



Spring 2017

Program Updates

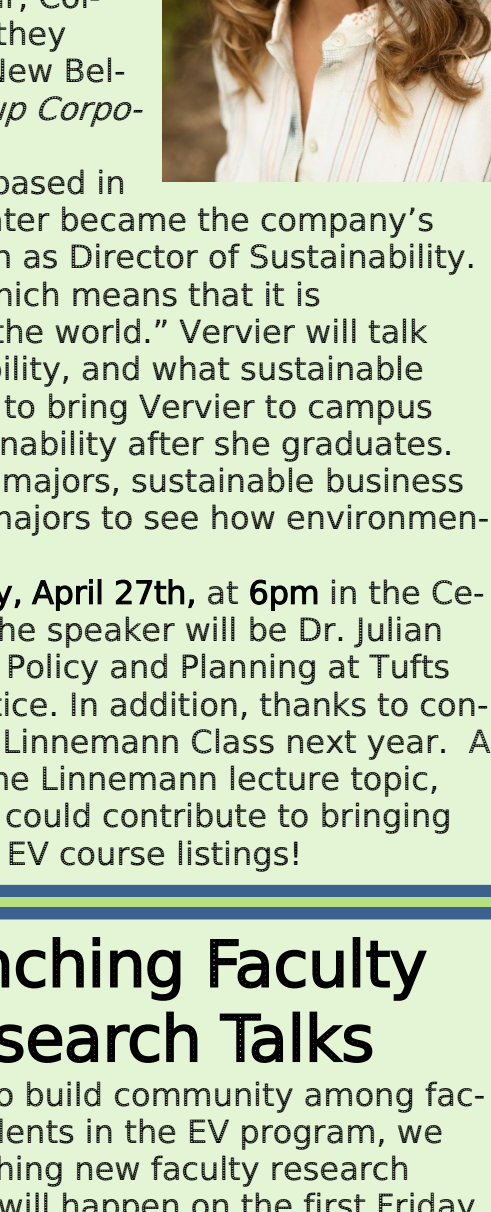
Faculty Research

Alumni Spotlight

Welcoming Dr. Horodyskyj in Blocks 7-8

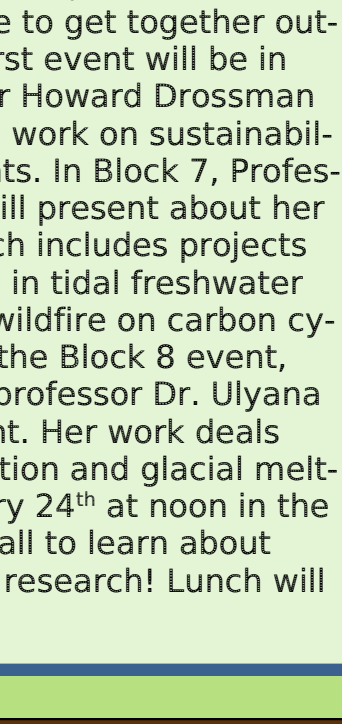
Dr. Ulyana Nadia Horodyskyj will be visiting CC in blocks 7 and 8 of this year to teach two sections of Introduction to Global Climate Change. Dr. Horodyskyj's research has centered on glacial melting and the impact of pollution. She did her undergraduate work at Rice University, moving on to a Master's in geoscience at Brown and completing her PhD at the University of Colorado Boulder in 2015. Her PhD research focused on mountain glaciers in the Himalaya, studying glacial lake growth and the impact of black carbon and dust deposition on melting. As part of her PhD work, she spent a year in Nepal on a Fulbright fellowship implementing a citizen-science program called the "Sherpa-Scientist Initiative," which trains locals to do field science. Dr. Horodyskyj also launched her own company, Science in the Wild, LLC, which takes citizen-science participants on "immersive adventure science expeditions" (http://scienceinthewild.com). In the spring of 2016, they traveled to Baffin Island, Nunavut, Canada to study the impacts of dust and black carbon deposition on the reflectivity of snow/ice, as well as continued important work on glacial lake growth in Nepal using robotics. The Science in the Wild team is currently in South America (Argentina and Chile), working on nearly 7000-meter peaks to explore snow pollution and potential for extremophile (bacteria) life at high altitude. More exciting expeditions to Kilimanjaro and Nepal are upcoming in 2017.

Dr. Horodyskyj loves the intersection of mountaineering with science. She has worked on every continent, including research expeditions to Antarctica, Greenland, Iceland, and Mount Everest. This taste for challenging herself led her to apply to NASA, and she is currently being considered for their astronaut training program. She is also continuing her work on soot and dust pollution as a postdoctoral researcher with the National Snow and Ice Data Center. We can't wait to bring her expertise and experience to CC for a two-block visiting lecture position this spring. She will be teaching Introduction to Global Climate Change in blocks 7 and 8, and infusing it with her extensive knowledge of human impacts in the glaciated parts of the world. The class will do a bit of field work in the mountains similar to what Horodyskyj has done in the Himalaya (looking at pollution in snowpack)- as well as do some "Science on a Sphere" at the Space Foundation in Colorado Springs.



2017 Linnemann Lecture: Jenn Vervier

The Timothy C. Linnemann Lecture on the Environment was established in memory of Timothy Linnemann, a Biology student at CC (Class of '91), who died tragically in a car accident during the summer before his senior year. His family created the Linnemann lecture series "in memory of Tim's lifelong interest in the environment and his love of Colorado College." Each year, the Environmental Program brings a speaker to campus during Earth week and hosts a dinner with all of our faculty and senior majors. A committee of majors in the graduating class choose the speaker and help organize the event. This year, Colleen Orr and Sarah McAuley are the committee members, and they picked Jenn Vervier, Director of Sustainability and Strategy at New Belgium Brewery, to give a lecture titled "New Belgium: Brewing up Corporate Social Responsibility for over 25 Years."



Jenn Vervier began her career at New Belgium Brewery, based in Fort Collins, CO, in 1993 as a worker on the bottling line. She later became the company's first CFO and then COO, before settling into her current position as Director of Sustainability. New Belgium is an employee-owned, certified B corporation, which means that it is "dedicated to proving that business can be a force for good in the world." Vervier will talk about her experience in the world of corporate social responsibility, and what sustainable business practice looks like at New Belgium. Orr '17 is excited to bring Vervier to campus because she is interested in corporate responsibility and sustainability after she graduates. Both Orr and McAuley found that when they talked to other EV majors, sustainable business was a common interest. They think that it will be inspiring for majors to see how environmental interests can be applied in the business world.

This year's Linnemann lecture will take place on Thursday, April 27th, at 6pm in the Celeste Theater at Cornerstone Arts Center. For next year's talk, the speaker will be Dr. Julian Agyeman. Agyeman is a Professor of Urban and Environmental Policy and Planning at Tufts University, whose work focuses on sustainability and social justice. In addition, thanks to contributions from the Linnemann family, we will be launching the Linnemann Class next year. A professor will propose to design or modify a class to relate to the Linnemann lecture topic, and receive additional funding to make it happen. This funding could contribute to bringing guest speakers, field trips, etc. Keep an eye out for next year's EV course listings!

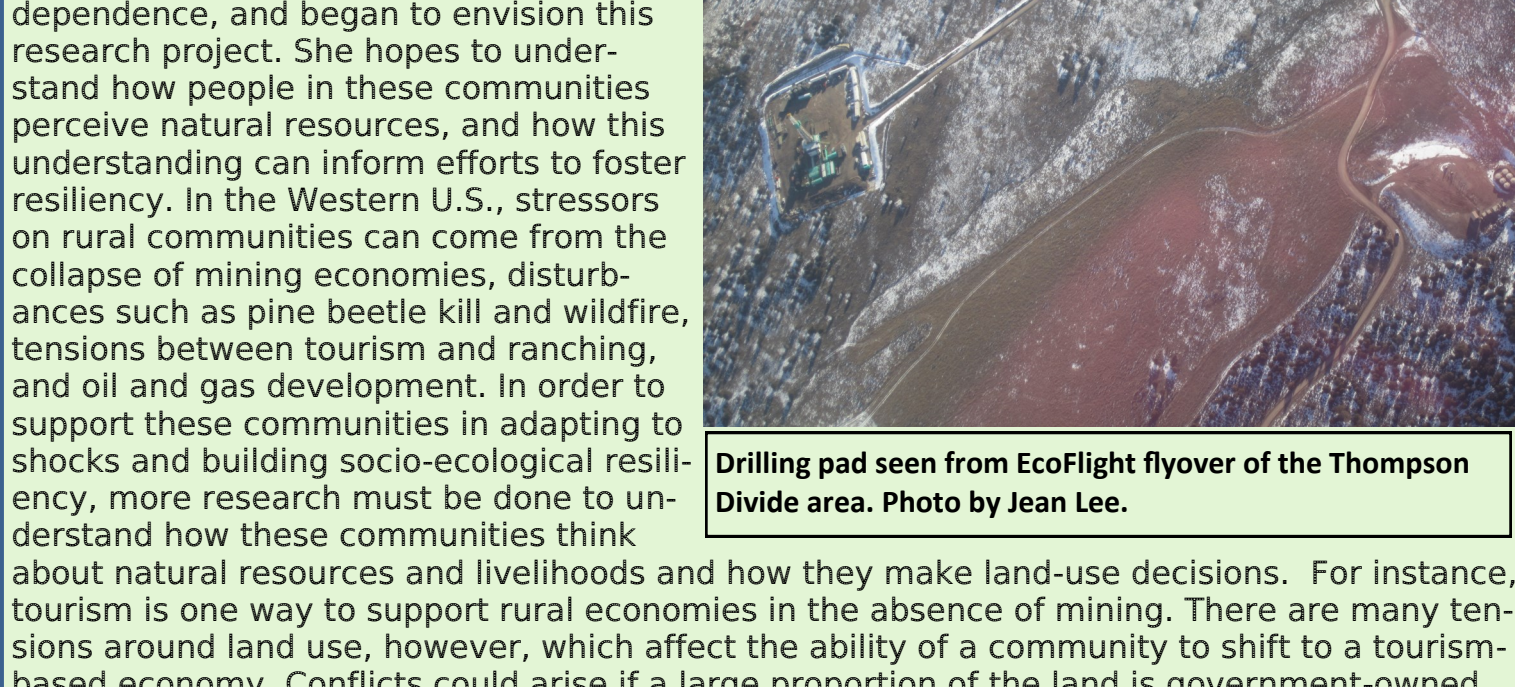
Program Review Update

Last month, the Environmental Program received the report from our recent program review. Among a number of great recommendations, the reviewers suggested that we define a set of learning objectives for the major, and build our curriculum around those. So, last block, EV program faculty held a retreat to discuss their goals for our program. Faculty discussed what makes the CC environmental program distinct from similar fields of study, such as geology, and what guides our study. They determined that at the heart of the environmental program is using multidisciplinary tools/perspectives from the natural sciences, social sciences, and humanities to study the earth system and the human interaction with it. In addition, program affiliate Professor Taber, who teaches in the Education department, introduced some tools from educational theory to help us think about our approach to teaching. This was the first important step in a process of revising our course offerings and major tracks over the next year or two. We hope to improve the program to best make use of the expertise of our faculty and serve the diverse interests of our students. Stay tuned for further updates as we continue to review and re-think the EV program curricula.

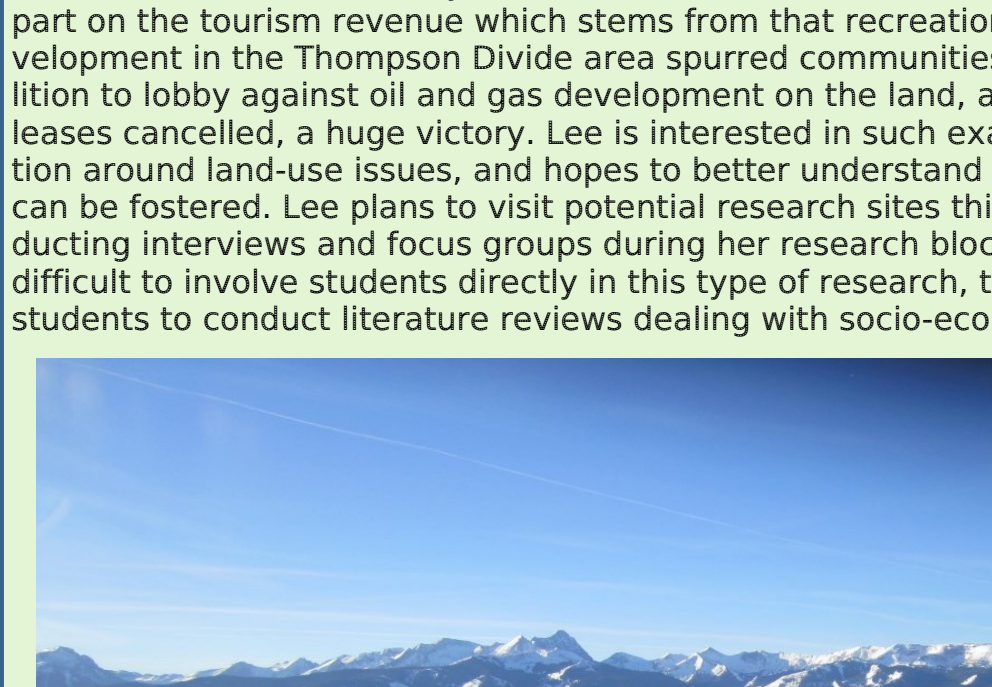
Launching Faculty Research Talks

In an effort to build community among faculty and students in the EV program, we will be launching new faculty research talks. These will happen on the first Friday of each block, at 12pm in Tutt Science 122. Faculty talks will give our students a chance to get to know their professors better and learn about their work (and potential research opportunities). In addition, it will give us the chance to get together outside of classes! The first event will be in Block 6, with Professor Howard Drossman giving a talk about his work on sustainability literacy assessments. In Block 7, Professor Rebecca Barnes will present about her current research, which includes projects on nitrogen processes in tidal freshwater zones, and effects of wildfire on carbon cycling in Colorado. For the Block 8 event, we hope that visiting professor Dr. Ulyana Horodyskyj will present. Her work deals with dust/soot deposition and glacial melting. Join us on February 24th at noon in the Tutt Science lecture hall to learn about Professor Drossman's research! Lunch will be provided.

Faculty Research



Congratulations to EV professors on their Research Development Blocks in 2017-2018!



Four Corners Generating Station. (Image: Climate Central).

Professor Lynne Gratz won't be teaching during eighth block 2018, because she will be starting up a project measuring mercury emissions from the Four Corners coal-fired power plant near Farmington, NM. The EPA measured emissions from the plant in 2011, before the Mercury and Toxics Standards were passed. Now, they hope to verify a trend of decreasing toxics emissions since the new standards came into effect. EPA contacted Dan Jaffe, Gratz's postdoc advisor from the University of Washington, about using his instrument to measure mercury emissions from the Four Corners plant. The instrument, called DOHGS (Detector of Oxidized Hg Species), was developed in Jaffe's lab. DOHGS separates oxidized from elemental mercury, which is important to understanding the potential environmental and health impacts of emissions. The instrument was originally designed with fast time-resolution for use in aircraft; Gratz used it for her postdoc work to measure atmospheric mercury from the NCAR C-130 research airplane. The EPA wants to use it for the Four Corners project because it has better resolution than the commercially-available detection systems.

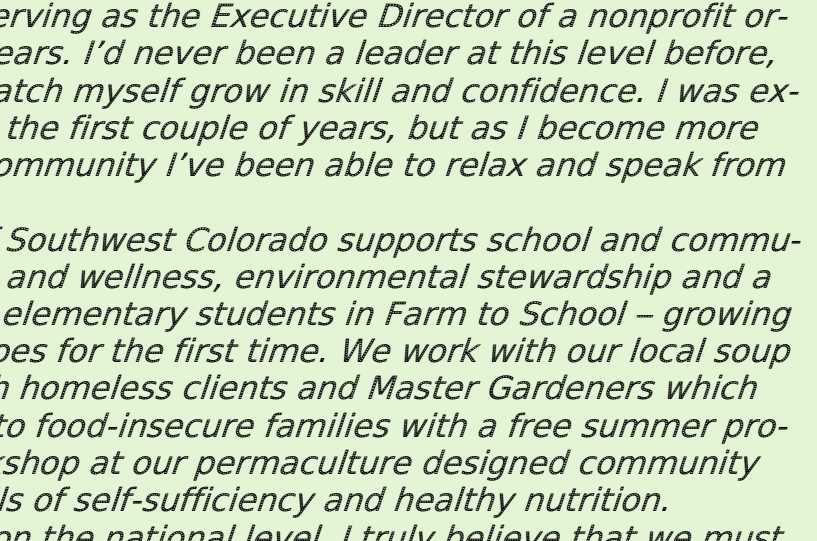
Gratz is involved because she is one of the few people who know how to run the DOHGS instrument. She is working with her former postdoc, advisor, as well as a professor at Utah State, to get the instrument up and running for a field campaign which will take place during the summers of 2018 and 2019. Gratz will head toward to the four corners area in May of 2018 to get set up to begin taking measurements. This is not her first time studying mercury emissions from coal plants. This past summer, she also took measurements near the Martin Drake plant in downtown Colorado Springs. She presented a poster on that research at the American Meteorological Society's annual meeting in block five. One of our current students, Evan Laufman, worked with her on that project last summer, and she will have more opportunities to take on research students for the Four Corners campaign as well!



NCAR C-130 research aircraft. (image: ucar.edu).

Professor Jean Lee: Rural Livelihoods & Natural Resource Dependency

Professor Jean Lee is taking time for research development as well, during block five or eight next year. She hopes to develop a locally-based research project that is still true to her field of interest: community land use. In the past, much of her research has been international, focusing on sustainable development in sub-Saharan Africa. Lee met Professor Courtney Flint from Utah State University at a conference a couple of years ago, a natural resource sociologist who does a lot of work in mountain communities. Professor Flint recently connected Lee with Adrian Uzunian, an AmeriCorps program coordinator based in Durango, CO, who works on projects to support rural livelihoods in legacy mining communities. These communities are characterized by economies that have historically depended on a use of natural resources that is no longer useful or in demand (e.g. a mine that has been shut down). They are now faced with the dilemma of creating alternative livelihoods in the absence of that economic foundation.



Drilling pad seen from EcoFlight flyover of the Thompson Divide area. Photo by Jean Lee.

Lee became interested in the issue of rural livelihoods and natural resource dependence, and began to envision this research project. She hopes to understand how people in these communities perceive natural resources, and how this understanding can inform efforts to foster resiliency. In the Western U.S., stressors on rural communities can come from the collapse of mining economies, disturbances such as pine beetle kill and wildfire, tensions between tourism and ranching, and oil and gas development. In order to support these communities in adapting to shocks and building socio-ecological resiliency, more research must be done to understand how these communities think about natural resources and livelihoods and how they make land-use decisions. For instance, tourism is one way to support rural economies in the absence of mining. There are many tensions around land use, however, which affect the ability of a community to shift to a tourism-based economy. Conflicts could arise if a large proportion of the land is government-owned, such as BLM land, or if there are ranching interests which also have a stake in land-use decisions.

One salient example of rural communities addressing land-use issues is the Thompson Divide Coalition. The Thompson Divide area consists of several hundred thousand acres of federal land, which is widely used for recreation. Rural economies in the area depend in large part on the tourism revenue which stems from that recreation. The threat of oil and gas development in the Thompson Divide area spurred communities into action. They formed a coalition to lobby against oil and gas development on the land, and succeeded in getting 25 leases cancelled, a huge victory. Lee is interested in such examples of community cooperation around land-use issues, and hopes to better understand how this type of collaboration can be fostered. Lee plans to visit potential research sites this spring and then work on conducting interviews and focus groups during her research block next year. While it would be difficult to involve students directly in this type of research, there are rich opportunities for students to conduct literature reviews dealing with socio-ecological resiliency in the West.

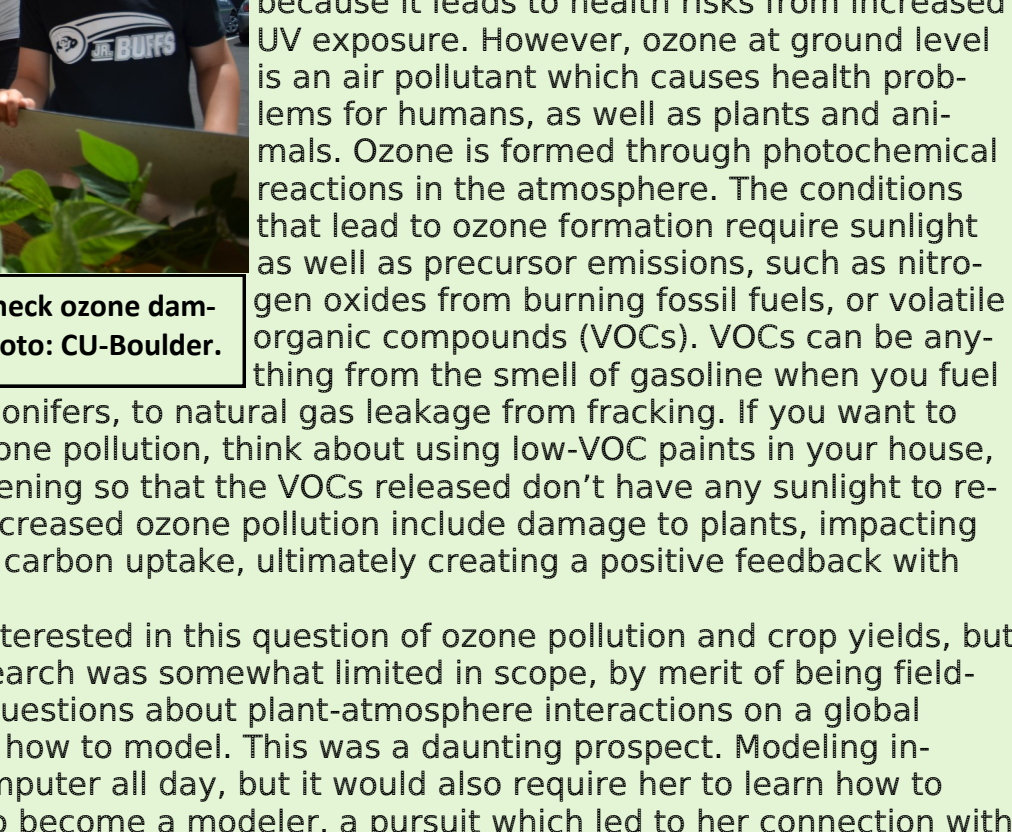


Thompson Divide area. Image taken during Ecological Economics class in Block 8, 2016. Photo by Jean Lee.

Alumni Spotlight

A Note from Sandhya Tillotson '09

When my CC peers and I graduated in 2009, Senator Michael Bennett gave the most depressing commencement speech I'd ever heard. The gist of it seemed to be "Good luck getting a job in your field in this economy! You might as well go back to school!" "Ha!" I thought. "CC prepared me to take on the world! I'm not going to let a silly recession hold me back!" But truth be told, I spent time working at a bike shop, starting my own leatherworking business, and volunteering with an environmental nonprofit before I ever found full time work "in my field" a full year after graduating.



Senator Bennett wasn't far off - but as an idealistic graduate, I wasn't open to hearing much about reality. At the same time, I am grateful for the continual change I experienced on the block plan at CC, which made for more fluid transitions from one opportunity to the next. And always, I felt as though there was a common thread weaving between my experiences (much like pursuing an EV major at CC, while taking random, but somehow relatable classes on the side). My common thread, however cheesy as it may sound, has been a desire to help both people and the environment by working towards a more sustainable future.

Fast forward a bit and I have been serving as the Executive Director of a nonprofit organization in Durango, CO for the past 4 years. I'd never been a leader at this level before, and it has been a fascinating process to watch myself grow in skill and confidence. I was extremely nervous about public speaking for the first couple of years, but as I become more confident in our program's impact in the community I've been able to relax and speak from the heart.

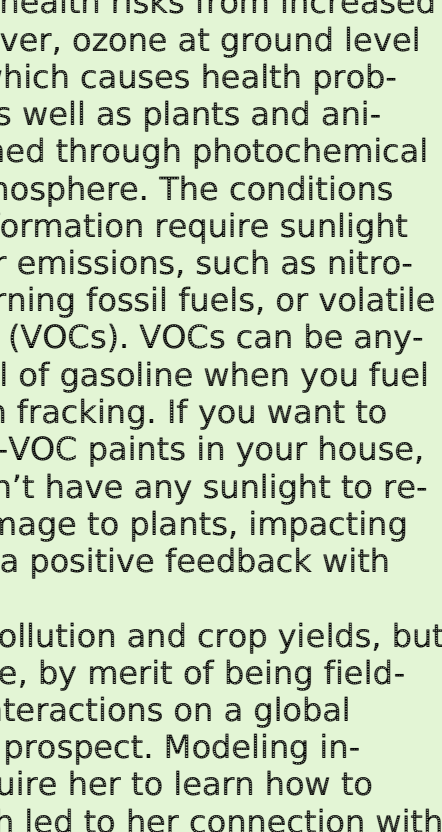
Our nonprofit, The Garden Project of Southwest Colorado supports school and community garden projects that promote health and wellness, environmental stewardship and a sustainable local food system. We engage elementary students in Farm to School - growing their own purple carrots and cherry tomatoes for the first time. We work with our local soup kitchen, growing a biodynamic garden with homeless clients and Master Gardeners which supplies fresh produce to the kitchen and to food-insecure families with a free summer produce stand. We offer hands-on public workshop at our permaculture designed community garden - empowering anyone with the skills of self-sufficiency and healthy nutrition.

During a time that may seem bleak on the national level, I truly believe that we must rally within our local communities to build bridges and uphold diversity on all fronts - and what better place to do that than working alongside your neighbor in a community garden? This spring we'll be hiring for full-time, year long, AmeriCorps direct service position starting in August. Although it doesn't pay much, our AmeriCorps members do incredible service work with our school garden education program and receive an educational award upon completion. A degree in teaching is highly preferable! Please reach out to me about school and community gardens, and let me know if you're coming through Durango - I'd love to hear from you! In my free time I'm enjoying interviewing prospective CC students as an alumni volunteer - it's been quite inspiring to Skype with the new crop of CC prospects!

Thank you to Phil Kannan, Miro Kummel and Howard Drossman for being the most amazing professors anyone could ask for! Yes, environmental science is totally relevant, meaningful and hire-able (as long as you don't mind taking the long route sometimes). Sandhya@TheGardenProjectsWColorado.org www.thegardenprojectswcolorado.org

Danica Lombardozi '04: Project Scientist at NCAR

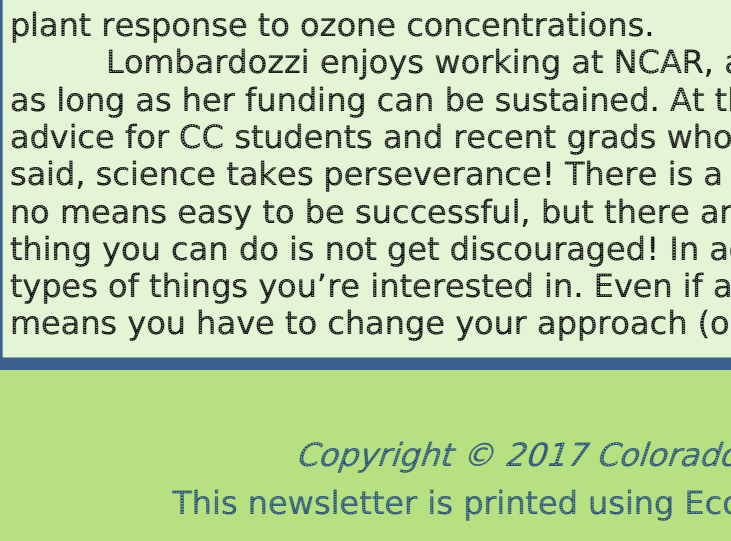
Recently, I spoke with EV graduate Danica Lombardozi about her work at the National Center for Atmospheric Research in Boulder, CO. She studies the interactions between terrestrial plants and the atmosphere, using global climate models. Her projects cover a wide variety of interests, including crop yields, and how to reduce uncertainty in models. The through-line of her research is figuring out how we can scale our understanding of ecosystem-climate interactions over the entire globe and through time, to get a better picture of what will happen with climate change.



NCAR ozone garden.

While at the CC, Lombardozi first discovered her love for doing research. The plethora of experiments and miniature research projects in EV classes initially sparked her interest. She ended up working with former EV professor Sharon Hall on a project in Hawaii, doing an REU (Research Experience for Undergraduates) in Tanzania, and engaging in research at the Catamount Institute as well! Lombardozi found that it was exciting to be able ask questions and figure out how to answer them. In particular, she enjoyed field-based research.

Lombardozi went on to work as a Scientist in Residence at a school on Long Island after graduating. Her job was to do science projects with kids at this school. Projects they did varied from comparing soil pH and nutrients between different land use conditions (e.g. farm, fallow land, and forest), collecting and comparing benthic insects in different ponds, and making biodiesel fuel. Working with kids and designing projects was creative, and exciting to share her enthusiasm for learning. However, she wanted to engage more with the scientific community. Lombardozi went to graduate school at Cornell University. For her PhD, she studied how ground-level ozone pollution affects plants. Her work involved literally blowing pollution at plants and measuring how it affected the plants' exchange of carbon and water with the atmosphere.



Lombardozi showing kids how to check ozone damage at CU Boulder ozone garden. Photo: CU-Boulder.

But wait, you might ask, isn't the ozone hole a bad thing? We need ozone, right? The answer is yes! Ozone in the stratosphere is essential for reducing the amount of UV light that reaches the earth's surface. We should be concerned about stratospheric ozone depletion because it leads to health risks from increased UV exposure. However, ozone at ground level is an air pollutant which causes health problems for humans, as well as plants and animals. Ozone is formed through photochemical reactions in the atmosphere. The conditions that lead to ozone formation require sunlight as well as precursor emissions, such as nitrogen oxides from burning fossil fuels, or volatile organic compounds (VOCs). VOCs can be anything from the smell of gasoline when you fuel your car, the pine scent from conifers, to natural gas leakage from fracking. If you want to reduce your contribution to ozone pollution, think about using low-VOC paints in your house, or mowing your lawn in the evening so that the VOCs released don't have any sunlight to react with. The implications of increased ozone pollution include damage to plants, impacting crop yields and reducing plant carbon uptake, ultimately creating a positive feedback with climate change.

Lombardozi was very interested in this question of ozone pollution and crop yields, but she began to find that her research was somewhat limited in scope, by merit of being field-based. In order to ask bigger questions about plant-atmosphere interactions on a global scale, she would have to learn how to model. This was a daunting prospect. Modeling involved not only sitting at a computer all day, but it would also require her to learn how to code. She was delved in, though, to become a modeler, a pursuit which led to her connection with NCAR. There is a lot of work at NCAR related to supercomputing and global models, such as those used by the IPCC to make climate predictions. Lombardozi contacted scientists at NCAR about getting help with her new research interest, and they were enthusiastic about a field ecologist who wanted to model; it was a unique perspective to bring. Lombardozi received funding to go to NCAR, and now works there full time as a project scientist.

The great thing about modeling, she says, is the scope of the questions she can ask. She is able to investigate global questions about how increases in ground-level ozone pollution will affect crop yields, and model future changes to come up with different scenarios for food production. In addition, NCAR is a great place to work because it is a community of scientists. While her PhD was primarily an independent endeavor, her work at NCAR is anything but. Lombardozi collaborates with a number of other scientists to answer these big questions, bouncing ideas off of each other and striving toward a common goal. For instance, she has been working on a project investigating nighttime plant water loss and how to represent it in models. Most models don't account for water loss from plants at night, but recent research has shown this to be fallacious: nighttime water loss can be important for semi-arid ecosystems, accounting for a 25% decrease in soil water availability. Lombardozi has been working with a woman in Australia to incorporate experimental data and figure out how to represent this process in a global climate model. In addition, she also started a network of ozone gardens. Ozone gardens include plants which are sensitive to ozone, showing visible spots on their leaves in response to high levels of pollution. This allows us to make visible an invisible pollutant, and collect data on plant responses to different concentrations of ground-level ozone. There are a number of these types of gardens in Colorado, including two at NCAR, one at UCSS, one in Rocky Mountain National Park, as well as more in other parts of the country. By working in a network, Lombardozi and other scientists can examine spatial variability in plant response to ozone concentrations.

Lombardozi enjoys working at NCAR, and hopes to stay there as long as her funding can be sustained. At the end of our conversation, she offered some advice for CC students and recent grads who are thinking about graduate school. Firstly, she said, science takes perseverance! There is a lot of rejection in the scientific world, and it is by no means easy to be successful, but there are a lot of rewarding things as well. The best thing you can do is not get discouraged! In addition, stay creative—don't lose touch with the types of things you're interested in. Even if asking the kinds of questions that fascinate you means you have to change your approach (or even learn how to model), you can do it.

