

University of Nebraska-Lincoln  
 New Academic Center  
 Academic Centers include bureaus and institutes

I. Descriptive Information

<b>Name of Institution Proposing New Center</b>
University of Nebraska-Lincoln
<b>Name of Proposed Center</b>
Center for Resilience in Agricultural Working Landscapes
<b>Name of the Programs (majors) Involved</b>
School of Natural Resources (NRES); Agronomy and Horticulture (AGRO); Agricultural Economics (AECN); Biological Systems Engineering (BSEN); Public Policy Institute; Computer Science and Engineering; Animal Science; School of Biological Sciences; School of Veterinary Medicine and Biomedical Sciences; School for Global Integrative Studies; College of Arts and Sciences; and College of Engineering
<b>Other Programs Offered in this Field by Institution</b>
There are no other programs or organizational units at the University of Nebraska or in the state of Nebraska with a comprehensive focus on resilience in agricultural landscapes, or resilience in complex systems of people and nature. The Center for Resilience in Agricultural Working Landscapes will bring together the strengths that exist individually in disparate faculty and programs in the supporting colleges and departments, enhancing the strength of each without duplicating the efforts of any. The center is meant to be synthetic and integrative, converging new science from multiple existing disciplines.
<b>Administrative Unit(s) for the Proposed Center [e.g. college, school, division, etc.]</b>
IANR; CASNR; schools and departments listed above and others as collaborations are developed.
<b>Physical Location, if applicable</b>
Keim Hall
<b>Date Approved by the Governing Board</b>
<b>Proposed Date the Center will be Initiated</b>
Summer, 2020

## II. Review Criteria

### A. Purpose and Context for the Center

The University of Nebraska-Lincoln is poised to lead the world in the science and practice of resilience in agricultural working landscapes. Nebraska provides the ideal experimental laboratory for UNL to continue advancing the concept of resilience. This is coming at a critical time. UNL is core member of the Resilience Alliance (RA), an international network of resilience scientists who are responsible for today's widespread use of the resilience concept, which grew from a strong theoretical foundation in ecology. Resilience is not only important to agriculture and natural resources, it permeates disciplines ranging from the natural to the physical and social sciences, and has a clear and important nexus with the goals of Nebraska One Health. UNL and the NU system have the potential to be a global leader in Resilience and One Health. One Health strengths exist in our expertise in animal sciences and veterinary medicine, as well as the diverse human health, engineering, natural sciences and social science programs across NU campuses. The Nebraska Water Center and University of Nebraska Public Policy Center, along with UNMC's Center for Global Health and Development, Center for Environmental Health and Toxicology, the Nebraska Center for Virology, and Daugherty Water for Food Institute provide linkages critical to successful Resilience and One Health initiatives. The Center for Resilience in Working Agricultural Landscapes will focus on core concepts of resilience and related theory in working agricultural landscapes. Specifically, UNL provides expertise in five unique and exciting areas: 1) application of resilience theory to agricultural systems; 2) combination of resilience and One Health; 3) application of adaptive management to agricultural systems; 4) quantification and application of resilience theory; and 5) development and application of panarchy theory. ***No other institutions have a focus and expertise in these emphases.***

Agriculture drives the Nebraska economy, with irrigated agricultural systems that are among the most efficient and productive in the world. However, these systems are less than a century old and have not yet withstood the test of time; their resilience is unknown. Nebraska is a global food producer and ensuring agricultural sustainability is critical to the state and nation. The university provides extensive expertise in water and agriculture, but integration and synthesis across academic disciplines is needed. The Center for Resilience will build upon and leverage existing resources, and set the stage for integrated and synergistic approaches that addresses the issue of sustainability in food production in the short- and long-term.

Resilience, in theory and practice, has expanded enormously. Calls for proposals from USDA, NSF, DOD, and other agencies now routinely call out resilience, but no institution in the United States or internationally has an explicit focus on *resilience in agricultural systems*. UNL is poised to fill that void. **This is the right time for a resilience center at UNL.** There is an opportunity **right now** to establish Nebraska as the leader in this new discipline/science, with benefits to the university, state, and world.

A Center for Resilience in Agricultural Working Landscapes at the University of Nebraska will serve as the platform for guaranteeing the resilience concept meets its potential to serve the

personal and economic well-being of Nebraska's citizens and the state's valued resources. The center will put us in a position to leverage national and international interests and guide the future of science, management and policy in a manner truly capable of protecting the important agricultural resources that drive Nebraska's economy and underpin our global leadership in feeding humanity.

The Center will provide a hub for interdisciplinary interaction and collaboration among UNL's programs and centers of expertise, and will signal the strength of this research emphasis to external partners, funding organizations and the public. Importantly, a center provides leverage, visibility and credibility that enhances our potential for securing large-scale external funding, such as an NSF Science & Technology Center, and shared space for the center creates the interdisciplinary interactions required for success.

These programs converge seemingly disparate expertise (natural resources, computer science, biological systems engineering, public and animal health, political science, law, public policy, environmental sciences, agronomy and horticulture) around a few common research themes and generate a common language for communication and problem solving.

The center will build on and substantially expand this successful model, incorporating researchers from within and outside the university, non-governmental organizations, producers, corporate partners, Indigenous knowledge-holders and other stakeholders. We will build on our past successes in integrating research, teaching and extension to deliver products and train citizens to apply resilience thinking in their professions and decision-making processes.

Currently at UNL no formal teaching occurs at the undergraduate level to train students in the theory or application of resilience. To address the complex and ever-changing problems facing agriculture in the 21<sup>st</sup> century, current and future agricultural leaders need to be competent in resilience concepts and view working agricultural landscapes as complex adaptive systems. We will leverage our existing momentum in graduate training to introduce several foundational courses that broadly appeal to undergraduates across all three campuses. Any new course(s) will be developed following standard university procedures, and will be housed within an existing academic department, and approved as necessary by the appropriate college Curriculum Committee and faculty, Undergraduate Curriculum Committee, or Graduate Council.

## **B. Centrality to UNL Role and Mission**

Agricultural production must increase greater than 70% by 2050 to meet the global demand for food, fuel and fiber. Meeting this goal will require agricultural intensification and more efficient use of marginal lands, while contending with a suite of complex and interacting drivers of global change, including extreme weather, soil degradation and biological invasions. Other programs work towards increasing productivity; no other program focuses on maintaining the resilience of production landscapes. Sustainable intensification of agriculture is a grand challenge for

humanity that will require fostering resilient working landscapes and transforming landscapes that are currently in undesirable states. The center is aligned with the IANR priority communities: stress biology, science literacy, healthy humans, healthy agricultural production and natural resource systems, computational sciences, and drivers of economic vitality for Nebraska.

### **C. Relationship of the proposal to the NU Strategic Framework**

The Center for Resilience in Agricultural Working Landscapes will build upon recent and current successes in funding research – and educational training. Educational Training includes the current UNL – National Science Foundation, National Research Traineeship, which supports 20+ graduate students from multiple departments and focuses on recruiting under-represented groups (<https://nrt.unl.edu/>), numerous grants supporting graduate students, and pending proposals to support Research Experiences for Undergraduates, among others. Faculty members who will be involved in the proposed center if approved have been at the forefront of novel approaches to education, and are committed to delivering quality education in unique manners. Examples include an experimental team taught (5 faculty members) graduate class in complexity, and the development of a student organization focused on resilience (recently approved). The Center’s interdisciplinary focus, complex landscape focus, clear focus on the concurrent development of applied science and supporting theory, and link to international resilience centers through the Resilience Alliance (<https://www.resalliance.org/>) will enable recruitment and retention of high quality faculty and students. Resilience as a concept has grown enormously – largely due to efforts of the Resilience Alliance – yet there is little focus on landscape and/or agricultural resilience. Therefore, this is a unique opportunity, and UNL is well-situated to further develop international recognition in agricultural resilience. Additionally, an explicit link with Nebraska One Health will create an internationally unique center, while serving the needs of Nebraska citizens.

### **D. Consistency with the Comprehensive Statewide Plan for Post-Secondary Education**

The mission of the Center for Resilience in Agricultural Working Landscapes is consistent with the major goals of the *Nebraska Comprehensive Statewide Plan for Postsecondary Education* in the following ways:

#### **Meeting the Needs of Students**

Nebraska colleges and universities will foster critical thinking skills and provide their graduate the knowledge and workplace skills needed to be successful employees, innovative entrepreneurs, and responsible citizens on a global stage. The resilience center will build upon our success in interdisciplinary student training that we established via a National Science Foundation Interdisciplinary Graduate Education and Research Training grant, and expanded with current National Science Foundation National Research Traineeship funding. These programs are explicitly interdisciplinary, and focus on the complex real-world problems that require answers from more than one discipline, challenges that have been characterized as “wicked” problems.

### **Meeting the Needs of the State**

The center will fill a niche in research and student training. The center will include research, student and workforce training, and build upon a network of engaged collaborators, ranging from private ranchers to state and federal agencies, and non-governmental organizations.

### **Meeting Needs by Building Exemplary Institutions**

Postsecondary education in Nebraska will be effective in meeting the needs of students and the state, will be efficient in its expenditure of the state's resources, and will be accountable for developing, sustaining, and demonstrating exemplary teaching, learning, research, and public service. The center for resilience in agricultural working landscapes has laid the groundwork for success in this area by building unique training approaches and tackling problems of societal importance within Nebraska.

## **E. Evidence of Need and Demand**

The Center will provide a hub for interdisciplinary interaction and collaboration among UNL's programs and centers of expertise, and will signal the strength of this research emphasis to external partners, funding organizations and the public. Importantly, a center will provide leverage, visibility and credibility that enhances our potential for securing large-scale external funding, such as an NSF Science & Technology Center, and shared space for the center creates the interdisciplinary interactions required for success.

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## **F. Organizational Structure and Administration**

C.R. Allen is identified as director for the Center, and is already a tenured professor of Natural Resources. Dr. Allen was formerly a research professor, with the USGS Nebraska Cooperative

Fish and Wildlife Research Unit. As such, his former responsibilities have been assumed by a new federal leader of the Coop Unit. Elizabeth Van Wormer (director, Nebraska One Health) and an assistant director (also existing faculty, TBD) will have partial administrative roles. In Dr. Van Wormer's case, she will continue with no change to her responsibilities, but will link her program with the new Center. An assistant director has not been identified at this time, but would originate from existing faculty with only a small change to include some administrative responsibility. Administrative staff will be supported by external grants (current full time professional on staff, + ongoing searches for coordinating positions) and through partnering with the Center for Grassland Studies (2 current support staff; co-location of Centers). Additional faculty will be from current searches in Natural Resources (spatial sciences) and Agricultural Economics (ecological economics), plus an additional faculty member to be hired from current National Science Foundation Funding. Thus, initially, the Center will comprise 6 core tenure-line faculty (Allen and Van Wormer, plus an internally identified assistant director, and three new hires), two staff members currently associated with the Center for Grassland Studies, a current staff member coordinating a resilience themed National Science Foundation Training Grant, and approximately three new staff members funded from new funding from the National Science Foundation EPSCoR Program.

In addition, over the first three years the Center will continue to develop a cohort of faculty members affiliated and engaged with the Center's work from across the university, visiting faculty, and post-docs and similar positions. These positions will be associated with departments and schools affiliated with the Center; in particular Allen is associated with the School of Natural Resources, Van Wormer with the School of Veterinary Medicine and Biomedical Sciences and the School of Natural Resources, the new spatial sciences hire with the School of Natural Resources and the Department of Agronomy and Horticulture, the new non-marked economist with the Department of Agricultural Economics and the School of Natural Resources, and the NSF funded new faculty hire with the Department of Agronomy and Horticulture and the School of Natural Resources. An MOU with academic departments will be in place regarding evaluation and promotion. Participating departments include: Department of Agricultural Economics, Department of Agronomy and Horticulture, Department of Animal Science, School of Biological Sciences, and the Department of Biological Systems Engineering, with conversations with faculty members from several other departments, such as Anthropology.

The director's salary and that of the two new tenure-track faculty, and the third tenure-track faculty starting in the fifth year (supported by external funds in years 1-4) will be permanently budgeted and paid for jointly by ARD and CASNR. Each line will have teaching obligations in either the School of Natural Resources, the Department of Agricultural Economics, or the Department of Agronomy and Horticulture and will have research and service obligations typical of tenure-line faculty. The teaching apportionment will be agreed on by the college deans and department chairs in these departments through an MOU at the time of hire, which will be reevaluated as needed. The annual teaching assignments will be determined by the department heads, based on what has been agreed on in the MOU.

## **G. Partnerships with Business**

No current partnership with business exists, but if created, the principals will engage agricultural industries and businesses with a component of agricultural sustainability.

## **H. Collaborations with Higher Education Institutions External to the University**

The international non-profit, non-governmental organization, the Resilience Alliance provides a natural conduit for exposure and collaboration (this includes numerous institutions in North America, Europe and Australia). We additionally have ongoing partnerships with the University of Montana and Michigan State University, outside of the Resilience Alliance.

## **I. Constituencies to be Served**

Graduate and undergraduate students; producers; collaborating agencies and NGO's (e.g., Nebraska Game and Parks Commission, Department of Environmental Quality, Sandhills Task Force, The Nature Conservancy).

The Center will engage with regional, national, and global groups involved in the management of complex landscapes to create an interactive culture of exchange among academics, practitioners and industry. Communication, outreach and partnership-building are critical to our mission of creating policy-relevant solutions to complex problems.

Nebraska's agricultural producers and industries already are thinking about resilience concepts. The 2017 Fremont Corn Expo included "increasing resilience" as one of its four primary themes, although their practices are not aligned with university or internationally-leading research in this area. The Center will build on UNL's history of working with agricultural industries and producer clientele to enhance resilience literacy in agriculture and to co-develop strategies for building resilience in working lands. Communicating this work in an engaging way and fostering knowledge exchange will be an integral part of the Center. Professional communications staff will co-develop outreach materials with our collaborative partners, rather than simply transferring information from the university outward. Core partners, such as the Platte Basin Timelapse Project, will bring substantial expertise in communicating resilience in working landscapes to a broad audience.

### **Partnership Building**

The interdisciplinary nature of the Center's work and our focus on working agricultural landscapes make external partnerships critical to our success. We will develop programs with partners whose expertise complements ours and who bring perspectives from diverse disciplines. Importantly, this will include establishing and building ties with commodity and related agricultural groups including the Corn Board, the Midwest Rowcrop Initiative, Nebraska Cattlemen's Association, the Sandhills Task Force and others. Existing relationships and collaborations include:

- State agencies: Nebraska Game & Parks Commission, Nebraska Department of Natural Resources, Nebraska Department of Environmental Quality, Nebraska Natural Resource Districts
- Non-governmental Organizations: The Nature Conservancy, Headwaters, the Resilience Alliance.

Craig Allen is on the Boards of the Nature Conservancy and the Resilience Alliance and is a founding member of the Nebraska Conservation Roundtable, which will enhance partnership opportunities, and impact.

## **J. Anticipated Outcomes, Significance, and Specific Measures of Success**

### **Strategic Objectives**

This plan is meant to cover a 5-year horizon. Our goal is to have a small core of university supported faculty members and a much larger self-sustaining component that includes research faculty, post-docs and students supported with external funding. This is the model of the Nebraska Cooperative Fish and Wildlife Research Unit, which has (federal) support for three scientists, but has 40-100 people on the payroll at any given time. We expect annual review of Center faculty, and the Center itself.

#### **Objective 1. Establishing the Core Faculty**

**Target: Core faculty of 4 permanent positions.**

The Center will operate with a small, highly productive core of faculty focused on high quality and high volume publishing in top journals, pursuing multiple funding opportunities, and leading in both teaching and extension.

- Director: UNL faculty position (new). Assistant Director: existing UNL faculty.
- Two (2) new faculty positions.
- Associated faculty – not fellows, but faculty with a core stake in the success of the center.

#### **Measurement**

All faculty members in place by 2021.

#### **Strategy**

- International search for competent faculty.
- Center hires post-docs and/or research professors as it grows, supported by sponsored funding.

#### **Strategic Objective 2. Staffing**

**Target: Administrative Assistant and communications expertise.**

**Measurement:** Key staff in place by 2021.

**Strategy:** IANR will support core staff (current support staff with the Center for Grassland Studies). Additional staff growth will be supported by sponsored funding. We currently have several externally supported personnel in place.

#### **Strategic Objective 3. Establishing space for the Center.**

**Target:** Sufficient space for growth of core staff, faculty, and students.

**Measurement:** Initial space needed is currently in place, and additional space for growth identified by the end of 2020.

**Strategy:** Meet with SNR Director and IANR administrators to explore options.

#### **Strategic Objective 4. Building key partnerships**

**Target:** Establish relationships with key partners through collaborative research, education and outreach efforts.

**Measurement:** Numbers of joint publications and proposals submitted with key partners.

**Strategy:** True partnerships grow from collaborative activities where everyone has “skin in the game” and shares in the success.

- Joint publications in top journals.
- Joint proposal submissions.
- Workshops and other activities, such as several NSF-funded Workshop (most recently in December, 2019).

#### **Strategic Objective 5. Center Sustainability**

**Target:** The Center will be self-sustaining by 2022 and beyond through sponsored funding.

**Measurement:** Meet budget goals.

**Strategy:** Proposals will be submitted to multiple federal (and other sources), to include USDA-NIFA, NSF-CNH, NSF-STC, and DOD-SERDP. These proposals will be submitted in the first calendar year, and we will continue to aggressively pursue external funding opportunities building upon past successes.

### **K. Potential for the Center to contribute to Society and Economic Development**

The Center will be the leading global institution in agricultural resilience, guiding the future of science, management and policy focused on protecting the agricultural systems that feed the world, and the health of the people that inhabit it. The mission will be to train future leaders in the theory of agricultural resilience; apply resilience theory to agricultural landscapes to ensure they can cope with external and internal stressors and maintain their adaptive capacity; identify win-win conservation gaps and provide guidance for closing those gaps; and position UNL as a leader in the science of agricultural resilience. The Center will provide a hub for interdisciplinary interaction and collaboration among UNL’s programs and centers of expertise, and will signal the strength of this research emphasis to external partners, funding organizations and the public. Importantly, a center provides leverage, visibility and credibility that enhances our potential for securing large-scale external funding, such as an NSF Science & Technology Center.

The resilience center embraces the diversity of backgrounds and concomitant insights needed to effectively address complex and dynamic social-ecological challenges in working agricultural landscapes. Addressing such challenges, determining and fostering resilience in agricultural landscapes is a grand challenge for humanity and critical for the sustainability of Nebraska’s agricultural landscapes, and therefore Nebraska economy.

**L. Adequacy of Resources:**

1. Faculty/Staff

The proposed center will include three (3) existing faculty members (as director, assistant director, and One Health director), and three additional faculty members – one funded externally, and two new hires.

2. Physical Facilities and Equipment

**No additional facilities needed at this time.**

3. Budget Projections *[see Table 1 and Table 2].*

Appendix - Letters of support *available*

- 1) Mark Button, Dean College of Arts and Sciences
- 2) Lance Perez, Dean College of Engineering
- 3) Nebraska Game and Parks Commission
- 4) Nebraska Prescribed Fire Council
- 5) The Nature Conservancy
- 6) Audubon Society
- 7) The Resilience Alliance
- 8) School of Natural Resources
- 9) Agricultural Economics
- 10) Nebraska Water Center
- 11) Andrea Basche, Agronomy
- 12) Nancy Shank, Public Policy Center

**TABLE 1: PROJECTED EXPENSES - NEW ORGANIZATIONAL UNIT  
UNL Center for Resilience in Agricultural Working Landscapes**

Personnel	(FY2021) Year 1		(FY2022) Year 2		(FY2023) Year 3		(FY2024) Year 4		(FY2025) Year 5		Total
	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	Cost
Faculty <sup>1</sup>		\$140,000		\$420,000		\$430,500		\$441,263		\$452,295	\$1,884,058
Non-teaching staff: Professional <sup>2</sup>		\$415,000		\$255,000		\$140,000		\$140,000		\$140,000	\$1,090,000
Graduate Assistants <sup>3</sup>		\$200,000		\$200,000		\$200,000					\$600,000
Non-teaching staff: Support		\$110,000		\$110,000		\$110,000		\$60,000			\$390,000
Benefits (~40%)		\$346,000		\$394,000		\$352,200		\$256,505		\$236,918	\$1,585,623
Subtotal		\$1,211,000		\$1,379,000		\$1,232,700		\$897,768		\$829,213	\$5,549,681
<b>Operating</b>											
General Operating <sup>4</sup>		\$120,000		\$40,000		\$40,000		\$40,000		\$10,000	\$250,000
Equipment		\$5,000		\$5,000		\$5,000		\$5,000			\$20,000
New or Renovated Space											\$0
Library/Information Resources											\$0
Other											
Subtotal		\$125,000		\$45,000		\$45,000		\$45,000		\$10,000	\$270,000
<b>Total Expenses</b>		<b>\$1,336,000</b>		<b>\$1,424,000</b>		<b>\$1,277,700</b>		<b>\$942,768</b>		<b>\$839,213</b>	<b>\$5,819,681</b>

<sup>1</sup> Includes salary for Allen, three new hires, portion of salary for Dep. Director and One Health Director. Estimate includes benefits. Position 3 is supported with external funds years 1-4, IANR year 5.

<sup>2</sup> Estimated numbers based on within-grant estimates. Sufficient to allow 2.5% annual increases for merit.

<sup>3</sup> All graduate assistantships are supported on external grant funds.

<sup>4</sup> Operating expenses included expenditures such as travel to local stakeholders, especially immediately following formation of the Center; purchases of items such as computers; and pay for graphic design, communication items, and web design.

**TABLE 2: PROJECTED REVENUES - NEW ORGANIZATIONAL UNIT  
UNL Center for Resilience in Agricultural Working Landscapes**

	(FY2021) Year 1	(FY2022) Year 2	(FY2023) Year 3	(FY2024) Year 4	(FY2025) Year 5	Total
	Reallocation of Existing Funds <sup>1</sup>	\$200,000	\$600,000	\$600,000	\$600,000	\$700,000
Required New Public Funds						
Tuition and Fees						
Other Funding <sup>2</sup>						
1. NSF - NRT	\$600,000	\$600,000	\$600,000			\$1,800,000
2. NSF - EPSCoR T2	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000		\$4,000,000
3. NGPC - Cedar management	\$240,000					\$240,000
4. NGPC - bats	\$115,000	\$115,000				\$230,000
5. NGPC - cedar planning	\$50,000	\$50,000	\$50,000			\$150,000
6. Joint Fire Science	\$90,000					\$90,000
7. USDA-AFRI	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$750,000
<b>Total Revenue</b> <sup>3</sup>	<b>\$2,445,000</b>	<b>\$2,515,000</b>	<b>\$2,400,000</b>	<b>\$1,750,000</b>	<b>\$850,000</b>	<b>\$9,960,000</b>

<sup>1</sup> Includes salary for existing university faculty (Director, Deputy Director, One Health Director). Year 5 includes faculty member paid via external funds in years 1-4.

<sup>2</sup> Other funding - received are grants awarded to UNL (partial list).

<sup>3</sup> Omits grants submitted but not awarded as of Jan 2020 (partial list). NIH \$625,000; USAID \$730,000; NET \$240,000; NGPC \$930,000.