

Spring 2019



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INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES | UNIVERSITY OF NEBRASKA-LINCOLN





NEBRASKA STRONG



Michael J. Boehm

The past few months have been challenging for Nebraskans. Unprecedented flooding and severe weather led to the most widespread natural disaster in state history. The massive flooding of the Platte, Loup, Elkhorn and Missouri rivers affected many of our families, friends and neighbors.

Not only has the flooding transformed our landscape, it has changed who we are as Nebraskans.

While the images of the flood will forever be etched in our minds, so too will the many scenes of compassion. Neighbors helping neighbors, strangers driving through the night to deliver hay and supplies, and community-organized donation drives are just a few of the ways people have come together. These acts of goodwill are proof that we are in this together and exemplifies the resilience of Nebraskans.

The Institute of Agriculture and Natural Resources and our colleagues across the university system are standing alongside Nebraskans during this trying time. Individuals across each of the University of Nebraska's five campuses are working to support those affected by the flooding. For example, in addition to our Nebraska Extension professionals who live and work in affected areas providing boots-on-the-ground assistance in the days immediately following the floods, Extension launched a comprehensive resource hub for families, businesses, producers and community leaders facing flood recovery - flood.unl.edu. New and updated information is added daily and will continue to be as recovery efforts continue and needs change.

Our university is also working hard to provide flexibility for students whose families, homes, communities or financial situations have been impacted. Campuses have enacted a number of student-friendly changes for incoming and current students ranging from providing greater flexibility for submitting course assignments and offering alternative living arrangements to stretching application deadlines and creating flexibility around scholarship start dates.

Other university efforts also include mental health and well-being support from the University of Nebraska Medical Center's Behavioral Health Education Center of Nebraska. A student serviceship program to assist with flood recovery efforts will place up to 50 students directly in communities impacted by the flooding.

We are fortunate that Chuck Hibberd, dean and director of Nebraska Extension, agreed to lead the university's coordinated response and recovery efforts. He has assembled a team of experts from across the University of Nebraska to help facilitate volunteer opportunities, connect with community experts and coordinate other agencies and efforts to ensure that support is provided where and when it's needed for as long as it's needed.

This issue of *Growing* is dedicated to the resiliency of those Nebraskans impacted by the flooding and to those who produce the food, fuel, feed and fiber that sustains a growing world. It explores and highlights the Institute's efforts - and our shared commitment - to accelerating crop and livestock production and profitability in a manner that ensures the resiliency of Nebraska's water, soil, and air, and the vitality of our rural communities. I am fortunate to witness the bright minds of IANR working in partnership with Nebraskans as they go about advancing the health of production agriculture and natural resource systems. From grazing research in the Sandhills (pg. 8) to enhancing the quality of life for individuals from underrepresented racial and ethnic groups in rural areas (pg. 20), this issue offers you a glimpse at IANR's commitment to the vitality of individuals and communities.

If you have ideas on how IANR can help ensure a resilient future for Nebraska, please don't hesitate to share your thoughts with me. Send an email to mboehm3@unl.edu.

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Nebraska Sandhills

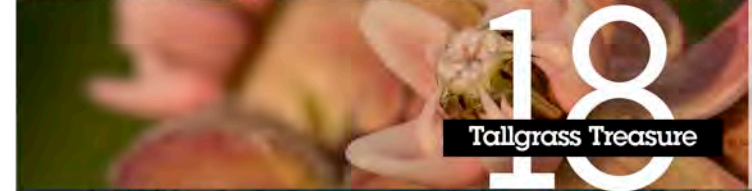
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GROWING A HEALTHY FUTURE

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There is no charge for this magazine. Each issue describes IANR programs that benefit Nebraska and beyond. If you happen to receive more than one copy, please share with a friend.

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Craig Allen



By: Linda Ulrich

Ag resilience a priority for IANR

Agricultural production must increase more than 70% by 2050 to meet the global demand for food, fuel, feed and fiber. Meeting this goal will require far-reaching growth in agriculture, more efficient use of marginal lands and new methods to deal with extreme weather, soil degradation and biological invasions.

To help meet that demand, the Institute of Agriculture and Natural Resources has formed a new resilience center with two components — the Center for Resilience in Working Agricultural Landscapes and Nebraska One Health. Together they focus on the theory and practice of resilience. The center’s director is Craig Allen, former research professor and director of the university’s Nebraska Cooperative Fish and Wildlife Research Unit.

Resilience is a term widely used by agricultural producers, industries and policymakers, and by federal agencies but definitions vary. “Resilience is simply a measure of the amount of disturbance a system can withstand before it collapses,” Allen said. “Resilience can be measured and operationalized to explicitly help us solve many of the issues that challenge human well-being in the 21st century.”

Nebraska is the ideal experimental laboratory to continue advancing the resilience concept, said Allen, an internationally respected expert on wildlife ecology and conservation. He is on the executive boards of the Resilience Alliance and the Nature Conservancy and is a founding member of the Nebraska Conservation Roundtable.

Allen envisions the center becoming the leading global institution in agricultural resilience, focused on protecting the agricultural systems that feed the world and the health of the people who inhabit it.

A resilience approach generally has some common elements, including

- Working with stakeholders to define key issues and provide a focus
- Using models, if necessary, to help identify limits to acceptable change or thresholds
- Examining the roles of decision-making, customs, rules or regulations for insights and options for building resilience and adapting to changing circumstances.

The university and the resilience center are in a unique position to better develop, integrate and

implement theories of resilience with field-based practices. This is because of the global expertise and leadership in both, and the history of blending theory with practical applications to management and production, Allen said. “No other institutions nationally or internationally have an explicit focus on resilience in agricultural systems.”

The multidisciplinary center, which draws on the expertise of many faculty members, emphasizes the resilience of the north-central Great Plains, one of the most productive agricultural regions with one of the most complex irrigation systems in the world.

“The science and technology that have enabled this agricultural production have been exported as a global solution to food insecurity, yet the resilience and long-term sustainability of this model is uncertain and untested,” Allen said. “The importance of this system, and others like it, demands an understanding of its response to stress and where critical tipping points may lay. We don’t understand how resilient it is.”

Resilience is not only important to agriculture and natural resources, it pervades disciplines ranging from the natural

sciences to the physical and social sciences. Additionally, it has an important link with the goals of Nebraska One Health, he said.

The university’s One Health program brings together people with diverse backgrounds, skills and perspectives to improve the health of humans, animals, both wild and domestic, plants and their shared environments. One Health and resilience are related concepts that together create a unique and novel approach to understanding those interactions, Allen said.

“In our world of rapidly changing landscapes and human and animal populations, there is an increasing need for creative local and global solutions to challenges at the human-animal-environment interface.”

“We envisioned a center small in terms of personnel, but with a large impact, focused on delivery of research, teaching, outreach and global leadership in the area of resilience of working agricultural landscapes.”
– Craig Allen

SOIL – THE 'UNDERDOG NATURAL RESOURCE'

By: Hcley Apel



As the global population rapidly expands, additional stress is placed on the resources found in the environment. While water quality and air pollution often first come to mind when people think of environmental issues, the state of our soil is just as critical according

to Andrea Basche, assistant professor in the Department of Agronomy and Horticulture. She considers soil the “underdog natural resource.”

“Soil plays a critical role in our health and environment,” Basche said. “Soil is where so much is happening – it’s an interface for both water and gases moving through the earth system, which plays a role in water and air quality. Plus it is where food is grown – and we all eat several times a day.”

The general public may not think of the resource often, but producers concerned with their long-term productivity are increasingly focused on soil health. Functions of a healthier soil include cycling the nutrients plants need to grow, or how well the soil holds water. Basche often refers to the biological, physical and chemical aspects of soil to gauge its health. Issues such as water erosion, nutrient depletion and contamination affect these soil properties.

Water erosion is a common issue that producers face. When a heavy rain hits the soil, it breaks up the matrix of particles found in the soil that helps water infiltrate the surface. When the particles separate, the topsoil erodes away, which can be a serious issue because the amount of topsoil is known to impact crop productivity. It takes a significant amount of time to replace the soil that was washed away.

“We’re currently losing soil at a rate much faster than it naturally forms,” Basche said.

However, producers can take steps to minimize the stress placed on soil and make it more productive. Cover crops, for instance, can help buffer a soil to things like flood and drought. Cover crops are planted to protect the soil when the land would otherwise be bare. The use of cover crops has shown to slow erosion, increase water infiltration and add carbon to the system.

Other common actions aimed at improving soil health include no-till farming, planting more diverse crops and integrating livestock, among others. While there are benefits to each of these actions, Basche doesn’t believe that any one practice will guarantee a resilient soil. She prefers a broader approach that creates a well-rounded cropping system, with soil health being just one of the benefits.

“Implementing just one of these practices isn’t going to guarantee soil health,” she said. “Producers can think about these principles – such as minimizing disturbance, diversifying crops and integrating livestock – as ways to influence soil health while improving their operation as a whole.”

Basche is currently co-leading a project mapping the “where” and “why” of conservation practices that are generally known to promote soil health. It’s a challenging task because practices related to soil health generally aren’t tracked well. While there are a number of resources to track many different aspects of crop production, there is much less information available to the public that consistently tracks the use of different conservation practices, such as cover crops.

The project is bringing together a diverse team of scientists, policymakers and practitioners with the goal of reducing barriers to the adoption of soil health improving practices. The project is funded by the National Science Foundation-supported Socio-Environmental Synthesis Center. To learn more, visit soilhealthfeedback.org.

“Soil plays a critical role in our health and environment.”

– Andrea Basche



Photo credit: SARE.

By: Haley Apel

A MAJESTIC RESOURCE – PRESERVING THE NEBRASKA SANDHILLS

Paceful, pristine and stunning are just a few of the words that travelers of Nebraska Highway 2 have used to describe the Sandhills. Often appearing on lists of the most scenic drives in the country, Highway 2 cuts through the middle of the largest sand dune formation in the Western Hemisphere plus one of the largest grass-stabilized dune regions in the world. What a passerby may not realize is that the Sandhills region provides far more than an outstanding view.

Photo provided by Platte Basin Timelapse.

The dunes of the Sandhills, some as high as 400 feet and as long as 20 miles, were formed from blowing sand after the last Ice Age. Today, the dunes are held in place and stabilized by vegetation that consists mainly of grasses. There are over 700 species of plants estimated to be growing without cultivation in the region. The rich biodiversity makes the Sandhills a prime region for livestock grazing. Over 535,000 head of beef cows call the Nebraska Sandhills home.

Given the high importance of the beef industry to the resilience of Nebraska, researchers at the Institute of Agriculture and Natural Resources at the University of Nebraska-Lincoln have long worked with ranchers in the Nebraska Sandhills to ensure the sustainability of the region. According to Walter Schacht, Sunkist Fiesta Bowl Professor of Agronomy, a significant amount of research occurs in the Sandhills because it's largely an intact grassland system and the region is "a long-term part of who we are and what we do."

Much of IANR's research in the Sandhills focuses on testing grazing management strategies that don't compromise the ecological processes and resilience of the region. For instance, several projects have focused on how various combinations of frequency and intensity of grazing affect plant community production and composition, efficiency of plant harvest by the grazing animals, soil properties and wildlife habitat. By altering grazing period lengths, recovery period lengths and stocking intensity, researchers like Schacht have been able to identify how grazing strategies can be used to optimize livestock production, create plant cover for a diversity of wildlife and improve belowground processes.

Jerry Volesky is a professor and extension range and forage specialist at the West Central Research and Extension Center in North Platte. He is involved in a long-term grazing research project at Barta Brothers Ranch examining grazing rotation. Volesky and his colleagues take detailed measurements to evaluate plant community responses, soil characteristics, pasture productivity and more.

“One of the things we’ve found over the years is that the timing of grazing is very important, so we suggest a rotational grazing system, rotating through five or six pastures during the season and adjusting which pasture the herd starts in,” Volesky said.

Other research has looked at precipitation in the region. While the Sandhills is generally viewed as a dry grassland, it sits atop the Ogallala Aquifer – one of the world’s largest aquifers. The makeup of the dunes quickly absorbs precipitation, which means the area is very important for aquifer recharge. Naturally, the more precipitation any given spot receives, the more plant biomass it will produce, but it’s not as easy to estimate with the varying topography of the Sandhills, where slopes can be as steep as 25%. Mitch Stephenson, range and forage management specialist at the Panhandle Research and Extension Center in Scottsbluff, led a study examining Sandhills plant production from 2001 to 2017. He found that cool-season grasses in swales, or low spots, responded

much more favorably to increased precipitation, which could help ranchers estimate grass production.

Findings from these projects are often shared with area ranchers who will adjust their grazing strategies to efficiently use the rangeland resource and maintain rangeland health. These actions also support a rich habitat for wildlife such as deer, coyotes, meadowlarks, cranes and ornate box turtles. And every spring, one of the few stable populations of greater prairie-chicken can be found on their mating grounds (leks) throughout much of the Sandhills. Area ranchers can take credit for managing the resources of the Sandhills for the betterment of their operations and the ecosystem in which they reside.

“Sandhills ranchers have had a long history of being really good managers. They’ve done a great job over the last century managing that resource,” said Volesky. “Their stewardship is really quite amazing.”



The Nebraska Sandhills encompasses 19,300 square miles of sand dunes stretching 265 miles across Nebraska. In addition to the wealth of research occurring on the lands of our ranching partners, the Gudmundsen Sandhills Laboratory and Barta Brothers Ranch are the sites of many IANR studies aimed at enriching the resources in the Sandhills.

✱ Gudmundsen Sandhills Laboratory consists of 1,200 acres of subirrigated and wetland meadows along with 11,600 acres of upland sandhills range.

✱ Barta Brothers Ranch is approximately 6,000 acres in size with over 5,500 acres categorized as upland range.



Task force takes holistic approach to Sandhills management

There is perhaps no one who understands the unique relationship between land, water, wildlife and people better than the ranchers of the Nebraska Sandhills.

“I believe the Sandhills is the best example of a resilient system that we have available,” said Shelly Kelly, program director for the Sandhills Task Force.

The Sandhills Task Force began in 1993 as a group of people concerned about the future of the Sandhills. Their goal is to enhance the sandhill wetland-grassland ecosystem in a way that sustains private ranching, wildlife and vegetative diversity and associated water supplies. This is achieved through efforts to secure financing for conservation projects, organizing workshops and other educational activities and partnering on research projects.

The group has been involved in over 200 projects over its 26-year history. By tapping into its large pool of partners from these projects, the Sandhills Task Force has also been able to assist researchers from the University of Nebraska–Lincoln. Often this means helping researchers get access to the land. Currently the group is very focused on eastern redcedar invasion and is working on research with Dirac Twidwell, rangeland ecologist in the Department of Agronomy and Horticulture.

Kelly attributes the success of the Task Force to its 16 board members and their focus on holistic approaches. They believe that a successful ranch requires a good ecosystem.

“What’s kept us successful through the years is that the majority our board members are ranchers – ranchers that have been on the land for generations and know that operating their business means relying on a healthy landscape.”

REDCEDAR TREES A COMPLEX SOCIAL- ECOLOGICAL ISSUE

By: Linda Ulrich

Eastern redcedar trees — the most rapidly expanding woody species on the Great Plains — are one of the biggest threats to the ecology of the Nebraska Sandhills.

“Simple transitions in vegetation systems can have far-reaching impacts,” said Dirac Twidwell, rangeland ecologist in the University of Nebraska-Lincoln Department of Agronomy and Horticulture. “Trees taking over rangelands can affect working lands in complex ways, even impacting our well-being in metropolitan areas.”

When eastern redcedars dominate a landscape, the impacts can be severe:

- 75 percent decline in forage for livestock
- Nearly all plants and wildlife unique to grasslands may become rare or locally extinct
- \$400,000 annual cost for Nebraska public schools to control redcedars on grazing leases
- Increased potential for cedar apple rust, a fungus that can grow on cedar trees and harm fruit trees
- Increased wildfire danger potential that may make standard suppression tactics ineffective.

The spread of redcedars is not limited to Nebraska. It also is problematic in Texas, Oklahoma and Kansas, and experiences in those states have proven that prevention is a better option than control, Twidwell said.

Prevention of redcedar encroachment is a complex social-ecological issue, he said. From the time Nebraska became a state, planting trees in grasslands was not only accepted but also encouraged, without the knowledge that planting redcedars in the Sandhills would eventually contribute to the loss of resilience of natural resources. As a result, redcedar, a juniper species native to Nebraska, was planted in many windbreaks throughout the state because the trees are sturdy, long-lived and drought-resistant.

One of the easiest ways to stop the spread of redcedars is to stop planting them and remove the source of spreading — seeds. Cutting off small redcedar seedlings by hand can remove newly established individuals, but it is labor intensive and requires careful monitoring. Additionally, seedling establishment increases over time and can compete with time spent on other necessary ranch management operations.



If prevention is not implemented, large redcedars can be removed using mechanized equipment, but the practice is cost-prohibitive and results in only small acreages being managed, Twidwell said. In Nebraska, the cost to mechanically remove redcedars from 1,000 acres is estimated to be \$150,000 to \$250,000. Costs have increased in Southern Plains states, where redcedar is more common, to approximately

\$1 million for 1,000 acres.

Prescribed fire is an effective tool for controlling the spread of seedlings; however, as the trees grow larger the fire intensity must increase in order to kill them. The live fuel moisture must be low enough in the large trees to allow the fire to scorch the crowns to be effective.

Increased awareness of the redcedar encroachment across the state may help decrease some of the current ineffective management, Twidwell said. “Prevention is critical to conserve the Sandhills, one of the largest remaining grasslands in North America.”

When an ecological base is shifting, resilience can be compromised, he said. “It’s not just about these trees, it’s about changes to the ecosystem. It’s a matter of when the ecosystem is going to be affected, not if, and how those changes influence Nebraskans’ ways of life.”

More information is at cedarliteracy.unl.edu/ and agronomy.unl.edu/twidwellresearchteam.

IDENTIFYING EFFECTS OF EASTERN REDCEDARS ON WATER

By: Linda Ulrich

Eastern redcedar trees may look innocuous but they could potentially become a widespread threat to Nebraska’s water resources.

This is particularly true in the Nebraska Sandhills, where eastern redcedars have spread more rapidly throughout the region in the past 20 years. The Sandhills is a crucial area of recharge to the Ogallala Aquifer and discharge to the Elkhorn, Loup, Niobrara and Platte rivers. In addition to threatening water resources, redcedars also threaten the Sandhills grasslands where more than half a million cattle graze, said Aaron Mittelstet, watershed hydrologist in the Department of Biological Systems Engineering at the University of Nebraska-Lincoln.

While redcedars are native to Nebraska, conservation plantings and lack of wildfires have led to the species’ expansion. “Due to its drought resistance, the expansion could continue unhindered,” he added.

“There is a clear and critical need to quantify the cumulative hydrological effects of future encroachment of the redcedar on groundwater recharge and levels, on streamflows and on the cattle industry,” Mittelstet said. He and his research team are conducting a study that will assess the impact of redcedar encroachment on recharge and streamflow in the Sandhills and ultimately on the water quantity and quality in the Platte River.

“The only method to understand the complexities of the hydrological cycle in the Sandhills is to use a hydrological model to demonstrate the interaction

between surface and groundwater,” said Mittelstet, a fellow in the Daugherty Water for Food Global Institute at the University of Nebraska.

A hydrologic model is a conceptual representation of a part of the water cycle. It is used for hydrologic prediction and for understanding hydrologic processes. Mittelstet and his team are using satellite and airborne imagery to quantify the current location and magnitude of redcedars in the Sandhills. The model will be created using the measurements of evapotranspiration, groundwater levels, streamflows and soil moisture.

“We will create a hydrological model to simulate multiple scenarios of future redcedar encroachment and its impact on water resources,” Mittelstet said.

Predicting the future encroachment of redcedar and its effects on the hydrologic cycle of the Sandhills will be essential to development of water policy decisions in Nebraska, he said. “This information will encourage state agencies and agricultural producers to be proactive in eliminating redcedar encroachment into the Nebraska Sandhills.”

Other research team members are Christopher Neale, Daugherty Water for Food Global Institute; Dirac Twidwell, Agronomy and Horticulture; Troy Gilmore, School of Natural Resources; and graduate students Yaser Kishawi, Biological Systems Engineering, and Nawaraj Shrestha, School of Natural Resources.

The Water Sustainability Fund and the Daugherty Water for Food Global Institute fund this research.



Center for Grassland Studies leader in prairie ecology

By: Linda Ulrich

The University of Nebraska–Lincoln has many centers, but the Center for Grassland Studies is unique because it embraces all three land-grant missions: teaching, research and extension.

Its goal is to facilitate interdisciplinary research, education and outreach programs that emphasize the role of grasslands as a natural resource.

The Center for Grassland Studies is part of the university's longtime leadership in grassland and rangeland research within the state and across the country. Martin Massengale, president emeritus of the University of Nebraska system and a Foundation Professor in the Department of Agronomy and Horticulture, was the founding director. Steve Waller became the center's interim director in 2017 after stepping down as dean of the College of Agricultural Sciences and Natural Resources.

The Institute of Agriculture and Natural Resources established the center 25 years ago to bring together nationally recognized university faculty in many disciplines whose primary research related to some aspect of grasslands, including forage, range and turf grasses. This research is valuable because Nebraska's grasslands comprise more than 60% of the state's land mass. Grasslands are the basis for the cattle industry, wildlife habitat and recreation, and help maintain surface and groundwater quality.

"Since the center's beginning, there has been a lot of growth in the complexity of what the center does," Waller said. Nevertheless, the core mission has remained the same, coordinating faculty and staff research, teaching and outreach in grasses and grasslands (native and introduced), including research in

- The improvement and management of forage, range and turf grasses
- Ruminant livestock systems
- Production economics
- Grassland, riparian and wetlands ecology
- Wildlife management and conservation biology
- Watershed management
- Grassland insects and diseases
- Grassland resilience.

"The overall emphasis is a holistic systems approach to maintaining and improving our grassland resources," Waller said.

Educational programs include a multidisciplinary seminar during the fall semester attended by students, faculty and the public, and the annual Nebraska Grazing Conference. The center also administers three interdisciplinary undergraduate degree programs – Bachelor of Science degrees in Grazing Livestock Systems, PGA Golf Management and Grassland Ecology and Management.

"Unfortunately, our grasslands have never been more vulnerable to conversion or collapse as they are today. Future generations deserve the very best grassland stewardship that we can provide to ensure that they can enjoy our shared prairie heritage," Waller said. "The role and importance of the center in crafting the future cannot be overstated, nor can the role that resilience science will play in the future of our grassland resources.

"A comprehensive research and education program serving grassland stewardship will ensure that grasslands will be part of our landscapes for generations to come," Waller said. "Grasslands define Nebraska's heritage."

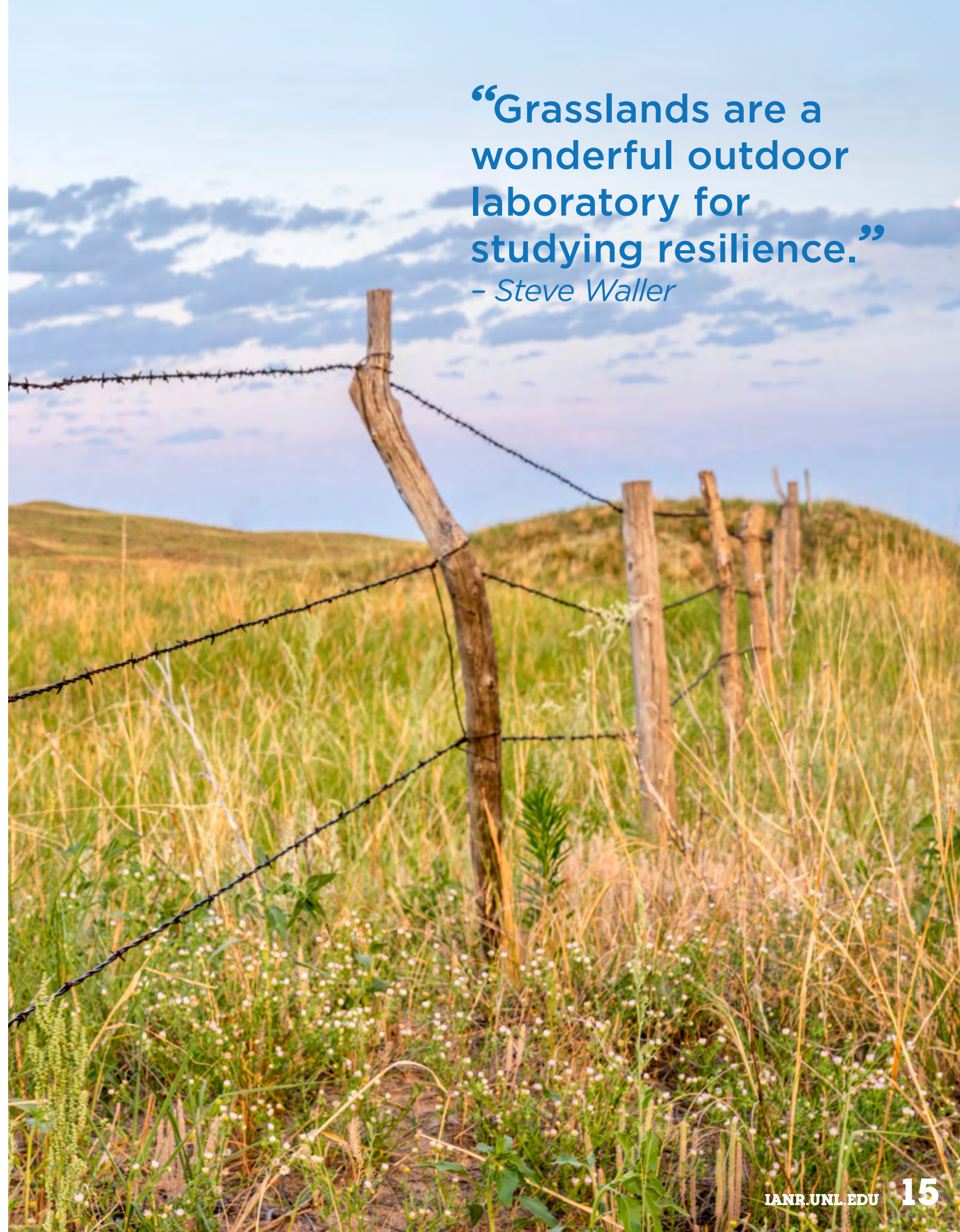
More information is at grassland.unl.edu.

Several early Nebraska researchers helped form the foundation for grassland science.

The pioneers in grassland ecology, such as Charles Bessey, Fredric Clements and John E. Weaver, taught and conducted research at the University of Nebraska. Weaver went on to be recognized as the "father of grassland ecology," said Steve Waller, Center for Grassland Studies interim director.

"These scholars and their students established the university's role as a leader in prairie ecology," he said. "Today's generation of faculty honor their legacy as they explore the evolution of ecological theory to include ecosystem resilience."

"Grasslands are a wonderful outdoor laboratory for studying resilience."
– Steve Waller



“Celebrate life by planting trees and saving and establishing natural prairies wherever you are.”

– Walter Bagley



PRAIRIE PINES PROVIDING NATURE-BASED EDUCATION

By: Natalie Jones, student, Agricultural and Environmental Sciences Communication

In 1959, Walter Bagley, a University of Nebraska-Lincoln forestry associate professor, and his wife, Virginia, purchased 145 acres of cropland near Lincoln. Their longtime dedication and hard work transformed the land into a nature preserve comprising grasslands, woodlands, wetlands, crop plots and grass trails now known as Prairie Pines.

The property became the first “choose and cut” Christmas tree farm in Nebraska in 1965. It was also the first home for Raptor Recovery and the first conservation easement in Nebraska. In 1992, the Bagleys donated Prairie Pines to the University of Nebraska Foundation to be “protected forever as a place that would provide a pleasant habitat for all beings – plant and animal.”

Today Prairie Pines gives the public an opportunity to explore the natural environment and provides

nature-based education about natural resources conservation, wildlife and the environment. It includes 10 acres of never-plowed tallgrass prairie, one of the most endangered ecosystems in the U.S.

The Institute of Agriculture and Natural Resources leases the space, with management by the Nebraska Forest Service. Programming is provided by the Prairie Pines Partners, a nonprofit established in 2009 to facilitate the Bagleys’ vision, in collaboration with IANR and the Forest Service.

As Prairie Pines Partners board members, Mike Hillis and Sue Kohles provide leadership to further develop Prairie Pines as a site of natural resource conservation for education, research and recreation for all.

Everything revolves around collaboration and education, said Hillis, who remembers taking his tree identification final exam on the property when he took a class taught by Bagley.

“We have this great space where anything is doable in it. We take our passions and expand upon this and make this grow,” Hillis said.

The board credits Prairie Pines’ success to partnerships with IANR, the Nebraska Forest Service, Community Crops and the Nebraska Statewide Arboretum. Collaborations have also existed with Lincoln community businesses and events, local schools and outreach and educational organizations. The board is currently working with the university’s Ruth Staples Child Development Laboratory and the LUX Center for the Arts to host a summer day camp for kids to teach them about nature and to incorporate nature into an art project.

The board’s biggest goal moving forward is to increase access to the site. It is currently working to build a trail to connect Prairie Pines with the current Murdock Trail in northeast Lincoln. This will provide alternative access for active and passive use by the public and learning communities. The board also plans

to expand hours and educational opportunities and add to the existing signage.

Offices are currently inside the Bagleys’ house, which is being remodeled to make it more conducive for meeting rental by corporations throughout Lincoln. The house also is being converted into a welcome center.

For a natural space to continue and to be conserved, its value must be realized, Kohles said. “We are part of a broader ecosystem. We are key to making sure that these communities are resilient and vibrant because they are the key to our existence.”

Prairie Pines is open to the public the second Saturday of each month from 8 a.m. to 5 p.m.

This summer Prairie Pines will host summer day camps for kids, the Meadowlark Music Festival and the “Run for the Pines” trail run. For more information on upcoming events and educational opportunities, visit prairiepines.org.

NINE-MILE PRAIRIE A UNIQUE TALLGRASS TREASURE

By: Linda Ulrich

Nine-Mile Prairie sometimes is called a biological treasure.

It is an apt description of this important but underappreciated remnant of virgin prairie, according to

David Wedin, University of Nebraska-Lincoln ecosystem ecologist and director of Nine-Mile Prairie.

The 230-acre site is unique because it is one of the largest high quality, intact tracts of tallgrass prairie left in the Midwest and a nationally important outdoor laboratory for grassland studies, Wedin said. More than 390 plant species and over 80 species of birds have been observed on Nine-Mile Prairie. These include the federally threatened prairie white fringed orchid and the rare regal fritillary butterfly. It also is a seed source for grasses and wildflowers for regional prairie restoration.

Most of Nine-Mile Prairie has never been plowed. A small area was farmed in the 1940s but since then all of it has been left in its natural state. It has been on the National Register of Historic Places since 1986.

Nine-Mile Prairie is so named because it is approximately 9 miles northwest of Lincoln. It is managed by the University of Nebraska with the stipulation that it be kept in its natural state and used for education and research.

The education ranges from 4th graders having a "prairie experience" to university students identifying

plants, learning about the importance of biological diversity and gaining a better understanding of climate change. The prairie is also the setting for public tours and special events to foster understanding and appreciation of Nebraska's prairie heritage.

Studied longer than any other natural area in Nebraska, Nine-Mile Prairie was the site of pioneering plant ecology research. University of Nebraska Professor John E. Weaver and his students did early research about grasslands beginning in the 1920s.

"Now the research includes everything from basic ecology to different kinds of spiders," Wedin said.

Additionally, prescribed burning approximately every three years helps maintain the native prairie vegetation and adds knowledge about the grasslands' resilience.

"Many of the management approaches we use, such as prescribed burning, are used in both pristine areas such as Nine-Mile Prairie and in working grasslands and rangelands across Nebraska," Wedin said. "Nine-Mile Prairie is an important benchmark of how a natural

grassland works."

Prairie stewardship is the responsibility of the Nine-Mile Management Committee, which includes university faculty from several departments and representatives of several natural resources-related agencies and organizations. Oversight is the responsibility of the university's Center for Grassland Studies in the Institute of Agriculture and Natural Resources.

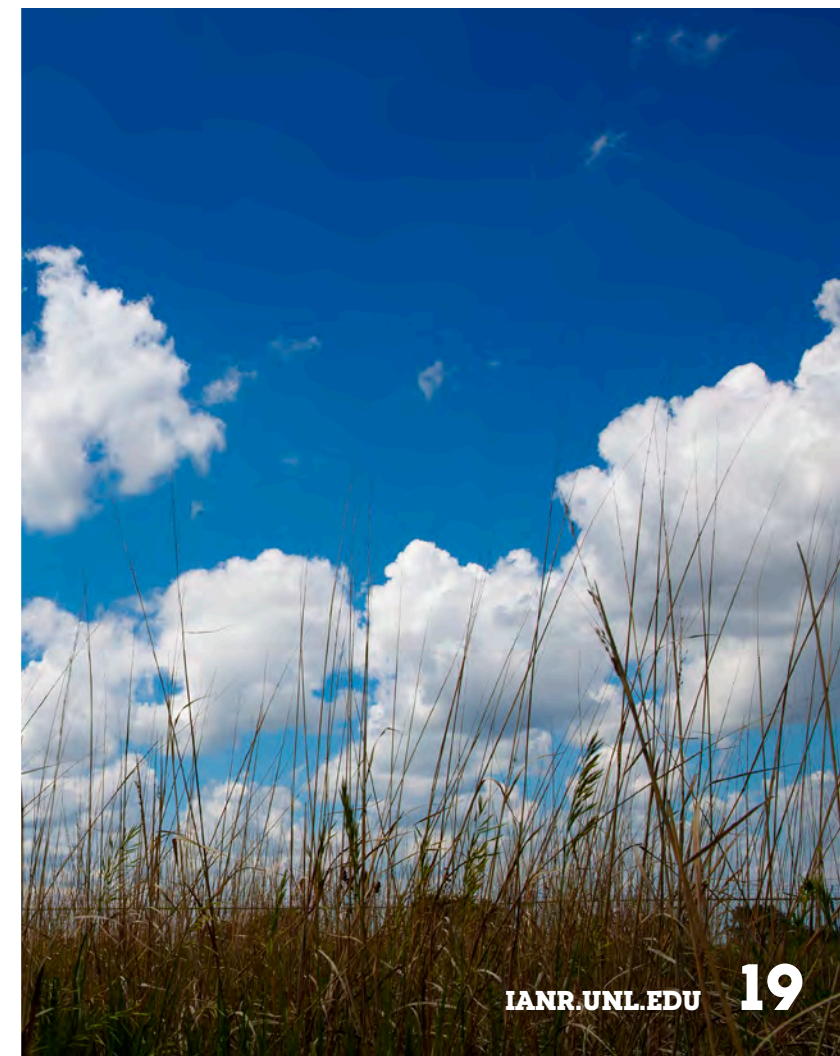
More information about Nine-Mile Prairie is at grassland.unl.edu/nine-mile-prairie.



Dickcissel nest



Spiderwort





Researchers identifying needs of rural minorities

By: Linda Ulrich

Why ethnic minorities move to rural communities and whether they stay is becoming increasingly important as rural populations across the country decline.

Approximately two-thirds of the 93 counties in Nebraska have had decreases in their populations in the last decade. For some of these counties, the population decline has been occurring for longer.

An influx of immigrants and ethnic minorities has helped many rural communities survive and thrive. However, little is known about the specific factors that affect non-majority residents' well-being and their decision to move or stay, said Maria de Guzman, associate professor and extension specialist in the Department of Child, Youth and Family Studies at the University of Nebraska-Lincoln.

"There's a big gap in research about which factors define quality of life for ethnic minorities in rural communities," said de Guzman, principal investigator for a research study exploring those factors.

Good jobs, housing and education are important to everyone, regardless of ethnicity, she said. "But we wanted to identify additional, specific factors important to ethnic groups in smaller communities."

Quality of life can include objective indicators of well-being, such as health and income, but it can also include subjective assessments of personal well-being, including emotional health, stress levels and resilience," said Rodrigo Cantarero, associate professor of Community and Regional Planning and co-principal investigator.

Data from this study indicates that while ethnic minorities may move to a community for jobs, whether they stay is based on a variety of subjective factors, including whether

- They feel a sense of community and belonging
- There are activities for families, especially the children
- There are cultural resources
- They experience discrimination.

One of the study's findings was that the frequency and experiences of discrimination affect minorities' quality of life and sense of well-being. "This is not surprising, but we are documenting a correlation between their experiences of discrimination and how it affects their sense of well-being and intentions to stay in the community," De Guzman said.

The research was conducted in Madison, Platte, Dakota and Scotts Bluff counties in Nebraska. It included interviews with stakeholders and decision-makers considered knowledgeable about the county's ethnic minorities, as well as focus groups and surveys of more than 650 self-identified ethnic minorities.

"Minorities can enrich the lives of everyone in rural communities. They also can provide an economic boost," Cantarero said. "Identifying cultural, environmental, social and other factors that rural minorities consider essential can help develop educational tools for people serving those groups."

As community leaders, educators, policymakers and planners contemplate how to address the needs of rural communities, "they need to take into account the potentially unique experiences of their ethnic minorities," de Guzman added.

In addition to de Guzman and Cantarero, the research team includes Evan Choi, associate professor of Child, Youth and Family Studies; Soo-Young Hong, associate professor of Child, Youth and Family Studies; Yan Ruth Xia, professor of Child, Youth and Family Studies; and Nebraska Extension educators Jill Goedeken, Jackie Guzman and Lee Sherry.

The University of Nebraska Rural Futures Institute funded the project. More information about this study can be found at culturalcompetence.unl.edu/research-publications.

By: Shawna Richter-Ryerson

Ecologist: Resilience doesn't mean stagnant

When one sits down to talk about water and ecosystem resiliency with Steve Thomas, river and stream ecologist with the School of Natural Resources, the conversation quickly meanders just like the streams he studies.

The Oyacachi River in the Ecuadorean Andes

Resilience can mean two things to scientists, he said. Either it can mean an ecosystem is resistant to change in the face of an outside stressor; or it can mean an ecosystem has the ability to return to its previous condition quickly after a disturbance.

"Stream ecosystems in their natural state tend to be both resistant to change and recover quickly once disturbed," he said. "Flow alteration and channel simplification associated with many human activities often compromise both these aspects of ecosystem resilience."

He points out that ecosystems operating naturally are evolving, on their own and at their own pace, and left alone, they grow, change, and sometimes collapse, only to reorganize and thrive again. That cycle, often called panarchy, is drawn to look like an infinity loop or figure 8.

"Resilience doesn't mean conditions remain stagnant," Thomas said. Just look at streams and rivers where water flow changes dramatically over time but the composition of species remains relatively constant by comparison.

His research in Brazil, Trinidad and Nebraska examines waterways over time to see how different variables affect the health of streams and the ecosystems around them. He's interested in knowing how changes in watershed land use and upstream channel conditions impact downstream habitats; how far nutrients like nitrate and phosphate travel in streams and how these stresses alter the food web in downstream areas. He's interested in how these upstream impacts lead to algae blooms that are increasingly impacting water quality and human health and recreation in Nebraska, the Midwest, and across the globe.

Sometimes the research leads Thomas and colleagues to the jungle in Brazil, where they stand knee-deep in water dripping known amounts of nitrate into streams and measuring its disappearance downstream. Other times, it's comparing the diversity of species across different elevations in the Ecuadorean Andes and Rocky Mountains in Colorado.

Thomas said research has shown streams display greater resilience when their flow and the channel conditions are close to their natural condition. As activities in the watershed begin to alter the chemistry and shape of the channel, resilience can be compromised.

"We also know streams are intimately linked to their floodplain under natural conditions and that the interaction between the stream and its floodplain strongly impacts the ecology of the stream," Thomas said. In other words, the stream ecosystem doesn't operate alone, and neither does the ecosystem around the stream. They are connected.

"Streams are very dynamic ecosystems and many are really prone to disturbance," he added. The challenge for Thomas and other researchers lies in figuring out the mechanisms that allow ecosystems to maintain their condition in the face of outside stressors, or quickly return to it after disturbance such as a severe drought or flood.

Thomas is currently applying what he does know about stream and ecosystem health to research

in Sao Carlos, Brazil, through a partnership fostered by the Institute of Agriculture and Natural Resources Global Engagement initiative. He's collaborating with researchers from the University of Sao Paulo to explore how restoring riparian forest and grasslands affects nutrient transport and cycling in adjacent streams. Thomas will compare and contrast nutrient retention in Brazilian streams to that of those here in Nebraska.

"We hope to understand how restoration of plant communities next to streams impacts the

ability of those streams to remove and retain nitrogen and phosphorus from the water passing through them," he said. "In Brazil, this means changing the riparian vegetation from sugar cane to native forest while in Nebraska, that often means transitioning from corn or soybeans to native grasses and shrubs."

That project, funded by the São Paulo Research Foundation and the University of Nebraska-Lincoln, runs through August 2020. Whatever the final results are, one thing is certain: The outcomes will either support or discount what scientists already know about the relationship between the two variables, and the knowledge will bring them another step closer to resilience.

To learn more about Thomas' previous research in Trinidad and Ecuador examining how species become locally adapted to their home conditions, visit bit.ly/ThomasEcuador.



Dimensions of Biodiversity research team

Drought resilience at home and abroad

Both in the U.S. and abroad, the National Drought Mitigation Center (NDMC) strives to help reduce the impact of drought on people, the environment and the economy.

The center takes the “ounce of prevention” adage seriously, advocating for the development of risk planning and management as the key to resilience in the face of drought, specifically in the Middle East and Northern Africa (MENA) region.

“In many places throughout the world, including sometimes in the U.S., drought is handled through crisis management, not proactive management,” said Cody Knutson, drought planning coordinator with NDMC. “Taking an integrated, systematic risk management approach, with monitoring systems that then trigger action in the event of a drought — that’s what helps places fare better moving forward.”

In collaboration with the International Center for Biosaline Agriculture (ICBA) and local consultants, NDMC works to help the area reduce the effects of drought events, focusing on Jordan, Lebanon, Tunisia and Morocco. The prospects of a hotter, drier future climate, combined with the complex political and population dynamics of the already water-stressed region, have brought this subject into sharper clarity.

“Even in Lebanon, where this has been a low political priority because of the widespread perception of being a water-rich country, recent drought events with a great deal of impact have increased the understanding of how important this planning is,” said Knutson. “This is one project that’s really actively working to build resilience to drought in the region.”

Now three years into the project, which is supported by the United States Agency for International Development, the team at NDMC and regional experts

from ICBA have developed a regional Composite Drought Index monitoring tool for the MENA region. They have also worked with local stakeholders to conduct vulnerability and needs assessments in each of the four countries. Having long-term, consistent engagement in the area is essential, said NDMC director Mark Svoboda.

“Being in the region over a long period of time, taking cultural aspects into consideration, actively seeking feedback on their needs rather than just trying to prescribe something — these are all part of what makes it work,” he said. “If I’ve learned anything on the whole drought planning process, it’s that it takes time. It takes trust and transparency.”

In the current stage, they’re working to progress from just having early warning systems into the application of that information: how to reduce risk and impacts, how drought planning can be worked into their national policies on climate change and water, and how all of this can be used to make more informed decisions going forward, Svoboda said.

Drought in particular is so challenging because of its huge spatial and temporal footprint in an area, in addition to its crosscutting effects in both rural and urban life, the economy, public health and often national security. Whether direct or indirect, the impact of drought is rarely confined to one part of the world.

“It can become a global issue, like when the drought started in Syria; it’s hard to believe all it led to,” said Svoboda.

The lessons learned from the work done in Morocco, Jordan, Tunisia and Lebanon help those nations respond better to future droughts, and serve as a model to other nations in the region. This in turn can provide further insight on how to better address these challenges in other parts of the world, including the U.S. Ultimately, developing resilience in parts helps create a more resilient whole.

“If I’ve learned anything on the whole drought planning process, it’s that it takes time. It takes trust and transparency.”
– Mark Svoboda





ALUMNI SPOTLIGHT

Dudley Sorensen (left) talks with students about his work as a conservation officer during the School of Natural Resources and Life Sciences Career Information Day.

By: Linda Ulrich

A natural fit

When people are asked to name their hero, the answer often is a parent, a nationally known sports figure or a distinguished humanitarian.

Dudley Sorensen's answer is different: two 1960s TV show characters — Porter Ricks, chief warden who appeared on "Flipper," and Tom Wedlow, wildlife officer on "Gentle Ben."

Influenced in part by those characters, Sorensen knew he wanted to be a game warden by the time he was 12. He achieved this goal in a highly competitive field after graduating from the College of Agricultural Sciences and Natural Resources in 1989. He is currently a conservation officer for the Nebraska Game and Parks Commission in the southeast district, primarily Lancaster and York counties. Conservation officers, also known as game wardens, are law enforcement officers who help protect and conserve fish, wildlife and natural resources across the state.

"It's a lifestyle, not an 8-5 job. Every day is different, and I love being outdoors," said Sorensen, who grew up on a farm near Bancroft.

As a conservation officer, he focuses on fish and wildlife, and public safety but also performs some of the same duties as other law enforcement personnel such as responding to natural disasters and recovering stolen property. His work ranges from freeing an elk tangled up in a barbed wire fence to dealing with a DUI at one of the state lakes to ensuring hunters have the proper permits.

"I like being that guy between the poacher and the animal," Sorensen said.

Although he enjoys his job, it can be dangerous. Most of the time conservation officers work alone, often in remote areas, and many of the people they encounter have firearms or knives.

"It's not so much the animals that pose a danger as much as dealing with people with guns and sometimes drugs," he said.

Fortunately, the great majority of his encounters with the public are positive. Sorensen spends a lot of time providing education on topics such as hunter safety to civic organizations, schools and colleges. He also taught his children, Kelsey, Cole and Audrey, to hunt and fish and to appreciate the natural world. An indication that he taught them well is that Kelsey, who graduated with an animal science degree, started the archery club when she was a student in CASNR.

Sorensen's undergraduate degree in natural resources with a wildlife management option was a good fit, and he attributes his professional success to the faculty and his advisor Ron Case. He tries to pay it forward by volunteering for CASNR in various capacities, such as speaking to the Wildlife Club and assisting at the School of Natural Resources and Life Sciences Career Information Day.

"We want to get as many people interested in natural resources as we can," Sorensen said.

by the numbers

59 doctoral degrees awarded by CASNR from summer 2017 through spring 2018, representing over 20% of all doctorates awarded by the university in that time period.

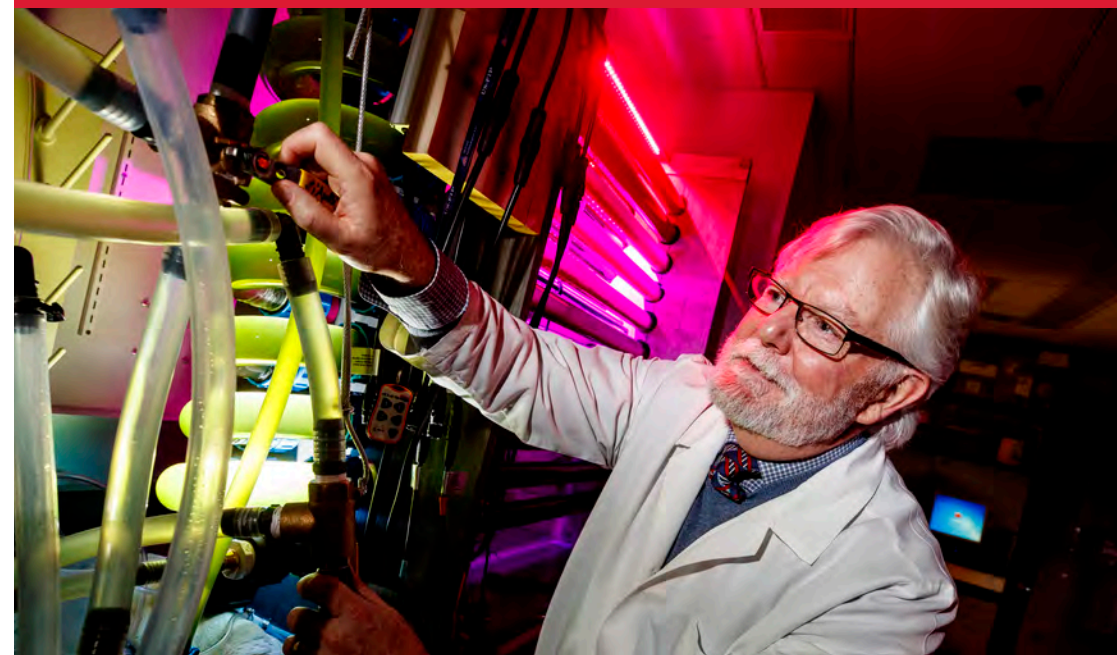
91 students enrolled in CASNR during the 2018-19 academic year represent 91 of Nebraska's 93 counties.

775 proposals submitted by IANR researchers for sponsored research in fiscal year 2018.

1,089 alumni of the Nebraska Lead Program, Nebraska's premier two-year agricultural leadership and development program, now in its 38th year.

1,108 learners engaged in Nebraska Extension farm and ranch succession planning education programs in 2018.

1,800 youth from across the state who have participated in Next Chapter, a college readiness program and UNL pre-admittance program offered to 8th graders enrolled in 4-H.



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