



International Field Work in NRCM

“Using International Remote Sensing Fieldwork to Improve Regional Natural Resource Management” is a project coordinated by Dr. Joni Bugden (NRCM). The project goals are: (1) to increase the international content of courses offered in the NRCM program, and (2) to conduct collaborative research using remote sensing data for natural and agricultural resources. Twelve RADARSAT-2 images will be acquired; 6 in Argentina and 4 in Brazil, and 2 images in Cullowhee, NC.

In this project, NRCM seeks to enhance its international collaborative research capability by developing projects and on-going relationship with international agencies such as the University of San Juan center for cartography, photogrammetry and cadastral (CEFOCCA) in Argentina and the National Institute for Space Research (INPE) in Brazil. This effort builds upon a ten-year working relationship between the Dr. Joni Bugden and Dr. Graciela Salmuni, a geologist at CONAE, the space agency of Argentina. In the previous project, the researchers used first-generation radar satellite data to map vine lands impacted by salinization. The work with Dr. Luciano Dutra, from the Image Processing Division of INPE, is a new collaboration.

Deliverables of the project are land-use/land-cover maps for three different biomes (temperate deciduous forest, tropical forest and semi-arid desert), using polarimetric radar data. In WNC, the data will be used to (a) map deciduous forest species composition and (b) map impervious surfaces. In Brazil, INPE is mapping illegal clearing

of tropical forest in the Tapajos National Park in the Amazon.

The semi-arid biome is in the Tulum Valley of Argentina. In March 2009, nine GNR students and two faculty members (Dr. Joni Bugden and Dr. Christopher Storie, Winthrop University, SC) participated in two workshops to teach polarimetric radar theory. One workshop was held in Buenos Aires, Argentina and the second in Sao Jose dos Campos, Brazil. The students assisted participants in the workshop on the use of Polsar-

moisture and canopy characteristics for wine grapes, olives, carrots, and alfalfa. The soil moisture will be used to understand the effect of salinization on radar return. Salinization occurs naturally because the phreatic level is close to the surface. This, along with high evaporation rates in a semi-arid environment, caused 65,000 hectares of San Juan province to be affected by salinization. Cultivars and canopy characteristics were also collected to monitor the amount of agricultural land lost to urban



NRCM and Geology students resting after a hard day of field work (Argentina, 2009).

Pro4.0, a freeware software, and aided with analyzing the radar data.

In addition to the workshops, we also participated in field data collection in San Juan, Argentina (north of Mendoza east of the Andes Mountains). We were involved in the planning and collection of soil

sprawl.

Now that we are back in Cullowhee, the students are working on mapping projects using radar data in the Advance Remote Sensing class.

The field work was funded through a USDA CSREES grant (\$99,614) and data funded through a grant from the Canadian Space Agency SOAR program (\$50,000).

NRCM Website

<http://www.wcu.edu/9558.asp>

Alumni Profile: Sharon Taylor (Class of 1996)

Sharon Taylor is the Land Protection and Deputy Director for the Land Trust for the Little Tennessee. Sharon graduated in 1996 with a concentration in water resources.

After graduating from WCU, Sharon went to work at Coweeta Hydrologic Laboratory as a research technician. Coweeta is a federal watershed research facility located in Macon County, North Carolina where Sharon worked as a co-op student and intern while attending WCU. In early 2001, she left Coweeta to become the third staff person of the Land Trust for the Little Tennessee (LTLT). LTLT's mission is to work with landowners on a voluntary basis to conserve the waters, forests, farms and heritage of the upper Little Tennessee and Hiwassee River valleys. The Land

Trust now has seven fulltime people on staff and has either directly conserved or partnered to conserve over 19,000 acres in western North Carolina.

As Land Protection Director, Sharon spends most of her time coordinating land protection projects. A typical day might include sitting around a landowner's kitchen table explaining the options for permanent conservation of their family land, drafting language for a conservation easement, or writing a grant for project funding. Other activities include speaking to community groups or seeking support from an elected official for public funding for conservation, such as for NC's Clean Water Management Trust Fund. "It's a challenging

job" Sharon says, "but my background in Natural Resource Management from WCU prepared me for not only the technical work at Coweeta but also for the broader work of natural resource conservation."

Chief Michell Hicks of the Eastern Band of Cherokee Indians (right) presents gift to LTLT's Sharon Taylor (left), Kate Parkerson, and Paul Carlson at an event celebrating the permanent conservation of the Cowee Mound, site the historic town of Cowee, the chief diplomatic and commercial hub of the mountain Cherokee in the 17th and 18th centuries.



Experience Exceeded Expectations *Street Hamrick*

Street Hamrick is a NRCM junior (Landscape Analysis) from Shelby, NC.

The invitation to travel to South America with the NRCM program seemed too good to be true. I was thrilled at the idea of traveling to a foreign country and international field experience directly within my major. Despite my excitement and high expectations for the trip, I knew little of what I was in for!

Somehow along the way I believed that the whole world speaks English. I quickly learned that this is not the case, and that I would have to rely on the little Spanish I could recall from high school. I found my "spanglish" went along way. One day in Buenos Aires I ordered roast lion and a Heineken because it was all I could recognize on the menu. Pointing and smiling turned out to be the best tactic in ordering food.

Buenos Aires is a large port city full of hustle and bustle similar to large cities found in America. Buenos Aires had lots of cobble stone streets that were full of motorbikes and late model compact cars. The social classes within the city varied from the very rich with nice cars and high fashion clothing stores to slums full of makeshift houses.

When we arrived in San Juan, a much smaller city, I rode solo in a taxi from the airport to our hotel. The driver was very friendly and eager to make conversation, but spoke absolutely no English. I tried hard to

pretend I knew what he was asking. When I told him I was from North Carolina, he responded, "ahh baskiitball"! The driver promptly gave me a lesson in South American driving edict, as we shoved slower drivers to the shoulder to pass inches away from oncoming traffic. Matters didn't improve once we made it into the city where stoplights and signs were non-existent. As I white knuckled the door handle, the driver didn't seem to notice his seatbelt dangling by his left shoulder.

Our project in radar remote sensing gave us the opportunity to learn about local agriculture as well as make friends with students from San Juan University. The students were extremely friendly, including us in their night life activities, a trip to the lake, and a hiking trip into the mountains one afternoon. Their eagerness to show us a good time really made the trip for me, and allowed us to get a taste of San Juan's true culture.

San Juan is located in a valley, east of the Andes Mountains. One day we rented a tour bus to drive to see Aconcagua, the highest peak in the western hemisphere at 21,000 feet. We hesitated with the trip because it was roughly a 12 hour round trip, but decided to go for it. The trip proved to be well worth

the drive allowing us to view the spectacular, rugged Andes Mountain range.

We ended in San Jose De Compos, Brazil for 3 full days at the end of our trip. We spent our time there at the Brazilian space agency giving a seminar on using polarimetric radar to detect illegal clearing of tropical forests in the Amazon. We also heard lectures on using interferometry and Lidar to make digital elevation maps. The last night of our trip the graduate students from the space agency put on a cookout that was so much fun! There was never a dull day in South America; almost every experience exceeded my expectations.

WCU Students at the highest peak in the western hemisphere (Aconcagua, 21,000 ft).



Artificial Wetland *Brian Kloeppe*

Current changes in global temperature and precipitation are altering the carbon accumulation in our ecosystems including an increase of carbon dioxide to our atmosphere. Natural resource managers are looking for ways to increase the accumulation of carbon in our forests and wetlands. Regional impacts including the mortality of eastern hemlock due to the hemlock woolly adelgid have resulted in reduced accumulation of carbon in these forests. Resource managers are promot-

ing the use of artificially constructed wetlands to trap surface water runoff, the sediments that runoff contains, and the litter that decomposes in the wetlands. We are initiating a pilot study at the Cullowhee Sports Complex to quantify the accumulation of carbon in and the flux of carbon dioxide out of the artificially constructed wetlands. This will be the senior research project of Lee Sorrell and will be mentored by Brian Kloeppe in the NRCM program and Ben Tanner in the Geosciences program.



Artificially constructed wetland at the Cullowhee Sports Complex

GNR Student Awards and Honors

Staci Mellon is a NRCM senior (Landscape Analysis) from Frederick, MD.

Staci received three awards: a GNR department award, an Honor's College award and a Herbert Stout NCGIA award for her work on "Understanding Canopy Characteristics for Mapping Deciduous Forest Land in Jackson County, NC" which she presented at NC GIS 2009 (Raleigh) and at an international workshop in Buenos Aires, Argentina.

Lee Sorrell is a Geology junior from Wake County, NC

Lee Sorrell has been awarded a \$2000 grant from the Institute of Watershed Research and Management at Western Carolina University. He will be studying carbon sequestration in constructed storm water wetlands in Jackson County, North Carolina. Lee will be working with Brian Kloeppe in the NRCM program to study carbon efflux from the wetland and with Ben Tanner in the Geosciences program to study carbon accumulation.

Ryan Sparks is a NRCM senior (Forest Resources) from Guilford County, NC

Congratulations to Ryan Sparks who was awarded a \$1510 research grant from WCU's Institute for Watershed Research and Management. Ryan's research proposal is entitled "Estimating Sedimentation Rates on Forested Watersheds in Western North Carolina over the life of a Forest Stand". He will work with Dr. Bates on the Waynesville watershed in the spring/summer of 2009 to determine the natural sedimentation rates of streams in the watershed. This data will serve as the basic reference conditions for comparison of the sedimentation impacts of forest management treatments.

Surreal Experience *Andrew Lawson*

Andrew Lawson is a NRCM sophomore (Landscape Analysis) from Stokes County, NC.



San Juan River, Tulum Valley, Argentina

Going to South America for Spring Break 2009 to do research in the Tulum Valley, San Juan Argentina, and conferences in Buenos Aires and Sao

Jose Dos Campos, Brazil was quite an experience that was enriching in both education and cultural knowledge. Being immersed in such a rich culture in Argentina and Brazil for two weeks was an experience none of us will soon forget.

I believe that stepping "out of the classroom" is such a great way to expand the knowledge of your studies, as well as the way you view the world as a college student. Having only seen the Appalachian Mountains before, I can still imagine myself standing at the base of the Andes in awe. Being in such a different ecosystem than I am accustomed to, in an area of such excellence and beauty, was definitely the highlight of my trip. The people we met in San Juan, Argentina still bring a smile to my face, and being in contact via email with them now, after the trip, reassures the hospitality and kindness they shared with us. The interactions with

people from another part of the world that do the same things we do, here in Stillwell on the campus of Western Carolina University, is a surreal experience that allows us to see what we're learning now effects the world.



WCU and UNSJ students hiking in San Juan, Argentina



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Conservation interns work with local land trust to restore river bluff forest

On the Friday before spring break, 5 NRCM Conservation Interns (CI's) spent a soggy day working with staff from the Land Trust for the Little Tennessee (LTLT) to help restore a white oak/yellow pine forest along the banks of the Little Tennessee River in Macon County. LTLT acquired this property, known as Gibson Bottoms, as part of their ongoing mission to protect the Little Tennessee river corridor.

The tract contains a degraded forest on the bluff above the river, and in 2008, LTLT contracted with Forest Stewards, Inc. – the forestry non-profit affiliated with WCU – to design and implement a forest restoration plan for this stand. That plan consisted of carefully harvesting the Virginia pine and white pine that had invaded the stand in order to release the white oak and yellow pine that were present. The harvest would also allow more sunlight to reach the forest floor, and stimulate the growth of native forbs and

grasses present in the duff.

The harvest was completed in January, and the CI's came in to apply the finishing touches. They lopped slash and other residues left over from the logging so that it would lie close to the ground and decompose faster (Fig. 1). They also piled and burned slash in areas that would be bushhogged in order to maintain open patches of native forbs and grasses (Figs. 2 and 3). The Land Trust staff were impressed by the dedicated effort demonstrated by these students, and the interns very much enjoyed the opportunity actively participate in such an important conservation project.



NRCM Conservation Interns (from L to R) Kyle Underwood, Jeff White, Ken Walton, Darren Caudel, Laura Moses, and NRCM alum Weston Van Denabeele

NRCM Conservation Interns and staff from the Land Trust for the Little Tennessee burning logging residues to allow bush hogging at Gibson Bottoms



In Memoriam

Adam Corey Becker (NRM '04) was tragically killed in a hunting accident earlier this year. Adam was completing his MS in Forestry at Clemson University, and is survived by his wife Toni Chaney Becker (NRM '04) and infant daughter Ada of Walhalla, SC.