

SNRE Spotlight: Chris Wilson says look beneath soil for carbon storage in grasslands



Wilson graduates with a doctorate in Interdisciplinary Ecology in August 2017. Photo from Jesse Wilson

By Hannah O. Brown

Since Chris Wilson's earliest research projects, he has focused on conducting science that can be applied.

His enthusiasm for applicable research dates back to his undergraduate thesis at [New College of Florida](#) where Wilson conducted an experiment on integrated pest management by planting rows of cabbage at increasing distances from a seed mixture of flowering plants and then measuring insect damage.

He joked: "To the endless amusement of my grandfather, when I told him I was growing flowers for my senior thesis."

His undergraduate field project was kind of a flop, but Wilson was hooked on the possibilities of exploring how ecological theories

could be applied to testing practical solutions for agricultural problems.

"I've always had this idea that if we can understand the ecological processes that are going on better, then we can more skillfully design these management interventions that are ideally cost effective and move toward more sustainable forms of production," Wilson said.

Wilson will graduate with his doctorate from the School of Natural Resources and Environment in August 2017. The overall focus of his dissertation was to understand what factors regulate the cycling of carbon and nitrogen in Florida ranchlands.

His project consisted of three studies, the first of which was completed at the [Range Cattle Research and Education Center](#) in Ona, Florida. The last two were conducted at the MacArthur Agro-ecology Research Center (MAERC), part of the [Archbold Biological Station](#) in the Lake Wales Ridge area of South Central Florida.

The study at Ona looked at how four different varieties of Bahia grass responded to conditions that mimicked cattle grazing. Wilson used a lawnmower to mow the grasses at varying heights and schedules and then measured the growth of the plants' roots and shoots.

“The importance of root production is that, in most grasslands, the majority of the soil carbon is originating in the root system,” Wilson said. “Roots turn over on average between one and a half to two years. The amount of root system biomass in production eventually has a lot to do with the amount of carbon that you see in the soil.”

His second study built on these data by focusing on how the spatial pattern of soil carbon related to other soil properties like topography and elevation at MAERC. Wilson set up 60 plots across 3,000 acres. He used GIS systems to measure the elevation, topography, soil chemistry and other soil properties of the plots, and then he used 30 years of satellite imagery to match each of the plot points.

With that information, Wilson was able to determine how much green leafy biomass there was in the past, and by combining this information with current data, he made predictions on how much carbon would be stored in the soil.

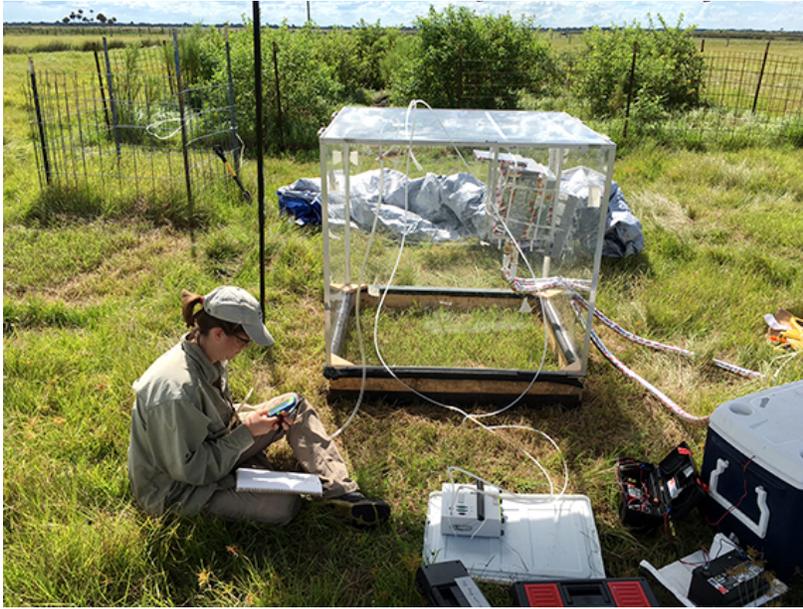


Wilson's research investigates the ecology and management of grassland ecosystems and agroecosystems in South Florida. Photo from Chris Wilson

“We sort of discovered if we integrate across this long time series, we actually have a relatively powerful predictor of the soil carbon stock,” he said. “Maybe 10 years from now, someone will go out and repeat [the study].”

For Wilson's capstone study, he used funds from a NSF Dissertation Improvement Grant to construct a Plexiglas chamber that allowed him to compare how plants accumulated carbon under different grazing conditions.

What he found was that grazed areas grew much larger roots—almost three times as much—as ungrazed areas. They also found that root tips in grazed areas were leaking more carbon into the soil—a process known as exudation.



Jesse Wilson helps set up Wilson's pulse-chase chamber experiment at MAERC. Photo from Chris Wilson

So what is the management takeaway from all of this? Wilson says the answer lies under ground.

“I would say we can make a very strong case that if we want to manage soil carbon more proactively we need to be monitoring root biomass,” Wilson said. “It’s not a surprising conclusion, but we have gone through the work to show that it’s really our most powerful indicator in terms of something that we can affect.”

Luke Flory, UF Agronomy professor and Wilson’s advisor,

said Wilson’s research both contributes to a basic understanding of how grazing affects carbon cycling and has the power to influence agricultural management practices.

“Chris has a long-standing interest in addressing the problem of climate change, so he develops questions and experiments that ultimately inform how grazing practices can be altered to enhance soil carbon sequestration,” Flory said.

While fieldwork in general is challenging, Wilson’s research included the added dimension of working with and around land managers who have their own priorities.

“It gave me a greater appreciation for the importance of trying to be as deeply collaborative as possible so that farmers and ranchers feel invested enough with the outcome of what you are doing,” he said.

Wilson worked alongside multiple researchers as well as land managers for the project, which Flory believes contributed to the project’s success in generating novel data with the potential of making a big impact on future research and agricultural practices.

“He has a unique ability to evaluate and understand big picture questions in ecology and develop targeted experiments to answer those questions,” Flory said. “I think Chris’s dissertation research is an excellent example of what is possible through the SNRE Interdisciplinary Ecology program because he conducted cutting-edge research set within the context of a critical global environmental problem.”
