



JULY - SEPTEMBER 2016 REPORT

Executive Summary

- Western Research Fellows complete on-the-ground research on the high plains and begin UHPSI publication methods class back at Yale.
- Russian Olive mapping with Sheridan Land Trust delivered for landowner outreach process.
- Manuscript submissions and acceptances at major scientific journals
- New student research projects with private ranches, NGO's, academic institutions, and local governments
- Sagebrush mapping with the Nature Conservancy and University of MT

UHPSI Welcomes New Student Researchers and Staff!

With the hard work of new UHPSI staff members Nick Olson & Sabrina Szeto, we've been able to put together an impressive and diverse group of students this Fall semester. Our research assistants bring years of experience in conservation, agriculture, finance, ecology, and complex analysis.

UHPSI staff are currently working with students on projects with Sheridan College, the Boot Ranch, The Nature Conservancy, Trout Unlimited, National Young Farmers Coalition, The City of Billings, Northern Plains Resource Council, and the Pinchot Institute's Working Lands Project.

We're excited to highlight specific projects in our next quarterly report as we dive into research, writing, and analysis with our students.



Hannah is a second-year student at the Forestry School studying the intersection of land conservation and agricultural management. She spent the past summer working at the Hawaiian Islands Land Trust, where she fell in love with the magic of Maui. She will be working with TNC's Tensleep Preserve and Spear-O Mountain Campus, both in Wyoming's Bighorn Mountains, to develop background research, feasibility studies, and management plans for a few different multi-use collaborative research and recreation outposts. She's super excited to join the Ucross team!



Eve is a first-year MEM student, hailing most recently from beautiful Washington state, where she worked as the Land Stewardship Manager for an agricultural land trust with a mission to protect prime farmland from development. Eve will be bringing her knowledge of farmland access issues to UHPSI this fall, assisting the National Young Farmers Coalition with the development of a financial modeling tool for farmers looking for land.



Austin is an MEM student interested in watershed restoration, outdoor recreation economics and collaborative land conservation in the American West. He grew up in New Mexico and France, and comes to FES after working as a natural resource economist in Portland, Oregon. Austin is working with UHPSI to evaluate how, when, and where beaver dams and beaver dam analogues can benefit western ranchers and land managers.



Eli serves as the Experimental Grassland Coordinator at Yale's West Campus. He is helping to prepare for a management competition at an experimental grassland site taking place in the spring of 2017. Eli is currently a joint-MEM and African studies master's student expecting to graduate in 2019. Prior to coming to FES, Eli spent 4 years in West Africa doing agroforestry and agribusiness work. He is interested in international agricultural research and anthropology as a tool for supporting sustainable natural resource management.



Julia is a first year Master of Forestry student with a background in environmental sciences. She has worked assisting in community based forest projects such as land planning, restoration, sustainable forest management for timber and agroforestry foraging with local species from a non-profit and the national autonomous university of Mexico in different agrarian communities in Mexico in dry forest, temperate forest and mangrove ecosystems. Julia will be assisting the Northern Plains Resource Council and the City of Billings in designing an urban compost program this fall.



Sam is a first year MEd student at F&ES with research focused on the sagebrush steppe in Wyoming. His work will hopefully help land owners and managers make more informed decisions and be better stewards to the systems they live and work in. He comes from a forestry background, and has work experience in agriculture, non-profits, and land managing agencies. Sam will be helping UHPSI in ongoing efforts to bridge the geographic and communication gaps between the Yale community and stakeholders, leaders, and researchers on the high plains.



Elizabeth is a second-year MEM student from Austin, Texas, interested in large-scale conservation solutions with a focus on the Western U.S. Prior to coming to F&ES, she served as the Director of the Shield-Ayres Foundation, a family foundation supporting natural resource conservation, health and human services, and education and the arts in Central Texas. Elizabeth will be working with UHPSI to bring a diverse set of practitioners (ranchers, managers, conservationists) to New Haven to talk about Western land conservation issues, and will also be working with TNC on designing protocols for monitoring fence crossings by wildlife in Wyoming.



Luke is a second-year MEM student originally from western Massachusetts. He is interested in learning how spatial analysis and financial tools can be incorporated into successful land management for conservation gains in the west. Luke recently worked in Portland, Oregon, where he used geospatial software to estimate the landscape-level effects of industrial forest management regime shifts on the abundance and health of Pacific NW forest resources. Luke assists UHPSI with geospatial projects, and is currently working with Sabrina to map sagebrush abundance and sage-grouse habitat in western states.



Jeremy Menkhaus is a second-year MBA / MEM Candidate at FES and the School of Management. Prior to Yale, Jeremy worked as an Analyst in M&A advisory at Wells Fargo Securities and an Associate and Senior Associate in middle-market growth private equity at Brockway Moran & Partners. Jeremy is interested in how private sector investment can promote conservation and how ecosystem services markets can be utilized to deliver more widespread conservation finance products. Jeremy is working with the Pinchot Institute to design financial models that will increase and streamline revenue, while also assisting with estate transition for landowners in the American west.



UHPSI is excited to welcome Sabrina Szeto, MF, as our new Geospatial Analyst!

I'm excited to join the Ucross team this year and jump into the spatial work that Ucross has build a solid reputation for. As the new geospatial analyst, I'm currently working on mapping sagebrush distribution at a pilot site in Wyoming using Google Earth Engine, a cloud mapping platform. I'm at the very beginning of this project and am digging into the literature to learn more about techniques and case studies that we can draw from. I will also be working with the Western Research Fellows to create story maps of their summer research.

After graduating F&ES in May, I worked as an apprentice forester at the Yale-Myers Forest in northeast Connecticut. The 8,000+ acre property is managed by students under the guidance and instruction of Prof. Mark Ashton and Shannon Murray, the forest manager. I learned to use a chainsaw, estimate logs on the stump and how to select trees for harvest while balancing a set of values - economics, wildlife, future regeneration and more. I was the resident mapmaker

and got to share some of that knowledge with my fellow foresters. Drawing from this experience and my work at Ucross, I want to develop both bird's eye and ground up views of the landscapes we look to manage.

I am from Singapore and have also lived in western Norway for a few years. Living in communities that are from both ends of the rural-urban spectrum has given me a deep appreciation for both, so I think it is great to be living in New Haven, the goldilocks city, for another year. In my spare time, I enjoy hiking, contra dance and learning new languages. I also look forward to visiting the Ucross Ranch and getting my boots on the ground in the beautiful landscapes of Wyoming.



Geospatial Analyst Sabrina Szeto learning how to plunge cut out at the Yale Myer's Forest, Union, Connecticut



UHPSI is thrilled to welcome Nick Olson, MF, as our new Program Manager!

Nick was raised in Durango, Colorado and Birmingham, Alabama. He received a B.S. in Economics from Birmingham-Southern College where he focused on international trade of natural resources. His studies landed him in the Upper Amazon Basin, working with indigenous groups to build sustainable supply chains for forest products. Interested in how market-based solutions for conservation translated to the U.S., Nick served as a Land Protection Specialist with AmeriCorps in Massachusetts before starting his masters at Yale.

In May 2016, Nick completed his Masters of Forestry, during which he focused on Western land management and conservation of working lands. He immediately joined the Ucross team as a Program Manager.

With Ucross, Nick is facilitating student research projects, connecting with Western partners, and assisting with the new experimental grassland at the Yale Landscape Lab. Student research projects range from valuing ecosystem services provided by beavers to establishing monitoring plans for wildlife corridors to building financial tools for working lands landowners.

Outside of work, Nick can be found fishing, skiing, running trails with his dog - Penelope, hiking with his wife – Cass, or reading about Victorian explorers.



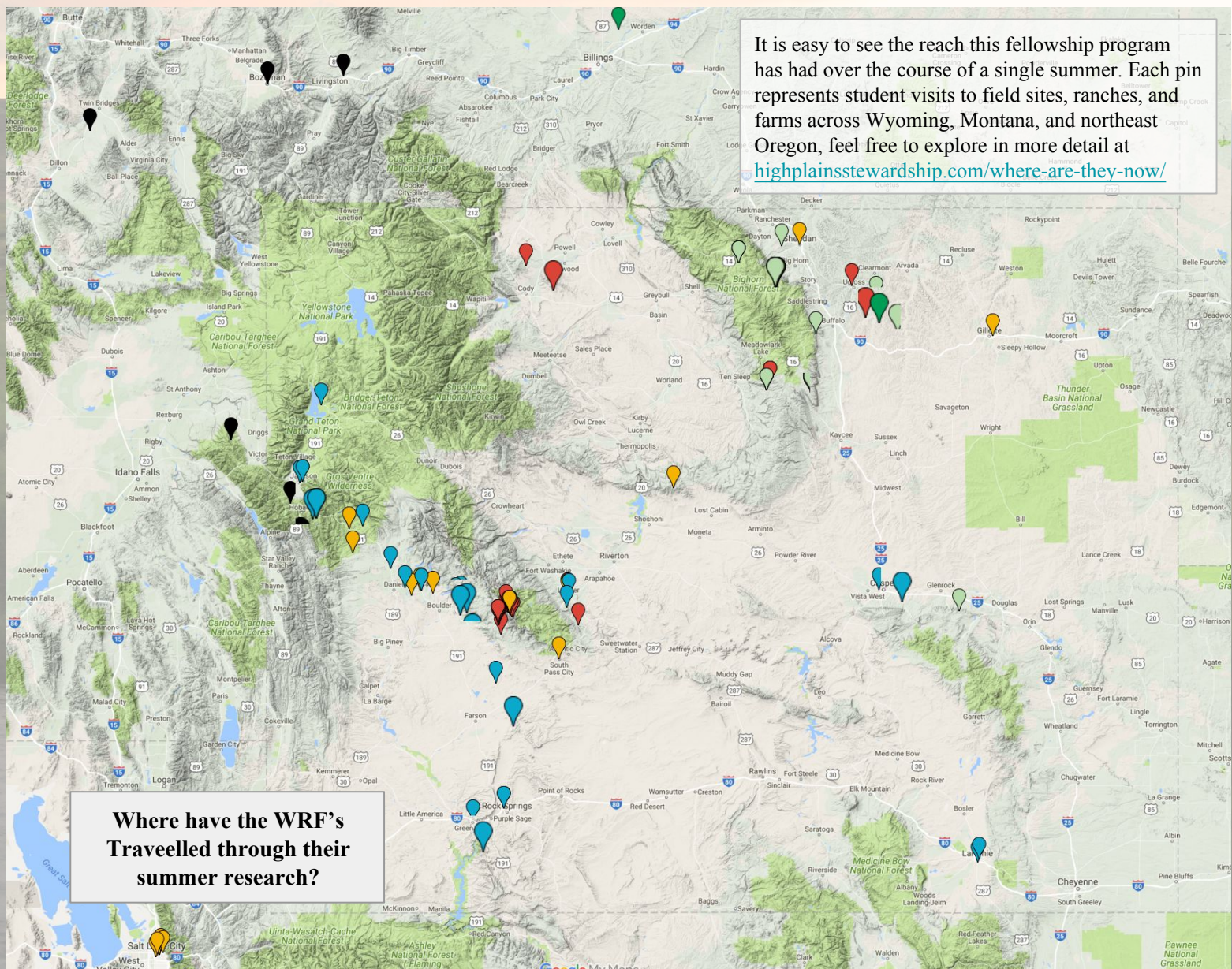
Program Manager Nick Olson elk hunting in his family's backyard - the San Juan Mountains, Colorado

2016 Western Research Fellows Return: Western Research Practicum Course Begins!

During the inaugural year of the Western Research Fellowship (WRF), UHPSI awarded summer fellowships to eight students -- six master's, one doctoral, and one undergraduate. Their research spans a broad array of management issues from water to soil to policy to finance. The WRF projects are, in fact, a wonderful reflection of the myriad issues facing land managers in the West today.

The Western Research Practicum working group provides our fellows with a forum for developing summer fieldwork in the American West into complete professional products. In addition to short lectures by Ucross staff (Kristofer Covey and Charlie Betigole) and outside experts, participants are paired with specialists in their research area who serve as project mentors. Each week a short lecture is followed by discussion, student presentations, and peer critiques. In addition to regular project deadlines, each student is building short interactive environmental case study designed to communicate their work to a popular audience, many using the ESRI Story Map platform. Regular peer feedback is a major component of the course and fellows are evaluated on the quality of their own work, as well as the reviews they provide. Early project drafts are already coming together and we're excited about where the fellow's work is bringing us!

Earlier in the semester, the Practicum visited with Ben Goldfarb, an environmental journalist focused on western issues, and Lisa Dale the associate director of the Yale Center for Environmental Law and Policy. In the coming months, we're looking forward to hosting Minna Brown (Yale F&ES Case Study Manager), Stuart Decew (Director of the Yale Center for Business and the Environment), Adrian Horoton (Partner at SaferMade), and Indy Burke (Dean of F&ES).



Updates from the Field - WRF 2016



Dan Kane (light green pins on the map) is working on developing tools to help land managers rapidly assess soil carbon on their properties - opening possibilities for enhanced ecological monitoring, and diversifying revenue streams by tying into carbon markets.

August 11th, 2016 -- Thirteen days and nearly 600 soil samples later, we're back from our last trip to Wyoming. The trip was a huge success! We started at Ten Sleep Preserve, where I left off earlier in July, taking three days there to sample an area of the preserve that is still grazed by cattle. I was struck again by how much soils there could vary over small distances! After work, we took the chance to see some of the beautiful scenery at the preserve, including an amazing sunset over the canyon that runs through it and a galloping herd of pronghorns we spooked while driving back to our tents (see the video on our website).

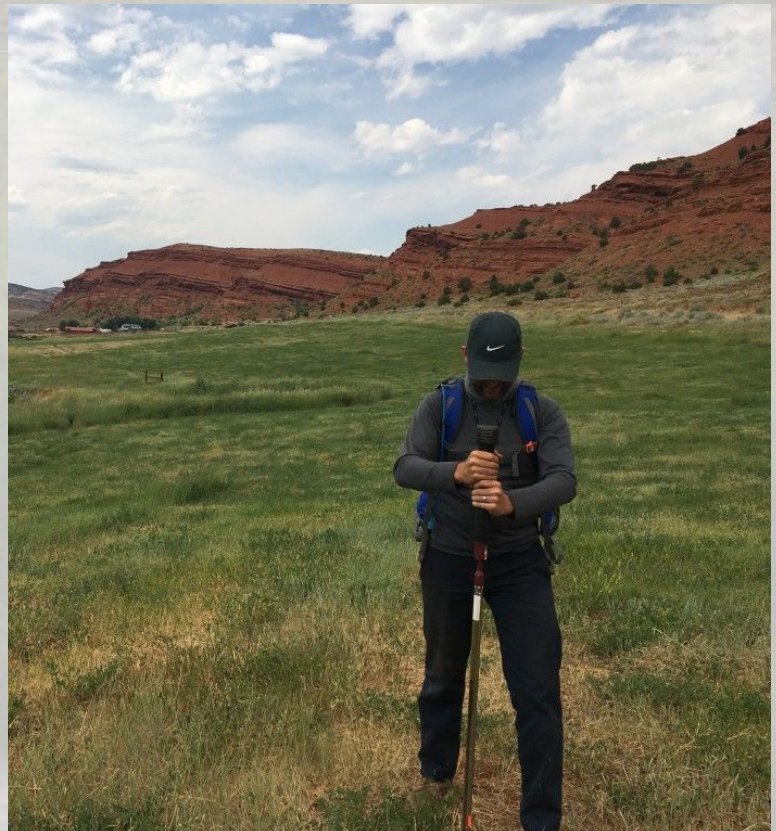
From there we went to Red Canyon Ranch, a 50,000-acre ranch at the foot of the Wind River Range managed by The Nature Conservancy. Through its center is a canyon carved out of Chugwater Formation, a red sandstone that erodes easily but generates deep, productive soils. TNC has started combining their herd with neighboring ranches and sharing acreage. This strategy allows them to graze at higher animal densities but for fewer days on each parcel, an approach that can improve soils and rangeland productivity. Red Canyon Ranch was, of course, far too large to sample in its entirety, so we focused on the canyon and some higher elevation pasture with completely different soils as a comparison.

After Red Canyon we headed to yet another TNC property, Heart Mountain Ranch Preserve. Located near Cody, WY, the ranch rises from flat sage brush rangeland with about 5 inches of annual precipitation to high mountain pasture with nearly 20 inches of annual precipitation. To a soil scientist, that means an amazing mix of soils to sample, and the views weren't bad either, even when we had to retreat to the truck to wait out a thunderstorm.

Finally, on our way back to Billings for our flight out, we took a few days to visit with ranchers working to improve their land through more strategic grazing and sample their soils. We even got the chance to go to a local watershed council meeting, a new experience for me. Listening to their observations and concerns gave me so much food for thought and a renewed sense of the importance of good management, especially as climate change threatens to change rangeland dynamics. I'll be excited to visit with these ranchers again in the future and see what data we can share with them.

Tired but grateful for an amazing trip, we flew home to CT. All that soil will certainly keep me busy this fall, but I'm excited to see what we'll learn from it.

Dan Kane samples soils at Red Canyon Ranch,
outside of Lander, WY





Jay Chancellor (black pins on the map) is working on developing tools to help land managers and property owners better understand the available resources for diversifying revenue streams on ranches and boosting operational income.

August 15th, 2016 -- As I wrap up my research with Beartooth Capital Partners in Bozeman, Montana, I want to take a moment to reflect on all of the incredible experiences and insights this summer has provided.

Beartooth operates with a small but efficient team of just seven people out of an office building in downtown Bozeman. The company invests in degraded ranches throughout the West, makes environmental improvements to the properties, and sells to good stewards of the land. One of the primary benefits of my working with Beartooth for the summer is the ability to visit a

number of these ranches and study the difference in management plans and value creation opportunities on these varied landscapes.

During my time with the company, I had the privilege of visiting (and fishing on!) four of Beartooth's ranches across Montana, Idaho, and Wyoming, as well as scouting several potential land acquisitions. While it may seem obvious that no two properties are the same, nothing drives this point home quite like actually getting out in the timber, hayfields, and streams. Some of the strategies I saw implemented include selective logging to promote forest health and improve elk habitat; restoration of spring creeks to revitalize wetlands and increase trout populations; and conversion of marginal ag land to food plots and native grasses to manage for whitetail and pheasant. While each property is unique, there are a number of ways to add value while simultaneously enhancing natural resources.

My biggest takeaway from this summer is that small changes can have an outsized impact in the aggregate. While Beartooth may only be making minor improvements on a handful of ranches, the fish, wildlife and habitat benefits that accrue from those changes would not otherwise have happened. Moreover, through cooperation with neighbors, landowners can reduce costs (e.g., for fencing) and have an even greater impact on fish and wildlife habitat.

Companies like Beartooth are lucky to have teams of professionals who can assess a wide range of properties and implement specialized management plans for each. However, the typical landowner generally does not have access to such resources. I hope that my research into new revenue streams such as species and habitat banking, lease of water rights, and renewable energy will prove useful to ranchers across the West, augmenting profits for the individual and producing greater conservation impacts on the whole.



Teton Timbers Ranch (ID), where selective logging has generated income while improving forest health and elk have now returned to this property for the first time in nearly a dozen years; note the majestic Tetons in the distance.



Fall 2016 Research Project Summaries

High Plains Partner Organization

Project Description

Boot Ranch

- We are working with rancher Shane Cross to enhance the profitability of his grass-finished beef enterprise on his family's 4th generation ranch. This includes market analysis, financial modeling, and site visits.

Curant Creek Ranch

- We are working with the property owner, the lessee, and Trout Unlimited to ensure that (despite the degraded nature of a riparian area on the Curant Creek Ranch) ranching & farming are able to remain as profitable enterprises on the property, ensuring the financial stability of all properties involved

National Young Farmers Coalition

- The National Young Farmers Coalition received funding through the USDA's Beginning Farmer and Rancher Development Program to build an interactive land affordability calculator. This tool will help young producers across the country navigate land access options, including leases, land trusts, farm loans, and land acquisition. UHPSI is assisting with the research and financial backbone to this tool.

Sheridan College & Spear-O

- We are assisting Sheridan College's Spear-O Mountain Campus with the research and design of a management/marketing plan. Spear-O - an historic ranch now serving as a center for research, education, and recreation - is located at 8,500 feet in the Bighorn Mountains of northern Wyoming, and is looking for a vision to maintain the profitability of this stellar educational facility.

City of Billings, Montana

- This is a collaborative project working with the City of Billings, local agricultural producers, and Northern Plains Resource Council. We will be assisting with researching successful city-wide composting programs in U.S. cities and identifying which programs may be replicable in Billings. We will then be designing a business plan for the city of Billings to create and operate a compost program that is either revenue neutral or makes profit for the city.

Working Lands Project - Pinchot Institute

- UHPSI is working on a study with the Pinchot Institute's Working Lands Project to complete financial modeling and quantitative market analysis for a conservation investment vehicle. The project will evaluate three ownership models that could help family forest, farm, and ranch landowners retain their land, particularly during intergenerational transitions.



Fall 2016 Research Project Summaries

High Plains **Partner Organization**

Project **Description**

Red Canyon Ranch

- TNC is exploring the mimicry of beaver dams in historically occupied stream reaches. Beavers are ecosystem engineers and their work may provide a suite of ecosystem services which may include dampening peak runoff in flashy hydrologic systems, sediment retention, riparian restoration and carbon sequestration. High resolution imagery and other cutting edge technologies may prove valuable in rapidly measuring an assortment of metrics to determine the value of ecosystem services provided by beaver. UHPSI is researching and developing a tool for calculating the values associated with the ecosystem services of beaver activity and human mimicry of beaver dam building activity, with the hope that this may become a potential revenue stream for landowners in the high plains who implement restoration.

Ten Sleep Preserve

- TNC's Tensleep Preserve provides crucial winter/yearlong elk, mule deer, and pronghorn range and includes important migratory pathways. The preserve is also host to a domestic grazing program in which portions of the preserve are leased to neighbors for grazing and a stock driveway runs along much of our boundary. A project to replace 1.9 miles of woven wire fencing along the southeastern border and 2.98 miles of woven wire fencing along the southern border is underway. A new wildlife friendly fence will be used to improve wildlife movements and will serve educational purposes for neighboring ranches and farms. UHPSI is working to design a monitoring program to assess the effectiveness of the project, using game cameras, among other strategies, to monitor wildlife crossings.



TNC's Hart Mountain Preserve

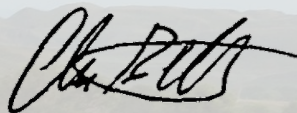
Notes from Charlie Bettigole, Program Director of the Ucross High Plains Stewardship Initiative

The Fall semester is in full swing here at F&ES, and as we await Dean Indy Burke's arrival, there is a buzz of excitement on campus around all things western. This is clear in the guests visiting campus for the National Parks Centennial, student interest in western water, land, and wildlife issues, and the dozens of conversations that UHPSI staff have had with a diverse group of Yale students, staff, and faculty.

With a handful of UHPSI staff working at F&ES orientation events this summer, we were able to engage early with the incoming cohort, sparking interesting conversations and building a fantastic group of student research assistants. I couldn't be more excited about the broad array of projects that students are working on this fall.

It's been a pleasure to co-teach our Western Writing Practicum with Dr. Kris Covey, taking the research our student fellows accumulated over the summer, and providing structure, resources, and mentorship as students move towards publishing their work. We're eager to see the high quality publications that come out of this class, and strongly hope that many of the projects will produce useful tools for land managers in the West.

We have a ton of momentum moving into '16-'17 and I can't wait to see where our staff and students can go!



Charlie and PhD student Dan Kane surveying grasses in the Bighorn Mountains

UCROSS
HIGH
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& ENVIRONMENTAL STUDIES