

A Bit of Restoration

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CAMPUS KUDOS

For the fourth year in a row, **Dordt University** has been ranked **number one in the nation for student engagement**, according to *The Wall Street Journal / Times Higher Education 2020* college rankings. To determine if the college effectively engages with its students, the rankings consider the number of accredited programs offered at Dordt, the level of student engagement, the opportunities for professors and students to interact, and whether students would recommend Dordt to a friend. To learn more, visit dordt.edu/news/48329.

Dordt has been ranked the **third best regional university** in the Midwest by the *U.S. News and World Report 2020* rankings. Dordt has also tied for the second most innovative in the Midwest and the second best undergraduate teaching university. Read more at dordt.edu/news/48347.

Dordt's enrollment for the fall 2019 semester is 1,547, the **second largest in the institution's history**. Dordt also welcomed the second largest freshmen class in 10 years. Learn more at dordt.edu/news/48424.



Daniel Moe, a sophomore studying biology and political science, **spent his summer interning for South Dakota Senator John Thune**. Moe appreciated learning about the work that goes into legislating and constituent services. "Senator Thune currently serves as Majority Whip, a role that provided me a great appreciation for the work it takes to pass motions even after they have made it to the senate floor," he says.

Chemistry major Marcus Van Engen **was awarded a travel grant** from the Peptide Therapeutics Symposium in La Jolla, California, held in October.

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A BIT OF RESTORATION

Dordt's campus is quiet during the summer, but it certainly doesn't shut down. For student summer researchers, it's home base for building on what they've learned in the classroom and doing collaborative research with a professor.

On campus and across Sioux County, students and faculty spend their days exploring and studying a range of projects that tackle issues in the world around them.

This summer, three student-faculty research projects focused on restoring, conserving, or finding innovative solutions to challenges in Northwest Iowa's natural ecosystem.

"Within the realms of conservation and restoration, there are many important things that could or should be done, but we are called to make a difference where we are," says Dr. Robbin Eppinga, a biology professor at Dordt who spent part of his summer studying silver carp in the Big Sioux River.

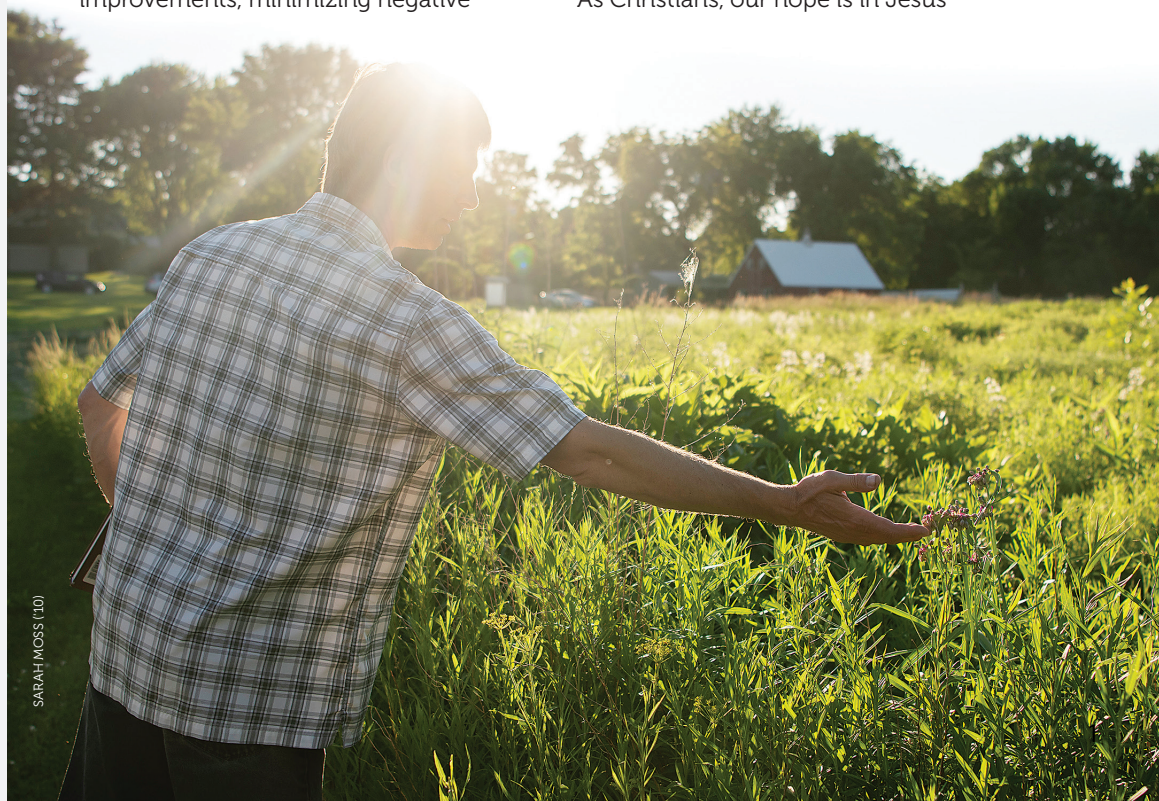
The research projects involved small improvements, minimizing negative

impacts of invasive species and restoring a small part of the natural ecosystem.

"I think living faithfully as a Christian means being faithful in your part of the world—each of us doing what we can," says Dr. Robb De Haan, an environmental studies professor who worked on Dordt's prairie this summer. "When it comes to prairie management and thinking about conservation, we need to do our part in the small things. In the long term, that can have a big impact."

The students and faculty involved in research wanted to bring Christ-centered renewal to the rivers, prairies, and fields of Sioux County—and to be witnesses to those who might be watching.

"As Christians, our hope is in Jesus



SARAH MOSS (10)



It's unlikely that silver carp will be eliminated from the waterways anytime soon. "That said, you don't have to get rid of them to give the native species a chance for their populations to rebound and to survive," says Dr. Robbin Eppinga.

Christ," says Dr. Jeremy Hummel, an agriculture professor who researched pest management and insect diversity this summer. "Many non-Christians perceive the natural world to be their best hope, and if we Christians don't respect creation, what kind of a witness are we providing to non-Christians? Will they be interested in learning about God?"

Recognizing the complexities of today's economic, agricultural, and natural resource systems, Eppinga, De Haan, and Hummel and their students found ways to bring a bit of restoration to Northwest Iowa. Here are glimpses into what that research entailed.

JUMPING INTO SILVER CARP RESEARCH

Biology Professor Dr. Robbin Eppinga launches the 18-foot johnboat into the Big Sioux River at the Hawarden landing. Carter Wyatt, a junior environmental

science major, takes the steering wheel and navigates the boat out into the muddy river. Sitting next to him on a wooden bench is Inioluwa Junaid, a

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— Dr. Robbin Eppinga, biology professor

recent Dordt graduate enrolled in a Ph.D. program in neuroscience at the University of South Dakota.

Wyatt, Eppinga, and Junaid are researching silver carp—an invasive filter-feeding fish species making its way northward from the Mississippi and Missouri Rivers into smaller rivers like the Big Sioux. Silver carp eat almost 20 percent of their body weight every day, weigh between 20 and 80 pounds, and travel in large schools.

What's most interesting about silver carp, though, is that they jump.

"Imagine you're out for a nice tranquil boat trip on the river, and then you're bombarded by a hoard of Asian silver carp," says Wyatt. "They pose a danger to boaters—they're heavy, and if you get hit by one it can cause injuries."

Silver carp also threaten the tourism and fishing industries.

"The area of most concern is the Great Lakes. When you look at the tourism and fishing industry there, the economic value is around \$7 billion," says Wyatt. "If the silver carp were to get into the Great Lakes, it would be extremely detrimental."

Silver carp also have negative effects on the Big Sioux. As an invasive species, silver carp cause problems for the native species that also feed on algae and zooplankton, altering the flow of energy in the river's ecosystem. Silver carp consume so much food that native species often can't keep up.

As Wyatt guides the johnboat up the river, Eppinga sits in a lawn chair at the boat's bow, directing Wyatt toward a

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creek feeding into the river. This is Finnie Creek, a spot where, on their last trip upriver, the group found a small school of silver carp. Junaid switches on the 360 GoPro camera that's mounted on a PVC pipe—they will use the footage later to examine the fish's jumping patterns—and pulls out a notebook. Eppinga hands a fishing net to his 13-year-old daughter, Elia, and he heads to the back of the boat. For five minutes, Wyatt revs the boat engine repeatedly; everyone in the boat holds tight.

"If you catch the silver carp at the right frequency, a whole school will jump in your boat," he says.

Their goal is to build a better trap for silver carp. In an attempt to create a species-selective trap, they are analyzing the carp's jumping behavior in response to audio stimuli. Revving the boat engine is the first of many steps to achieve that goal; they need to find where the silver carp are, study their habitat, and try to capture one to take back to the lab.

No silver carp appear, so the team turns the boat back to the Big Sioux. They drive past Oak Grove Park and stay on the Big Sioux as it splits with the Rock River, eventually reaching Pattee Creek. Junaid checks the depth—eight feet—before Wyatt navigates the boat down the narrow, wooded creek. She flips the camera on.

As Wyatt revs the engine, a dozen silver fish leap into the air and splash into the water. Junaid screams and leans toward Wyatt, while Eppinga and his daughter reach their nets as far out as they can to try to catch the fish. Eppinga bags one and scoops it into the boat's live well. Giant fish come flying from all directions; one hits the boat's fire extinguisher, another flops right into the boat. Eppinga tosses all of them into the live well.

Over the engine, Wyatt yells, "This is awesome!"

They spend 13 minutes in Pattee Creek and catch 23 silver carp. Later, when Wyatt and Junaid quantify the jump

frequency, they discover that, in five minutes, there were more than 700 jumps.

After the fish stop jumping, Eppinga and his students test the water visibility as well as the PH, oxygen, and phytoplankton levels and then repeat the tests on the Big Sioux's main channel. If they can replicate the carp's preferred water conditions in the 1,000-gallon stock tank in Dordt's engineering lab—a controlled environment—and get the fish to survive, they can test the carp's jumping behavior in relation to audio stimulations.



IN 3D

Experience what it's like to be part of the silver carp research. Check out a 3D video of the research trip up the river at voice.dordt.edu/online-exclusives.



"Nobody has used audio-induced jumping behavior to selectively trap fish," says Eppinga. "Other traps use electric probes, which many species are susceptible to. But if you can selectively capture the silver carp during peak migration, you can reduce their populations and give native river species a chance."

This research project will only last four weeks during the summer, which is not enough time for Eppinga, Wyatt, and Junaid to build a better silver carp trap. Still, Eppinga has a vision for what he hopes to construct in future years: a raised flatbed pulled behind a boat that can capture and harvest silver carp when they jump into the trap. In future years, he would like to acquire a waterproof speaker that he can attach to the boat; that way, he can better track what audio stimuli the carp respond to.

Junaid takes the helm and steers the boat down the river toward Hawarden. Wyatt spots a gray heron, and, moments later, sees an eagle soar overhead. As they ride along, Eppinga points out that they haven't seen another human being all afternoon.

SARAH MOSS (10)



Carter Wyatt enjoys fishing and wildlife, which is what initially drew him to the silver carp research. Inioluwa Junaid finds the silver carp's jumping behavior most interesting.



Dordt's prairie benefits the local community. "Many people intentionally walk through the prairie to see what's flowering or how tall the grasses are," says Dr. Robb De Haan. "Giving people something to look forward to and appreciate is valuable."

"It doesn't seem like people love this river like Minnesotans love their lakes," says Eppinga. "From a creation care perspective, I'd like to see more people view the Big Sioux not as a dirty place but as an interesting ecosystem with bird life and plenty of living creatures under the water's surface, even if you can't see them."

When asked why he thinks it's important for Christians to be involved in conservation efforts, Wyatt points to Genesis 2:15: "The Lord God took the man and put him in the Garden of Eden to work it and take care of it."

"As Christians, we are called to take care of creation. The Big Sioux River isn't perfect—there's a lot of silt, it floods often, and it has other issues," he says. "But this silver carp research is something we can work on right now, in this moment. And I think that's a way of being a good steward and fulfilling my calling as a Christian to be a good creation caretaker."

"With Genesis 2:15, you can think of 'to work it and take care of it' as protecting and keeping or tending and gardening," says Eppinga. "Both of those concepts fit with trying to help creation flourish—not just humans, but all of creation. Asian carp are wonderful creatures, but they

should have their place. It's likely we won't be able to get rid of them entirely, so with our research, we want to help manage them long enough so the natural ecosystem can adapt."

A WALK THROUGH DORDT'S PRAIRIE

It is a Tuesday evening in late June, and 12 people have gathered at the south end of the Dordt prairie to go for a prairie walk with Dr. Robb De Haan, an environmental science professor. Once or twice a summer, De Haan invites anyone from the Sioux Center community to come and explore Dordt's prairie and learn about the native and

non-native species that grow there.

De Haan guides the group toward the paved sidewalk that cuts through the prairie. He stops and plucks a plant with white flowers and purplish buds.

"Here, take one stem and pass it on to someone else," instructs De Haan. "Now, crush the stem between your fingers and tell me what you smell."

The group is silent for a moment. "I smell onions or chives," says one person, and everyone else nods or murmurs in agreement.

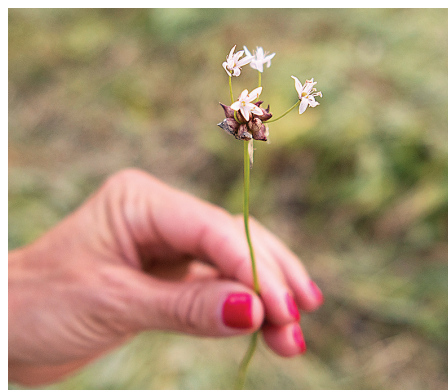
"Yes, this is wild onion. The bottom of the prairie—directly behind you—was never plowed, so there's quite a lot of onion in here that pre-dates European settlements."

"So, it's totally native?" asks a woman.

"Yes, completely native."

"And you can cook with it?" asks another.

"Oh, you can, just chop it up and put it in your soup," says De Haan. "Now, see this plant? Notice how its seeds look like pennies. It's called field pennycress. The University of Minnesota has been working on the idea of using this as a winter crop, because it starts growing in



Wild onion is sometimes confused for wild garlic, which also grows in Dordt's prairie.

the fall and finishes in the spring. During the winter, it removes nitrogen from the soil—the idea is to turn this weedy plant into a useful crop.”

“It’s so pretty,” a woman says. “Does it dry well?”

“Yes, but you need to hit them with some hairspray, or they’ll fall apart. The hairspray helps the seeds to hold together.”

“That’s interesting—so crafty! I’ll be back to get some for my house,” jokes the woman.

De Haan smiles and guides his group to the next stop: a mulberry tree. “If you’re a prairie person, mulberries are a problem. Birds eat the berries, and then they drop the seeds wherever they perch. So, the mulberry trees spread really readily.”

Leading prairie walks to educate others about native and non-native plant species is just one way De Haan sees the restored prairie having an impact at Dordt and in the broader community. During the academic year, the introduction to environmental science, restoration ecology, agroecology, plant science, botany, and entomology classes all spend time in the 20-acre prairie, not to mention the photography classes that gravitate there. On any given day in the summer, dozens of people run, walk, bike, and skateboard through the prairie; some wander through the prayer garden perched on a little rise at the edge of the prairie, paying special attention to the nice mix of flowers and grasses along the way.

“It’s been fun to see the way people in the community have embraced the prairie,” says De Haan. “When we first planted the prairie in 2007, most people in Sioux Center didn’t have an appreciation for it but, at this point, if the prairie were to disappear, I think there’d be quite an outcry. It’s something they didn’t know they were missing.”

Once comprised almost entirely of prairie grass, Sioux County now has very few stretches of prairie left. De Haan believes that having the Dordt prairie available to students and the community is important for establishing a sense of place and remembering what the land used to be like.

“If you live in an area where your soils have been shaped by prairie, it’s



SARAH MOSS/TLO

Currently, Dordt’s prairie includes 90 species of grasses and wildflowers, and De Haan hopes to incorporate more. “You can never get enough prairie if you’re a prairie person.”

important to have a sense of what plants, insects, animals, and birds were part of this system. It helps to appreciate the history. Fortunately, it only takes five or six years to grow a nice prairie.”

To De Haan, one of the most Reformed classes on campus is restoration ecology. In that class, De Haan and his students talk about the renewal of all things, but especially the renewal of beauty and diversity of all creation.

Dordt’s prairie looks much like a historical prairie might have looked in Northwest Iowa, but De Haan and his students must provide continued management to compensate for historical ecological processes that are no longer there. For example, bison used to roam the Great Plains and munch on prairie grass; now, De Haan and his students mow stretches of prairie to mimic the bison’s eating habits. Historically, prairies burned every five

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—Dr. Robb De Haan, environmental science professor

“Having a prairie on campus is a living testimony to that concept,” says De Haan. “Not all of Sioux County should be prairie but, ideally, we should have kept the prairie and added the people, not lost the prairie. Dordt’s prairie brings back some of that beauty, and it’s an example of restoration on a small, doable scale. It’s indicative of what we can do as Christians.”

years or so; now, De Haan has eight to 10 students in his wildlife ecology class help conduct a controlled burn of a quarter of the prairie every spring.

De Haan talks about the prairie parade—how, throughout the summer months, flowers bloom, hit their peak, subside, and make way for the next flower and

color to take over. Purple spiderwort, which blooms in the morning and closes by evening, makes an appearance; next, the purple meadow rue with its tall white clusters. The most prominent phase is the Maximilian sunflowers, towering golden blooms that turn the whole prairie yellow in September.

"The prairie has a nice mix of soils and environments; drier hilltops, hillsides, bottom areas that are wetter, slopes that face east and west. You have a variety of species in one part of the prairie that's quite a bit different from another part of the prairie."

Many people who live in the Midwest assume they need to go to the mountains or the ocean to experience the beauty of God's creation, says De Haan. He hopes that, by experiencing Dordt's prairie, the community will realize that nature is right in their backyard.

"We have a natural legacy and history in Iowa. You don't have to go to Northern Minnesota or Yellowstone National Park to experience something beautiful."

The prairie also provides a way for Dordt and De Haan to love their neighbors.

"Think about the great commandment, 'Love God above all and your neighbor as yourself.' It's hard to love God and not care for what he's made; it's hard to love your neighbor and not be concerned about the world your neighbor experiences," says De Haan. "Conservation work in many different forms is important for Christians, because it fits so integrally with the great commandment and the general idea of loving one's neighbor and loving God—you can't separate them."

PEST MANAGEMENT MEETS INSECT DIVERSITY

The concept of studying insects in Northwest Iowa may make some squeamish, but for Dr. Jeremy Hummel and Lilly Smith, it's the best way to spend a summer.

"Ever since I took Dr. Goedhart's entomology class when I was a student

at Dordt, I've found insects to be so fascinating," says Hummel, an agriculture professor. "Conservative estimates say there are seven million species of insects; they're the most diverse group of organisms on the planet. Even our simplest ecosystems are chock full of them."

As a child in Winter Haven, Florida, Smith, now a senior agriculture and animal science major at Dordt, spent countless hours exploring nature.

"Growing up, my parents told me to go outside and find something new," she says. "I've always had an insect collection, too. So, being curious and having that

diversity mindset has helped me have the tools I need for this research project."

The insect-centric summer research project involves two parts, the first of which is pest management. They investigate parasites that feed on corn rootworm, a major pest of corn in the Midwest, and on bean leaf beetles, which can be damaging to soybean crops.

"Insects have a big impact on agriculture," says Hummel. "When insects aren't controlled, there are considerable yield reductions in crops, which can lead to economic issues. And to control insects, we spend a lot of money on insect-resistant crops

like rootworm-resistant corn and insecticides."

Hummel says that, for every plant, there are often one or more specialized insects feeding on it. For example, corn rootworm larva feeds on corn roots, which decreases the plant's vigor and can cause enough damage that the plant can blow over in a wind storm. When the rootworm becomes a beetle, it feeds on the corn silks and can cause significantly reduced ear size. Feeble plants and smaller ears of corn are not good for the farmer's bottom line.

But, just as there is a specialized insect for every plant, there are parasite species for every insect species. That surprised and excited Smith when she began the research.

"Think of the hundreds of thousands of insect species, and there's probably a parasite out there that specializes and targets just that bean leaf beetle. If you can weaponize or at least collect and use this one parasite, you could control an entire species and not touch anything else," says Smith. "The parasites could serve as bio-controls—you could release the parasite into, say, a Northwest Iowa cornfield per the farmer's request, and it could control and keep at bay those pest populations."

As part of their research, Hummel and Smith collect corn rootworm and bean leaf beetles by walking through alfalfa, corn, and soybean fields and sweeping



IN FULL BLOOM

Check out a video of Dordt's prairie in full bloom – visit voice.dordt.edu/online-exclusives.



ELLA RINDENS (1/9)

"Creation was created not just for us to use but to give glory to God," says Lilly Smith. "God created diversity—if you look around, you see more than one species of plant or animal."

the crops with an insect net. They take the samples back to the lab, where they feed the insects and try to keep them alive for as long as possible. The goal is for the insects to stay alive long enough that a parasite—a nematode, fly, or wasp—emerges from them. Last year, Hummel caught 279 adult beetles and 117 beetle larva, and two endoparasitic nematodes emerged—"a low parasitism rate," according to Hummel. This year, Hummel and Smith have caught 127 beetles.

Hummel believes that, as insects develop resistance to insecticides, the agriculture industry should consider alternative options for pest management.

"In the last several decades, our approach has been to spray agrochemicals first and then think of other options later," says Hummel. "I think a better paradigm is to think about other pest management strategies first and say, 'Agrochemicals and insecticides are a useful tool, but let's use them at the end of a whole system of control strategies.' We should do less fighting of creation's organizational structure and find ways to better collaborate with it."

The second component of Hummel and Smith's summer research is to conduct a survey of insect diversity at Oak Grove Park, specifically focusing on ground beetles, water beetles, and pollinators—insects that are indicators of ecosystem health.

"Oak Grove is a little pocket of conservation surrounded by cornfields," says Smith.

As the Northwest Iowa prairies—places of deep insect and plant diversity—have been tilled to make way for corn, soybean, and alfalfa fields, the complex ecosystems have disappeared from the landscape. Less than one percent of the natural prairie remains in the Great Plains, which makes parks like nearby Oak Grove Park in Hawarden, Iowa, all that more important.

Have you ever been on a walk and seen a black beetle skitter across your path?



ELLA RYNDERS (19)

"Places like Oak Grove Park can be refuges for diversity that has largely been pushed out of our agricultural areas," says Dr. Jeremy Hummel.

Most likely, what you've seen is a ground beetle.

"Ground beetles are almost all predatory and beneficial, so don't step on them," quips Hummel. "This one family of beetles, the carabidae, are sensitive to

they are also curating some of the ground beetles into an insect display that will be used in Oak Grove's new nature center. Ultimately, Hummel hopes to compile a field guide that Oak Grove visitors can take with them as they walk through the park's prairie and the woodlands.

Hummel grew up on a dairy farm near Lethbridge, Alberta, earned a Ph.D. in plant science, and has taught agriculture for 10 years. Having spent his entire life in and around the agriculture industry, Hummel has seen many agricultural practices work well, but just like with any other industry, he sees things that could be done better. He also thinks Christians should reconsider the way we often approach the cultural mandate given in Genesis 1:28: "God blessed them and said to them, 'Be fruitful and increase in number; fill the earth and subdue it. Rule over the fish in the sea and the birds in the sky and over every living creature that moves on the ground.'"

66 Christians need to consider what the word 'subdue' means within the context of Genesis 1:28. I see it as caring for and collaborating with creation, and that includes investing in creation care and valuing ecosystem diversity.

— Dr. Jeremy Hummel, agriculture professor

habitat changes—you can go 10 feet, and you'll have a different community of ground beetles."

All over Oak Grove, Hummel and Smith placed 24 pitfall traps—a plastic sleeve and cup combination that has a collecting fluid at the bottom where insects expire quickly. Once a week, Hummel and Smith collect the samples and separate out the different insect species. They are creating a partial species list of what they discover, and

"It is important for Christians to engage in conservation efforts and in renewing natural ecosystems; God created ecosystem diversity. I think we as Christians need to consider what the word 'subdue' means within the context of Genesis 1:28. I see it as caring for and collaborating with creation, and that includes investing in creation care and valuing ecosystem diversity."

SARAH MOSS ('10)