12-2017

SageSTEP News, Fall 2017, No. 31

SageSTEP

Sagebrush Steppe
SageSTEP
Treatment Evaluation Project

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Issue 31, Fall 2017

Unmined Treasures: An Invitation to Dig Into SageSTEP Data and Sites

SageSTEP's research mission is both deep and broad. When establishing the scope of the project, we realized that what we were doing could be useful for more than just our own research questions. For one, we were developing an on-the-ground infrastructure with years' worth of baseline measurements that others could use for future research. Secondly, we soon realized that there would never be enough time for us to thoroughly analyze all the collected data ourselves. Despite now having published more than 120 technical papers on all aspects of the study, we are still awash in unpublished stories.

This is where you come in. We are issuing an open invitation to use SageSTEP data and sites to discover some of those untold and important stories for yourself. We have sites that could be collaboratively used for non-destructive and non-manipulative research (within our exclosures or adjacent to them). We also have a treasure trove of data for analysis that spans 20 sagebrush steppe sites, 13 of which have been encroached by pinyon-juniper woodland, and 7 that are lower elevation and treeless (SageSTEP map). For all sites, we have data on every layer of vegetation and all aspects of the fuel bed, and we can tie these data to weather and to soil chemistry, moisture and temperature. We also have data on sage-obligate passerine birds, on insect biodiversity, and on various aspects of hydrology, all of which can be tied to the vegetation, soils, and fuel bed. In addition, most data are available pre-treatment, and up to six years post-treatment, which allows for a reasonably long-term assessment of treatment effects. Finally, portions of two woodland sites and one treeless site have been burned through by wildfire, allowing the opportunity to do a case study on wildfire effects of treated sites, on which an abundance of pre-fire data have been collected and stored.

Thus far, our scientists have examined treatment effects up to six years post-treatment, mostly by focusing on one or two disciplinary areas (e.g. vegetation, soils). But few analyses have looked at multivariate responses to treatment, which would allow assessment of trade-offs, and a better understanding of species interactions and other relationships within these ecosystems. Scientists have begun to explore aspects of climate change, but there are many opportunities that remain unexplored in this area, including comparison of hot and cold sites within species ranges, or species abundance patterns at the edges of ranges. While analysts have begun to scratch the surface on how treatment response might vary in systematic ways across the sagebrush steppe region, there is much work yet to be done on conditional response of this kind.

Check out our website for more details about the study and sites. Then, if you have additional questions or are interested in getting involved, contact us. We have a fairly painless data request process that involves the approval of our PIs, but to date, nobody has been turned away. You can contact us to ask for data to analyze on any topic we work on. Check out the website for contact information, or send an email directly to Jim McIver (james.mciver@oregonstate.edu).

A Farewell to a Friend: SageSTEP Pioneer and Scientist Paul Doescher

June 3, 1953 — Aug. 2, 2017

By Jim McIver

I wanted to take a bit of space to acknowledge the recent passing of our valued SageSTEP colleague and friend Paul Doescher. Paul made many contributions to Range Ecology, and to SageSTEP in particular. I wanted to share a bit about Paul's pivotal role in planning and developing SageSTEP, and his fascination with all things Great Basin, particularly native plants and the things that live on them.

Paul and I first met on a handball court in Corvallis back in 1985. We had recently finished our Ph.D.s there; Paul had just started as an Assistant Professor in the Department of Rangeland Ecology and Management, and I was doing a post-doc in the Department of Entomology. He was one of the best handball players I ever knew. He routinely beat me using both guile and skill, but always did so with a warm smile as if to say, "Don't worry Jim, it's just luck this time, maybe you'll get me next time."

It didn't take me long to discover that Paul had a passion for grasses and the Great Basin. I didn't know much about grasses back then, but we shared our love of the Great Basin from the get-go. It was those two shared interests that kept us in touch over the years, even after I left Corvallis in 1991. Fast forward to 2001 – I had been leading a national project on alternative fuel reduction methods in seasonally dry forests since the late 90's (the 'FFS' study), and Paul really wanted to start such a study in the Great Basin, focused on pinyon-juniper expansion and cheatgrass invasion. Turns out that Paul was part of a group led by Robin Tausch at the time, that had been conferring with the Joint Fire Science Program (JFSP) on just such a project. The JFSP had given Robin and Paul's group the heads-up to continue development of a fire and fire surrogate project in sagebrush, but had also suggested they gather information from the FFS study that I had been leading, so that they didn't "reinvent the wheel."

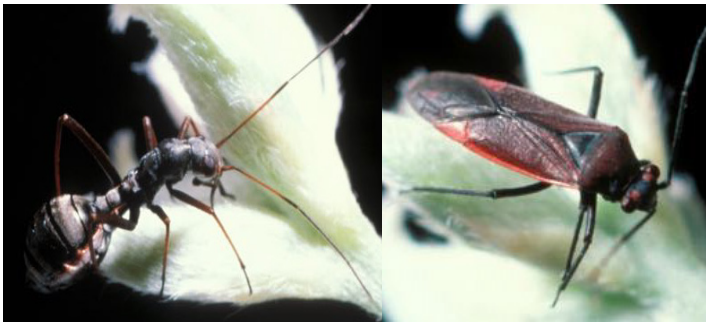
Knowing that I had been leading the FFS study, and that I had a passion for research in the Great Basin, Paul called me late that summer, introduced me to his group, and together we developed a proposal for what would later become SageSTEP. Certainly, we used lessons learned from the FFS study as a guide to planning the organization of SageSTEP, but it was the considerable ecological expertise of Paul, Robin, and their colleagues, that really made SageSTEP what it is today. And coincidentally, the acronym 'SageSTEP' was the brainchild of Paul – he knew we needed a moniker that was both descriptive and catchy, something that rolled off the tongue. This all illustrates one of Paul's most visible skills -- bringing people together. I know that in his view, there couldn't have been a more important place for cooperation than in developing and carrying out a study like SageSTEP.

The second story I want to share about Paul has to do with his fascination with the natural history of native plants, and the species that live on them. Back in 1985, not long after I first met Paul, I told him about the insects and spiders that I had been studying out on Steens Mountain in southeastern Oregon, all of which lived on or frequently visited the native forb *Lupinus caudatus*, or 'Kellogg's Lupine' (Figure 1).

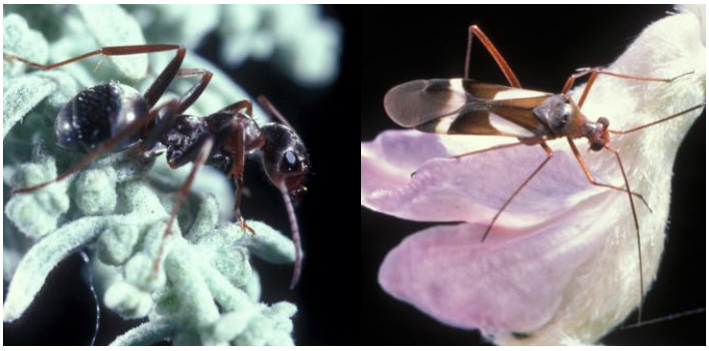
Paul rolled his eyes and said something about how difficult it was to identify species of lupine, and speculated that *L. caudatus* was actually a complex of species, all having a similar plant chemistry. All I knew was that *L. caudatus* supported a number of insect species that could be found on no other plant, even other lupines (e.g. *L. sulphureus*) that grew nearby. And one of those insect species, and in fact the one that most fascinated Paul, was the ant-mimic *Coquillettia insignis* (Figure 2a).

Figure 1. Kellogg's Lupine, *Lupinus caudatus.*

Figure 2a. The ant-mimic *Coquillettia insignis*



Figures 2a and 2b. The ant mimic (a) *Coquillettia insignis* compared to (b) a more typical plant bug.



Figures 2c and 2d. Details of (c) an ant model and (d) males of the *Coquillettia insignis* acquire wings, and look much more like typical plant bugs.

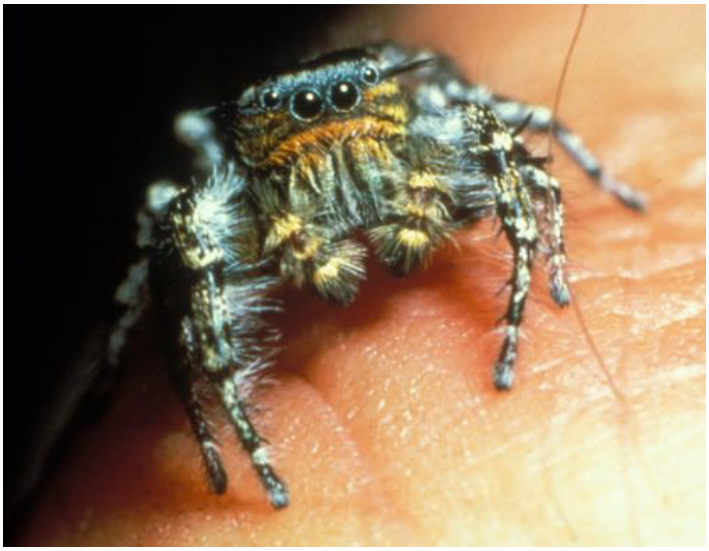


Figure 3. Most visually oriented arthropod predator species (critters like assassin bugs, mantids, and jumping spiders like this one) tend to avoid ants of all species.

Coquillettia is a plant bug, and has piercing/sucking mouth parts, which it uses to poke into plant tissue to extract mesophyll. *Coquillettia* occurs only on Kellogg's lupine, and carries out its entire life history, from egg to adult and back again on this single native species. The adult females of *Coquillettia* (Figure 2a) look nothing like 'typical' plant bugs -- compare Figure 2a with the more typical plant bug of Figure 2b. Adult females are wingless, have slender, elongate bodies, big heads, and move very much like ants (compare the mimic in Figure 2a with the ant model in Figure 2c), which they resemble. While the developing immatures of *Coquillettia* also resemble ants (albeit smaller species), adult *males* acquire wings, and look much more like typical plant bugs (Figure 2d).

When I showed these photos to Paul, he immediately asked me why the adult female, but not the male of *C. insignis*, looked so much like ants. After three months of fieldwork in the Steens back in 1985, I felt like I had a tentative answer to Paul's question. Turns out that most visually oriented arthropod predator species (critters like assassin bugs, mantids, and jumping spiders; Figure 3) tend to avoid ants of all species. This is because ants are relatively dangerous and distasteful, at least to other arthropod species of similar size – they have sharp mandibles, they are loaded with chemicals that taste bad, and being entirely social, they have lots of friends. So if a jumping spider decides to attack an ant worker, the spider must first avoid getting bit by the sharp mandibles, and then avoid the workers' nestmates, who would likely come running when one of their kin is attacked. So ant mimicry of the kind illustrated by *Coquillettia insignis*, most likely evolved as a consequence of natural selection favoring body shapes and behaviors that were antlike, because of the protection that such an appearance would confer from many of the arthropod predators with which the ant-mimic co-existed through evolutionary time. This is called 'Batesian Mimicry', and is very common in the insect world (~~think Monarch and Viceroy). As to why the adult ma~~le is not protected by a resemblance to ants, is still a bit of mystery, although it is likely that the male has a strong role to play in dispersal and gene flow for the species.

When Paul got sick a couple of years ago, at some point I sent him a postcard featuring an ant-mimetic plant bug and one of its ant models, and asked him if he remembered the story he had spurred me to discover so long ago. He sent me back a text right away and told me many parts of that story as he remembered it. I could tell he was still tickled by it – yet another example of the beauty of the natural world that he loved so well. Fare thee well, Paul Doescher.

SageSTEP has been funded by:

U.S. Department of the Interior Bureau of Land Management

National Interagency Fire Center Boise, Idaho

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www.sagestep.org

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