



# Faculty Employment Application

Human Resources  
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Tucson, Arizona \* 85721-0158

(520) 621-3662 Telephone  
(520) 621-8299 TDD (8-5 M-F)

Job Number: <b>44727</b>	Job Title: <b>Assistant or Associate Professor</b>	Date: <b>Mar 9 2010 2:16PM</b>
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## Personal Information

Last Name: <b>Bunn</b>	First Name: <b>Andrew</b>	Middle Name:	Email Address: <b>andy.bunn@gmail.com</b>			
Address: <b>3625 18th St</b>	City: <b>Bellingham</b>	State: <b>WA</b>	Zip Code: <b>98229</b>	International Postal Code:	Country:	
Home Phone: <b>360-733-3515</b>	Cell / Other Phone:		Contact Number: <b>360-961-7447</b>			

## References

Name:	Institution/Organization	Address	Title:	Phone:	Email Address:
<b>Lisa Graumlich</b>	<b>University of Arizona</b>	<b>325 Biosciences East Tucson, AZ 85721</b>	<b>Director, School of Natural Resources</b>	<b>360-733-3515</b>	<b>lisag@cals.arizona.edu</b>
<b>Scott Goetz</b>	<b>Woods Hole Research Center</b>	<b>149 Woods Hole Road Falmouth, MA 02540-1644</b>	<b>Senior Scientist</b>	<b>508-540-9900</b>	<b>sgoetz@whrc.org</b>
<b>Dean Urban</b>	<b>Duke University</b>	<b>A320 LSRC Box 90328 Durham, NC 27708</b>	<b>Professor</b>	<b>(919) 613-8069</b>	<b>deanu@duke.edu</b>

## Other Information

Are you legally authorized to work in the U.S.? <b>Yes</b>
What is your current employment status with the University of Arizona? <b>Not a University of Arizona employee</b>
<b>If you are a current employee enter your Employee Identification Number (EID) in the space to the right. If you never worked for the University, worked as a student, or terminated your employment prior to July of 2001 enter N/A.</b> Note: Please do not enter hyphens in the EID field. Your 9-digit EID number (Ex: 120001234) may be found by logging into the Employee Link website. Your EID number is located in the "Current Employment" tab. You may also find your EID number on your pay stub. Note: Your Employee ID number is NOT your Social Security Number. <b>N/A</b>

## Supplemental Questions

Where did you first learn about this position?
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**Referred by UA Employee**

Enter the specific name of any referral source, or the code printed on the business card you received from The University of Arizona career fair booth:

**Malcolm Hughes**

Have you ever been convicted of or plea bargained to a misdemeanor offense?

**No**

If yes, you must provide criminal conviction information and dates: (*You are responsible for knowing if traffic violations or other citations received were classified as a misdemeanor*).

Have you ever been convicted of or plea bargained to a felony offense?

**No**

If yes, you must provide criminal conviction information and dates: (*You are responsible for knowing if traffic violations or other citations received were classified as a felony*).

By indicating 'Yes' below, I affirm that my responses above are true, complete and accurate. I understand that if I accept a job offer, I will be asked to give my written consent for the University of Arizona to conduct a check of my criminal conviction history, motor vehicle record, educational credentials and work history.

I further understand that a 'yes' response will not automatically disqualify me from consideration. However, falsifying, misrepresenting, or omitting criminal conviction information on any application document will likely result in a withdrawal of any job offer and termination of any subsequent employment with the University.

**Yes, I affirm that my responses above are true, accurate and complete to the best of my knowledge.**

Can you perform the essential functions (job duties) of this position with or without accommodation?

**Yes**

What is your current employment status with The University of Arizona?

**Not a University of Arizona employee**

If you have never worked for the University or terminated your employment prior to July 2001, please enter N/A in the space to the right. If you are a current, former, or retired UA employee and were issued an EmplID please enter your number in the space to the right. Your EmplID can be found by logging in to UAAccess Employee and viewing your paycheck. Please do not enter hyphens in the EmplID field. Note: Your EmplID is not your Social Security Number.

**N/A**

**Agreement**

I certify the statements made by me in this application are true and complete to the best of my knowledge and belief and are made in good faith. I understand that any false statement made herein will void this application and any actions based upon it, and I agree to revise this application should any of the information change. I understand that this application and all attachments are the property of The University of Arizona. I authorize The University of Arizona or any of its agents to make reference checks relating to my employment and I also authorize all prior employers to provide full details concerning my past employment. I authorize the University of Arizona to request and obtain records to determine the accuracy of my responses. I understand that employment in certain positions may be conditional upon a background verification including but not limited to criminal records. I certify that I am or will be legally authorized to work in the United States at the time of hire.

BY SIGNING BELOW, I certify that I have read and agree with these statements.

**Andrew Bunn**

Applicant's Name

Applicant's Signature

Date

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To: Search Committee

From: Andrew G. Bunn

Date: March 9, 2010

Re: Bunn application to Job#: 44727 (Forests in the Earth System at the University of Arizona/Laboratory of Tree-Ring Research/Institute of the Environment, USA)

Please accept these materials as my application to the Forests in the Earth System faculty position. I

am currently Assistant Professor of Environmental Sciences in Huxley College at Western Washington

University. I was recently granted tenure with promotion to Associate Professor.

My research program on forests and environmental change links empirical data at multiple temporal

and spatial scales to mechanistic models. My research is supported via extramural grants and demonstrated through peer-reviewed publications ranging from trends in gross primary production

across the Arctic to impacts of fire on boreal forests to paleoclimatology in the intermountain west. I

teach an average of **five classes per year** to environmental science majors and master students. I am

strongly committed to multidisciplinary research and education and take particular pleasure in working

closely with undergraduate students. My teaching evaluations from students and faculty peers are

consistently excellent. Separate **Teaching** and **Research** sections begin on the following page.

However, my activities in those categories are tightly coupled. For instance, my research program is

built around participation from undergraduate and graduate students. My teaching is continuously

honed to incorporate current scientific understanding and I routinely teach with examples and data

gained from my research program. In addition, my service to the University involves teaching in terms

of explaining research results to various groups (e.g., via the Washington State University Extension

program). My service to the profession (e.g., journal reviews, sitting on panels, etc.) is dependent on

the success of my research program. Interweaving my teaching, research and service improves each

facet of my work. Last year, I was one of the 9% of the university faculty recognized with a Special

Merit award.

My primary interest in this position is that it would provide world-class collaboration opportunities across

the University of Arizona community. For example, a central research question in arctic carbon cycling

revolves around the so-called "divergence problem" where high-latitude gross primary production in

forests appears to have decoupled from growing season temperatures during the last two decades.

Ecologists do not know if this phenomenon is related to temperature-induced drought stress, reduction

of shortwave surface radiation, nonlinearities in the climate-growth association, or other factors. With scientists in the Laboratory of Tree-Ring Research (e.g., Hughes & colleagues), the School of Natural Resources (e.g., Breshears & colleagues), the Soil, Water and Environmental Science (e.g., Huete & colleagues), the Department of Geosciences (e.g., Overpeck & colleagues), and others too numerous to list, the University of Arizona is one of the only places in the world where questions like this can be scaled from multiple types of empirical data to provide real breakthroughs. Indeed, there is not a single other institution that brings such excellence to the global change arena. Thank you for your review of these materials. I am a young and energetic scientist and eager to expand my research program at the University of Arizona. Respectfully submitted,  
Andrew G. Bunn

## **I. Teaching and Related Activities**

Students that work with me frequently comment that my enthusiasm is infectious. Although the praise is welcome, I feel that this is through no merit of my own – I never summon any additional energy to be excited about my work. Early in my own education I saw that the most effective teachers loved their work. My passion is environmental science and bringing that science to students.

### **A. Courses**

My teaching fundamentally deals with describing and quantifying the impacts of the 6.7 billion people on the planet. I teach classes where the students and I learn how the globe is changing. My classes focus on changes to the climate and the Earth's biogeochemical cycles ranging across time scales of years to millennia. Climate change is intimately related to human use of energy. I teach two classes in the physics and environmental impacts of energy, and *developing a renewable energy major at Western* as described in section 1C below. Since coming to Western I have developed and taught six new classes. These range from graduate seminars and rigorous classes for environmental science seniors to 300-level classes developed for nonscience majors with interests in climate and energy. My student evaluations are consistently excellent (see

histograms of pooled course evaluations, left). I read the written evaluations from the students with great care and use them to make changes to my teaching. Indeed, I feel very fortunate to have a job where I can impact students so directly. I have also made a substantial effort to seek peer-review of my teaching. These reviews have been helpful in shaping my teaching approach (see insets on pages 3 and 4, left).

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My classes are constantly evolving. The field of global change (of which climate change is a subset) is dynamic. The science is becoming more refined on almost a daily basis and therefore my classes are constantly incorporating new material. I have made the incorporation of technology a key aspect of my teaching. I use blogs, wikis, and other online resources extensively in virtually all of my classes. For instance, in Climate Change (ESCI 492) I keep a blog where, several times a week, I summarize new literature and other science information available on the internet. The students are required to follow-up on the information presented and respond to the way that the material integrates into the class. In my Introduction to Global Change Class (ESCI 392) the students are responsible for making blog posts of their own on the topics we discuss in class and comment on each other's writing. Both of these activities teach students the right way to gather materials online, discern quality information from worthless matter, and help them develop good, informal writing skills that complement formal writing in lab reports and theses.

*Applications in Energy Production*  
*students interact with an*  
*engineer at Canyon Industries –a*  
*company that manufactures*  
*microhydro turbines.*

I make substantial efforts to give my students experiences outside the classroom with trips and exposure to professionals in the field. For instance, in my Applications in Energy Production class last year (ESCI 497), I organized weekly field trips where the students were able to interact with and learn about local

renewable energy industries from energy professionals (see inset page 2, left). Additionally, in Past Environments of the Pacific Northwest (ESCI 423), my students developed a paleoclimate record using dendrochronology from climate sensitive trees they sampled in the field from both sides of the Cascades. The data produced were of sufficiently high quality that they are available on the International Tree-Ring Data Bank. This exercise teaches students the power of sharing data in science and makes a worthwhile contribution to the field of paleoclimatology.

*“Dr. Bunn demonstrated an uncommon ability to engage his class...Dr. Bunn consistently interacted with the students in the class, calling on them by name, to keep them engaged look forward to Dr. Bunn’s expanding contributions to our curriculum. During the summer of 2009 he will be developing a plan for an innovative program in sustainable energy production through a grant from Rese and Sponsored Programs that may incorporate a numbe departments on campus. Overall, I find Dr. Bunn to be a stimulating teacher and innovative colleague and am very pleased that he chose to come to Western.”*

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*Leo Bodensteiner, Environmental Sciences Chair, in a letter to the Huxley Personnel Committee dated December 10, 2008*

### **B. Undergraduate Involvement in Research**

In addition to advising graduate students (my first masters student finishes this year), I strongly encourage undergraduate scholarship in my lab. Since coming to Western, I have supervised seven students on

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independent studies. Jon Riley (Winter 2007) researched the climatological impacts of the El Niño- Southern Oscillation in the Pacific Northwest. Ben Warren (Spring 2007) researched paleoecology in the Pacific Northwest with an emphasis on marine applications. Matt Remsbecher (Fall 2007-Spring 2008) performed a commercial carbon analysis of RE Sources in Bellingham in concert with an

internship with that organization. Scott DeWees (Winter 2008) researched local alternative energy suppliers. Holly Faulstich and Chris Robertson (Fall 2008) studied dendrochronology of the old-growth forest at Canyon Lake Community Forest. Amy Strohm (Winter 2009) worked on shrub advances in the Alaskan Arctic as part of a NSF Research Experience for Undergraduates.

I have also advised five students on senior theses and projects in Environmental Sciences. Justin Lewis completed a senior thesis titled 'Associations between Bristlecone Pine (*Pinus longaeva*) distribution and abiotic variables at high elevations in the intermountain western United States' in fall 2007. Justin worked in my lab on grant money over the course of one year, applied for and received a competitive scholarship from the University of Arizona for his research, and worked with me and my colleagues in the field. I advised Kari Hocking on ecological niche modeling for her senior project titled 'Shifting habitat niches of *Larix occidentalis* as a result of climate change in 2080 based on two carbon emissions scenarios'. I also served as the advisor for Tyler Llewellyn who did independent research related to his participation in the Polaris Project.

Tyler presented his research at the annual meeting of the American Geophysical Union in December 2008 with a poster titled 'Using dendrochronology and remote sensing to assess lake drainage rates of pan-arctic lakes.' With my help, Tyler also applied for and received a research grant to further advance his research by obtaining carbon-14 dates for some of his samples. Max Janicek and Kayla Henson are environmental seniors and Polaris Project participants writing senior theses on macro-invertebrate assemblages on the Kolyma River and presenting their research at this year's State of the Arctic meeting in March 2010.

*"Andy is very well organized and well prepared, develops excellent visuals, has excellent presence in the classroom, uses humor masterfully, and makes complex scientific concepts accessible to the students."*

*"He demonstrated enthusiasm, excellent eye contact, and interspersed humor. He engaged the students by presenting questions to them. And he created an environment in which students*

*freely came forward with questions and comments.”*  
*Peter Homann, Associate Professor, Environmental Sciences, in a letter to Dean Brad Smith dated January 6, 2008*  
*“Dr Bunn...radiates those attributes of fine and effective teachers – he is organized; he is uptodate (to the day!); he can extrapolate; he can explain...AND he has wit!”*  
*“Huxley has a fine new faculty with great promise and far more than effectiveness in teaching; he has real artistry.”*  
*Professor Kate Wayne, Woodring College, in a letter to the Huxley Personnel Committee dated January 27, 2007*

### **C. Renewable Energy**

The creation of carbon-free forms of energy has made the intersection of energy and environment stronger than ever before. The creation of green-collar jobs is a focus of the federal administration and renewable energy technologies are poised to be this generation’s primary global industry. There are only a very few institutions that are training the personnel needed to fill these industries. I am currently developing a new curriculum in renewable energy at Western. I secured funding from Puget Sound Energy to

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fund a curricular development workshop that is being held in May 2010. My goal is to establish a new degree program in renewable energy that will allow Western Washington University to leverage its current role as a leader in environmental education into training the workers of the green economy. I am working with others on campus to develop a premier program that is focused on the applied science, policy, and technology of renewable energy. The project would enable the University to weave together several existing but disparate threads of energy-related curricula that range across departments and colleges into a defined and robust program in renewable energy education. The interest in energy on the part of students and faculty at Western Washington University is its zenith. I am currently advising three Huxley students in selfdesigned majors titled ‘Energy and Environment’.

*Siberia: Juniors Max Janicek and Kayla Henson sample for benthic*



*invertebrates (top). Graduate student Logan Berner collects tree-ring data in a drained lake basin for his thesis (bottom).*

## **II. Scholarship and Scholarly Activities**

My research activity revolves around understanding the interactions between forests and climate over temporal scales of decades to centuries and spatial scales of organisms to bioregions. My research program on forests and environmental change links empirical data at multiple temporal and spatial scales to mechanistic models. In my research, I focus on interpreting past climates from tree rings, and on understanding current climate forcings on forest growth, and how those might relate to perturbations in the global carbon cycle. For instance, we do not even know the *sign* (let alone the *magnitude*) of the relationship between global warming and boreal forest carbon storage despite suggestions that this is a critical feedback in the global climate system. Some of the research I do in the Arctic seeks to determine if boreal forests will become more productive (e.g., increased Mg C ha<sup>-1</sup> yr<sup>-1</sup>) in the face of global warming or if temperature-induced drought stress will hamper the ability of trees to photosynthesize and store carbon.

My program elements below are linked in so far as they all seek to unravel limiting factors on forest growth whether to better understand paleoclimatology through bristlecone pine growth or the interactions between arctic carbon cycling and forest productivity (see pages 6 and 7 for further detail on each element). I actively develop new software tools to answer these questions (see Dendrochronology Program Library in R below).

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### **A. Current Program (alphabetical)**

**Boreal Greening:** I have a *NSF-funded* project studying ‘greening’ and ‘browning’ trends in northern high latitude boreal forests. This project includes *undergraduate and graduate researchers*. This work seeks to describe how various species of boreal forest trees are responding to climate through a combination of field and space-based measurements. Part of this research includes describing declining tree growth in the presence of increasing temperatures. I am currently supporting one graduate student on a GRA with this grant and I funded three undergraduate researchers full time over the summer for field work and independent research projects. I was invited to discuss this research at a special session at

the 2007 American Geophysical Union and as part of a panel discussion at the First American Dendrochronology Conference in Vancouver, British Columbia in 2008. I was invited as an AGU speaker again in 2009 in a session on mountain and arctic environments. This work has produced three peer-reviewed publications to date including a 2007 cover story in *Eos* – a high profile publication of the American Geophysical Union reaching more than 50,000 geoscientists worldwide. I am one of the Principal Investigators on this collaborative project.

**Bristlecone Pine:** I am studying the dendroclimatology of ancient Bristlecone Pine at high elevations throughout the intermountain west in a *NSF-funded* project that includes *undergraduate and graduate researchers*. My role in this project is to bring the tools of landscape ecology to bear on unmixing the confounding factors of temperature and precipitation (via soil moisture) in controlling bristlecone pine growth. I have been working closely with collaborators at the University of Arizona's Tree Ring Lab on this project. I have given several presentations on this research in the past three years and was a co-author with Malcolm Hughes and Matt Salzer (Laboratory of Tree-Ring Research) on a paper in the Proceedings of the National Academy of Sciences. I am one of the Principal Investigators on this collaborative project.

**Dendrochronology Program Library in R (dplR):** I have developed a software library to perform standard tree-ring analyses. The dplR package is an add-on library in the R statistical programming environment. R and its packages are completely free to use licensed under the GNU Public License. I developed this library to update the software typically used by dendrochronologists. My software library is described in a 2008 paper in *Dendrochronologia* and is being widely used in the tree-ring research community. Development of the package is ongoing with *four active co-developers from three countries*. I recently completed a variety of new functions for the package based on input from the research community. This resulted in another paper (in press) highlighting new functions to visually and statistically crossdate samples. The source code is available online: <http://cran.r-project.org/web/packages/dplR/> .

**Eurasian Forest Growth and Climate:** This *NASA-funded* project seeks to understand the

response of forest growth to climate variability across European Russia in terms of remotely sensed spectral vegetation indices, production efficiency models, and *in-situ* data from micrometeorological tower sites that use eddy covariance measurements. This work is funded for the next three years and is just getting underway with collaborators from the University of

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Arizona. I am named as senior personnel in this project under Malcolm Hughes at the Laboratory of Tree-Ring Research.

**The Polaris Project:** This *NSF-funded* project synthesizes arctic research and education and is structured around *undergraduate research*. *The Polaris Project* is a collaborative effort by several universities and the Woods Hole Research Center. The project includes a field course and research experience for undergraduate students in the Siberian Arctic. I have taken four Environmental Science undergraduates and one graduate student to Russia to conduct research on carbon cycling (see inset page 5, left). The students involved in the Polaris Project receive travel money and stipends and do primary research in one of the most beautiful and remote places in the world. I developed and continue to maintain the project website at <http://www.thepolarisproject.org>. On the website, there is extensive information on the scientific research and cultural experiences from the program. This project is ongoing and I plan on returning with more students. Undergraduate student Tyler Llewellyn presented initial results from his research at the American Geophysical Union fall meeting in December 2008. Undergraduates Max Janicek and Kayla Henson are working on Polaris data and writing senior theses under my advising this year. The Polaris Project, including an audio slideshow that I narrated, was featured in the New York Times. I am one of the Principal Investigators on this collaborative project.

## **ANDY G. BUNN**

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Bellingham, WA 98229

Phone: 360-733-3515

Email: andy.bunn@gmail.com

Web: myweb.facstaff.wwu.edu/bunna/

## **Appointments**

**Assistant Professor, 2006 to present** Department of Environmental Sciences

Western Washington University

Bellingham, WA

**Post-Doctoral Fellow, 2004-2006** Woods Hole Research Center, Woods Hole, MA

## **Education**

**PhD, Environmental Science, 2004** Montana State University, Bozeman, MT

*Advisor:* Lisa J. Graumlich

*Dissertation Title:* Temporal and spatial patterns at alpine treeline in the Sierra Nevada USA:

Implications for global change

**MEM, Resource Ecology, 2000** Duke University, Durham, NC

*Advisor:* Dean L. Urban

*Masters Project Title:* Landscape connectivity using graph theory

**BS, Zoology, 1996** The Evergreen State College, Olympia, WA

*Advisor:* Steven G. Herman

## **Research Experience**

**Assistant Professor** Huxley College, Western Washington University

September 2006 to present

Develop and maintain an externally funded research program in global change; research projects include terrestrial carbon cycling, ecosystem response to climate variability, and paleoclimatology; advise graduate and undergraduate students on independent research projects; research, analyze, and prepare publications; develop research proposals for funding.

**Post-Doctoral Fellow** Woods Hole Research Center, Woods Hole, MA

September 2004 to July 2006

Developed statistical and process models of boreal forest dynamics in relation to climate and disturbance especially in regards to carbon cycling; investigated the links between forest demography and biogeochemistry using models and field data; researched, analyzed, and prepared publications; developed research proposals for funding.

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**Graduate Research Assistant and** Montana State University, Bozeman, MT

**Canon National Park Science Scholar** May 2000 to July 2004

Investigated and modeled subalpine forest dynamics, especially foxtail pine (*Pinus balfouriana*), and their relationship to climate through the last millennia and across spatial scales from trees to bioregions; developed GIS and remote sensing applications for robust field sampling; researched, analyzed, and prepared publications; developed research proposals for funding.

**Stanback Conservation Intern** Duke University, Durham, NC

May to August 1999

Examined ecological connectivity in terrestrial and marine ecosystems using graph theory; modeled habitat dispersal for American mink (*Mustela vison*) and prothonotary warblers (*Protonotaria citrea*) using least-cost path algorithms; wrote code in Arc Macro Language, Avenue, and Fortran; wrote and submitted manuscripts for publication.

**Research Intern** Seabird Restoration Program, National Audubon Society, Bremen, ME

April to August 1997

Participated in an ongoing research effort involving North Atlantic seabirds in the Gulf of Maine; conducted provisioning and growth studies for arctic tern (*Sterna paradisaea*), common tern (*S. hirundo*), and roseate tern (*S. dougallii*); conducted monitoring and breeding surveys for Atlantic puffins (*Fratercula arctica*); conducted studies in nest site fidelity for Leach's storm-petrel (*Oceanodroma leucorhoa*); assisted in studies involving the social attraction of common murrelets (*Uria aalge*), razorbills (*Alca torda*), and common terns (*S. hirundo*); banded terns, puffins, and petrels; controlled predators; lived for extended periods on remote seabird colonies.

**Research Intern** Hawk Mountain Sanctuary, Kempton, PA

August to December 1994

Conducted a research project investigating temporal effects on behavior and number of nonbreeding

raptors; conducted road surveys; collected and analyzed data; wrote and submitted manuscript for publication; participated in official migration monitoring efforts; assisted at a raptor banding station; designed displays and publications; led in interpretive programs for visitors.

**Volunteer Biologist** US Fish and Wildlife Service,

Hart Mountain National Antelope Refuge, OR

May to August 1993

Participated in study of breeding birds in eastern Oregon and northern Nevada: identified passerine species by sight and vocalization, banded birds, and sampled vegetation; assisted in evaluation of cavity nesting requirements for American kestrels (*Falco sparverius*), mountain bluebirds (*Sialia currucoides*), house wrens (*Troglodytes aedon*), tree swallows (*Tachycineta bicolor*), European starlings (*Sturnus vulgaris*), and red-naped sapsuckers (*Sphyrapicus nuchalis*); conducted surveys for sage grouse (*Centrocercus urophasianus*).

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## Teaching Experience

**Assistant Professor** Western Washington University

2006-present

Teach upper-division classes in the Department of Environmental Sciences; full class design including developing student learning outcomes, preparation of course materials, student assessment, etc.; in addition to various seminar classes, courses include ESCI 329 Energy and the Environment (Spring 2008, Winter 2009, 2010), ESCI 392 Introduction to Global Change (Fall 2007, 2008, 2009), ESCI 423/523 Past Environments of the Pacific Northwest (Spring 2007, 2008, 2010), ESCI 492/592 Climate Change (Winter 2007, 2008, 2009, 2010), ESCI 497 Applications in Energy Production (Spring 2009).

**Trainer/Mentor** Woods Hole Research Center

2004-2006

Trained and mentored research assistants, research associates, and interns in research and educational activities related to the WHRC; provided programming and statistical assistance; assisted in preparation of manuscripts and other publication materials.

**Instructor** Woods Hole Research Center

Content Institute on Climate Change July 2005

Participated in a weeklong training for Massachusetts teachers; assisted in developing class; developed lecture and workshop material; followed-up with participants.

**Teaching Assistant** Montana State University

Remote Sensing and Image Processing Fall 2001

Gave lectures and ran laboratories in an introductory remote sensing class; graded papers, homework assignments and lab reports; held office hours; tutored students.

## Publications

**Bunn, A.G.** 2010. Statistical and visual crossdating in R using the dplR library.

Dendrochronologia. In press.

Salzer, M.W., M.K. Hughes, **A.G. Bunn**, and K.F. Kipfmüller. 2009. Recent unprecedented tree-ring growth in bristlecone pine at the highest elevations and possible causes. *Proceedings of the National Academy of Sciences*. doi:10.1073/pnas.0903029106.

**Bunn, A.G.** 2009. The rock and ice problem in national parks: an opportunity for monitoring climate change impacts. *Park Science* 26 17-21.

**Bunn, A.G.** 2008. A dendrochronology program library in R (dplR). *Dendrochronologia*, 26: 115-124.

Malanson, G.P., D.R. Butler, D.B. Fagre, S.J. Walsh, D.F. Tomback, L.D. Daniels, L.M. Resler, W.K. Smith, D.J. Weiss, D.L. Peterson, **A.G. Bunn**, C.A. Hiemstra, D. Liptzin, P.S.

Bourgeron, Z. Shen, and C.I. Millar. 2007. Alpine treeline of western North America: Linking organism-to-landscape dynamics. *Physical Geography* 28, 378–396.

Houghton, R.A., D. Butman, **A.G. Bunn**, O.N. Krankina, P. Schlesinger, T.A. Stone. 2007. Mapping Russian forest biomass with data from satellites and forest inventories.

*Environmental Research Letters* 2, 045032 (7pp): doi:10.1088/1748-9326/2/4/045032.

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Lloyd, A.H. and **A.G. Bunn**. 2007. Responses of the circumpolar boreal forest to 20th century climate variability. *Environmental Research Letters* 2, 045013 (13pp): doi:10.1088/1748-9326/2/4/045013.

Schrag, A.M., **A.G. Bunn**, and L.J. Graumlich. 2007. Influence of bioclimatic variables on treeline conifer distribution in the Greater Yellowstone Ecosystem: implications for species of special concern. *Journal of Biogeography* doi:10.1111/j.1365-2699.2007.01815.x.

**Bunn, A.G.**, S.J. Goetz, J.S. Kimball, and K. Zhang. 2007. Northern high latitude ecosystems respond to recent climate change. *Eos* 88:333-335.

**Bunn, A.G.** and S.J. Goetz. 2006. Trends in satellite observed circumpolar photosynthetic activity from 1982-2003: The influence of seasonality, cover type and vegetation density. *Earth Interactions* 10:1-19.

Goetz, S.J., G.J., Fiske, and **A.G. Bunn**. 2006. Using satellite time-series data sets to analyze fire disturbance and recovery in the Canadian boreal forest. *Remote Sensing of Environment* 101:352-365.

Zambon, M., R.L. Lawrence, **A.G. Bunn**, and S. Powell. 2006. Effect of alternative splitting rules on image processing using classification tree analysis. *Photogrammetric Engineering & Remote Sensing* 72 (1): 25-30.

**Bunn, A.G.**, S.J. Goetz, and G.J. Fiske. 2005. Observed and predicted responses of plant growth to climate across Canada. *Geophysical Research Letters* 32:L16710.

Goetz, S.J., **A.G. Bunn**, and G.J. Fiske. 2005. Satellite observed photosynthetic trends across boreal North America associated with climate and fire disturbance. *Proceedings of the National Academy of Sciences* 103(38): 13521-13525.

**Bunn, A.G.**, L.J. Graumlich, and D.L. Urban. 2005. Interpreting the climatic significance of trends in twentieth-century tree growth at high elevations. *The Holocene* 15(4): 481-488.

Graumlich, L.G., Waggoner, L.A., and **A.G. Bunn**, 2005. Detecting change at alpine treeline: coupling paleoecology with contemporary studies. In *Global Change and Mountain Regions: An Overview of Current Knowledge. Series: Advances in Global Change Research, Vol. 23* (ed. by U. Huber, H. Bugmann, and M. Reasoner), pp 405-412. Springer, Dordrecht, the Netherlands. ISBN: 1-4020-3506-3, 650 p.

**Bunn, A.G.**, L.A. Waggoner, and L.J. Graumlich. 2005. Topographic mediation of growth in high elevation foxtail pine (*Pinus balfouriana* Grev. et Balf.) forests in Sierra Nevada, USA. *Global Ecology and Biogeography* 14: 103-114.

**Bunn, A.G.**, T.J. Sharac, and L.J. Graumlich. 2004. Using a simulation model to compare methods of tree-ring detrending and to investigate the detectability of low-frequency

signals. *Journal of Tree-Ring Research* 60(2): 77-90.

Lawrence, R.L., **A.G. Bunn**, S. Powell, and M. Zambon. 2004. Classification of remotely sensed imagery using stochastic gradient boosting as a refinement of classification tree analysis. *Remote Sensing of Environment* 90:331-336.

**Bunn, A. G.**, R.L. Lawrence, G.J. Bellante, L.A. Waggoner, and L.J. Graumlich. 2003. Spatial variation in distribution and growth patterns of old growth strip-bark pines. *Arctic, Antarctic and Alpine Research* 35:323-330.

**Bunn A.G.**, D.L. Urban, and T. Keitt. 2000. Landscape connectivity: a conservation application of graph theory. *Journal of Environmental Management* 59: 265-278.

**Bunn A.G.**, W. Klien, and K.L. Bildstein. 1995. Time-of-day effects on the numbers and behavior of non-breeding raptors in Eastern Pennsylvania. *Journal of Field Ornithology*, 66(4): 544-552.

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## Grants

**NASA**, Land Cover/Land Use Change, Response of forest growth to climate variability and change: remotely-sensed and in situ data for European Russia, Award 08-LCLUC08-1-0043 (Subcontract to WWU through the University of Arizona)

**Western Washington University**, Faculty Development Committee, Renewable Energy: Science Policy and Technology

**National Science Foundation**, Office of Polar Programs/Division of Arctic Sciences/Course, Curriculum and Laboratory Improvement/International Polar Year, The Polaris project: rising stars in the Arctic, 2008-2010, Award 0732477

**National Science Foundation**, Arctic System Science, Past, present and future productivity of arctic woody vegetation in a warming climate, 2006-2009, Award 0612341

**National Science Foundation**, Paleoclimate, A geospatial approach to dendro-climatology of multi-millennial bristlecone pine, 2006-2009, Award 0629172

**U. S. Geological Survey**, The role of demography in forest carbon dynamics, 2005-2006, Cooperative Agreement 05WRAG0015

**Canon National Parks Science Scholarship**, Forecasting global climate change at alpine treeline: integration across space and time, 2001-2004

**Montana Space Grant Consortium**, Assessing sensitivity of alpine treeline, 2001-2002

## Selected Presentations

Expectations and reality for high latitude versus high elevation global change. Fall meeting of the American Geophysical Union. San Francisco, California (Eos Trans. AGU, 90(52), Fall Meet. Suppl., Abstract B32A-01). December 2009. Invited.

The Polaris Project: a barge, twenty bunks, and a river at the top of the world. Center for International Studies, Western Washington University. Bellingham, Washington. October 2009.

What Occam's razor teaches me about climate change. CarbonMasters. Washington State University Extension, Bellingham, Washington. April 2009

Occam's razor and climate. Nobel Peace Prize Forum. St. Olaf College, Northfield, Minnesota. March 2009

A spatial analysis of bristlecone pine growth: Implications for paleoclimatology. Climate Impacts Group Weekly Seminar. Climate Impacts Group, University of Washington. Seattle, Washington. January 2009.

Ancient bristlecone pine growth in the White Mountains of California: A spatial analysis. Climate, Ecosystems and Resources in Eastern California. Bishop, California. November 2008.

Invited talk.

Global change in the northern high latitudes. Ecology, Evolution and Conservation Biology Fall Colloquium, University of Nevada. Reno, Nevada. October 2008.

The Polaris Project: Undergraduate research in the Siberian Arctic. Huxley Seminar, Western Washington University. Bellingham, Washington. October 2008.

Divergence issue panel discussion. American Dendrochronology Conference. Vancouver, British Columbia, Canada. June 2008. Invited.

California's ancient bristlecone pines. Alumni Seminar, Western Washington University Alumni Association. San Francisco, California. June 2008.

Biotic response of the northern high latitudes to climate change. Biology Seminar, Western Washington University. Bellingham, Washington. February 2008.

Whither dendroclimatology? Fall meeting of the American Geophysical Union. San Francisco, California (Eos Trans. AGU, 88(52), Fall Meet. Suppl., Abstract PP54A-01). December 2007. Invited.

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An overview of climate change in the high latitudes. Presidio of San Francisco, National Park Service. San Francisco, California. December 2007.

A geospatial approach to dendroclimatology. Geology Seminar, Western Washington University. Bellingham, Washington. May 2007.

Northern high latitude ecosystems respond to climate variability. Earth and Space Sciences Seminar, University of Washington. Seattle, Washington. April 2007.

Associations between tree growth, NDVI, and climate in boreal forests. Fall meeting of the American Geophysical Union. San Francisco, California (Eos Trans. AGU, 87(52), Fall Meet. Suppl., Abstract B24A-02). December 2006.

Space-based photosynthetic trends in high latitude mountains: Greening or browning? MTNCLIM 2006, Mt. Hood, Oregon, September 2006. Invited.

High latitude global change: Coupling paleoecology, contemporary studies, and modelling. Acadia University, Wolfville, Nova Scotia, Canada. January 2006.

Are the high latitudes greening or browning? Evidence for nonlinear responses in tree growth and the satellite record. Fall meeting of the American Geophysical Union. San Francisco, California (Eos Trans. AGU, 87(52), Fall Meet. Suppl., Abstract B42A-03). December 2005.

Photosynthetic trends in the high latitudes: Is the boreal forest greening or browning? Botany Seminar, University of Wyoming. Laramie, Wyoming. December 2005.

Backpacking for science: Undergraduate-led research in Sequoia National Park. Biology Seminar, Middlebury College. Middlebury, Vermont. April 2005.

Mountain carbonsheds. Woods Hole Research Center Ecopresentation. Woods Hole, MA. May 2004.

Global warming in the Gallatin Valley and beyond. The Northern Rockies Bioneers Conference. Bozeman, Montana. October 2003.

A decade Sierran treeline research. Sierra Nevada and Western Mountain Global Change Workshop. Sequoia National Park, California. March 2003.

Merging time and space: Variability in tree-ring widths and the physical template. Annual meeting of the International Association of Landscape Ecologists. Banff, Alberta, Canada. April 2003.

Global change in alpine environments. Museum of the Rockies. Bozeman, MT. March 2003. Comparison of topographic correction algorithms for use with Landsat ETM+ in mountainous landscapes. ACSM-ASPRS Conference and Technology Exhibition. Washington, DC. April 2002.

Interpreting the climatic significance of trends in twentieth-century tree growth at high elevations. Fall meeting of the American Geophysical Union. San Francisco, California. December 2001 (Eos Trans. AGU, 82(47), Fall Meet. Supplement, Abstract GC22B-01, 2001).



A multivariate analysis of tree growth at high elevations. Annual meeting of the Ecological Society of America. Madison, Wisconsin. August 2001.

Variability in the physical and biotic templates of alpine treeline. Annual meeting of the International Association of Landscape Ecologists. Tempe, Arizona. April 2001.

Landscape connectivity: A conservation application of graph theory. Fourth International Conference on GIS and Environmental Modeling. Banff, Alberta, Canada. September 2000.

Using GIS to compute a least-cost distance matrix: A comparison of terrestrial and marine ecological applications. Annual meeting of the Society for Conservation GIS. Borego Springs, California. June 2000. Invited.

Conservation and metapopulation applications of graph theory. Annual meeting of the International Association of Landscape Ecologists. Ft. Lauderdale, Florida. April 2000.