



# Notes from the Field

Spring  
2014

The biannual newsletter of the Intercollege Graduate Degree Program in Ecology at The Pennsylvania State University

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Photo by PJ Perry

## Spring 2014 Ecology Seminar Series Synopsis

By Bradley Carlson, Christen Miller & David Watts

For another year, the Ecology Program's spring seminar series successfully concluded on Earth Day. This time around, the twelfth and final speaker, Robert Colwell, was also afforded a slot in the Huck Distinguished Lecture Series. Over the course of the semester, he was certainly in good company, as a number of prominent ecologists, including Katharine Suding, Lacey Knowles, Dov Sax, Karen Lips, and many others came to Penn State to engage with our ecology-oriented community. These speakers came from our own university, nearby institutions, such as the University of Pittsburgh and Temple University, and also far away lands like Bellingham, WA (Dave Hooper of Western Washington University) and even Quebec, Canada (Mark Vellend of Université de Sherbrooke)!

The theme of the series, "Diversity in Ecological Systems: Genes, Species, and Beyond," was purposefully quite broad in order to allow our visitors to discuss a diversity of diversities. Everything from the importance of behavioral diversity on population- and even community-level patterns, through the role of species richness and other aspects of biodiversity in the function of ecosystems to the broad biogeographic patterns that can be seen in both ancient and contemporary communities was on the table. And that was just the seminars! Penn Staters also engaged with our visitors in myriad meetings, meals, and even walking and talking interludes on a variety of topics.

It should go without saying that we owe the success of the series to the magnanimity of our record-setting number of spon-

sors, but we're going to say so anyway. We extend our wholehearted gratitude to the Eberly College of Science, The Huck Institutes of the Life Sciences, the Penn State Institutes of Energy and the Environment, the Earth and Environmental Systems Institute, the Environment and Natural Resources Institute, the Center for Infectious Disease Dynamics, the Institute for Molecular and Evolutionary Genetics, the Center for Environmental geoChemistry and Genomics, the Department of Biology, the Department of Ecosystem Science and Management, the Department of Geography, and the Intercollege Graduate Degree Program in Ecology. We also offer thanks to all those who arranged schedules for, guided and transported, and met and dined with every one of our speakers, and, of course, also to those who attended the seminars.

Also, new this spring was the use of the resources that can be taken advantage of in the rooms equipped with MediaSite technology. We recorded three seminars, and although one was sadly erased, the other two shall remain for posterity. In order to relive the vivaciousness of Jonathan Pruitt's talk or to listen again to the wisdom Robert Colwell has accumulated since his first invited seminar (on the original Earth Day!), go to <http://www.huck.psu.edu/calendar/talks-and-seminars/ecology/2013/jonathan-pruitt> and <http://www.huck.psu.edu/calendar/talks-and-seminars/watch-past-talks/distinguished-lectures>.

Lastly, although Fred Allendorf was unable to visit us this past spring, he has expressed the desire to do so this upcoming academic year, perhaps as early as the fall semester. So stay tuned!



## Penn State SER: A new student association

By Dr. Ken Tamminga, SERxPSU faculty advisor

A group of students from diverse backgrounds, but with a shared interests in hands-on involvement with recovering ecosystems, has recently formed a student chapter of the Society for Ecological Restoration (SER). We have also received status as a Penn State student organization from the Office of Student Activities. Activities include on-the-ground restoration projects through ClearWater Conservancy and Penns Valley Conservation Association and attendance at upcoming SER Mid-Atlantic chapter and international conferences. Contact Emily Carlson, president (enc121@psu.edu) or Lara Nagle, secretary (lkn904@psu.edu) for further information, or visit the group's Facebook page at SERxPSU.

## White-tailed deer and the American chestnut

By Kristine Averill

I presented at the PA/NJ Chapter of The American Chestnut Association meeting on November 2nd, 2013. The meeting was comprised of about 60 members and was held at the Tyler Arboretum in Media, PA. I talked about my research on deer feeding preferences for native and invasive exotic plant species, entitled "Are deer facilitating plant invasions?" Deer browsing is a major issue during chestnut establishment in this region, as the tree is highly palatable to deer. High chestnut sensitivity to deer browsing requires fences around saplings during the first

several years after planting. Invasive and weedy plants also pose a threat to tree restoration and must be diligently managed, particularly within the first several years of establishment.

## Lions, tigers, and PTSD: Can ecology inform human mental health?

By Lauren Chaby

As neuroscientists come to rely more on ecologically relevant models of stress and ecologists become more interested in the mechanisms underpinning behavior in wild systems, the potential for exciting new collaborations is developing rapidly. This year, at the Gordon Research Conference "Predator-Prey Interactions: From Genes to Ecosystems to Human Mental Health," scientists came together to integrate ecological perspectives on predation effects with knowledge gained using predation threat in the lab as the premiere model of PTSD utilized nationwide. Against the endearing backdrop of Ventura, CA, leaders of the field discussed how fear impacts systems from individual brain morphology and the response of individual peptides to complex multi-trophic level systems including apex predators in the African savannah. The contexts that shape the capacity for animals to respond to threats, as well as behavioral and morphological antipredator defenses, were central themes of the conference. Another meeting is scheduled for winter 2016.



**Left:** With Fox Lake in the background, a sea of Lapland rosebay (*Rhododendron lapponicum*) fills the foreground in the arctic tundra of Greenland with some much appreciated vibrancy (Photo by David Watts). **Top Right:** A bird's-eye view of what might be succession in action, with mountain avens (*Dryas integrifolia*) possibly growing across a glacial isolate while potentially making way to the rosebay (Photo by David Watts). **Bottom Right:** A close-up view of what is likely the most brightly colored flower in inland West Greenland (Photo by David Watts).





Left: Megan Kepler has just finished introducing the first speaker, Andie Chan, in the kickoff event of the EGSO's Science Café series from spring 2014. Andie opened up the discussion about how changes to the Earth's climates will, and already have, affect organisms and ecosystems (Photo by Jeff Kerby). Right: Lauren Chaby expounds on the stressors that fill the lives of animals large and small to an audience composed principally of stressed-out college students (Photo by Gail McCormick).

## The EGSO is getting the word out about Ecology

By Dr. Matt Hurteau, EGSO faculty advisor

This spring eight members of the Ecology program organized and launched a three event Science Café series at Webster's Bookstore Café. The objectives of this series were twofold: 1) provide an opportunity to engage a non-science audience on ecological topics in an informal setting; 2) provide students with an opportunity to gain experience with outreach in their area of expertise. The first event entitled "Climate Change: From the Forest to the Sea" featured Andie Chan and Christy Rollinson speaking about climate change impacts on corals and forests. The second event featuring Gail McCormick and Lauren Chaby answered the question "Why is stress stressful?" and provided a discussion on how humans and animals respond to challenges. The final event of the series featured Danelle Laflower and Tomás Carlo and focused on what makes a species invasive, how they impact ecosystems, and discussed some of the invasive species in Pennsylvania. The events were a resounding success with approximately thirty people in attendance.

This series would not have been possible without the dedication of Lauren Chaby, Andie Chan, Courtney Davis, Megan Kepler, Danelle Laflower, Gail McCormick, and Shauna-Kay Rainford who planned and organized the series and got the word out to the community. We are planning to build on this three café series with monthly events during the 2014/15 academic year. However, we cannot do that without your help! We are looking for topics, as well as speakers who are interested in communicating with a non-science audience. This is a great opportunity to engage. If you are a student and on the fence about participating, I'll offer up the following reasons why you should participate:

- ⊗ For those interested in reaching a broader audience – we have your audience at Webster's.
- ⊗ For those interested in obtaining an NSF Fellowship – this is BROADER IMPACTS!

- ⊗ For those that are motivated by guilt – after all, doesn't the public fund your research?
- ⊗ For those who love the topic they research – get other people excited about it too!
- ⊗ For those who like attention – we'll make sure a flyer with your name on it is emailed to the Ecology student listserv at least three times!

This is a great opportunity to hone your communication skills and engage with a broader audience about ecological topics. We hope you will join us by suggesting topics and speakers, volunteering to speak, or joining us in the planning process. Help us showcase the fantastic work conducted by members of the Ecology IGDP. For questions, suggested topics and speakers, or to volunteer, please contact Courtney Davis ([cld303@psu.edu](mailto:cld303@psu.edu)).

# In the sky, on land, and under the sea: High-tech ecological research at Penn State

By Larry M. York

Chimpanzees use twigs to scoop termites out of mounds, but they're not the only ones aping around. The use of technology has been a defining characteristic of the human animal, from the creation of stone tools, to the taming of fire, to the computer. Over the past century, the patient naturalist taking notes in the field is increasingly relying on high-tech solutions that augment his or her abilities. Ecological research at Penn State is at the forefront of technological innovation in science.

## Look! Up in the sky!

In the cool air of Greenland, something is buzzing, and it's not the dreaded mosquitoes. A lightweight, GPS-enabled unmanned aerial vehicle, or UAV, flies overhead snapping photos of the landscape below that will be used for assessing the type and distribution of vegetation throughout the year. The UAV is operated by Jeff Kerby, a PhD student working with Eric Post. Kerby remarks, "Technological advances have made relatively basic DIY applications of quantitative time-lapse photography and aerial mapping accessible at a reasonable cost. I can now explore a variety of 'herbivore-scale' questions about the dynamics of the vegetation community in Greenland that just a few years ago would have been logistically impossible." UAVs are remotely-operated small aircraft, sometimes referred to as drones, which use cameras and other sensors to acquire spectral data. "These tools are poised to

Jeff Kerby prepares to launch a UAV. A composite aerial photo from the UAV is shown at bottom, and example phenology data are shown at right (Photo by Christian John).



bring about rapid changes not only in how we collect data, but how we frame basic ecological questions," says Kerby, "Exploring new applications for these research tools is essential if PSU wants to stay competitive with other large research universities." In Greenland, he is primarily seeking to understand how vegetation dynamics might change with climate and how these changes affect large herbivores, like caribou and muskoxen, which rely on the vegetation for food. Jeff aims to expand this work to other systems while also demonstrating the positive value of UAVs as research tools to the public "that doesn't often get to hear about the societal benefits of small UAVs."

## Secrets of the forest

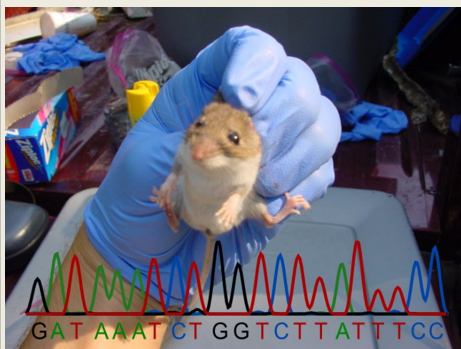
A small white-footed mouse rustles in the forest litter, but what it carries inside potentially poses a bigger threat than its stature suggests. Emerging infectious diseases are becoming more common as people increasingly come into contact with animals in increasingly fragmented habitats. At the moment, nobody can be sure where or when the next disease will arise but Dr. Kurt Vandegrift, a research associate with the Center for Infectious Disease Dynamics (CIDD), thinks infectious disease scientists should be more proactive. His work provides a case study for how researchers might find the next pathogen before

it finds us. For ten years, Vandegrift has monitored populations of white-footed mice in Penn State's Experimental Forest, collecting biological samples from each individual animal. White-footed mice are common rodents with which humans live in close proximity and these rodents are a proven source of emerging pathogens. A collaborator, Dr. Amit Kapoor of Columbia University, employed high-throughput, next-generation sequencing in order to find DNA from any viruses that might be in the samples collected from the mice. Thus far, Vandegrift's group has discovered 8 new viruses that were previously unknown to science. Kurt says, "Currently, we are characterizing these new pathogens to reveal if and how they influence their host populations. In the best case scenario, we could uncover the next emerging infectious disease and prevent it from becoming a human health crisis."

## Sounds from the deep

A North Atlantic right whale mother sings to her calf in the Bay of Fundy, a critical area for foraging, located off the coast of New Brunswick, Canada. North Atlantic right whales are one of the most endangered marine mammal species in the world, with fewer than 600 individuals remaining. Jenny Tennesen, a PhD student in the Langkilde lab, is interested in understanding how underwater noise pollution from shipping activities in the Bay of Fundy affects critical right

A white-footed mouse after sampling. Example DNA sequence data are shown at bottom (Photo by Dr. Kurt Vandegrift).





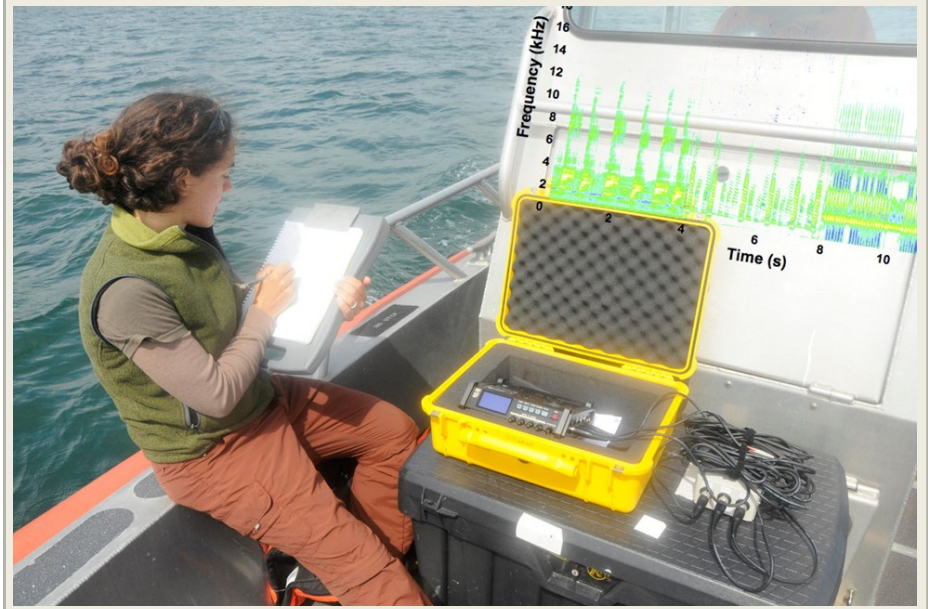
whale habitat. Jenny listens in with a network of hydrophones connected to a digital recorder that records ocean sounds. The spatially dispersed network allows localization of sound sources and identification of the caller in many cases.

Jenny analyzes the digital recordings with specialized software that can isolate the whale calls, and uses these calls to parameterize sound propagation models, to explore how communication space between mothers and calves is reduced by noise. Jenny says, "Often when I hear really interesting sounds I wonder, 'How does that cool sound look?' The neat thing about acoustics is that you can create visual representations, called spectrograms, of those sounds to see with your eyes how they sound to your ears." Some of the findings of this research were recently presented at the 20th Biennial Conference on The Biology of Marine Mammals in Dunedin, New Zealand during December, 2013.

### **Challenges and opportunities presented by high-tech research**

When asked about the challenges of high-tech research, these researchers said acquiring funding can be difficult, especially when the technological approach was novel. They recommend funding be obtained before beginning a project, because costs can grow quickly. Else, be prepared to use funding from other sources. Jeff Kerby has supple-

Jenny Tennessen makes observations in the field, well, in the Bay of Fundy, while recording ocean sounds from a towed hydrophone array. An example spectrogram is shown in the top right (Photo by Lisa Conger).



mented his research with money from his own pocket. Other difficulties encountered by the researchers included troubleshooting device failures and having adequate battery power, problems with which we can all relate. However, Tennessen summarizes the rewards of high-tech research well. When asked what advice she would give to investigators considering a new approach, she says, "Do it! High-tech methods are the future, and jumping on the wagon now will be fascinating, rewarding, and help

you secure a job," though Kerby cautions researchers against focusing on an exciting new method rather than the questions that it can answer. All of these researchers pointed out that technological advances are continually driving costs down while simultaneously increasing the depth and scope of possible observations technologically driven research can provide. We can be assured that ecology researchers at Penn State will remain pioneers in the exploration of the world with advanced technology.





## Recent Publications

- Ahrestani, F. S., Hebblewhite, M. & E. Post. 2013. The importance of observation versus process error in analyses of global ungulate populations. *Scientific Reports* 3.
- Amsalem, E., Malka, O., **Grozinger, C. M.** & A. Hefetz. 2014. Exploring the role of juvenile hormone and vitellogenin in reproduction and social behavior in bumble bees. *BMC Evolutionary Biology* 14: 45.
- Brossman, K., Carlson, B. E., Stokes, A. & T. Langkilde. In press. Eastern newt (*Notophthalmus viridescens*) larvae alter morphological but not chemical defenses in response to predator cues. *Canadian Journal of Zoology*.
- Caraballo-Ortiz, M. A. & T. A. Carlo. 2013. Resurrection of *Dendropemon sintenisii* (Loranthaceae): an endemic mistletoe to Puerto Rico. *Phytotaxa* 82: 1-6. ([journal cover](#))
- Carlo, T. A., Flores-Mangual, M. & M. A. Caraballo-Ortiz. 2013. Post-dispersal seed predation rates in a Puerto Rican pasture. *Caribbean Journal of Science* 47: 153-158.
- Carlo, T. A., García, D., Martínez, D., Gleditsch, J. M. & J. M. Morales. 2013. Where do seeds go when they go far? Integrating distance and directionality of avian seed dispersal in heterogeneous landscapes. *Ecology* 92: 301-307. ([journal cover](#))
- Carlo, T. A. & J. J. Tewksbury. 2014. Directness and tempo of avian seed deposition increases emergence of wild chiltepins in desert grasslands. *Journal of Ecology* 102: 248-255.
- Fricke, E. C., Simon, M. J., Reagan, K. M., Haak, D. C., Levey, D. J., Riffell, J. A., Carlo, T. A. & J. J. Tewksbury. 2013. When condition trumps location: seed consumption by fruit-eating birds removes pathogens and attractants to seed predators. *Ecology Letters* 16: 1031-1036.
- Grozinger, C. M.**, Richards, J. & H. Mattila. 2014. From molecules to societies: the mechanisms regulating swarming behavior in honey bees (*Apis* spp.) *Apidologie* DOI: 10.1007/s13592-013-0253-2.
- Holt, H. L., Aronstein, K. & C. M. **Grozinger**. 2013. Chronic parasitization by the microsporidian *Nosema* causes global expression changes in core nutritional, metabolic, and behavioral pathways in honey bee workers (*Apis mellifera*). *BMC Genomics* 14: 799.
- Huntingford, C., Mercado, L. & E. Post. 2013. Earth science: The timing of climate change. *Nature* 502: 174-175.
- Hurteau, M. D., Robards, T. A., Stevens, D., Saah, D., North, M. & G.W. Koch. 2014. Modeling climate and fuel reduction impacts on forest carbon stocks. *Forest Ecology and Management*, 315: 30-42.
- Hurteau, M. D., Westerling, A. L., Wiedinmyer, C. & B.P. Bryant. 2014. Projected effects of climate and development on California wildfire emissions through 2100. *Environmental Science and Technology*, 48: 2298-2304.
- Kariyat, R. R., Scanlon, S. C., Moraski, R. P., Mescher, M. C., Stephenson, A. G., & C.M. De Moraes. 2014. Plant inbreeding and prior herbivory influence the attraction of caterpillars (*Manduca sexta*) to odors of the host plant *Solanum carolinense* (Solanaceae). *American Journal of Botany* 101: 376-380.
- Malka, O., Niño, E.L., **Grozinger, C. M.** & A. Hefetz. 2014. Genomic analysis of the interactions between social environment and social communication systems in honey bees (*Apis mellifera*). *Insect Biochemistry and Molecular Biology* 47C: 36-45.
- Manfredini, F., Lucas, C., Nicolas, M., Keller, L., Shoemaker, D. & C. M. **Grozinger**. 2014. Molecular and social regulation of worker division of labor in fire ants. *Molecular Ecology* 23: 660-672.
- Muli, E., Patch, H. M., Frazier, M., Frazier, J., Torto, B., Baumgarten, T., Kilonzo, J., Kilmani, J., Mumoki, F., Masiiga, D., **Tumlinson, J.** & C. M. **Grozinger**. Evaluation of distribution and impacts of parasites, pathogens, and pesticides on honey bee (*Apis mellifera*) populations in East Africa. *PLoS ONE* (in press).
- Niño, E. L., Malka, O., Hefetz, A. Tarpy, D. R. & C. M. **Grozinger**. 2013. Chemical profiles of two pheromone glands are differentially regulated by distinct mating factors in honey bee queens (*Apis mellifera* L.). *PLoS ONE* 8: e78637.
- Perry G. H. 2014. The promise and practicality of population genomics research with endangered species. *International Journal of Primatology* 35: 55-70.
- Shapiro, L. R., Seidl-Adams, I., De Moraes, C. M., Stephenson, A. G. & M. C. Mescher. 2014. Dynamics of short and long-term association between a bacterial plant pathogen and its arthropod vector. *Scientific Reports* 4: 4155.
- Toth, A. L., Tooker, J. F., Radhakrishnan, S., Minard, R., Henshaw, M. T. & C. M. **Grozinger**. 2014. Shared genes related to aggression, rather than chemical communication, are associated with reproductive dominance in paper wasps (*Polistes metricus*). *BMC Genomics* 15: 75.
- Yang S., Albert R. & T. A. Carlo. 2013. Transience and constancy of interactions in a plant-frugivore network. *Ecosphere* 4: Article 147, pp. 1-25.



Above: A wood frog keeping an eye out for new publications (Photo by Jennifer Tennessen).

## Fellowships, Awards, Grants, and Achievements

**Ottar Bjørnstad** was named a Fellow of the American Association for the Advancement of Science.

**Bradley Carlson** accepted a position as Assistant Professor of Vertebrate Biology at Wabash College.

**Lauren Chaby** was recently awarded the J. Lloyd Huck Dissertation Research Grant (previously known as the Huck Enrichment Award) to investigate the effects of predation stress on gene expression in the brain.

**Christopher Fernandez** will begin a position as a postdoctoral scholar at the University of Minnesota.

**Denise Finney** was bestowed the [2014 Intercollege Graduate Student Outreach Achievement Award](#).



Photo by Kristine Averill

**Christina Grozinger, John Tooker, and Anthony Vaudo** were selected for an award from the North American Pollinator Protection Campaign for the project entitled "The effects of pollen diversity on bumble bee health in an agricultural environment." \$9,700.

**Andrew Read** was recently named an Evan Pugh Professor of Biology.

**Britta Teller** will begin work as a postdoctoral scholar under the advising of Peter Adler and Steve Ellner.



Photo by Gail McCormick

**Christopher Thawley** was recently awarded the J. Lloyd Huck Dissertation Research Grant (previously known as the Huck Enrichment Award) to investigate the link between epigenetic changes and adaptive behaviors in lizards.

**David Watts** was recently awarded the J. Lloyd Huck Dissertation Research Grant (previously known as the Huck Enrichment Award) to investigate the role of sexual recruitment in the spread of an arctic shrub.

**Larry York** will soon begin work at the Center for Plant Integrative Biology at the University of Nottingham working under John Foulkes and Malcolm Bennett.

## Recent Program Graduates

Warm congratulations to each and every one of the Ecology Program's spring graduates!

- Bradley Carlson (Ph.D.)
- Christopher Fernandez (Ph.D.)
- Sarah Johnson (Ph.D.)
- Lindsey Swierk (Ph.D.)

This publication is available in alternative media upon request. Penn State is committed to affirmative action, equal opportunity, and the diversity of its workforce.

U.Ed. # GRD 15-08.

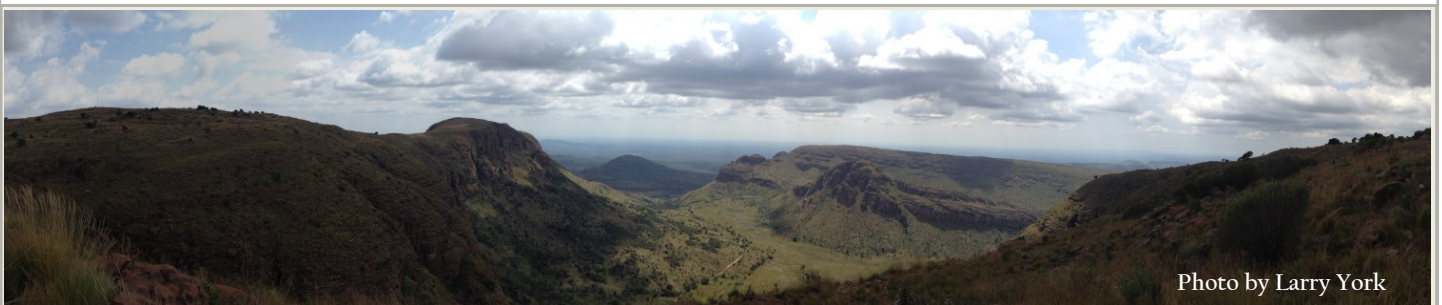


Photo by Larry York