology of an Archaic Period House Floor

Brian S. Robinson[1,2], Andrew R. Heller[2]

1. *Climate Change Institute, University of Maine.*
2. *Department of Anthropology, University of Maine.*

Abstract: Recent excavations at the Waterside site in Sorrento, Maine confirm John Rowe's 1940 report of a 4000 year old, shell free occupation layer marked by a concentration of animal bone. Our excavations yielded abundant bone including swordfish ribs and a vertebra lying in almost direct contact with sterile subsoil. Suspecting this could be a unique semi-subterranean house floor, we collected an intact soil column through the layer, which was consolidated with polyester resin, cut, and polished. Micromorphology analysis yielded multiple contrasting layers of trampled bone that strongly support the hypothesis that this is a deeply buried Late Archaic period house floor.

A targeted ice coring campaign to investigate abrupt climate changes in The Cordillera Vilcanota, Peru: exploiting a novel glacier geometry

Charles I. Rodda[1], Paul Mayewski[1], Anton Seimon[1,2]

1. *Climate Change Institute, University of Maine.*
2. *Appalachian State University, Boone, North Carolina.*

Abstract: A novel ice coring campaign is planned for two glaciers in The Cordillera Vilcanota in Southern Peru. Initial ultra high resolution trace element analyses revealed well-preserved records in samples collected near the surface of a vertical exposure of annual layering on Osjollo Anante. These annual layers will be used to target sample collection and absolutely date sub-samples from cores spanning abrupt climate changes and significant El Niño events.

Photographs taken of the margin of a glacier on Osjollo Anante in southern Peru in 1984 and 1998 show obvious dark layers created by extreme melting during El Niño events in the previous years, as well as continuous layering to the bottom of the exposure. Ultrahigh resolution trace element sampling of cores retrieved from that marginal exposure in 2013 proved to record chemical concentrations with annual peaks likely linked to dry season dust loading (Rodda, et al., 2014). The Quelccaya Ice Cap, located ca. 40km from Osjollo Anante has a dated climate record stretching back 1800 years (Thompson, et al., 2013), and displays visually similar annual layering. Thompson et al. (2013) also established the strong link between El Niño events in the Cordillera Vilcanota and major climate shifts. Using the easily-identified in-situ annual layering on Osjollo Anante, we will collect samples of major El Niño events from the modern era to compare to instruments records, and thus establish a chemical signature for El Niño events in the Cordillera Vilcanota. We will then use annual layer counting to direct sampling of other major climate shifts identified in the Quelccaya record, including the end of the Little Ice Age (LIA; CE 1880), the beginning of the LIA (ca. 1550), and potentially the end of the Medieval Climate Anomaly warm period (ca. (1350). We will also be conducting a thorough reconnaissance of the Quelccaya Ice Cap to search for the distinctive 1983 and 1998 El Niño melt layers. If the two layers can be identified, samples of the same modern El Niño events sampled on Osjollo Anante will be collected, to establish the regional character of the El Niño signal. Ultrahigh resolution sampling (ca. 1000 samples/yr) will allow unprecedented precision in description of the number, intensity and timing of storm events - all critical features of El Niño precipitation anomalies.

Fig 1. Distinct annual layers on Osjollo Anante

Acknowledgements: This research benefits from the direction and funding coordination of Dr. Paul Mayewski.

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ICD2: An Ice Core Dating Software Tool

Mark Royer[1], Sudarshan S. Chawathe[1,2], Andrei V. Kurbatov[2], Paul A. Mayewski[2,3]

1. *School of Computing and Information Sciences, University of Maine.*
2. *Climate Change Institute, University of Maine.*
3. *School of Earth and Climate Sciences, University of Maine.*

Abstract: We present a software program called the Ice Core Dating 2 (ICD2) that is an enhancement to a Java software package available to download from the Climate Change Institute's website. However, there are many areas in which the ICD2 software is an improvement to the previous system. The ICD2 lets users load raw ice core data in CSV format and associate interpolated dates. The system uses open source software, and it can be enhanced with additional features due to its plug-in architecture. Finally, the ICD2 system has been designed so that aspects of it may be incorporated into P301, so that users are permitted to utilize tools from that system.

Ice Core Dating 2 Tool

The ICD2 allows users to analyze ice core data and associate it with date information. The system is written in Java using Open Services Gateway initiative (OSGi) technology, which is the same open source technology used to build Eclipse. Modeled after the Ice Core Dating Software funded by CCI, this new version includes enhancements for larger data sets, incorporation of Hierarchical Data Format 5 (HDF5) data storage, integrated non-linear curve fitting for dating, and data semantic constraints.

ICD2 projects are stored in a workspace on the local machine. The workspace contains a data folder where imported cores are stored and a sessions folder that contains previously saved core dating sessions. The information stored in these folders may be copied to other systems, which enables users to easily share data and sessions between one another.

Core files that are imported by the system, undergo a number of checks to ensure that they are in fact valid. Basic checks include: the top depth of any sample is not deeper than its bottom depth; the top and bottom depths of cores are monotonically increasing; and no important core information is missing (e.g. top or bottom depth). Additional constraints may be added by the end user.

Validated core data is stored as a new HDF5 file in the workspace. This is beneficial because many types of scientific systems use this format. The HDF5 format that ICD2 uses is based on the format used by GNU Octave (Open source Matlab). This has the side effect that any core data imported by ICD2 is immediately usable in Octave. The HDF5 files are compatible with NetCDF-4 and can also be read by R applications without extra work.

The ICD2 system is composed of core dating projects and core dating sessions. A core dating project is a collection of core elements plotted against depth. A core dating session contains information that compares depth and date. The original core versus depth data is displayed on the top of the screen, and the interpolated time scale is shown on the bottom (see Fig. 1). The date and depth information is smoothed using a spline interpolation. When a new date marker is added to the current session, the interpolated year data is recalculated and displayed in near-real time.

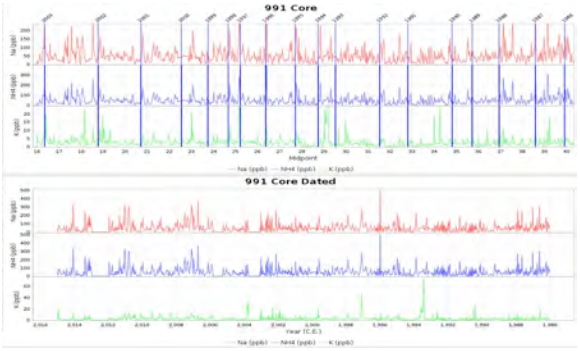

Fig. 1. An ICD2 dating session. The dated core appears in the top graph, and the interpolated, dated values, appear in the bottom graph.

ICD2 is built using open source technology so that it can be used with the rest of the scientific community. The system is composed of a plug-in framework called OSGi, which can be extended and incorporated into other systems. These features of the ICD2 system help facilitate the dating of core data.

A Whole Lake Thermal Experiment in a West Greenland Lake

Jasmine E. Saros[1,2], Robert Northington[1,2], Dennis Anderson[2] & Joan McCue[1]

1. *Climate Change Institute, University of Maine.*
2. *School of Biology and Ecology, University of Maine.*

Abstract: Across the Arctic, lake sediment records provide some of the few key archives documenting rates of ecosystem change in this region since the last ice age. In particular, striking changes in communities of diatoms have occurred over the last 150 years, but we understand little about what these changes indicate about lake response to climate. We used a whole lake manipulation to gather key ecological information that will enhance interpretation of several existing diatom records from southwest Greenland.

In numerous lake sediment records from the high Arctic of Canada and Europe, diatom species generally associated with warmer conditions increased at unprecedented rates during the 20th century (Smol, 2005). Diatom communities in lake sediments from west Greenland are dramatically different from those in the rest of the Arctic- they are rich in these "warmer" water diatoms throughout the Holocene, not just the last century (Perren et al. 2009). This difference has raised questions about what we can use diatoms to infer in the Arctic, and suggests the need to clarify the ecological traits of key diatom taxa in order to advance our understanding of drivers of change.

We hypothesized that climate-driven changes in nutrients and water column stability (via its effects on light availability) are key factors shaping diatom community structure in these lakes. To test this, we conducted a whole- lake manipulation in 2014 in which water column stability was reduced through enhanced water circulation to assess the response of key taxa to this change. Lake SS16 was manipulated by deploying a Solar Bee hydraulic lift system into the lake (Fig. 1). The neighboring lake was left unmanipulated but monitored over the same time frame.

We found that the relative abundances of key diatom taxa are under complex control by the interactive effects of nutrients and light. Understanding the ecology of these species will provide important tools to decipher the extent to which direct and indirect effects of climate are contributing to rapid ecological change. Ultimately, diatom records from arctic lakes may be providing much richer signals of the response of these lake ecosystems to climate change than previously thought.

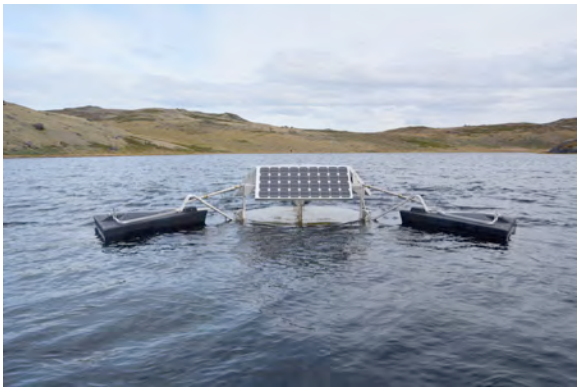

Fig. 1. *Solar Bee system in Lake SS16 during lake manipulation.*

Acknowledgements: This project is funded by NSF Arctic 1203434.

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Latitudinal Trends in Saltmarsh Sparrow (*Ammodramus caudacutus*) Fecundity

Katharine J. Ruskin[1], Matthew A. Etterson[2], Brian J. Olsen[1], and Thomas P. Hodgman[3]

1. *School of Biology & Ecology, Climate Change Institute, University of Maine.*
2. *U.S. Environmental Protection Agency, Mid-Continent Ecology Division.*
3. *Bird Group, Maine Dept. of Inland Fisheries and Wildlif.e*

Abstract: In this study, we quantify fecundity, or reproductive success, of Saltmarsh Sparrows across their global species range. We observed large-scale trends, most notably that fecundity was greatest near the high-latitude range margin, rather than the range center as predicted by ecological theory.

In 1906, Joseph Grinnell hypothesized that the population growth rate of a species highest near the center of its geographic range, where the conditions are most favorable for that species. This hypothesis is very intuitive, and perhaps because of this, it is deeply entrenched in ecological and evolutionary theory. Many subsequent hypotheses have been based upon this assumption that species thrive at the center of their ranges. Additionally, this idea has formed the basis of many wildlife management actions, such as protection of habitat for endangered species. Despite the ubiquity of Grinnell's hypothesis, it has almost never been tested across the global range of a species or with demographic data. We present one of the first range-wide demographic analyses of a species as a test of Grinnell's hypothesis.

We quantified the fecundity, or reproductive success, of Saltmarsh Sparrows (*Ammodramus caudacutus*) across their global breeding range. Saltmarsh Sparrows are endemic to tidal marshes and breed exclusively in the northeastern United States (Greenlaw & Rising, 1994). From 2011-2013, we conducted intensive demographic surveys of breeding Saltmarsh Sparrow populations in Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, and New Jersey. We calculated fecundity via a Markov-chain approach using programs developed by the Environmental Protection Agency (EPA). We combined nest failure probabilities with various other life history parameters such as number of eggs per nest and number of nesting attempts per year of each female to create a robust estimate of annual fecundity.

We found that Saltmarsh Sparrow fecundity increased with latitude. In contrast to the Grinnell's hypothesis, Saltmarsh Sparrow fecundity was highest near its high-latitude range margin. This result has interesting implications for ecology, evolution, and conservation. Our results suggest that Saltmarsh Sparrow populations at the range margin are not constrained by adaptations at the range center. Rather, populations at the center may be constrained by the high-latitude populations, which may be problematic for adaptation to climate change.

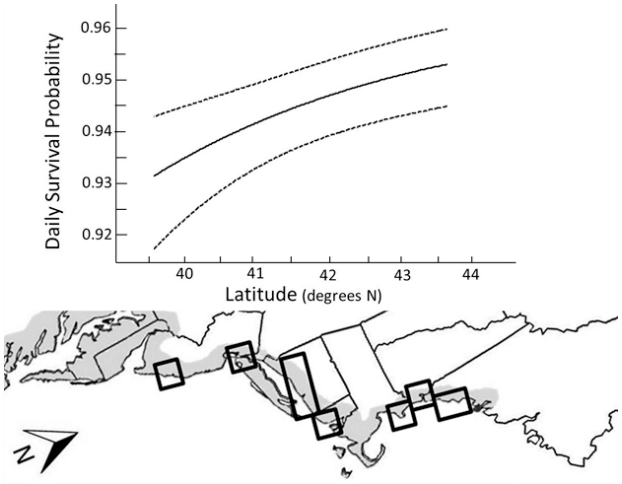

Figure 1. We observed that annual fecundity increased toward the high latitude range margin of Saltmarsh Sparrows.

Acknowledgements: Funding for my research has been provided by the U.S. Fish & Wildlife Service and the University of Maine. Thanks to the Saltmarsh Habitat & Avian Research Program collaborators, my committee, particularly Matt Etterson, and the Olsen lab.

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Changes in Iceberg Size Distribution in Disko Bay, West Greenland

Jessica Scheick[1], Gordon Hamilton[1], M. Brady Butler[2], Eva Mätzler[3], Jakob Abermann[3]

1. *Climate Change Institute and School of Earth and Climate Sciences, University of Maine.*
2. *Department of Physics and Astronomy, University of Maine.*
3. *Asiaq, Greenland Survey, Nuuk, Greenland.*

Abstract: Recent dynamic changes along the margins of the Greenland ice sheet have caused a change in the sizes and distribution of icebergs in coastal waters. However, little work has been done to quantify these changes. Here we present preliminary results from an iceberg delineation algorithm pointing to a shift in iceberg size-frequency occurrence from a small number of large icebergs towards a larger number of small icebergs. These changes have implications for freshwater fluxes to the ocean as well as coastal maritime navigation.

Over the past two decades, the response of the Greenland ice sheet (GIS) to climate changes has become increasingly pronounced. Nowhere are these changes more evident than along the margins of the ice sheet, where outlet glaciers channel ice from the interior and often terminate in marine environments. These dynamic changes currently account for up to half of Greenland's annual mass loss, with the rest due to surface ablation (e.g. van den Broeke, *et al.* 2009). Thus, understanding ice dynamics and ice-ocean interactions is essential for improving models of how the GIS will respond to future climate changes. Icebergs are an important and relatively understudied component of this ice-ocean system. Conversations with locals in Ilulissat, West Greenland indicate that over recent decades, Disko Bay iceberg size distributions have shifted concurrent with the speedup, thinning, and retreat of nearby Ilulissat Isbræ, with impacts on coastal navigation and the fishing and tourism economies.

We have developed an algorithm to automate the collection of physical and spatial information about icebergs from optical satellite imagery (Landsat) to better understand the role of icebergs in Greenland's coastal waters. Preliminary results (Fig. 1) indicate that there has been a change in size-frequency distribution of the icebergs in Disko Bay since the turn of the century, shifting from a small number of large icebergs to a larger number of small icebergs. Future work will focus on understanding this frequency distribution in the context of natural systems by increasing the temporal resolution of this record.

Acknowledgements: This work has been supported by the US NSF A2C2 IGERT program (grant DGE-1144423) and is in cooperation with Asiaq, Greenland Survey.

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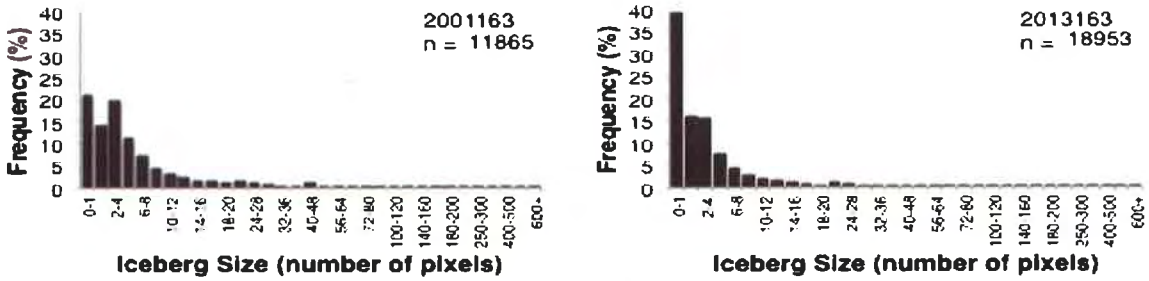

Figure 1: Representative iceberg size-frequency distributions for Disko Bay, West Greenland showing the increase in the smallest size icebergs from 2001-2013. Results shown are from Landsat images acquired 12 June 2001 (left) and 12 June 2013 (right). One pixel is 225 m^2. Note: Bin sizes are not uniform and increase in size as iceberg size increases.

Can Seed Dispersal Traits Keep Trees from Reaching Equilibrium with Climate?

Benjamin J. Seliger[1, 2], Jacquelyn L. Gill[1, 2]

1. *Climate Change Institute, University of Maine.*
2. *School of Biology and Ecology, University of Maine.*

Abstract: We tested how seed dispersal traits influence the geographic ranges of North American trees. Trees with known adaptations to extinct megafauna are poorly dispersed and were used as a natural experiment to see how well they accessed potential range relative to trees with other dispersal mechanisms. Dispersal type was not found to be a significant predictor of range filling for individual trees. However, our results suggest most trees have experienced dispersal limitations following post-glacial warming, suggesting poor ability to track future climate change.

Climate is considered the major determinate of species' geographic ranges at continental scales.[1] Climate changes are expected to drive species to higher latitudes and altitudes, which has already been documented.[2] Yet our abilities to determine which species will shift and whether they can keep up with changes are poor. Species distribution models are a leading tool for predicting the effects of climate change on species' ranges, however, they assume that species are at equilibrium with climate. Dispersal limitations, where species have had insufficient time or face insurmountable barriers, can prevent species from reaching all places with a suitable climate.[1] Recent studies suggest dispersal may play a strong role in limiting the ranges of some species, particularly trees.[3] Thus, dispersal has fundamental consequences for species' ranges and our ability to forecast them as climates change.

We investigated how dispersal limitations caused by seed traits can influence climate equilibrium by focusing on species with anachronistic dispersal adaptations. Trees which possess large fleshy or woody fruits ill-suited for dispersal by extant animals are proposed to be adaptations to extinct Pleistocene Megafauna.[4] Subsequently, megafauna-adapted trees are expected to have narrower ranges relative to trees with other dispersal mechanisms.[4] We hypothesized megafauna adapted trees will show a greater disequilibrium with climate because of this. Climate disequilibrium was quantified by the proportion of its potential range a species utilizes. Potential ranges were calculated for North American trees using climate variables with known physiological linkages to survival.

North American trees were not found to be at equilibrium with their physiological climate limits (mean range filling 49%). Neither dispersal type nor megafauna-adaptations appear to influence range filling. The most significant predictor of range filling was realized range size. This suggests 1) species with larger ranges are more likely to be running up against their own physiological climate limitations and 2) climate becomes less important of a determinate as the size of a species' range decreases. Biotic factors, such as competition, may be a major limiting factor for small ranged species, widespread species have overcome by being competitively superior.[5] Overall, results suggest North American trees have not yet fully responded to post-glacial warming, and thus we would expect limited tracking of future changes.

Acknowledgements: Thanks to Jacquelyn Gill, CCI, and SBE for supporting this research.

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Maritime Adaptation and Cultural Boundaries in Frenchman Bay, Maine

Chris Sockalexis[1, 2], Brian Robinson[1, 2]

1. *Climate Change Institute, University of Maine.*
2. *Department of Anthropology, University of Maine.*

Abstract: Shell middens in Frenchman Bay produced an unusual number and variety of bone tools. Although long known, it is unclear whether these represent a localized maritime adaptation within Frenchman Bay or an identifiable cultural region, where bone was a preferred material for tool production. This problem will be addressed through analysis of the Jones Cove shell midden site in comparison with bone and stone tool assemblages from across the region in relation to marine resources, sea level rise and site erosion.

Frenchman Bay is rich in marine resources and there is clear evidence of dependence upon marine-based food resources where localized complex seasonal settlement patterns emerged (Sanger 1988).

Cultural differences are interpreted from visible material patterns that vary significantly in content and meaning. Tool technology and ritual artifacts provide the most visible or distinctive traits to help identify cultural boundaries. A tool form known as the "simple bone point" is often the most abundant artifact found in shell middens in Frenchman Bay (Tyzzer 1936), but nearly absent in western Maine shell midden sites.

Unusual frequencies of tools might signify cultural preferences, hunting of different animal species, or different rates of erosion due to sea level rise, among other factors (Robinson 1996).

This research project consists of two parts. First, analysis of bone and stone tool technology and faunal remains will be conducted to determine if there is a correlation between tool types and specialized resources, or if the tool proportions, as a whole, could represent distinct cultural practices compared to other sites within the Gulf of Maine. Second, DNA analysis of selected bone tools will be conducted to determine if a certain species of animal was specifically chosen for bone tool production as a form of hunting and fishing ritual.

In 2006, the University of Maine Anthropology Department conducted a Maine Academic Prominence Initiative (MAPI) funded archaeological field school in Gouldsboro, Maine at the Jones Cove Site in Frenchman Bay. This Late Woodland Period shell midden was previously excavated in 1929, producing an abundance of bone and stone artifacts.

Bone tool production first caught the attention of archaeologists in the 1920's but little research has since been conducted as to the use of these abundant tool forms, or to which species of animal bone was commonly used to produce them. This new research will contribute to a better understanding of culture areas and maritime adaptation within the Gulf of Maine.

Fig. 1. Jones Cove Assemblage Sample

Acknowledgements: Assistance has come from the MAPI field school grant, the Climate Change Institute, the Department of Anthropology, and the Abbe Museum.

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Spatio-Temporal Variability of Suitable Habitat for American Lobster (*Homarus Americanus*) in Long Island Sound

Kisei R. Tanaka[1,2], Yong Chen[1,2]

1. *Climate Change Institute, University of Maine.*
2. *School of Marine Sciences, University of Maine.*

Abstract: Using four environmental variables (bottom temperature, bottom salinity, depth, and bottom sediment type) as well as 34 years of spring and fall lobster surveys, we developed a Habitat Suitability Index (HSI) model to analyze the spatio-temporal variability of suitable American lobster (*Homarus americanus*) habitat in Long Island Sound (LIS). The suitability indices (SIs) calculated for the four environmental variables were combined to form a composite HSI model. Maps of estimated HSI values were produced using kriging interpolation for adult and juveniles in spring and fall from 1978 to 2012.

The lobster fishery in Long Island Sound (LIS) remained the third largest lobster fishery in the United States until 1998, but has experienced a substantial decrease in lobster abundance over the last 20 years. As climate change continues to alter Northwest Atlantic coastal ecosystems, it is necessary to quantify the change in availability of suitable lobster habitat over time.

Habitat Suitability Index (HSI) models are widely utilized in wildlife management to evaluate relationships between environmental variables and the relative abundance of a target species (Franklin 2010). The objective of this study is to develop a HSI model for evaluating the spatio- temporal variability of suitable lobster habitats in LIS for juvenile and adult in spring (April-June) and fall (September-October) from 1978 to 2012.

The modeling result revealed overall spatial distribution of estimated HSI values in LIS for each group of lobster (2 seasons * 2 size classes) (Fig 1). Temporal variation in availability of suitable habitat was observed in all four groups of lobster over the period of 34 years (Fig. 2). Overall, there were no statistically significant temporal trends in suitable habitat change for adult lobsters in spring and fall.

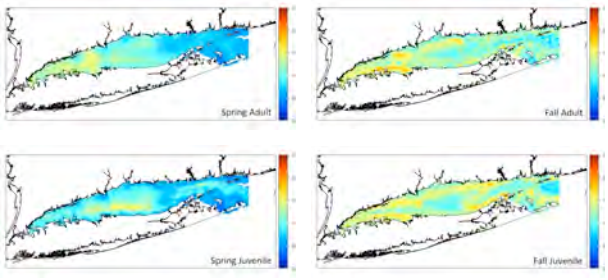

Fig. 1: Spatial distribution of the median habitat suitability index (HSI) values in the Long Island Sound over 34 years (1978-2012).

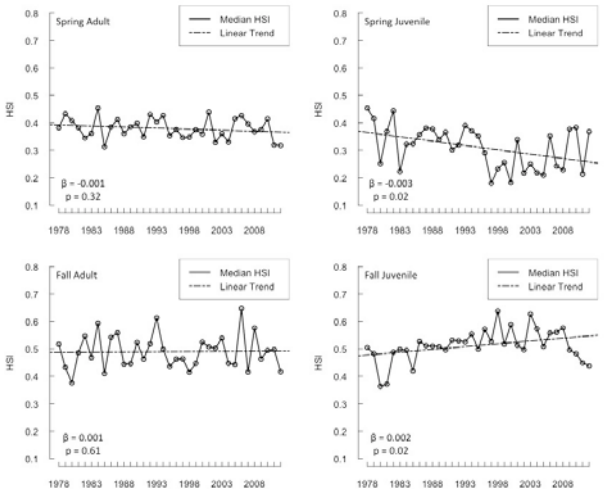

Figure 2: Median habitat suitability index (HSI) score for each year from 1978 to 2012. The trend in each group was shown by the fitted simple linear regression model.

Acknowledgements: This work is being funded by the US National Science Foundation Adaptation to Abrupt Climate Change IGERT program grant DGE-1144423.

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Recent Trends in Jordan Pond: The Impact of Changing Clarity and Epilimnion Thickness on Phytoplankton Community Dynamics

Nora Theodore[1], Jasmine Saros[1], Kristin Strock[2], Kelsey Boeff[1]

1. *Climate Change Institute and School of Biology and Ecology, University of Maine.*
2. *Environmental Science Department, Dickinson College.*

Abstract: The clarity of lakes in Acadia National Park and lakes across the northeast has been declining over the past two decades. These changes have been linked to increases in dissolved organic carbon (DOC). In this study, we are exploring how changing transparency and thermal structure in Acadia lakes are affecting phytoplankton community dynamics.

In recent years, water clarity in Jordan Pond in Acadia National Park has been declining. This trend is occurring in Jordan Pond (Fig. 1), as well as other lakes in Acadia and across the northeastern United States.

There are two main drivers suspected behind these changes in lake transparency. Lakes may be returning to earlier conditions (less transparent) as a result of reduced acid deposition due to the Clean Air Act Amendment of 1990. Reduced acid deposition results in reduced ionic strength of soils, and therefore increased organic matter solubility, which results in higher concentrations of DOC in surface waters (Monteith et al. 2007). In addition, DOC could be entering the lake as a result of the increased storm frequency that is occurring as a result of climate change (Zhang et al. 2010).

The thickness of the epilimnion in lakes is determined by both DOC and wind. DOC is considered the main driver of epilimnion thickness in lakes less than 500 hectares, which includes Jordan Pond (Fee et al. 1996). With significant increasing trends in DOC in Jordan and other lakes in Acadia including Seal Cove, Eagle, and Echo, epilimnion thickness is predicted to become shallower. In this research, we are interested in exploring how changing epilimnion thickness and secchi depth will influence phytoplankton dynamics in Acadia lakes. We will address questions such as: due to the extreme clarity of Jordan Pond, will certain phytoplankton species be constrained by altered light availability? How important is mixing depth to phytoplankton community dynamics in the lake?

There are several unknowns about how the recent change in lake clarity is influencing lake biota currently and how it will do so in the future. Jordan Pond is the clearest lake in Maine as well as a municipal water source and is therefore particularly important to study.

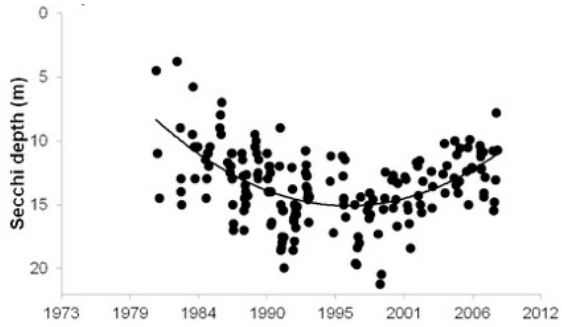

Fig. 1. Secchi disk transparency in Jordan Pond from 1981 to 2008 (Strock 2013).

Acknowledgements: This research was funded by a grant from Canon, Inc.

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Glacier Change over the Last Century, Caucasus Mountains, Georgia

Levan G. Tielidze[1], Gordon S. Hamilton[1, 2]

1. *Institute of Geography, Tbilisi State University, Georgia.*
2. *Climate Change Institute, School of Earth and Climate Sciences, University of Maine.*

Abstract: The article describes observations of glacier changes on the southern slope of the Caucasus Mountains, Republic of Georgia. Glacier area has decreased by more than 40% since the late 1800s, with the fastest rates of loss occurring since 1960. These changes are linked to observed air temperature warming in the region.

The Caucasus is one of the major mountain systems in Eurasia, stretching ~1,300 km from the Black Sea in the west to the Caspian Sea in the east and separating southwestern Russia from Georgia. The range contains ~1,200 glaciers with a total volume of ~68 km^3. On thesouthern slope, these glaciers are an important source of water for agriculture and hydropower generation in Georgia, as well as for the Caspian Sea.

Glacier research has a long history in the Caucasus. The first scientific reports of the early1700s are from the great Georgian scientist Vakhushti Bagrationi. Almost continuous observations have been carried out since 1930s. There are considerable amounts of data in the archives of the Vakhushti Bagrationi Institute of Geography.

We used the catalog of glaciers on the southern slope of the Caucasus compiled in1911 by K. Podozerskiy, on the basis of 19th century maps. The catalog is compared with glacier extents in the 1960s derived from topographic maps at 1:50 000 scale. Modern glacier extents are mapped from Landsat images of L8 OLI/TIRS (Operational Land Imager and Thermal Infrared Sensor) acquired in August 2014.

We show that the area of glaciers Georgia has decreased from 613.1 km^2 to 555.9 km^2 between 1911-1960, while their number increased from 515 to 786 (Fig. 1, 2). The number of glaciers increased due to the separation of tributaries from the main trunks of compound glaciers.

Between 1960-2014, the area of the glaciers has decreased from 555.9 km^2 to 355.8 km^2 and their number was reduced from 786 to 637 (Fig. 1, 2). The rapid reduction in glacierized area coincides with an observed ~0.2°C warming in the region since the mid-1950s. Continued glacier wastage will have important consequences for water resources in the Southern Caucasus region.

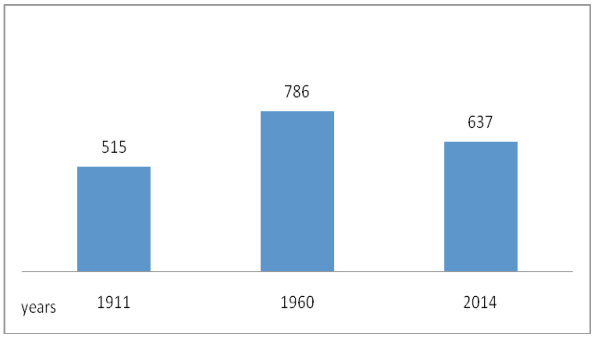

Fig. 1. Variability of the number of the glaciers of Georgia in 1911-1960-2014

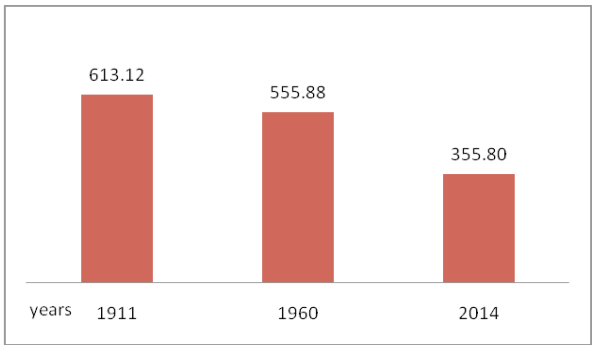

Fig. 2. Variability of the area of the glaciers of Georgia in 1911-1960-2014.

Linking Environmental Conditions to Spatio-temporal Variability in the Distribution and Growth of Sea Scallops *Placopecten magellanicus* in the Gulf of Maine

Michael P. Torre[1,2], Yong Chen[1,2]

1. *Climate Change Institute, University of Maine.*
2. *School of Marine Sciences, University of Maine.*

Abstract: This project will develop the modeling framework to predict spatio-temporal variability in the distribution and growth rate of sea scallops *Placopecten magellanicus* with respect to underlying environmental conditions in the Gulf of Maine. Model outputs will be used to predict potential impacts of climate change on scallop populations along with improving spatial management design and stock assessment for this fishery.

The distribution and growth of many benthic species are closely tied to their surrounding environment, which fluctuates over space and time. Current fisheries models often assume that these parameters are homogeneous across the entire range of a population; however, Ignoring spatial variation can lead to large biases in estimates of stock sizes and make it difficult or impossible to reliably predict recruitment.

This study will develop a modeling framework to quantify the distribution and growth rate variability of sea scallops (*Placopecten magellanicus*) within the Gulf of Maine based on underlying biotic and abiotic conditions. This framework will comprise a variety of approaches to quantitatively describe different aspects of scallop ecology including a habitat suitability index (HSI) model (see Fig. 1), a generalized additive model (GAM), and a growth model.

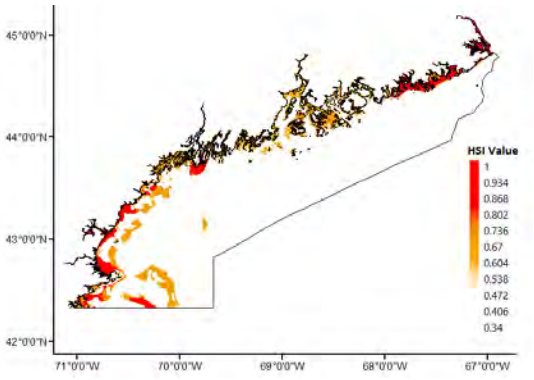

Fig. 1. Preliminary habitat suitability index (HSI) model predicting habitat value for sea scallops (*Placopecten magellanicus*) based on depth and bottom composition in the Gulf of Maine. HSI values range from 0-1, with 1 being most the suitable habitat.

Model outputs will contain the basis for forming pre-recruitment indices that will improve predictions of future scallop biomass and facilitate the fine-tuning of rotational closure parameters.

In light of recent extreme warming events within the Gulf of Maine (Mills et al. 2013) it is becoming more and more important to view resource management from within the context of climate change. This project will provide an unprecedented opportunity to evaluate the potential impacts of abrupt climate change on the distribution, abundance, and life history processes of scallops. The modeling framework developed for this project will be forecasted under various climate change scenarios to predict how scallop populations are likely to respond to a warming Gulf of Maine ecosystem, and to stimulate the development of future mitigation efforts.

Acknowledgements: This research was supported by the US National Science Foundation Adaptation to Abrupt Climate Change IGERT program grant DGE-1144423 as well as the Maine Department of Marine Resources.

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Assessing the Vulnerability of Maine's Drinking Water Resources to Extreme Precipitation Events

Kate A. Warner[1,2,3], Mario F. Teisl[3], Jasmine E. Saros[1,2]

1. Climate Change Institute, University of Maine.
2. School Biology and Ecology, University of Maine.
3. School of Economics, University of Maine.

Abstract: Increases in extreme precipitation across the Northeastern U.S. have led to increased dissolved organic carbon (DOC) in aquatic ecosystems. DOC is an important and fundamental regulator of aquatic ecosystem structure and function, and increases in DOC may have profound implications for water quality and treatment practices. The goal of this study is to assess the vulnerability of Maine's drinking water lakes to extreme precipitation events and subsequent increases in DOC.

Maine's high water quality is threatened by a rapidly changing climate, in particular, extreme precipitation events, which have increased in frequency in the Northeastern U.S. by 60-80% since the 1950's (Madsen & Wilcox 2012). Analysis of a 30-year database of surface water geochemistry and watershed-specific landscape data throughout the Northeast suggests increased concentrations of dissolved organic carbon (DOC) in lakes during extreme wet years (Strock 2013). DOC is an important regulator of ecosystem structure and function, flows into lakes and streams via surface, ground, and soil waters and can have profound implications on the quality of drinking water and the effectiveness of water treatment practices. Algal blooms, taste and odor problems, and harmful by-products are some of the problems created by rising DOC concentrations. Currently the extent to which changing precipitation is altering the chemistry and consequently the biota of Maine's lakes is unclear. Additionally, throughout the state of Maine, many drinking water sources are not required to filter their water like other regions of the U.S. and increases in DOC pose high economic costs.

The goal of this research is to assess the vulnerability of Maine's drinking water lakes to extreme precipitation events and subsequent increases in DOC. Ecological and economic criteria were used to select a representative subset of 12 Maine drinking water lakes with varying concentrations of DOC (Fig. 1). The objectives are to quantify ecological changes from extreme precipitation events and quantify ecological and economic costs and benefits of potential changes to water quality, management, and treatment practices. This research will help to inform the development of adaptation and management strategies for Maine's drinking water sources to ensure sustained high water quality.

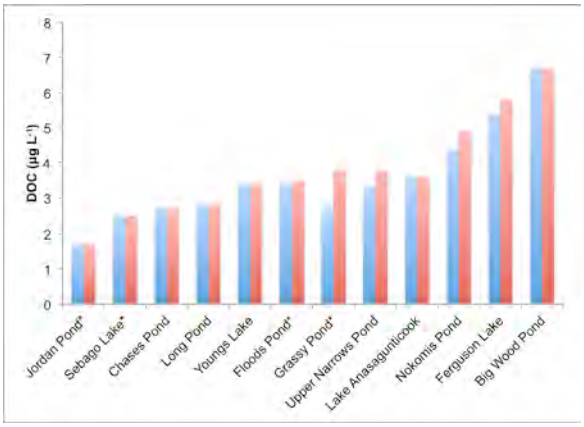

Fig. 1. Gradient of DOC concentrations shown for the selected 12 lakes in June (blue) and August (red). * indicates unfiltered water sources.

Acknowledgements: This research was supported by the US National Science Foundation Adaptation to Abrupt Climate Change IGERT program grant DGE-1144423.

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Reconstructing Late Holocene Seawater Temperatures in the Gulf of Maine Using *Arctica islandica* Oxygen Isotopic Composition

Nina M. Whitney[1], Karl J. Kreutz[1,2], Alan D. Wanamaker[3], Douglas S. Introne[1,2]

1. *Climate Change Institute, University of Maine.*
2. *School of Earth and Climate Sciences, University of Maine*
3. *Department of Geological and Atmospheric Sciences, Iowa State University.*

Abstract: We present an annually resolved, 200-year seawater temperature reconstruction for the Gulf of Maine from oxygen isotopes measured in *Arctica islandica* shells. Preliminary analysis suggests multi-decadal oscillations in Gulf of Maine hydrography, possibly as a result of changes in the strength of the Atlantic Meridional Overturning Circulation.

Introduction: The impact of anthropogenic climate change on the Gulf of Maine (GoM) is currently unclear. Satellite data suggest the GoM has been warming at a rate of 0.026°C/yr since 1982 and 0.23°C/yr since 2004, faster than 99% of the global ocean (Pershing et al., 2014). However, short-term monitoring stations within the GoM do not corroborate the rapidity of this warming (D. Townsend, personal communication, October 10, 2014). The lack of long-term, reliable instrumental records in the GoM makes it difficult to determine how much of this warming, if deemed reliable, is outside the natural variability of GoM climate and therefore attributable to anthropogenic climate change. Our research seeks to address the need for a better understanding of GoM temporal hydrographic variability by reconstructing a 200-year GoM seawater temperature record using oxygen isotopes measured in *Arctica islandica* shells.

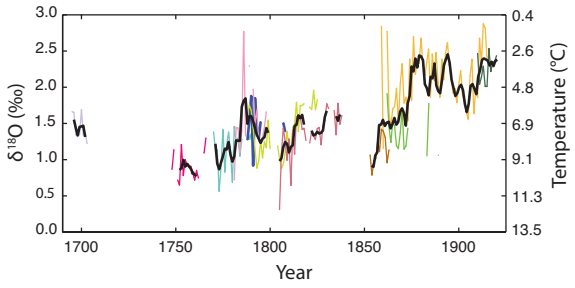

Figure 1. The oxygen isotope and derived temperature time series measured from Gulf of Maine *Arctica islandica* shells. The different colors represent different shells sampled. The black line is a three-year running average.

Methods: Over the last several years, over 400 live caught and fossil *A. islandica* shells have been collected off of Seguin Island in the GoM. Because *A. islandica* grow their shells in annual increments, the unique pattern of these increments can be used to date the collected shells using the dendrochronological technique of cross-dating (Schöne et al., 2013). Oxygen isotope data were measured in shell increments dated from 1695-1920 (see Fig.1). Seawater temperatures in the Gulf of Maine could then be reconstructed using these oxygen isotope data because *A. islandica* shells precipitate in isotopic equilibrium with seawater (Schöne et al., 2013). Oxygen isotope data were also measured in shells dated from 1921-2012. These data are currently being processed and are not considered here.

Results and Conclusions: Our 200-year temperature reconstruction in the GoM suggests substantial oscillations in seawater temperatures on multi-decadal time scales. Initial analysis of the data suggests a significant negative correlation with the strength of the Atlantic Meridional Overturning Circulation. Future work will include a comparison of recent temperature trends in the GoM to this long-term reconstruction to evaluate potential recent deviations from natural variability as a result of anthropogenic climate change.

Acknowledgements: This research is funded by a Paleo Perspectives on Climate Change grant from the National Science Foundation.

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Urban Transformation and Landscape Change at the Nadin Archaeological Site, Croatia

Gregory Zaro[1, 2]

1. *Anthropology Department, University of Maine.*
2. *Climate Change Institute, University of Maine.*

Abstract: This project will generate data from the Nadin archaeological site, Croatia, to better understand the links between urbanism, landscape change, and climate during the late Holocene. Nadin is situated near the 3,000 yr old city of Zadar.

Cities are a dominant factor in global environmental change today, but as a long-term process, urbanization has played a significant role in shaping our planet's landscapes and environments for millennia, effectively creating anthropogenic landscapes. Recognition of this point opens the door for archaeology to make significant contributions to contemporary urban/ecological issues while also generating cross-cultural knowledge about urbanism in the ancient, historic, and modern worlds.

In the Zadar region of coastal Croatia, this process has unfolded over the course of at least the past 3,000 years (Chapman et al. 1996). Zadar remains an important social and economic center in the region, but resource management, economic development, rural-to-urban migration, and environmental policy are becoming major concerns, particularly in the context of projected climate change over the coming century (Giorgi and Lionello 2008).

Fig. 1. Central Zadar with the 8th century C.E. church of St. Donat (center-right) and fragments of the Roman forum from the 1st century C.E.

Because Zadar is a living city, the archaeological focus of this project will be on the Nadin site in Zadar's hinterland. With more than 2,000 years of occupational history, Nadin affords the opportunity to investigate the relationship between phases of urban growth and decline and broader changes in landscape and environment—processes that persist around Zadar today. Excavations will recover subsistence indicators and other economic data as a measure of the links between humans and the environment, as well as data concerning chronology, urban form, and spatial organization. The results will help build a range of knowledge on human-environmental interactions in the Zadar region, offering deep-time perspectives on contemporary issues.

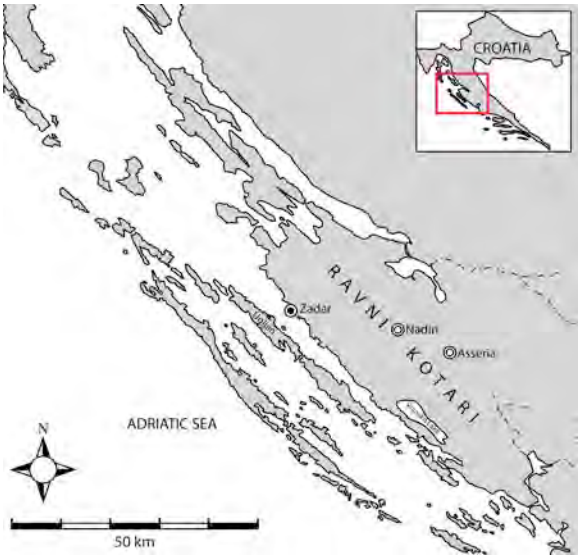


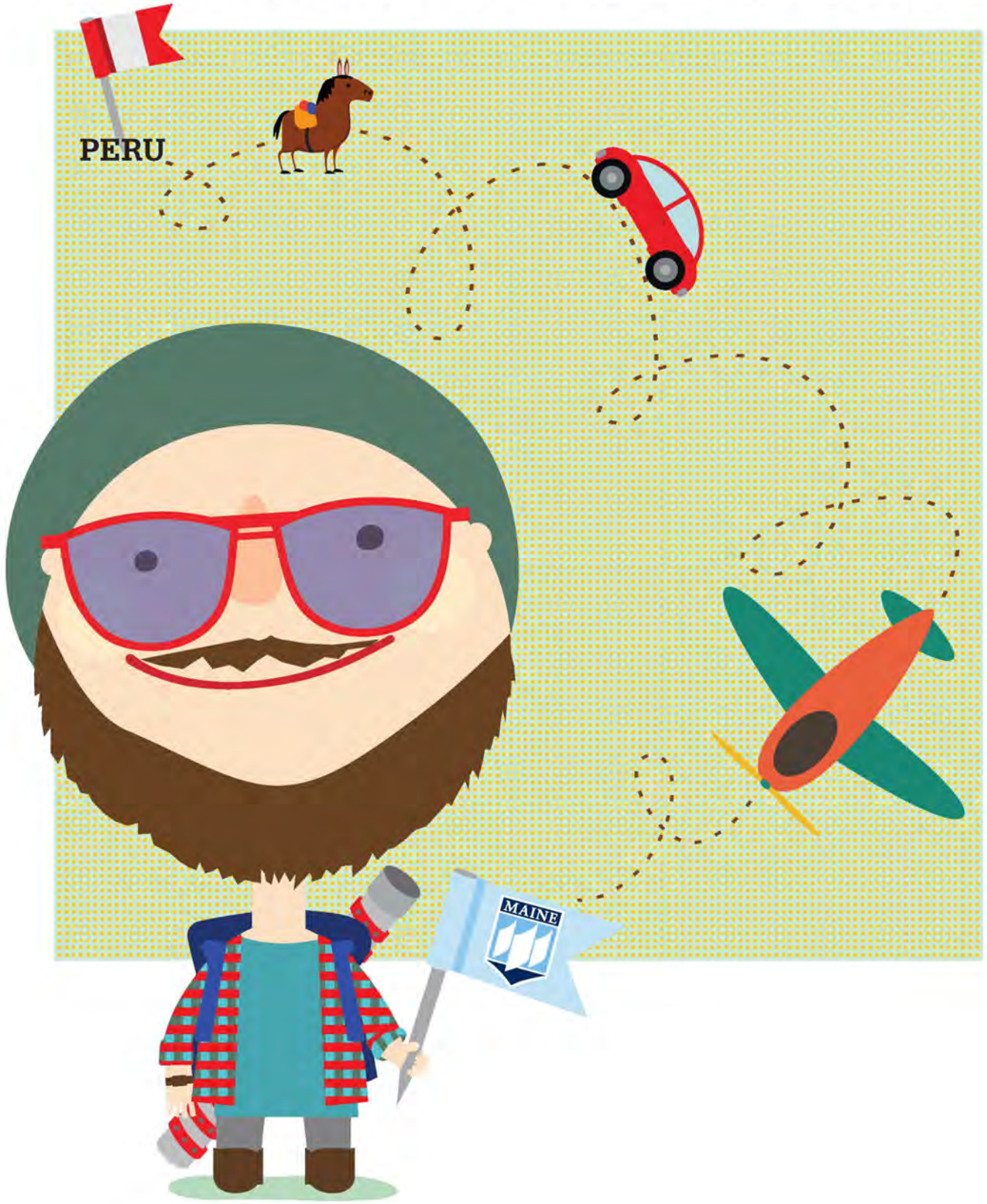
Fig. 2. Location of Zadar and the Nadin site along Croatia's Adriatic coast.

Acknowledgements: National Geographic Society (2015); Fulbright (2013).

Bibliography: Chapman, J., R. Shiel, and Š. Batović (1996). *The Changing Face of Dalmatia*. Leicester University Press, London

Giorgi, F. & P. Lionello. (2008). Climate change projections for the Mediterranean region. *Global and Planetary Change* 63:90-104.

Where's Chuck?



Technology called inReach Explorer, a global satellite communicator created by DeLorme, tracked the UMaine researchers' movements and generated an online map so students could follow their trek in nearly real time.

Innovative STEM education initiative connects K–12 students with researchers working in the field, anywhere in the world

By Elyse Kahl

WHEN UNIVERSITY of Maine climate change researchers Charles Rodda and Kit Hamley took a lunch break from drilling ice cores on a glacier in Peru this spring, they hiked to camp and sat down to eat. That's when they got a volley of questions via text: "How will you keep all of your ice cores from melting?" "What is your camping setup while on the glacier?"

The interviewers weren't scientists or locals, but elementary and middle school students in Maine and throughout the country who connected with the researchers through a new program offered by University of Maine Cooperative Extension with support from UMaine's Climate Change Institute (CCI) and the Maine 4-H Foundation. The Follow a Researcher program gives students a glimpse into a scientist's world by providing live expedition updates, and facilitating communication between youths and researcher.

"Science isn't just white lab coats and pouring things into beakers," says Rodda, a doctoral student at CCI who helped develop the program and is one of its first researchers. In his case, science means putting on crampons, scaling glaciers and drilling ice cores in Peru and Tajikistan to conduct research focused on abrupt climate change.

In March 2015, Rodda and Hamley traveled to Peru to collect snow and ice from glaciers high in the Andes. This summer, Rodda will travel to Tajikistan to join an international team that will retrieve and research samples from the Fedchenko Glacier, the world's largest nonpolar glacier that covers about 270 square miles and extends about 48 miles.

While in Peru, Rodda and Hamley interacted with participating classrooms and students by sharing prerecorded weekly videos and live tweeting in response to questions. Rodda also will connect with students when he's in Tajikistan.

TO COMMUNICATE with students, Rodda and Hamley used the inReach Explorer, a global satellite communicator created by Maine-based company DeLorme. The tool allowed them to tweet to students from the glacier. It also tracked the researchers' movements and generated an online map so students could follow their trek in nearly real time. To document the journey, the researchers also took several cameras, including a GoPro; a solar panel and battery pack to charge electronics; an iPad; satellite receiver; and memory cards.

In advance of the weekly question-and-answer sessions, prerecorded videos of Rodda explaining aspects of the expedition and research were released. The videos were created to spark discussion among students and were aligned with Next Generation Science Standards.

An elementary school in Hudson was one of 26 schools or individuals in Maine and 43 sites in the country to participate in the program this spring.

Schools in Iowa, Ohio, Rhode Island, Connecticut, North Carolina, Montana, Minnesota and Massachusetts also participated.

Every week while the researchers were in Peru, about 30 fourth-graders would fill Maine's Hudson Elementary School gymnasium to watch a video, view updates from the researchers and send questions.

The two classrooms — an entire fourth-grade population — also connected the program to other subject areas they were currently studying, such as historical fiction, geography, and the use of Twitter and other technology.

"Real life is so abstract when you're 9 and 10 years old," said teacher Sherry Blanchard. "So when you can give kids that hands-on experience that connects them to their lives in the moment right now, that's what we want for our kids."

RODDA, WHO has participated in several outreach events around the state as a UMaine Extension 4-H STEM Ambassador, says having a science-literate society is important, and getting students interested at an early age is essential.

"I think that's the time — middle and early high school — when students seem to decide if they're going to be interested in science or not. There's great research happening here at the University of Maine and we want to make sure students know about it," he says.

Blanchard and Hudson Elementary fourth-grade teacher Cheryl Wood are learning how to use Twitter with their students. One day after the students had gone home, the two teachers tweeted the researchers to see if they would visit the schoolchildren when they returned.

Rodda and Hamley, who had already planned to travel to participating Maine classrooms, confirmed that they would. The teachers printed the response and taped it to the classroom board for students to see when they arrived.

"How do you convince someone who doesn't believe in global warming that your data proves it?"

The next morning, students noticed right away and immediately became excited, Blanchard says.

That excitement and connection is exactly what the organizers hoped for when creating the program.

"Follow a Researcher is part of a big effort to connect youth in Maine with current university students. It may be the first time a youth has contact with someone who is going to college, or their first connection to a university," says Laura Wilson, a 4-H science professional with UMaine Extension.

IN PERU, Rodda and Hamley looked at signals that have been captured in the ice during El Niños events, or warming of the waters of the equatorial Pacific. They hope to see what El Niños look like in the ice cores to determine if those events may have triggered abrupt climate system shifts in Central and South America.

Rodda completed preliminary research in Peru in 2013.

This summer in Tajikistan, Rodda will work with a team of international researchers to drill a long ice core that will be split among teams from the University of Idaho, Japan, France and Germany. Rodda will focus on the core's chemical makeup, while others will focus on other characteristics, including physical measurements of the ice or biological signals, such as stable isotopes, he says.

In advance of the Peru trip, youth in grades six through eight took part in a UMaine 4-H Science Saturday workshop on campus where they were challenged with determining how to keep ice core samples frozen and intact for research. Students were given ice and materials and were tasked with designing a container that would keep ice frozen under a heat lamp for a set amount of time.

In reality, Rodda says bringing ice cores home from Peru is more like *Planes, Trains & Automobiles*. It involves horseback transportation, long car rides, even longer airplane trips, and a lot of dry and blue ice, which he describes as heavy-duty freezer packs.

"It's a great way to get students on campus to sort of demystify the university, and show them some of the cool stuff we do at the university and in the sciences," Rodda says of 4-H Science Saturdays, which are offered by UMaine Extension.

Organizers would like to continue Follow a Researcher after the pilot year, as well as expand it to other disciplines throughout the university. Connecting youth to campus may inspire them to explore higher education, and perhaps come to UMaine in the future, Wilson says. ■

"Are you exposed to Peru's culture when you are there?"

STEM statewide

4-H STEM Ambassadors are trained University of Maine students who facilitate hands-on science, engineering, technology and math (STEM) activities with 8- to 14-year-olds statewide. The ambassadors work with after-school programs, libraries, schools and camps, and, in some cases, start science or engineering clubs, says Laura Wilson, a 4-H science professional with University of Maine Cooperative Extension.

In addition to community offerings, 4-H STEM Ambassadors provide opportunities tied to academic offerings on campus, such as 4-H Science Saturdays. Through 4-H STEM Ambassadors, youth become connected to the research, resources and scientists at Maine's public universities.

Charles Rodda, 4-H STEM Ambassador and Follow a Researcher lead, led a 4-H Science Saturday workshop at the Climate Change Institute before his research trip to Peru. In the session, students were challenged to keep ice core samples frozen and intact for research over a long period of time. Other recent workshops focused on horses, led by veterinarians at UMaine's J.F. Witter Teaching and Research Center, and marine sciences at the Darling Marine Center in Walpole. The workshops are offered by UMaine Extension with support from the Maine 4-H Foundation.