



DEPARTMENT OF AGRONOMY AND HORTICULTURE

2023 ACADEMIC PROGRAM REVIEW

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Review Process



Review Process

The University of Nebraska-Lincoln is required to periodically review academic programs for the Academic Planning Committee (APC). According to the Board of Regents (BoR), the mandated purpose of the periodic comprehensive review of academic programs is to evaluate the teaching/learning program, with particular emphasis being given to the program's contribution to undergraduate education. The Institute of Agriculture and Natural Resources (IANR) academic program reviews honor the BoR mandate with the expectation that the reviews provide attention to each mission area: teaching/learning, research, and extension/engagement. While unique attention may need to be given to each mission area separately, emphasis should be placed on how contributions in these mission areas work together in an integrated fashion to accomplish the mission of the department/school and institute. A focus should be placed on integration across mission areas.

The objective of the review is to provide an assessment of the unit's strengths and opportunities in a way that informs the strategic future direction of the unit. The primary goal is to improve the unit's effectiveness and quality in fulfilling its mission. The review entails (1) an internal self-study, (2) an external review of the program, (3) a final report that provides a clear plan for applying the results of the review, and (4) specific responses to the program review developed by the IANR Vice Chancellor and Deans.

The department of Agronomy and Horticulture has broadly engaged the department faculties, staff,

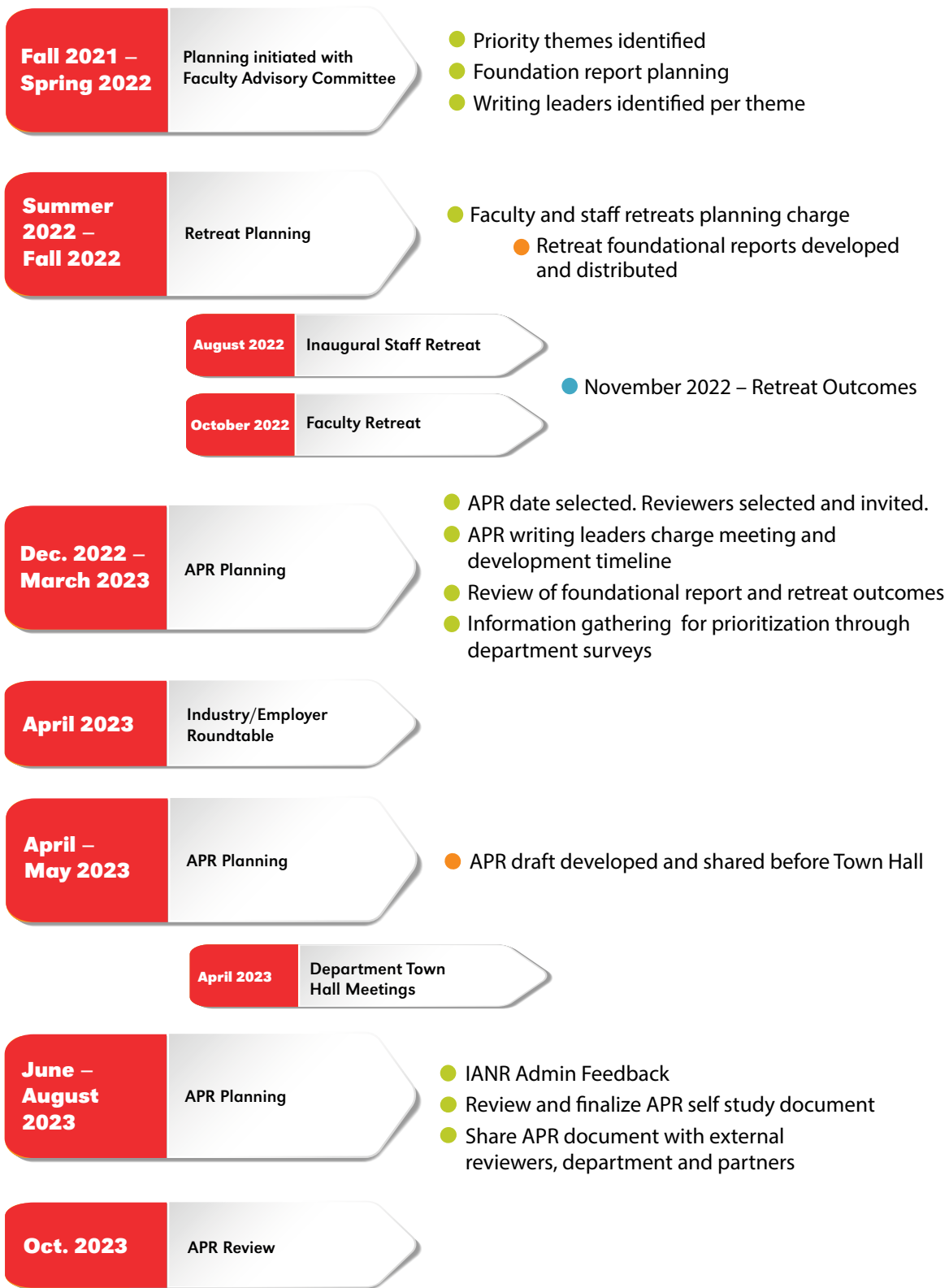
and students to develop a self-study document. Key activities that lead to the self-study documents include (1) Faculty and staff retreats; (2) Town hall meetings; (3) Web surveys. The preparation and planning timeline are outlined in the flowchart below.

The self-study document is divided into nine sections – four programmatic areas and four cross cutting themes. Supporting documents are listed in the Appendices and referenced appropriately in the self-study text. We invite the reviewers to help us think or re-think our plans, questions, and challenges in order to frame shared strategic framework for this strong and dynamic department. We appreciate the reviewers' honest and objective questions, comments, and attentiveness.



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Planning and Preparation



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Department Information



The department of Agronomy and Horticulture has a long-standing legacy and leadership in mission areas of teaching, research, and extension. Disciplinary areas include Crop Physiology and Production, Soil and Water Sciences, Range and Forage, Horticulture, Weed Science, Plant Breeding and Genetics, Turf Science and Management, and Landscape Design and Management. Faculty work is achieved through collaborations across disciplines, and in partnership with internal and external as bridge to effective interdisciplinary teaching, research, and extension. Our mission and core goals were articulated in 2019 to capture the urgency of the challenges in agriculture (climate extremes, biotic and abiotic stresses, water quality and quantity, food and nutrition security, resource use efficiency), prepare our students to be exceptionally skilled and competent professionals, and meet the needs of our stakeholders. The department's 2019 strategic framework and activities align with IANR Strategic Plans, UNL's N2025 Strategic Plans, and NU 5-year Strategic Priorities ([Overview Appendices 1-4](#)).

Mission

The Department of Agronomy and Horticulture continues to build leadership in plant, soil, and landscape systems through innovation and technology that is science-based and results-driven, with an urgency to anticipate and embrace future challenges. We partner with stakeholders to meet these challenges through creative research, learner-driven teaching, and extension that support multi-function

resilient landscapes and food production to enhance the quality of life for the citizens of Nebraska and the world.

Core Goals

- Share a culture of mutual respect and inclusive excellence among peers, staff, and the stakeholders we serve
- Develop synergy among Agronomy and Horticulture faculty through collaborations, shared governance, and organized strategic meetings
- Build capacity in research, teaching, extension and outreach programs
- Increase standard of excellence in our programs
- Approach activities with a spirit of innovation, cooperation, and entrepreneurship
- Identify programs that are fundamental to the mission of the department and ensure their support
- Increase cross-collaboration and stakeholder engagement to fulfill common mission

Department Status including accomplishments since last APR in 2017

The department of Agronomy and Horticulture is the largest academic unit at the University of Nebraska-Lincoln. The department is structured with standing and appointed committees, and key leaders to facilitate communication and governance ([Overview Appendix 5](#)). The mission of the department is fulfilled through the collective efforts and innovation of faculty, staff, students, and partners. We developed shared strategic priorities in 2019 as a roadmap and guide for our work ([Overview Appendix 1](#)).

The department currently has 77 faculty (two TT faculty starting in January 2024) with 49 tenure-track (TT) and 28 non-tenure track positions (full list in [Overview Appendix 6](#)); about 80 permanent staff positions comprised of office professionals, research technologists, facilities and farm managers (full list in [Overview Appendix 7](#)), and 312 undergraduate and graduate students. In total, the department has 19.25 teaching FTE, 38.68 research FTE,

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Department Information

and 13.10 extension FTE. Eleven of the department's faculty are located at Research Extension and Education Centers (REEC) at West Central (North Platte) or Panhandle (Scottsbluff). Our faculty are also connected closely with the Center for Plant Science Innovation (PSI) with ten faculty members located at the Beadle Center. Several

faculty have strong working affiliations with the Nebraska Food for Health and the Center for Grassland Studies. The department has 21 women faculty, of which eight are TT and 13 are NTT. About 20% of the faculty are funded through non-state funds as either grant or revenue generating service centers.

Table 1. Current Faculty Number and FTE distributions.

	Lecturer	Assistant		Associate		Full	
		TT	NTT	TT	NTT	TT	NTT
Total Count	2	11	16	14	4	24	5
Female Faculty Count	1	4	6	1	3	3	2
Teaching FTE	2	2.50	2.20	2.90	1.50	4.20	3.20
Research FTE		4.70	10.95	8.23	-	13.30	1.00
Extension FTE	2.00	2.85	2.10	2.50	3.65	0.25	
Total FTE	70.03	9.20	16.0	13.23	4.00	21.15	4.45

Current faculty distribution June 2023. TT – tenure track, NTT – non tenure track (Professor of Practice, Extension Educator, Research Professor)

The department's state aided budget allocation is nearly \$11M, with the largest state funded allocated to the research mission ([Overview Appendix 8](#)). Total faculty proposal submission has increased by \$10M from \$25.9 M in 2018 to \$38.5 M in 2022 with peak of \$57M in 2020. Total proposals funded has increased by 27% since 2018 to \$13.9M in 2022. The department's research

expenditure has averaged nearly \$12M in the last 5 years and continues to be a strength of the department. The department's research portfolio have been strengthened or augmented by key partnerships with PSI, Nebraska Food for Health, Research, Extension, and Education Centers, Daugherty Water for Food Global Institute and other centers ([Overview Appendices 9-15](#)).

Table 2. Funds expended and raised since July 2017.

Category	Fund Expended \$	Fund Raised \$
Research	3,511,681	2,100,000
Student Support	759,129	1,000,000
Other	61,860	300,000
Total	4,332,670	3,400,000

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Department Information

Table 3. Faculty retirement since 2017.

Faculty	Area	Appointment
Bruce Anderson	Range and Forage Specialist	Research/Extension
Tim Arkebauer	Plant Physiology	Research/Teaching
Stephen Baenziger	Small Grains Breeding	Research/Teaching
Roger Elmore	Cropping Systems	Research/Extension
Charles Francis	Agroecology	Research/Teaching
Clyde Ogg	Pesticide Safety Educator	Extension
Ellen Paparozzi	Horticulture	Research/Teaching
Walt Schacht	Grazing land ecologist	Research/Teaching
Charles Shapiro	Nutrient Management	Research/Extension
Paul Staswick	Plant Molecular Biology	Research/Teaching
Charles Wortman	Nutrient Management	Research/Extension

The department manages a long list of foundation funds including endowed fund to support students, research, and other activities. These funds are particularly important for scholarships, fellowships, co-curricular activities, and student travel.

Since the last APR, 11 faculty members have retired; however, 30 new faculty – 14 tenure-track (five women) and 15 non-tenure track (six women) – were hired, to strengthen capacity in fulfilling the mission of the department.

Key new faculty positions hired since the last APR include precision nutrient management, soil health specialist, small grains breeder, cropping systems agronomist, vadose zone scientist, nutrient management and water quality specialist, landscape and regional food systems specialist.

The department had focused on several key areas that are strategic and responsive despite the COVID-19 challenges – curriculum, building collaborative precision agriculture research, increase quality of service and delivery in crop variety performance, new and strengthened collaboration with Nebraska Food for Health. In the teaching and learning area, we have increased FTE capacity in online education, increased the number of online courses and online MS students, created new courses, and certificates.

A major recent change is the establishment of the Plant and Landscape Systems (PLAS) degree

program in fall 2022. The 2017 APR reviewers recognized overlap in the programs the department delivered to prepare students for careers in plant production and landscape systems. The review recommendations combined with a desire to take advantage of the breadth of plant system management expertise in the department motivated the development of the PLAS major. The department now offers the PLAS with options in Turf and Landscape Management, Horticulture, and Landscape Design and Management. Agronomy and Plant Biology majors are also offered.

Challenges, Aspirations, and Key Questions

While the department has enjoyed success since the last APR, budget shortfall and cuts have been the reality across the UNL and NU system. The department has incurred nearly \$1M in reduction since FY2020. Reductions have included the release of staff lines, a reduction in operating funds, and changing staff salaries from state to other sources.

The landscape of higher education also has been dynamic and competitive. COVID-19 and public perception of the relevance of higher education has exacerbated the enrollment landscape. The department of Agronomy and Horticulture is experiencing decreasing enrollment – 27% decrease in graduate student number and 11% in the undergraduate

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Department Information

Table 4 – Faculty hired since the last APR in 2017

	Name	Research FTE	Extension FTE	Teaching FTE	Other FTE
1	Carolina Cordova	0.00	0.60	0.20	0.2 SNR
2	Daniel Uden	0.25	0.00	0.15	0.6 SNR
3	Javed Iqbal	0.40	0.60	0.00	0.00
4	Katherine Frels	0.75	0.00	0.25	0.00
5	Laila Puntel	0.40	0.30	0.30	0.00
6	Michael Kaiser	0.25	0.00	0.75	0.00
7	Nicolas Cafaro La Menza	0.50	0.50	0.00	0.00
8	Nicolas McMillan	0.20	0.00	0.40	0.40
9	Gwendwr Meredith	0.25	0.00	0.15	0.6 SNR
10	Brian Rice**	0.70	0.00	0.30	0.00
11	Milos Zaric**	0.50	0.50	0.00	0.00
12	Amanda Easterly	0.70	0.20	0.10	0.00
13	Dillon Fogarty	1.00	0.00	0.00	0.00
14	Fatima Tenorio	1.00	0.00	0.00	0.00
15	Guillermo Balboa	1.00	0.00	0.00	0.00
16	Jingjie Hao	1.00	0.00	0.00	0.00
17	Luis Posadas	1.00	0.00	0.00	0.00
18	Ming Guo	1.00	0.00	0.00	0.00
19	Ravi Mural	1.00	0.00	0.00	0.00
20	Suarav Das	1.00	0.00	0.00	0.00
21	Gen Xu	1.00	0.00	0.00	0.00
22	Zhen Wang	1.00	0.00	0.00	0.00
23	Amanda Folck	0.00	0.90	0.10	0.00
24	Jennifer Weisbrod	0.00	1.00	0.00	0.00
25	Christian Stephenson	0.25	0.75	0.00	0.00
26	Luqi Li	0.00	0.00	1.00	0.00
27	McKinzie Sutter	0.00	0.00	1.00	0.00
28	Aaron Daigh	0.50	0.00	0.25	0.25 BSE
29	Andrea Basche	0.40	0.00	0.60	0.00
30	Marc Libault	0.80	0.00	0.20	0.00
	TOTAL FTE	17.35	4.85	5.75	0.00

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Challenges, Aspirations, and Key Questions

student number since spring 2018. Changing this trend and staying relevant will require planning and unique strategies: How do we set our programs and student experiences apart at UNL, Nebraska, the region and beyond? What are the unique opportunities to be the destination for plant and landscape systems career pathways? How do we leverage the distributed strength of alums and partners? What programmatic areas should we strengthen or consider merging or discontinue? How do we ensure a balance in teaching FTE to deliver key and fundamental courses such as Plant Physiology?

Although, our research portfolio is strong, there may be research bridges that are missing to help the department harness its talent and deliver on research outcomes that are timely and responsive to agricultural and natural resources challenges for the state, the region, and the world. However, the department is challenged with lack of capacity in plant physiology research, quality of research infrastructure, recruitment and retention of office, research, and business staff. Despite these challenges, how do we partner to continue building the momentum in precision and digital agriculture? How do we move from research to translation leveraging extension program? How do we strengthen the bridge between extension faculty across the state and research teaching faculty with no extension appointment?

Key Questions to the Review Team

- How can we better market our programs, our successful students, and the flexibility of our academic programs?
- What online programming has the highest potential for success? (e.g. online BS, PhD, certificates)
 - What are the advantages and limitations of an online PhD program?
 - What does an online BS degree program look like for PLAS and/or Agronomy?
- How do we prepare to support growing number of students in our online program?
- What are strategies to increase graduate student funding?
 - How do we ensure holistic graduate education while balancing funding constraints

- How might we synergistically address multiple research priorities?
- How might we prioritize new faculty needs in the face of budget restrictions? In particular, the program-wide need for a whole plant physiologist as well as molecular physiologist and weed molecular physiologist?
- Which are successful ways for extending Extension reach beyond large-sized stakeholders to small- and medium-sized stakeholders for education, outreach, and training?
- How do we best leverage National Ag Data Network for Nebraska Extension? We also need to leverage the commercial and consumer horticulture part of the department.
- How can the department maximize transparency regarding the staff performance/merit process?
- How can the department support staff mentoring or community building so as to make these efforts sustainable in the long run, accounting for factors such as understaffing?
- What suggestions do you have for recruitment-retention of business staff and efficiency in field operations?
- What are other land-grant institutions doing directly or indirectly to improve the culture of their departmental work and learning environments?
- Do we have consistent, equitable service expectations of faculty and staff regardless of rank, gender, race, etc.? Are we collecting data or providing transparency for this distribution of service? How is this issue handled at other institutions?
- Did your own Departments/Institutions have limitations with Research-Teaching-Extension integration and if so, what are/were strategies used to resolve them what we have not identified?

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REVIEW SCHEDULE – October 2-6, 2023

MONDAY, OCTOBER 2

Time	Activity	Location & Host	Participants
By 4 p.m.	External Review Team Members Arrive in Lincoln		
5:30 p.m.	Charge Dinner	Misty's Downtown 200 N 11th St.	Review Team and IANR Administration*
8 p.m.	Organizational Meeting	Hotel Conference Room	Review Team

* Rich Bischoff, Associate Vice Chancellor for Faculty and Academic Leader Success
 Mike Boehm, Vice President and Vice Chancellor of Agriculture and Natural Resources
 Derek McLean, Dean, Agricultural Research Division
 Tiffany Heng-Moss, Dean, College of Agricultural Sciences & Natural Resources
 Héctor Santiago, Assistant Dean and Assistant Director, Agricultural Research Division
 Charlie Stoltenow, Dean, Nebraska Extension

TUESDAY, OCTOBER 3

Time	Activity	Location & Host	Participants
Before 8 a.m.	Breakfast on Own	Hotel	External Review Team Members
8 – 8:30 a.m.	Transport to East Campus		
8:30 – 9:15 a.m.	Department Overview	150 Keim Hosts: Martha Mamo, David Holding, Amit Jhala	All Hands
9:15 – 10 a.m.	Online Education Discussions	150 Keim Hosts: Leah Sandall and McKinzie Sutter	All Hands
10 – 10:15 a.m.	BREAK		
10:15 – 11:15 a.m.	Discussions with Center Directors	150 Keim Hosts: Ed Cahoon and Kelly Bruns	REECs, PSI, CGS, WFI, CRAWL, Food for Health*
11:15 a.m. – 12:15 p.m.	Graduate Program Discussions	150 Keim Hosts: David Holding and Blaine Johnson	All Hands

*REECs – Research, Extension and Education Centers; PSI – Center for Plant Science Innovation;
 CGS – Center for Grassland Studies; WFI – Daugherty Water for Food Global Institute;
 CRAWL – Center for Resilience in Agricultural Working Landscapes; Nebraska Food for Health Center.

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REVIEW SCHEDULE - October 2-6, 2023

TUESDAY, OCTOBER 3

12:15 – 1:15 p.m.	Lunch with Undergraduates and Club Officers	150 Keim Host: Will Anderson	Clubs Members and Undergraduate Students
1:15 – 2:15 p.m.	Undergraduate Program Discussions	150 Keim Hosts: Anne Streich and Meghan Sindelar	All Hands
2:15 – 2:30 p.m.	Break		
2:30 – 3:30 p.m.	Staff Discussions	150 Keim Hosts: Greg Puckett and Kaye Wolfe	All Staff
3:30 – 4:30 p.m.	Discussions with Agronomy and Horticulture Advisory Council	150 Keim Hosts: Jeremy Groeteke and Alex Renaud	Aghort Alumni Advisory Council
4:30 – 5 p.m.	Transport to Hotel		
6 p.m.	Dinner	Piedmont Bistro 1265 S Cotner Blvd Ste 38.	

WEDNESDAY, OCTOBER 4

Time	Activity	Location & Host	Participants
7:30 – 9 a.m.	Breakfast with IANR Administration		Review Team: Richard Bischoff, Derek McLean, Tiffany Heng-Moss, Hector Santiago, Charles Stoltenow
9 – 9:30 a.m.	Transport to East Campus		
9:30 – 10:30 a.m.	Extension Program Discussions	150 Keim Hosts: Amit Jhala and Nevin Lawrence	All Hands
10:30 – 11:15 a.m.	Diversity, Equity, and Inclusion Discussions	150 Keim Hosts: George Graef and Carolina Córdova	All Hands
11:15 – 11:30 a.m.	BREAK		
11:30 a.m. – 12:30 p.m.	Research Program Discussions	150 Keim Hosts: Patricio Grassini and Daniel Uden	All Hands
12:30 – 1:30 p.m.	Lunch with Graduate Students	150 Keim Host: Alyssa Hall	AGHSA and Graduate Students

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REVIEW SCHEDULE – October 2-6, 2023

WEDNESDAY, OCTOBER 4

1:45 – 4:30 p.m.	Site Visit and Facilities (Greenhouse, Seed Lab, Agronomy Farms-ENREEC)	150 Keim Hosts: TJ McAndrew and Mike Livingston	Review team and hosts
4:30 – 5 p.m.	Transport to Hotel		
5:30 – 7 p.m.	Department reception with review team	Embassy Suites Hosts: Connie Hansen and Admin Team	Review Team + Faculty + Staff + Students
7 p.m.	Dinner and writing session	Hotel	Review Team

THURSDAY, OCTOBER 5

Time	Activity	Location & Host	Participants
Before 8 a.m.	Breakfast on Own	Hotel	
8 – 8:30 a.m.	Transport to East Campus		
8:30 – 9:30 a.m.	Discussions with Commodity Board Reps	150 Keim Host: Amit Jhala	Wheat, Pea and Lentil, Corn, Soybean, Sorghum, NCIA
9:30 – 10:30 a.m.	Discussions with HAPPI Business Center	150 Keim Host: Teresa Loseke	HAPPI staff
10:30 – 10:45 a.m.	BREAK		
10:45 – 11:45 a.m.	Discussions with USDA-ARS & NRCS	150 Keim Hosts: Virginia Jin and Scott Sattler	NRCS key partners and USDA-ARS Scientists
12 – 1:30 p.m.	Lunch with Unit Heads	150 Keim Host: John Ruberson	All unit heads
1:30 – 3 p.m.	Individual Faculty Meetings	279M PLSH Host: Kay McClure-Kelly	
3 – 5 p.m.	Review Team Report Preparation	Hotel	Review Team
6 p.m.	Dinner	Fleetwood Restaurant 801 O St, Suite 100	Review Team

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REVIEW SCHEDULE – October 2-6, 2023

FRIDAY OCTOBER 6

Time	Activity	Location & Host	Participants
Before 8 a.m.	Breakfast on Own	Hotel	External Review Team Members
8 – 9 a.m.	Review Team Exit Meeting	150 Keim Host: Review Team	Review Team, Richard Bischoff, Mike Boehm, Derek McLean, Tiffany Heng-Moss, Hector Santiago, Charles Stoltenow
9 – 9:30 a.m.	BREAK		
9:30 – 10:30 a.m.	Exit Meeting with Department	150 Keim Host: Review Team	All Hands
11 a.m.	Box Lunch		

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Review Team



William Anderson

Undergraduate Student
Plant and Landscape Systems
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Review Team



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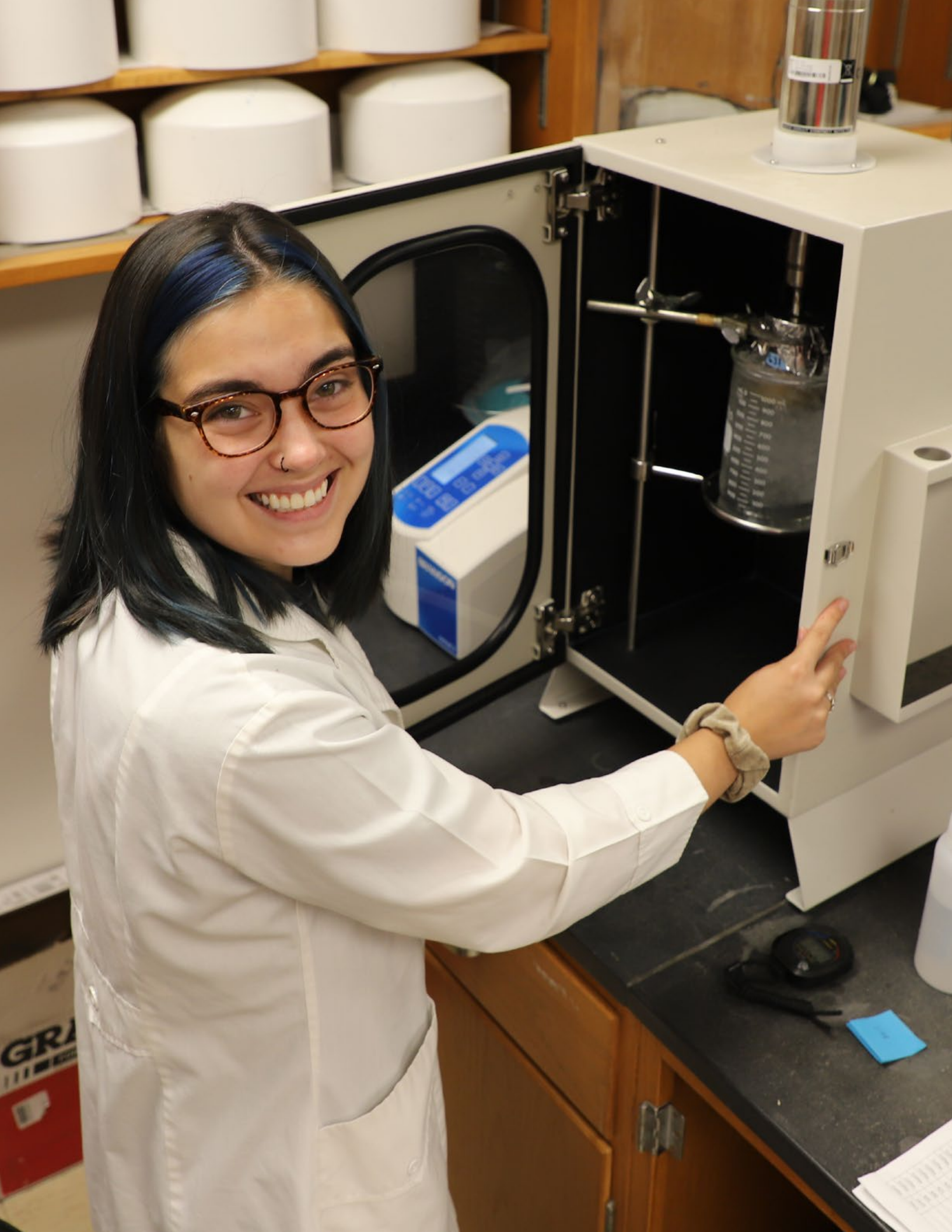
APR Self-Study Writing Leaders

Theme	Writing Leader	Peer Reviewers
Student Success	Meghan Sindelar and Anne Streich	Don Lee, Christian Elowsky, Cheryl Dunn
Graduate Education	David Holding and Blaine Johnson	Keenan Amundsen, Amanda Easterly, Aaron Daigh, Bijesh Maharjan
Online Program	Leah Sandall and McKinzie Sutter	Luqi Li, Becky Young, S. Carolina Córdova
Research	Patricio Grassini and Daniel Uden	Michael Kaiser, David Hyten, Humberto Blanco, Christian Stephenson, Stevan Knezevic
Extension	Amit Jhala and Nevin Lawrence	Terri James, Rock Gaussoin, Nicolas Cafaro La Menza
Integration	Cody Creech, Daren Redfearn and Marc Libault	Katherine Frels, Saurav Das, Laila Puntel, Laura Thompson
Diversity, Equity, and Inclusion (DEI)	Sam Wortman and George Graef	Andrea Basche, Jeff Mower, Christopher Anuo, Gandura Abagandura
Facilities	Tom Clemente, TJ McAndrew and Ben Loseke	Stacey Adams, Mike Livingston, Chris Proctor, Kim Todd
Staff	Greg Puckett and Kaye Wolfe	Jenny Stebbing, Greg Dorn, Elizabeth Jeske, Richard Little



AGRONOMY AND HORTICULTURE
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STUDENT SUCCESS IN UNDERGRADUATE PROGRAMS



Overview

The Department of Agronomy and Horticulture offers multiple Bachelor of Science degrees including Agronomy, Plant and Landscape Systems, and Plant Biology* with five-year mean undergraduate enrollment of 218. Teaching facilities include 18 classrooms located in the Beadle Center, Keim Hall, and Plant Sciences Hall adjacent to Plant Sciences Hall are three greenhouses providing 6,000 square feet for instruction and two acres of faculty-maintained outdoor classroom. The Beadle Center greenhouses include 130 square feet of teaching space. The Department has 42 faculty with teaching appointments ranging from 0.10 to 1.0 FTE (Full-Time Equivalent) for a total of 17.95 FTE (18.25 FTE beginning January 2024) offering over 40 undergraduate courses annually. Our teaching FTE generates more than 85% of the student credit hours (SCH) through undergraduate courses ([Student Success Appendix 1](#)).

In the fall of 2017, the Department of Agronomy and Horticulture conducted the 5-year Academic Program Review (APR). At that time, the Department had more choices for majors, and numerous options within majors, to represent the various disciplines of applied plant science. The external review recommendations included: streamlining the existing majors and options; creating core experiences for all undergraduate degree programs within the department; creating a degree name and options that attract new audiences while retaining the traditional audience; and developing a flexible curriculum that allows students to tailor their degree program to meet their career pathway and professional goals.

In response to the review, the Department created the Plant and Landscape Systems (PLAS) major to encompass horticulture, landscape design, and turfgrass management through six unifying student learning outcomes ([Student Success Appendix 2](#)). These SLOs provided a structure for faculty to communicate and work together to coordinate the learning progression of our students through the major. Faculty have worked together to ensure that these are introduced, developed, and mastered as students move through the curriculum. Students in all these majors take the same core courses ([Student Success Appendix 3](#)) to introduce the concepts. Students build on this foundation into mastering or achieving the SLOs by selecting a discipline of focused expertise in crop production, horticulture, landscape design and management, or turfgrass science and management and then additional specialization through emphases and/or minors. With this change, students have the flexibility to make use of courses in agronomy, horticulture, landscape design, and/or turf in pursuit of their degree.



Figure 1. Schematic developed to show pathways available to students.

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Changes to the major were accompanied by an overhaul of the [Departmental website](#) which not only helps layout the courses available to students but also clarifies career pathways associated with each discipline. Given the above updates, enrollment is projected to increase for the Horticulture, Turf, and Landscape options of PLAS while maintaining enrollment in the Agronomy and Plant Biology majors.

Summary of Strengths

In Nebraska, one in four jobs is related to agriculture and natural resources, and demand for a skilled ag workforce is expected to continue to grow. Students in Agronomy and Plant and Landscape Systems (PLAS) typically enter the applied plant management workforce while the interdepartmental Plant Biology degree is designed to prepare students for graduate programs.

- The department has conferred 403 B.S. degrees across all majors in the past five years ([Student Success Appendix 4](#)).
- The department has a proven history as the main source of plant management professionals in Nebraska and the region. For example, nearly 100% of destination golf courses in Nebraska have alums as superintendent, assistant superintendent, or director of agronomy.

- The first year to second year retention rate is variable across degree programs, with Agronomy program at or near the UNL retention target of 88% ([Student Success Appendix 5](#)). Although much work needs to be done to increase retention across all programs.
- The department, in partnership with the College of Agriculture and Natural Resources (CASNR), is committed to students' success and workforce development and has a framework for student success ([Student Success Appendix 6](#)).
- The department's culture includes a teamwork approach to teaching and curriculum. The team approach spills over into individual courses as well with many courses using a combination of teaching talent (undergraduate and graduate teaching assistants (TAs), teaching staff, professors of practice, and tenure-track faculty) to either offer more sections or diversify the offerings for resident, hybrid, and online audiences. This team approach to teaching requires coordination and intentional focus on student learning needs but greatly benefits students by providing the opportunity to learn directly from a variety of diverse experts. For example, the Soil Resources course is able to teach 100 students in small sections of 20-24 students with 5 hours of lab and discussion per week by spreading the time across multiple faculty members.
- The department invests nearly \$70k each year for partial TA support for a large and growing number of courses that integrate hands-on indoor or outdoor activities, have labs or recitations, require multiple writing and presentation assignments. The faculty are responsible for training, mentoring, and supervising of their TA(s) and are expected to report on the professional development of TA's and their mentoring success in next year's funding request. TAs are expected to participate in TA workshop organized by the department before the beginning of the semester.

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- A standing committee for undergraduate education provides leadership in curriculum planning. This committee meets regularly to discuss and plan on overarching curriculum matters, support course development, guide the department's teaching and learning mission, and organize and lead teaching retreats. Course development is done through inter- and intra-departmental dialogues to ensure revised or new courses connect and align with broader curriculum framework and position teaching staff to be successful.
- The department offers student learning through various extracurricular activities ([Student Success Appendix 7](#)). There are five clubs and four competitive teams homed in the department with nearly half of students engaged in these extra-curricular activities. Three undergraduate competition teams also have courses (PLAS 391T, Turf Competitions; PLAS 496, Crop Judging; and PLAS 279/379, Soil Evaluation/Advanced Soil Evaluation) associated with them that can be used to meet discipline and/or emphasis requirements. The teams have been very successful in recent years with top ten national finishes for each (In 2023, Turf Team placed 4th at the Quiz Bowl and the Soil Judging Team placed 4th in the team competition at the national ASA contest.).
- Several courses in the department emphasize hands-on plant skills in the greenhouses and gardens. Furthermore, experiential activities have been partnered with service learning in several courses. For example, horticulture courses (PLAS 355 & 356) have set themselves up to produce and sell appropriate fall (container) and spring (bedding) plants.
- The Department's curriculum is also strongly integrated with other academic units across the College and University; many of the majors in CASNR include required courses offered by the department such as Soil Resources; Agronomic Plant Science Lab; Genetics; and Botany ([Student Success Appendix 8](#)). Several department courses also meet university or college general education requirements including Plants, Landscapes & the Environment; Plant Science; Invasive Plants; Edible Landscapes; Floral Design; and Landscape & Environmental Appreciation. As an example of wide enrollment, during the 2020-2021 academic year, Plant Science included 218 non-majors. Similarly, the enrollment for Soil Resources included 220 non-majors. Further impact of our program across UNL is also evident from the number of minors, with 66 students from 18 different majors seeking a minor in one of our disciplines.
- Students expand their learning through engagements with research labs (on average, 12 student researchers are supported by ARD grants each year). The department also supports several REU projects, UCARE, and summer research interns. Many individual faculty integrate their teaching and research programs by using their research data for course lectures, case studies, and other activities.
- The links between undergraduate education and extension including student interns in extension roles, educational outreach programs for high school teachers and students (e.g., Nebraska Soil Summer Institute; Indigenous Garden Program), and service-learning projects. A highlight of service learning is evident in PLAS 467, Planting Design, where recent course projects have included working with Lincoln Public Schools to design the landscape and edible teaching garden for Everett Elementary School and with Lincoln Parks and Recreation to develop master plans for Lewis Ballfields, Muny Park, and Easterday Recreation Center and Park.
- A final area of strength is advising and mentoring within the Department. Academic advising is centralized with a professional advisor for each major which allows the advisor to identify trends in classes within and outside of our Department that improve our ability to address scheduling issues and the need for additional courses. A dedicated advisor also allows for

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more experience with difficult situations that are not common when only advising a handful of students (e.g., financial aid appeals, dismissal appeals). Advisors also work closely with the CASNR Cares program to identify students who need additional support to ensure a successful academic experience. Beyond academic advising, students receive advising and mentoring from faculty employers (in research, extension, and teaching roles), from faculty advisors of clubs and competitive teams, and from instructors (including peer TAs). Many faculty spend time assisting struggling students without a mechanism to report this effort on annual evaluations.

Self-Assessment of Needs and Concerns

Four year and six year graduation are variable across programs, although close or higher than the UNL target of 55% and 72% for four and six year graduation rate, respectively ([Student Success Appendix 9](#)). In partnership with CASNR, this is an area the department needs to review as cost of higher education. From a fall listening session that included Agronomy and Horticulture Department faculty, five themes emerged: 1) assessment of our alumni and academic programs, 2) marketing of our undergraduate programs, 3) infrastructure improvement, 4) engagement of extension and research faculty in

teaching activities, and 5) engagement of industry, governmental agencies, and alumni in teaching. Faculty were later surveyed to determine priority issues and methods to address each issue.

The first theme is for more intentional and frequent **assessment** of our academic programs. This should include internal assessments (the curriculum committee is working on developing this) and external assessments. There is strong interest in surveying alumni and employers to assist with both assessing alumni preparedness and gathering information to keep academic programs current with emerging industry technologies and challenges. Developing this connection will also potentially encourage more alumni and industry professionals to engage with current students through mentoring, internship offerings, and coursework case studies. A combination of surveys and listening sessions with stakeholders and alumni (both undergraduate and graduate) were suggested to gather information. Survey planning is underway in partnership with the UNL Bureau of Sociological Research.

The department has six overarching learning outcomes for students in the Agronomy and PLAS majors that can be used as the framework on developing internal and external assessments. *Outside of surveys and listening sessions, are there other ways to get data to help assess and advance our program? Are there obvious questions that should be gathered by a survey or listening session?*

The second theme of **marketing** was brought forward because it is not always clear to stakeholders where the information they use comes from. The goal with marketing is to make it clear to our stakeholders that we are the leaders in the science and application of plant, soil, and landscape education in Nebraska, regionally, and nationally. The knowledge producers and managers receive often originates from our department but is delivered to them by an industry professional. *How can we better market our programs, our successful students, and the flexibility of our academic programs?*

The theme of **funding** is specific to infrastructure when addressing teaching needs. Various classroom equipment (e.g., microscopes) need updating;

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however, the most significant concern is high quality teaching greenhouse space with connected classroom and preparation spaces. This has been an on-going issue for at least the last 10 years. *How can we address inferior quality greenhouse spaces and laboratory equipment for teaching?*

The fourth theme of **faculty engagement** revolves around encouragement of extension and research faculty to share their knowledge and experiences with undergraduate students. Because of our research capacity, we have faculty developing cutting-edge plant and soil science knowledge that can be brought into the classroom or shared via our Plant and Soil Science eLibrary, during prospective students campus visit, or department outreach events. Outside of faculty supervising research or internship experiences, *how can we increase engagement of non-teaching faculty with undergraduate students? How do we leverage the extension affiliate program to increase extension engagement in formal or formal ways?*

The final theme of **professional engagement** focuses on the need to develop and nurture a more intentional relationship with our industry professionals. Many already serve important roles through the Agronomy and Horticulture Alumni Advisory Council, supporting interns, guest speaking to clubs and classes, and more. For example the Nebraska Agribusiness Association co-sponsors Certified Crop Advisor (CCA) exam for agronomy student seniors, cost-sharing exam and leading subject matter review sessions. *What types of interactions with these groups are most successful in bringing industry experiences and knowledge to undergraduate students throughout their academic program? What type of management systems (LinkedIn, listserv, etc.) have proven to work well?*

Opportunities for Partnership and Growth

Given the continued need for food, and increasing interest in locally produced fresh food, all majors have opportunities for growth. In alignment with Nebraska's [Regional Food Systems Initiative](#), the greatest potential lies in PLAS horticulture career pathway to connect with entrepreneurship program, food

processing center, nutrition, food science, and agricultural leadership and communications to empower students to develop Nebraska food systems. Possible partnership to [Nebraska's Rural Prosperity Program](#) (NE Extension Program) to develop student driven CSA farm with ties to the [Engler Entrepreneurship Program](#). Such partnerships present opportunities for experiential learning that is realistic, where our students learn to produce fresh herbs, fruit, and vegetables ready for business and communities. ***However, such opportunities require collective visioning, investment in support and infrastructure to empower the next generation of plant and food production workforce professionals.***

The Plant Biology major continues to grow; a 3+1 partnership with Northwestern Agriculture and Forestry University (NWAUFU) in Yangling, China will begin in the fall 2023. The 3+1 program is a dual degree program in plant protection and plant biology with the curriculum mapped to meet the requirements of both degree programs. Students spend their first three years at NWAUFU and the last year or fourth year at UNL. Similarly, the Agronomy major is a strong program; the greatest need for growth is in precision agriculture and digital agriculture systems. Partnerships with Agricultural Systems Technology have resulted in available minors in Precision Agriculture and Digital Agriculture. *How can we expand those programs, partner with industry, and get more hands-on experiences for student?*

Our Department contributes to the Food Energy Water and Society Systems (FEWS2) pathway program of CASNR, partners with various Lincoln schools, offers the outreach programming for high school teachers, and regularly contributes to FFA and 4H events. However, expanding these partnerships could increase the pipeline of students to our programs. In particular, we have the capacity to develop and share lesson plans through the [Plant and Soil Science eLibrary](#). *How can we build strong and continuous relationships with high school science teachers and provide specific deliverables that would help teachers incorporate plant, soil, and landscape topics into their teaching activities?*

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Summary

Our pressing goals are to gather data from local industry, alumni, stakeholders, and employers about the success of our students as well as their perceived future needs. This data will allow us to direct our mid-term planning toward content, partnerships, and facilities that meet the needs. This approach to getting ahead of the curve combined with the fact that UNL is poised to partner undergraduate education with the outstanding research and extension arms of our University (both within our Department and through partnerships across campus) will lead toward our grand goal of becoming the leading undergraduate program in the applied plant and soil sciences.

Key Questions to the Review Team

1. How can we better market our programs, our successful students, and the flexibility of our academic programs?
2. Outside of surveys and listening sessions of alums and stakeholders, are there other ways to get data to help assess and advance our program?
3. How can we incentivize engagement of non-teaching faculty with undergraduate students?

4. What types of interactions with industry are most successful in bringing their experience and knowledge to undergraduate students? What type of management systems (LinkedIn, listserv, etc.) have proven to work well?
5. How can we expand digital ag programs, partner with industry, and get more software into student hands?
6. How can we build relationships with high school science teachers and provide specific deliverables that would help teachers incorporate plant, soil, and landscape topics into their teaching activities?

* Plant Biology is an interdisciplinary program with a steering committee of faculty from multiple departments with management oversight by the Department of Agronomy and Horticulture.



GRADUATE PROGRAMS



Overview

The Department of Agronomy & Horticulture's Graduate program vision is to provide each student with an optimum educational experience that is both rigorous in curriculum and inclusive in all activities, leading to the development of foundational knowledge, expansion of practical experience, and advancement of critical thinking, with this educational experience centered around the background, talents, and career aspirations of each unique, individual student.

The Graduate Program is a large component of the Department's teaching program. Total enrollment of graduate students is (as of April 2023 FY23), of which 43 are resident PhD students, 46 are resident MS students and 46 are on-line MS students. Overall graduate student enrollment has been declining over the last several years ([Graduate Program Appendix 1](#)). Applications to the graduate program have averaged around 70 over the last four years ([Graduate Program Appendix 2](#)). A detailed breakdown of graduate student admissions since 2018 across six different graduate specializations, within residential and on-line Masters and PhD programs is shown in [Graduate Program Appendix 3](#). The total number of students receiving graduate degrees since 2018 is 177 as detailed in [Graduate Program Appendix 4](#) (57 PhD, 74 agronomy resident, 10 horticulture resident, 36 on-line agronomy). Graduate student success is illustrated by the plethora of awards received across the

graduate student body in the last five years and these are shown in [Graduate Program Appendix 5](#).

An encompassing word describing these students is diversity; diversity in degree being sought, diversity in career objectives, and diversity in educational and experiential backgrounds. Students enroll as resident degree seeking students, as non-resident degree seeking students, as non-resident certificate seeking students, and as distant-ed students simply wishing to extend their knowledge of specific specializations. Degree objectives are also diverse, spread across multiple specializations depending on career objectives. Finally, experiential diversity brings richness to the collective educational experience of all students, yet diversity of experiential background brings challenges to the provision of a comprehensive, rigorous, positive educational experience to each unique student within an inclusive educational environment.

Some 100+ AGRO courses are listed (or cross-listed) ([Graduate Program Appendix 6](#)). These courses are augmented by several AGRO 896 independent study courses to address specific needs/gaps in the graduate curriculum. Unfortunately, however, multiple courses are no longer being taught due to low enrollment and/or lack of teaching FTE and/or expertise. The department has, as of April 2023 1742 faculty FTE spread across both undergraduate and graduate level courses. This FTE is a mix of tenured or tenure-track and non-tenure track teaching faculty. For faculty involved in graduate education, time commitment to graduate students includes not only time committed to teaching formal courses, but also time committed to advising, guiding, mentoring, and advocating for individual graduate students.

Any endeavor always involves balancing available resources against needs. For Graduate Programs, this struggle is one of balancing available FTE and faculty time against the need of providing an optimal educational experience to each unique graduate student, both in and out of the classroom. An additional resource challenge is funding for grad students, a problem that impacts, among other issues, recruitment and inclusion. Approximately one fourth of graduate applicants are admitted, with low admission partly a result of faculty having insufficient funds to recruit and support a diverse and otherwise talented group of students. Despite the ever-present need to

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increase graduate student funding, total AY 2022-2023 graduate student support totaled approximately \$453,000 from state funds and approximately \$1.2M from non-state sources including federal agencies, industry, commodity boards and foundations Table 1 and Figure 1.

Many, if not most, of these issues are not unique to the Department of Agronomy & Horticulture. Nevertheless, improvement and management of Graduate Programs must be addressed holistically and comprehensively, with constant review and adjustment. The

following sections of this document outline activities and actions, past, present, and anticipated future, impacting the department's Graduate Programs.

Actions since 2017 APR: 2019-2021

1. Ad hoc Working Group

The 2017 APR focused heavily on the undergraduate program and led to the design and implementation of the new single major, Plant and Landscape Systems. Relatively minor emphasis was placed on improving the graduate program, however the department made numerous improvements to the graduate program over the last two years. In 2019-2020 an ad hoc working group reviewed the graduate programs and identified several gaps, culminating in a virtual retreat in May 2020 in which the working group presented findings and recommendations to the larger faculty and sought feedback. Included amongst prioritized gaps were:

- Improved visibility and definition of graduate specializations and their corresponding component courses for both prospective and current students;
- Review under- or unsubscribed specializations for removal or renovation;

Table 1. Graduate student funding source distribution, AY22-23.

Non-State Source	Amount	Other
DEPT OF ENERGY	\$ 51,425	NEB ROADS
DEPT OF AGRICULTURE	\$ 370,920	NEB BOARD OF REGENTS
EDUC RESEARCH & NON-PROF	\$ 244,228	NEB LOCAL GOVERNMENTS
FUNDS VIA NU FOUNDATION	\$ 168,091	CORN DEV UTIL & MKTG BOAR
INDUSTRY	\$61,134	NEB GAME AND PARKS COMMIS
NEB SOYBEAN BOARD	\$ 57,096	NATL SCIENCE FOUNDATION
NEB AGRICULTURE	\$ 48,389	\$ 93,213
Total	\$ 1,094,496	

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Figure 1 - Non-state graduate student funding sources.

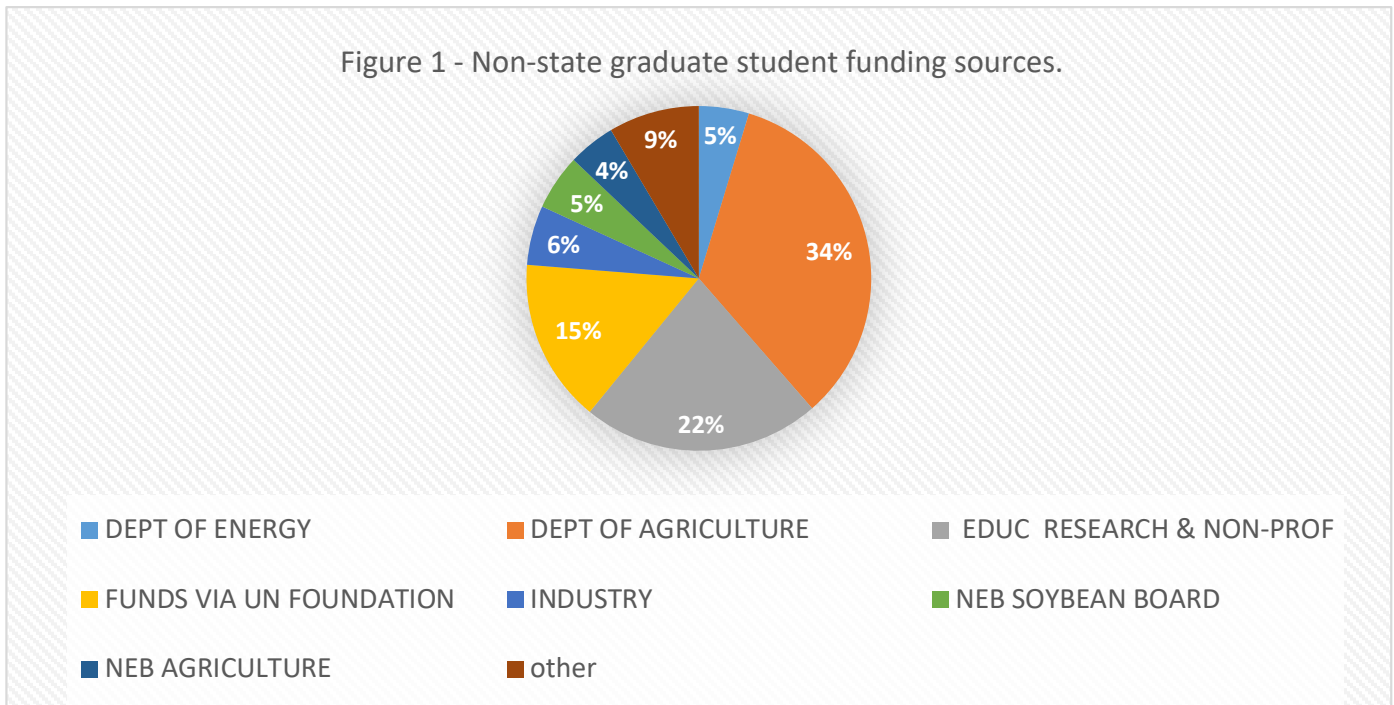


Figure 1. Non-state graduate student funding sources.

- Need for new courses, revisions of current courses, and removal of obsolete and redundant courses across, and per needs, of all graduate specializations;
- Enhancement of internship and professional development opportunities;
- Improved and extended targeted recruitment;
- Innovation in funding graduate education;
- Improvement of methods used for graduate student evaluation;
- Implementation of Individual Development Plans (IDPs) for all graduate students;
- Explore the need for a dedicated graduate curriculum committee

2. Graduate Curriculum Review Committee (GCRC)

In 2021, an ad hoc committee was appointed by the agronomy leadership team. The committee consisted of faculty representatives from each specialization: 1. Plant Breeding and Genetics, 2. Crop Physiology, Production and Horticulture, 3. Soil Sciences, 4. Range Forage and Turf and, 5. Weed Sciences. Doctor

of Plant Health and Distance Education was also represented. Other specializations including Agricultural Meteorology and Applied Ecology were slated for removal as they had no enrolled students for many years. However, students have since enrolled in both and will be updated in the manner described below.

The GCRC identified a conspicuous lack of, or otherwise inconsistencies of, defining features for all specializations, including frequent lack of defined learning objectives for many courses as well as failure of many specializations to require, or even suggest core courses supporting the learning objectives of the specialization. Failure to identify required/suggested courses negatively impacts (a) student recruitment, (b) ability to direct students into appropriate specializations, and (c) provide guidance by advisors and mentors on course selection.

To alleviate this deficiency, a common webpage template, across specializations, was designed, providing a standard format showing all required, suggested, and elective courses. The main webpage with links can be found at: <https://agronomy.unl.edu/graduate-program-specializations>. Information found within the webpage and the hyperlinks are continually updated as courses are revised and other

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information becomes available. Information contained within hyperlinks include course instructor, course learning objectives, pre-requisites, and other relevant information. This website provides ease of access to information to students and advisors when preparing MOCs and information needed for development of the proposed IDPs. Using student and faculty guidance, as well as other input, the webpage provides for tracking and prioritization of improvements and changes made over time.

Although the specialization website is a big step forward in promoting the graduate program and helping guide new and current grad students, work remains to be done as identified by faculty and current students. First, the graduate program web page could be much more effective as a recruitment tool. Second, the [specializations pages](#) need to have information about when courses are offered and how frequently to help guide students' program of studies and IDP.

Designated GCRC specialization representatives are responsible for organizing the format and promotion of courses, as well as identifying and fixing gaps and redundancies in courses and course content. Specialization reps, as well as the broader graduate faculty share the responsibility of keeping course offerings current.

Despite good progress in organizing the specializations and in curriculum updates, the role of the GCRC going forward remains uncertain. The

department's curriculum committee votes on both undergraduate and graduate courses. Furthermore, the current bylaws of the graduate committee state that is responsible for curricular improvements. But there has been some ambiguity on these roles in the last two years. The question of whether the GCRC should remain as an intermediary to the curriculum committee and graduate committee or formally take on voting has been considered as part of the APR preparation.

Much work remains to be done on improving graduate curriculum, the above-described efforts have already resulted several actions:

- The Plant Breeding and Genetics (PBG) specialization conducted an external review, using a review team of industry scientists. The review resulted in the identification of numerous weaknesses and strengths in PBG curriculum, some of which are being addressed. This review is suggested as a model for similar external reviews for other specializations.
- Revision and synchronization of the two courses Plant Molecular Biology (AGRO 810) and Plant Biotech applications (AGRO 829)
- Consolidation of the three AGRO 815 breeding 1cr modules into a single Introductory Breeding 3 credit course targeting the 400/800 level. This effort also resulted in the planning of a new 300 level introductory plant breeding course which will serve as a prerequisite for the 400/800 level course.
- Development and delivery of an advanced, 3-hours credit breeding course, loosely based upon consolidated content from the current AGRO 816 series of 1-hour courses, with the new course covering genetic theory specifically pertaining to plant breeding, advanced breeding methodologies, and hybrid breeding. The old 816E module (G x E) is being resurrected as a standalone course
- Development and delivery of a new course on design of field experiments, data management and analysis, a course which complements existing statistics courses offered in the Statistic Department, and specifically addresses the need of student for exposure to concepts and methods of applied statistics.

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- Recent discussion among PBG instructors has identified a common lack of basic understanding of population and quantitative genetics. Thus, a combined introductory course covering these areas is in the works (Agro 831).
- The plant breeding and genetics faculty have considered the idea of having a dedicated Plant Molecular Biology graduate specialization while still leaving the more customizable molecular track available within PBG. The link to the mocked up PMB specialization is as follows <https://agronomy.unl.edu/plant-molecular-biology-specialization>. Any action taken needs to consider the existing Integrated Plant Biology specialization within the Complex Biosystems Graduate program.

Lack of a graduate level whole plant physiology course within the department was identified as a weakness across the whole graduate program. A significant barrier to solving this deficiency is lack of teaching FTE. The problem has been exacerbated by the retirement of two faculty who taught related graduate courses, water management and nutrient management. Thus, a major goal is to find means of resourcing a new faculty line who would develop and deliver one or more courses covering these three critical subjects.

Process for identifying and shortlisting priorities for APR

The identified priorities described in the following section was the result of an extensive multi-step process. The details of this process are described in [Graduate Program Appendix 7](#).

1. Priorities identified by a small working group and presented in the foundational document
2. Priorities identified by the whole faculty at the October retreat ([Graduate Program Appendix 7](#))
3. Overlay of 1 and 2 and scoring by faculty in a February 2023 survey ([Graduate Program Appendix 8](#))

Note on the proposed action on GCRC structure

Although the survey mentioned above and shown in [Graduate Program Appendix 8](#) identified support for creating a formal graduate curriculum committee, such a move needs to consider practical logistics. First, the existing curriculum committee currently votes on graduate level courses and most reps are graduate faculty. The chair seeks wider council when the sitting graduate faculty are ill-equipped to vote on specific grad level courses. The majority of the committee's business is with undergraduate courses and votes on graduate courses do not place a heavy burden. Second, a new Graduate Curriculum Committee would undoubtedly involve some faculty having to serve on both committees and may create an unnecessary burden. Third, the majority of the GCRC's work going forward is projected to be curriculum focused. For these reasons, it is proposed that the GCRC will remain as an ad hoc and fluid group overseen by the graduate committee. Voting will stay with one overarching curriculum committee, and the GCRC reps and broader graduate faculty will provide recommendations to the curriculum committee on specific courses as needed.

Identified Priorities for APR

A. Program Relevance, Identity and Rigor

Although the new curriculum website helps in framing the identity of the department's graduate program and provides a means of tracking recom-

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recommendations of the department's areas of specializations, further work is needed beyond the website itself for the department to establish an identity and promote its graduate program as a whole.

1. Identification of common threads uniting the specializations. How do courses fit into the overall curriculum of the department and what common courses are lacking (e.g., graduate physiology water relations)?
2. There is a lack of graduate only level courses in some specializations and the level of proficiency rigor required within and across specializations is ambiguous. Each specialization will, where possible, identify core required courses.
3. Each graduate specialization will be encouraged or required to conduct an external review (similar to the one conducted in 2021 for Plant Breeding and Genetics) to assess rigor and industry relevance.

B. Career preparedness for graduate students

1. Establish a Career Diversity Advisory Committee, including industry representation and Alumni Advisory Council representation. Create connections between our graduate program and a wide array of companies who seek qualified employees. This action will be supplemented by other activities such as follow-up session with the industry reviewers

from the PB&G external review.

2. Training in diverse communication skills from classroom, to government, to industry, to farmers. Training in developing and funding independent research programs and projects.
3. Implementation of Individual Development Plan for all graduate students.

C. Mentoring

1. Implement formal professional development for faculty and students on effective mentoring and mentee/mentor expectations.
2. Opportunities should be provided to late-stage graduate students to serve as peer mentors to incoming students, thereby providing valuable mentoring experience.

D. Inclusion

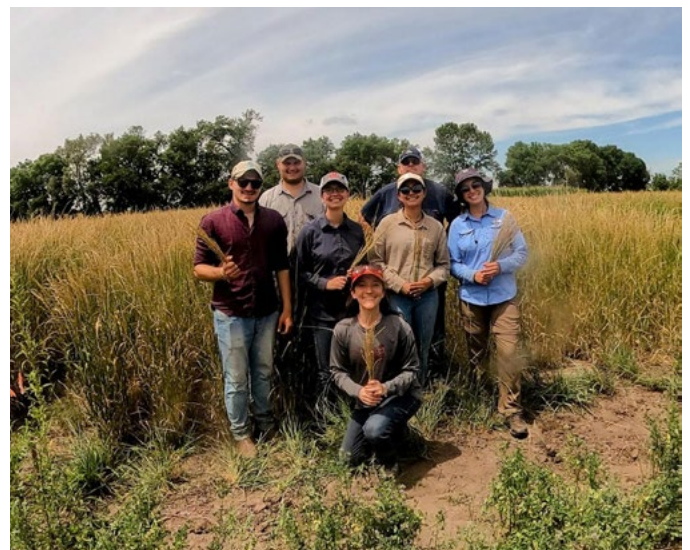
1. Provisions will be made to improve inclusion and thus retention, especially newly arriving international students. Some students may not know all required steps in their graduate program. Such a program needs to be proactive in reaching out to these students before they fall behind.
2. Provisions will be made to be more inclusive of students who are located at research centers off-campus and/or fully online graduate students.
3. Department will develop expectations for effective mentoring for mentors and mentees.
4. Current committees and activities related to Graduate Programs typically have one or more student representatives. Yet the department needs to develop a strong culture of engaging the breadth of the graduate student community in issues involving Graduate Programs; students are typically **invited** to participate, but most commonly **not specifically encouraged** to participate. How does the department induce a paradigm shift such that improvements in Graduate Programs become a collaborative effort involving both faculty and graduate students?

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Key Questions to the Review Team

- Which of the above priorities do the reviewers feel are the most important/urgent or less important?
- Do the reviewers have suggestions on the graduate program specializations in terms of their organization, size and oversight? For example, we have considered the creation of a separate Plant Molecular Biology Specialization to stand alongside the more customizable Plant Breeding and Genetics Specialization within our program and the separate Complex Biosystems Graduate Program. <https://agronomy.unl.edu/plant-molecular-biology-specialization>
- One option for increased graduate student funding would be a departmental match of one to two years funding is matched by two to three years funding from Federal, State or industrial sources. Do reviewers support the concept of matching funds, and/or do they have other creative suggestions on recruiting and funding graduate students?
- Are there obvious actions/issues missing in the above list of priorities that Graduate Programs should address over the next five years?





ONLINE PROGRAM



Overview

Well before online learning became a necessity due to COVID19 in 2020, the Department of Agronomy and Horticulture had already established a breadth of high-quality online programming and courses. In fact, the long-established online program was a major asset in assisting teaching staff to navigate effectively in transitioning many of the in-person courses into fully online or hybrid delivery. The department employs a distance education coordinator and two full-time lecturers to provide oversight and development for the online program. The online program core team is dedicated to sustaining and growing the program through online teaching, content development, and various roles for teachers and students. The department currently offers 39 fully online courses (undergraduate & graduate) from 25 faculty and staff. The annual Student Credit Hour (SCH) total for online courses has averaged 2,934 over the past five years with >1000 students enrolled in online courses ([Online Program Appendix 1](#)). The department online program offers academic and extension learning and support through:

- Services for Academic Learners: undergraduate and graduate courses, [online MS](#) in Agronomy, Graduate certificates in Agronomy (fall 2023), Advanced Horticulture, or Grassland Management

- Services for Extension Learners: [The Plant and Soil Sciences eLibrary \(PASSeL\)](#), [Plant Breeding and Genetics \(PBG\) badge](#)
- Services to Support Online Teachers: guidance for online course development, technical support (e.g. Canvas, video editing), administrative support for online graduate students

The Department Distance Education committee works with the department head to set the annual program budget from revenue returned with the primary goals to support and grow the online program ([Online Program Appendix 2](#)). Some of the ways funding has been used are for full-time and partial funding for positions, scholarships for MS students, and incentive funds for online teachers which are all aimed at increasing capacity.

Setting Priorities and Short-, Med-, Long-term goals

A survey was distributed to the department in February 2023 to gather feedback on priority areas and goals for the Department online program (number of respondents = 44). The percentages in parenthesis indicate the respondents' agreement that the goal is important to online program success in the next five years. Following the goals, we've listed questions that arose from the survey.

Priority 1: Expansion of online course options to support growth

Offering students flexibility and choice of course options can help expand our educational reach. Therefore, maintaining current online courses is important as well as identifying new online courses/sections to develop. Our goals are:

- Medium-term: Expand online course options (undergraduate and grad-only courses). (75%)
- Medium-term: Structure our online course offerings into a regular, predictable schedule of classes. (59%)
- Medium-term: Expand and revise badge (non-academic) and certificate (academic) module/course options. (50%)

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Table 1: Current status on the department’s online program. Details found in [Online Program Appendices 3 to 5](#).

	Current status	Notes
Total online courses	39	13 – undergrad, 11 - 400/800 level, 15 - graduate
Total online students served	1,107 (AY23)	42% increase from AY17
Total online teachers	25	25% increase from 2017
Online MS students	46*	Graduated 43 in last 5 years (36 non-thesis, 7 thesis)
Total online MS advisors	17	
Graduate Certificate students	9	Graduated 13 in last 5 years
PASSeL	Users: 1.46 million across the world (in 2022) New content: 10 lessons in the past 5 years	Major website revision since last APR to make site more accessible to users; launched in Jan. 2020
PBG badge learners	15 learners in the last year	74 learners in last 5 years (10 earned the entire 12-unit badge)

*NOTE: See [Graduate Program Appendix 1](#) for total department graduate student numbers.

Considerations:

- How do we ensure efforts are focused on the most needed and relevant courses when planning for new online course offerings?
- Each stakeholder group (extension, faculty, industry, graduate students) has their own unique set of goals/objectives that can differ significantly from those of other units. How do we make it attractive to work with us to offer more online courses and certificates.

Priority 2: Create a culture that values online education.

Through the retreat, misunderstanding surrounding the online program was identified. The department’s online program has identified short and medium-term goals to address this challenge.

- Short-term: Conduct survey to learn about our online student demographics and student achievement. This will help in our department’s Diversity Equity and Inclusion (DEI) efforts by better understanding the background

of our audiences and giving us the ability to address any concerns. (50%)

- Medium-term: Build up successes in creating online courses using our infrastructure and communicate those successes with the department (and beyond). (73%)
- Medium-term: Pilot technologies for learning at a distance (e.g Augmented Reality, Virtual Reality, online simulations, remote laboratories, and formulating potential pathways to agronomic and horticultural technology around the state or other basic tools at a distance). This will help our department explore the full potential of online teaching technologies for agronomy and horticulture. (43%)
- Ongoing, with increased efforts in the short-term: Communicate about the online growth opportunities and inter-relationship between badges, certificate, the online PLAS, etc. This goal includes sharing about new technologies, platforms, and ways of creating or delivering online resources in addition to amplifying

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existing resources provided by the University. This goal was added from survey and Department APR discussion feedback.

Considerations:

- Should we create an advisory board with external partners (note: internal [Distance Education Committee](#) currently exists)?
- How do we empower people to keep teaching during times of UNL online technology transition?
- How do we continue to expand online offerings while considering learner accessibility, cost of the technology, and transferring hands-on activities to online learning?

Priority 3: Facilitate Online Program Infrastructure Growth

Our existing infrastructure supports the current online program needs, but increased growth in the online program will require use optimization of current infrastructure to facilitate the growth.

- Medium/long-term: Facilitate connection between Department online program, PASSeL, and the broader Nebraska community through extension, researchers, and industry (especially training). This will offer more cutting-edge learning opportunities and greater flexibility across Nebraska for academic (degrees, certificates) and non-academic (badges, trainings) learners. (80%)
- Long-term: Preventing teacher overload by building up people resources for teaching the online courses that are created. Our department has suggested some solutions – partner with graduate students, hire online teachers only, or reallocate time for current teachers to support online programming. (41%)
- Medium/long-term: Expand Open Educational Resource (OER) development and maintenance to support academic and non-academic learning needs (PASSeL). (32%)

Considerations:

- What do people need to be able to collaborate in creating online courses/resources/etc?

- Extension has a focus on at-risk or urban populations. Would our online programming have potential to help support this extension focus?
- Pre-tenure faculty may need to focus on tenure/promotion efforts. How does our online programming (e.g. development, teaching, advising) fit into those activities?
- Are there barriers in working on online programming that we can alleviate with current resources and infrastructure in the department and wider university (e.g. faculty could use instructional design support)?

Priority 4: Recruitment, Retention & Growth

Online MS student admissions have been relatively steady over the last five years. The department has the capacity for increased enrollment across the [Department online offerings](#) (online MS, badges, certificates, online undergraduate courses). There is an opportunity to do this through existing offerings and new online badges and certificates.

- Short-term: Invest in training our online program leaders (individuals heavily focused in online teaching and development) in online program growth and maintenance. (75%)
- Short-term: Consult with UNL/CASNR about collaboration in marketing the online MS and online learning opportunities for undergraduates. (55%)
- Ongoing, with increased efforts in the short-term: Continued efforts to regularly and clearly communicate with online graduate students and create online communities for virtual gatherings (e.g. seminars, workshops, classes).
- Long-term: Develop an online PhD. (27%). After discussions and feedback, continue to evaluate and identify opportunities to develop additional graduate certificates, the online undergraduate degree, and/or an online PhD.

ONLINE PROGRAM



– An “online completion” option – This is a combination of online courses with some requirements for in-person education. E.g. [CASNR Bachelors of Applied Science](#), 2 + 2 program, or other similar concept.

- How do we engage more stakeholders to expand online collaborations?
- How do we prepare to support growing number of students in online program?

Considerations:

- Do we currently have good “conversion” of interested to enrolled online MS students? Ideally this should be high to indicate that marketing is a good investment. If it’s low, we need to troubleshoot the low conversion rate.
- How do we provide a quality advising experience for the online MS students and accommodate future program expansion? What factors need to be addressed or questions answered?



Key Questions to the Review Team

- What online programming has the highest potential for success? (e.g. online BS, PhD, certificates)
 - What are the advantages and disadvantages of an online PhD?
 - What does an online BS degree program look like for PLAS and/or Agronomy? Two options are:
 - An “all online” option – All degree requirements could be completed online from 100-level to 400-level education. Note that some general requirements are difficult to implement online and we don’t teach them in our department (e.g. math, chemistry).



RESEARCH PROGRAM



Overview

The Department of Agronomy and Horticulture leads departmental-to-international-level team-based research across multiple disciplinary areas at scales ranging from genes to biomes. The research enterprise addresses emerging issues for state, region, and nation including climate smart cropping systems, biotic and abiotic stresses, precision management, resources use efficiency, and crop grain quality and nutrition. To build on past successes, address existing shortfalls, and progress toward future goals, it is useful to identify areas in which we are leading and lagging, consider how we might prioritize growth, identify opportunities for strategic partnerships, effectively leverage resources, and determine how we might quantify progress.

For the 2023 Academic Program Review theme of Building Research Capacity, information on current trends and future priorities was derived through a series of structured discussions, surveys, and feedback sessions with departmental faculty and staff members, as well as research data analytics from UNL and peer institutions ([Research Program Appendix 1](#)). At the October 2022 departmental retreat, participants engaged in a series of structured small-group discussions about needs and opportunities for building research capacity. Feedback was aggregated and distilled into a set of ten future departmental research priorities. In January–February 2023, more than thirty faculty responded to a survey to rank the

ten priorities, based on perceived importance and urgency ([Research Program Appendix 2](#)). Information on current trajectories and future priorities was used to develop a key set of questions for consideration and feedback by members of the department and 2023 APR reviewers. Faculty clearly identified that issues concerning staff recruitment and retention as well as equipment and infrastructure are the most important and urgent needing attention to continue building research successes and innovation. However, these issues are overarching and affect all the major themes covered in this APR self-study and are thus covered as dedicated, cross cutting themes under Staff and Facilities. This section provides an overview of the status of some of the interrelated research themes and brings forward some of the perceived needs within each.

Research Themes

Research in the Department of Agronomy and Horticulture spans a wide range of disciplines many of which are already strongly interconnected, interdisciplinary, and align with our mission of research leadership in plant, soil, and landscape systems (Figure 1). This interconnectedness stands to continue getting deeper as we continue to strive integration across all three mission areas, elevate team science, and augment internal and external partnerships.

As we prioritize needs, the most overarching one is that of a whole plant physiologist to fill research and teaching gaps created by recent retirements. This is an urgent priority across many research areas (below) including breeding and genetics, horticulture, physiology and production, weed science and other IANR units. Molecular physiologist needs have been identified within Plant Breeding and Genetics and Weed Science disciplines (see below) and we are considering the possibility that these three needs can be combined.

In spring 2023, representatives from each of the department's disciplinary groups were asked to converse with colleagues and identify a small set of emerging research areas and suggest associated investments for promoting disciplinary leadership of the department. Some of these emerging priorities are listed below.

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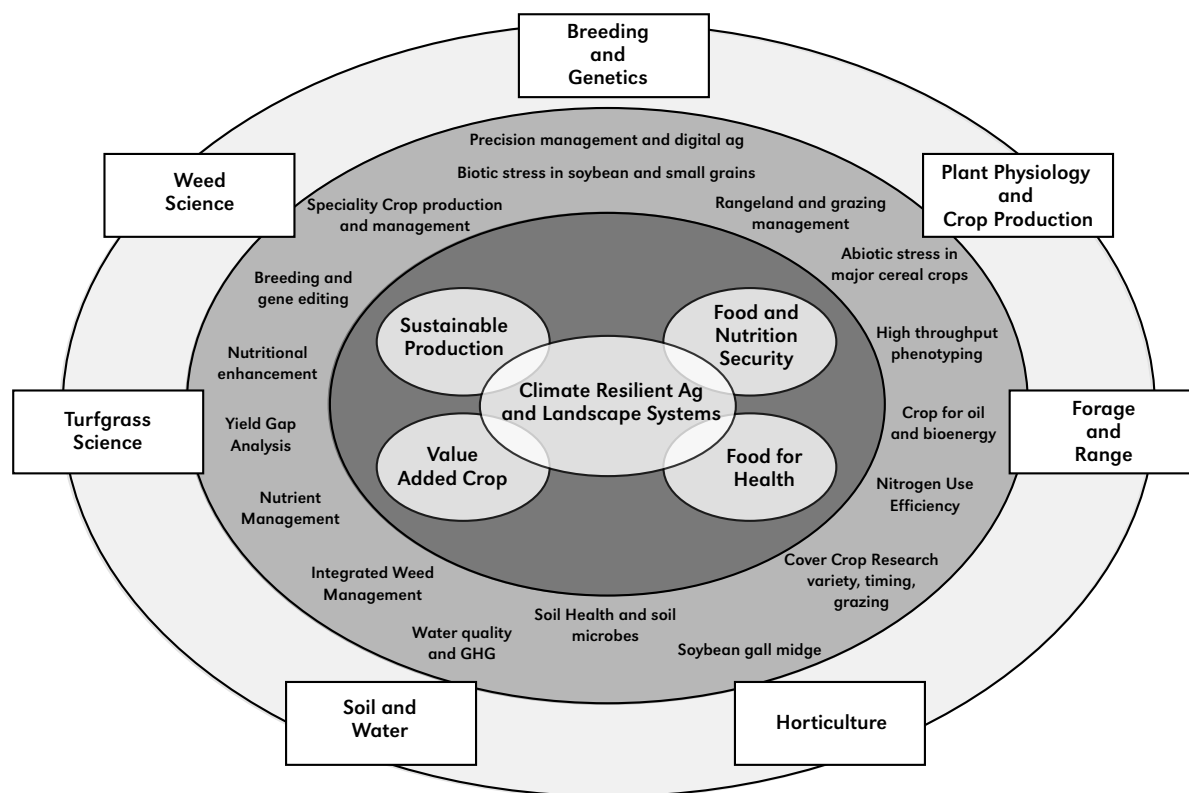


Figure 1. Agronomy and Horticulture research connectivity. IANR Grand Challenges are shown in the center and agronomy and Horticulture Research Areas at the periphery. These are interfaced by current research foci.

Breeding and Genetics

- Faculty in plant breeding and genetics are more heavily research focused than teaching focused. With the imminent retirement of a faculty member who has large breeding and genetics teaching footprint, an urgent need is to seamlessly recruit for this core position.
- Leverage breeding and genetics expertise to address the growing need for diverse and scalable crops for Nebraska, while increasing climate resilience, resource efficiency, nutritional quality, localized production, and agricultural innovation for both row crops and horticultural crops.
- Build expertise in molecular physiology, with a focus on protein structure/function. This expertise is necessary for filling genome-to-phenome knowledge gaps in plant biology and using mechanistic understanding of phenotypes to reach the full potential of the genetic strategies being designed for different

phenotypes. A molecular physiologist faculty line is needed in this area that is separate from the cross-cutting whole plant physiologist described above.

Horticulture

The horticulture program is especially poised to contribute to the Nebraska Regional Food Systems Initiative. This initiative's goal is to have resilient food systems with all Nebraskans having access to good quality fresh food – from growing to marketing to distribution.

- Sustainable and resilient systems – Design and develop ecologically sound plant and landscape systems that can withstand and recover from increasing environmental stressors and optimize ecosystem services. This is a universally important theme across the systems of emphasis in the department with the opportunity to collaborate and work with Landscape Architecture and Urban and Regional Planning. Capacity in this area is lacking to develop creative

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practices and design alternative systems that are better able to cope and recover from extreme events (heat stress, drought, flood). This capacity can also address research and teaching gaps in turfgrass.

- Urban landscape design – Optimize food quality and access, human health, and environmental outcomes. People are rethinking the role of the urban landscape to include a diversity of functional outcomes. Research in this area impacts the lives of most Nebraskans who live in or manage urban and peri-urban landscapes, but the department currently lacks any formal research FTE in the area. This position can collaborate with researchers including social scientists in SNR, Ag leadership, Ag Economics, Plant Breeding and Genetics, Nutrition, and the UNL Minority Health Disparity program to study human health outcomes.

Plant Physiology and Cropping Systems

- Invest in development of digital tools and advanced statistical methods for identification of management opportunities for sustainable crop intensification.
- Prioritize combinations of models and novel experimental approaches for exploration of plant tolerances to weather extremes in the context of climate change.
- Invest in development of smartphone-based crop management decision support tools.

Range and Forage

Wildfires are projected to continue increasing in Nebraska in the future. There is a major need and substantial stakeholder demand for a Rangeland Fire Ecologist faculty position. Nebraska prescribed fire management has rapidly increased in NE over the last 10-years to address the expansion of woody invasions in the state. Over 300 people now attend Nebraska's annual prescribed fire conference and capacity from the department is needed to address stakeholder needs and building a strong curriculum.

Soil and Water

- Invest in soil carbon and climate smart agricultural research, including enhancing adoption of climate-smart agricultural practices on large-scales, quantifying/monitoring, and verifying soil carbon dynamics and stocks, and related soil ecosystem services, and promoting or developing soil carbon and soil ecosystem service markets.
- Establish a hub that brings together researchers from the department and beyond to address climate adaptation and mitigation efforts in agriculture, including enabling development and validation of advanced techniques for monitoring soil carbon under in-situ conditions with cutting-edge technologies. This should involve coordination and interdisciplinary collaboration with the School of Computing, with strategic hiring for leadership in this arena.
- Invest in research on soil resilience and its relationship with soil health. Further development of practice that promote soil health is key for developing resilient soils against climatic fluctuations. Leadership in this area could include forming alliance with the Center for Resilience in Agricultural Working Landscapes (CRAWLS).

Turfgrass

- Develop, evaluate, and apply technological advancements in turfgrass systems.
- Invest in applied research on reducing inputs in managed turfgrass and developing best practices to mitigate stress.

RESEARCH PROGRAM



- Infrastructure needs – The Turfgrass Since Program has adequate facilities and resources to meet the above objectives. The current teaching faculty are oversubscribed in teaching resulting in the need for a Research/Teaching tenure line faculty member, allocation TBD.

Weed Science

UNL has five weed science faculty positions; however, no one is conducting research on molecular weed ecology which is required considering widespread occurrence of herbicide-resistant weeds in Nebraska. There is a major need for the Lincoln-based faculty position of Molecular Weed Ecologist (70% Research; 30% Research). Weed scientists at UNL will collaborate with the Molecular Weed Ecologist to conduct projects such as evaluating the genetics and population biology of economically important herbicide-resistant weeds in Nebraska; confirming gene flow among and within weed populations using genomics approaches; and developing molecular markers for rapid herbicide-resistant weed diagnostics to support on-farm management decisions. This position will strengthen insights about herbicide resistance mechanisms and integrated pest management strategies for herbicide-resistant weeds affecting crop production in Nebraska.

Current Trends in Relation to Peer Universities

We assessed trajectories in departmental research funding and outputs over time using four indicators: average federal funding per FTE, average number

of publications per FTE (including only journal articles), and average number of citations per FTE ([Research Program Appendix 3](#)). For comparative purposes, also shown is the trend for peer universities with Agronomy and Horticulture departments, or their equivalents. These universities include the University of California-Davis, Texas A&M University, The Pennsylvania State University, Purdue University, Michigan State University, Oklahoma State University, The University of Minnesota, Kansas State University, The Ohio State University, Colorado State University, Iowa State University, and The University of Illinois at Urbana-Champaign. These data don't consider faculty apportionment, journal articles that are not typically picked by Data Analytics™ and the substantial non-federal funding (Commodity Board, State, Foundation, International) that the department receives. Thus, the trend should represent the general trajectory of the department's research productivity and must be interpreted carefully.

The department has a strong history of bringing extramural funding. For example, faculties in the department received \$10.9 million to \$14.1 million annual funding during 2018 to 2022 with the research expenditure of \$11.0 to 13.1 million ([Research Program Appendix 4](#)). In addition, faculties in the department have been honored with prestigious internal, external, and professional awards ([Research Program Appendix 5](#)).

Key Questions to the Review Team

- How might we synergistically address multiple future research priorities?
- How might we prioritize new faculty needs in the face of budget restrictions? In particular, the program-wide need for a whole plant physiologist as well as molecular physiologist and weed molecular physiologist?
- How can we balance our prioritization efforts between documenting impacts and addressing current and emerging issues?
- Should the two-dimensional ranking approach (shown in [Research Program Appendix 2](#)) be redeployed in the future for standardized monitoring of research priority perceptions?

EXTENSION PROGRAMS



Overview

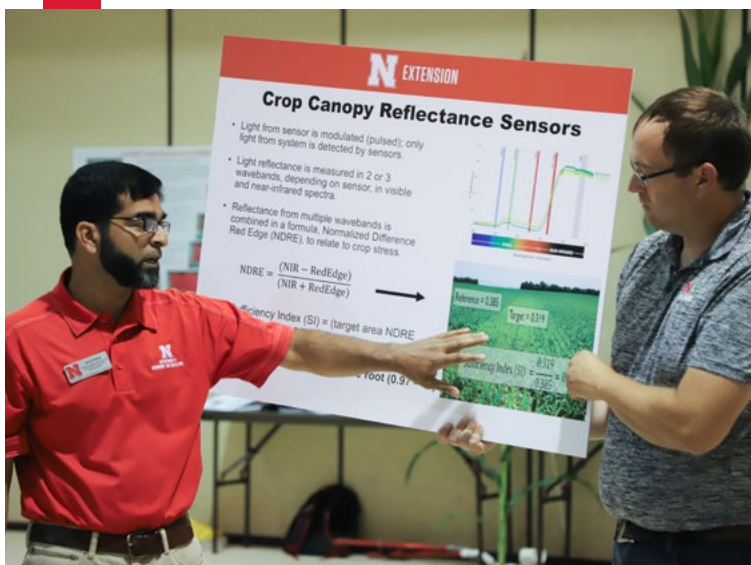
Extension and outreach activities are integral to the Department of Agronomy and Horticulture at the UNL. The Department of Agronomy and Horticulture has 26 Extension faculty ranging from 0.10 to 1.0 FTE (Full-Time Employees) Extension appointment. The Extension FTE in the department is expected to increase by hiring new Extension faculty such as Precision Application Technology Specialist (0.5 FTE). The Extension Coordinating Committee, established in 2019, created a new [webpage](#) highlighting Extension subject areas and faculty. The department has achieved a notable reputation for Extension efforts in program areas, including crop production, cropping systems, distance education, horticulture, specialty crop production and management, landscape systems, pesticide safety, range, pasture & forages, soil science, turfgrass science, and weed science. Some of the signature Extension programs include [Backyard Farmer](#), [Crop Production Clinics](#), [Nebraska Master Gardener Program](#), [Nebraska Grazing Conference](#), [Nebraska Pesticide Safety Education Program](#), [Weed Management Field Days](#), etc. Numerous extension faculties are involved in the nationally known [On-Farm Research Network](#). The departmental Extension faculties work closely with check-off commodity boards to solve real-world problems that Nebraska growers and ranchers face to meet immediate and future needs of stakeholders.

The department Extension faculties partner with industry and stakeholders to meet challenges through innovative research and learner-driven Extension and outreach to support resilient crop and food production and enhance the quality of life of Nebraskans. The departmental Extension programs have helped to improve leadership and organizational development in the industry, government, community groups, agricultural literacy, and in-service training of Extension educators. The departmental Extension programs align with the strategic direction of NE Extension of strengthening NE Agriculture and food Systems, inspire Nebraskans and their communities, and enhance the health and wellbeing of Nebraskans. The sections below were captured from faculty survey questions ([Extension Appendix 1](#)).

Challenges and Opportunities

- Integration of relevant research/teaching faculty into Extension for new linkages and to better share research results to help Nebraska growers solve real-world problems.
- Due to the anticipated loss of Extension FTE in the department, there is a need for a comprehensive and prioritized list of Extension faculty and staffing, both short and long-term. For example, limited Extension/research faculty capacity in horticultural crops to better address healthy systems, urban food, small farm production, and landscape systems.
- Develop long-term projects on-site at UNL facility and on-farm on growers' fields in collaboration with county-based Extension educators, growers, and commodity boards. Projects should demonstrate solutions, challenges or applied research experienced locally to the site. We need to look at the future state of farming considering water scarcity, land scarcity, growing food demands, the need for better resource management, urbanization, and climate change. Is the [Long-term Agro-ecosystem Research \(LTAR\) Network](#) at UNL's Eastern Nebraska Research Extension and Education Center (ENREEC) an opportunity to broadly engage Extension educators?
- Several Extension programs are more focused in eastern or western Nebraska, there is a need

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to expand Extension programs to make them accessible statewide. There needs to be better communication as to what is happening. This includes on-campus, and across the state.

- Develop standard survey questions which can be utilized across multiple programs/disciplines to better analyze the tools we can use to distribute information and document impact.
- Peer-reviewed Extension publications should be readily and easily accessible and available to improve stakeholders' access and use. Does this need to be on the department website, or do we work with NE Extension to create a better tool for Extension publications? Extension digital tools, such as an App, should be developed?
- Extension Educator Affiliate Program is a good step to strengthen faculty-specialist-educator ties. How best can we support this program? How can we ensure the program is mutually beneficial to all parties? How do we make sure the connections are strong? How does the department reach out to those who are not in the affiliate program? How do we share our stories with Extension?
- Graduate and undergraduate students should be encouraged to speak at Extension events and to develop Extension programing. We should investigate participating in the NE Extension Intern Program. This may expand their

interest in NE Extension and serve Nebraska agriculture by recruiting them as Extension educators/specialists. A Dual Track Extension Instructor Educator is a good step by NE Extension to recruit early career talented students after completion of their undergraduate degree. We need to better promote the possibility of industry opportunities and possible advanced degree options.

- Too frequent structural changes in IANR and NE Extension negatively impact specialists and educators within the department.

Proposed Actionable Goals (Short, Medium, Long-term)

Short Term:

- Continued increase in cost of input such as fertilizers, seeds, pesticides, and limited resource availability, such as scarcity of herbicides, are major challenges for Nebraska growers. This is being seen in the landscape and turf industries as well as in the consumer horticulture arena. How can we support producers/homeowners to make it economically viable?
- Support Extension Educator Affiliates by inviting them for guest lectures, seminars, and collaboration on Extension proposals and Extension publications.
- Make a need assessment for developing an Extension Digital App that help Extension educators and specialists to reduce time looking and sharing information, homogenize way of reporting field visits or grower calls, and provide tools to Extension educators and specialists to make quick field assessments (e.g., soil maps, scouting tools, unit conversion tools, historical weather data of the location, GPS tools, etc.).
- When hired, support Dual Track Extension Instructor Educator to develop collaborative Extension programs.
- A step towards Digital Extension: Peer-reviewed Extension publications should be made available online for easy access.

EXTENSION PROGRAMS



- Develop horticulture (e.g., NE-Extension Master Gardner Volunteer Program) credit course for non-majors who may be involved in forms of horticulture therapy aspects, biology, social sciences, nursing, pre-med, nutrition, etc. There are fewer Horticulture therapy programs; can we partner with the social sciences to offer this as an option? Can this be some of the stackable certificates?

Medium Term:

- Teaching faculty should collaborate with department affiliated Extension educators for hands-on activities, so students can learn relevant and applied grower problems and the function of Extension in providing research-based information. Implementation of innovative ideas need to be in various growing environments – greenhouse production, high tunnel production, small-scale field production, urban environments, and hydroponics.
- Develop a strategic plan to maintain and continuously improve the quality of statewide Extension programs. This may include developing long-term, on-site projects that can be used to test and show current and emerging issues and solutions. This plan should also help to strengthen the link and flow between research, Extension, and teaching.

- A step towards NE Extension Global: Exposure of international students and growers by visiting Nebraska Agriculture. Develop a program with Nebraska Extension and UNL Global for this setup and delivery. The [AGRI 042 – Introduction to Production Agriculture in Nebraska](#), can be expanded through additional investment and planning.
- Develop a two-credit course for graduate students and Doctor of Plant Health students focused on Extension. It could be a team effort by Extension specialists, Extension educators, and Extension affiliates.
- Look for funding and collaboration from other departments at UNL to develop and test the Extension Digital App.

Long Term:

- Generate a statewide database from Extension programs and Extension Digital App that can be used for research, teaching, and Extension. It will also serve to visualize long-term impacts, shifts, trends, and emerging issues.
- Recruit new tenure track Extension specialists to address emerging challenges in agronomic and horticultural crops.
- Developing strategic plan within Extension programs will help connect research, teaching, and Extension, improve information flow, increase impact, and improve onboarding of new Extension educators and specialists.

Key Questions to Review Team

- Which are successful ways for extending Extension reach beyond large-sized stakeholders to small- and medium-sized stakeholders for education and training?
- Digital Extension delivery will be critical in the future with a reduced number of in-person attendees at Extension meetings. What is the future platform of Extension delivery and how should we prepare for that? (Webinars, online presentations, videos, use of real-time survey tools such as Slido, etc.).

EXTENSION PROGRAMS

- How do we best leverage National Ag Data Network for Nebraska Extension? We also need to leverage the commercial and consumer horticulture part of the department.
- What strategy might we consider using to assess the value and impact of developing online Extension/outreach programs?



INTEGRATED RESEARCH/ TEACHING/EXTENSION



Overview

Research, Teaching, and Extension (RTE) Integration has not been explicitly addressed in previous APRs. However, it does not mean this convergence has not existed across mission areas within our department. For example, numerous faculty integrate research outcomes from their teaching and learning portfolio. Likewise, non-extension faculty engage in partnering with Extension Educators and Specialists to share their research and directly support extension programs and stakeholder needs and publish extension resources. It is important to note that not all faculty can, should or need to be active with an integrated RTE program. However, there exists the need to find a common identity, especially in understanding what already exists to complement individual programs.

Survey Feedback

The interest of Agronomy & Horticulture faculty in integrated RTE was recently assessed through a survey to look for common themes that could be used as building blocks to strengthen future integrated programming. Results from the survey indicated that 68%, 21%, and 11% of the Agronomy and Horticulture faculty expressed high, medium, and low levels of interest in integrated RTE, respectively.

The responses were summarized by interest level. Responses from faculty indicating a **high-interest** level of RTE integration (n = 19) could be grouped into six distinct categories (number of unique responses in parentheses). These were Instruction-focused (3), Extension-focused (2), Research-focused (2), Communication (7), and Miscellaneous (5).

Faculty responses indicating a **medium-interest** level of RTE integration (n = 6) could be grouped into two categories (number of unique responses in parentheses). These were Extension-focused (4) and Incentive-focused (2). Those faculty with a **low-interest** level of RTE integration (n = 3) could also be grouped into two categories (number of unique responses in parentheses). These were Incentive-focused (1) and Communication (2). For comparison, not a single respondent indicating a high level of interest in RTE Integration suggested incentives as a need to strengthen departmental RTE integration.

Strategic Opportunities

Using survey responses and earlier discussions from a faculty/staff retreat in the Fall 2022, we have summarized and expanded strategic and intentionally integrated RTE opportunities.

1. Fostering communication between faculty members.

Because of the size and breadth of departmental faculty disciplines and interests, it is important that both informal and formal opportunities encouraging faculty engagement in integrated RTE exist. Opportunities already exist to foster communication between faculty members such as the Departmental Seminar Series. The following areas should be further explored to enhance the communication between faculty:

- Use of our seminars as tools for teaching and extension programs
- Invite Extension Educators to present guest lectures with an agreement that instructors and/or research faculty will reciprocate at extension events

INTEGRATED RESEARCH/TEACHING/EXTENSION



- Coordinate Departmental Research Symposium/Retreat with Teaching/Extension Retreat
- Challenge faculty to update webpages and resources for increased accessibility

2. Identifying, Designing, and Implementing strategies that support RTE integration.

Within the Nebraska System, there are examples and frameworks that support disciplinary RTE integration. These successes should serve as examples to support new integrated RTE programs. To stimulate the creation of these programs and the expansion of existing programs, we propose to:

- Provide seed grants to promote new RTE Integration
- Co-develop facilities at Research and Extension Centers to support undergraduate and graduate teaching
- Co-develop integrated RTE grant proposals and educational projects with stakeholders
- Co-design “On-farm Practicum” with Extension Educators/Specialists for Research/Teaching faculty

3. Encouraging student engagement in RTE opportunities.

Usually, graduate students lack experience,

knowledge, and training in RTE integration beyond research. However, graduate advisors with a major apportionment in either teaching or extension regularly provide informal opportunities for their students to either teach or participate in extension programming. To encourage additional opportunities, we propose to:

- Identify research, teaching, and extension programs for faculty/graduate student immersion
- Identify opportunities for graduate students to engage with Extension Educators and Specialists
- Invite graduate students to present and attend departmental seminars
- “Bring the Classroom to the Field” for workshop/field days or “Bring the Field to the Classroom” by including research and/or extension activities
- Encourage students to communicate with faculties about their interest in RTE through their advisor or Individual Development Plan
- Co-develop Graduate Specialization/Certificate in Teaching and/or Extension (note this discussion has already begun with Ag Leadership and Communication for developing minor)
- Co-create experiential learning opportunities for integrated RTE in Capstone courses, following examples from PLAS 405 Crop Management Strategies



INTEGRATED RESEARCH/TEACHING/EXTENSION



There are many opportunities to enhance RTE integration within the Department of Agronomy and Horticulture. The majority of identified needs for RTE integration center around both Instruction-focused RTE Integration and Extension-focused RTE Integration.

Key Questions to the Review Team

1. Are we justified using proposed strategies for enhancing RTE integration? Which ones do you think are practical and/or impractical?
2. Did the reviewers own Departments/Institutions have limitations with RTE integration and if so, what are/were strategies used to resolve them what we have not identified?





STAFF



Overview

The Department of Agronomy and Horticulture employs approximately 78 staff members. Staff are full- and part-time non-faculty employees with “managerial/professional or “office/service” classifications. For this review, postdoctoral research associates or student workers not defined as staff. Staff support the department’s mission in a wide variety of ways, including research, human resources, office logistics, communications, facility management, learning management, resource development, student recruitment, and event coordination.

The department held its inaugural staff retreat in August 2022, during which staff members voiced and discussed some of the major challenges they face and brainstormed strategies to address these challenges. The retreat resulted in a report written by the department’s Staff Advisory Committee, which addressed both department-level and institute-/university-level challenges and recommendations. The committee presented the substance of the report to the department’s faculty retreat held in October 2022. Then, in the context of the Academic Program Review (APR), the committee focused on already defined department-level challenges to draft staff-related goals for the department. The retreat and surveys have identified the following goals:

1. Compile salary and development pathway data for all staff positions in the department.

2. Ensure that all department staff members:
 - a. Have two performance conversations each year with their supervisors.
 - b. Have a merit increase conversation each year with their supervisors; and
 - c. Regularly undergo internal equity analyses.
3. Establish a framework for handling work requests.
4. Establish a sustainable mentoring program for department staff.

Both faculty and staff emphasized the staffing-related challenges discussed in this section as a priority. The APR Writing team that focused on the department’s research mission conducted a survey of faculty, asking them to rank departmental research priorities by both importance and urgency. Based on the responses of 30+ faculty, staff issues (hiring, salaries, promotions) ranked first in both importance and urgency, despite the survey’s focus on building future research innovation. Faculty are highly concerned about staff challenges and appear to recognize that the department’s threefold mission will be hampered until these challenges are meaningfully addressed.

Compile salary and development pathway data for all staff positions in the department

The diversity, equity, and inclusion team identified the lack of development and promotion opportunities for staff in the unit. In some cases, the only way to promote a staff member into a new job category is to post for a new position and require that individual to apply and compete for it. UNL Human Resources policy allows for job requisitions to be posted in three different ways: external (fully public), university employees only, and department employees only. The latter two options can only be used with approval from the Office of Institutional Equity and Compliance. When seeking to promote a staff member by way of posting a new position, it seems possible that university-only or department-only requisitions could be used to the benefit of that staff member while potentially speeding up the hiring/promotion process. While the department is not advocating skirting hiring rules, it is hoped that there will be an

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equitable process for advancement or job reclassification, and encouragement and investment to pursue professional development.

The University of Nebraska uses the “NU Values Compensation plan” to guide staff compensation. The UNL Human Resources describes NU Values as “a means of selecting and retaining a highly qualified and talented workforce and opportunity for that workforce to experience growth and advancement in a rewarding work environment.” This system employs job families, job tiers, and salary bands to guide staff compensation and advancement (Figure 1). While noting that some staff positions in the department do not have advancement opportunities, we also note that, because of the structure of the NU Values job tiers and salary bands, even positions with built-in advancement ladders (e.g., Research Technician I, II, and III) sometimes face a situation

in which advancing to the next job tier (i.e., I to II) results in a pay cut.

Lastly, the department has struggled in recent years with recruiting and retaining staff members. While a variety of factors likely contribute to this problem, we believe the department’s (and, more generally, the university’s) major disadvantage is its inability to meet rapidly changing market hiring conditions. This manifests itself both in uncompetitive wages and in unnecessarily lengthy hiring processes. We do not perceive a sense of urgency on the part of the university or IANR to address this disadvantage, despite staff being critical to the university’s mission. Other university policies, such as charging employees nearly \$600 per year to park on campus for work, add to the recruitment and retention challenge.

At least two provisions (not including the job requisition provision discussed above) in UNL Human Resources policy that the department could potentially use to alleviate its staff recruitment and retention challenges:

1. The use of a search committee when recruiting staff members is optional. It is unclear if Agronomy and Horticulture presently uses search committees for some, most, or all of its staff recruitment. Forgoing a search committee could speed up the hiring process.
2. When the normal hiring pay rate for a position cannot attract qualified candidates, Human Resources can approve either a higher pay rate or lower minimum job qualifications. It is unclear how long it will take for this entire process to play out, but it could be used to fill critical staff positions when they remain vacant for unsustainably long periods.

\$	\$\$	Salary Band	\$\$\$	\$\$\$\$
Assistant				
	Associate			
		Specialist		
			Senior	

Figure 1. NU Values job tiers and salary bands for a given job family. Source: UNL Human Resources.

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Considerations

- Under current UNL/IANR policies, how can the department work with IANR Human Resources to enhance retention, promotion, and recruitment of staff?
- How can the department leverage current Human Resources policies for the mutual benefit of the department and its staff members?
- In the long term, how can the department advocate for positive changes to UNL/IANR staff policies?
- How can the department more readily adapt to rapidly changing market hiring conditions?

Short-term goals

- The Staff Advisory Committee (SAC) and department administration collaborate to identify problematic HR policies
- The department and SAC regularly follow up with IANR HR regarding their progress on re-evaluating staff advancement, reclassification, and pay increase policies

Medium-term goals

- Revise staff job descriptions to replace vague language (i.e., “other duties as assigned”) with more equitable language

Ensure that all department staff members: (a) have two performance conversations each year with their supervisors, (b) have a merit increase conversation each year with their supervisors, and (c) regularly undergo internal equity analyses.

Under IANR guidelines, staff members are to have two “performance conversations” each year with their supervisors. According to IANR Human Resources, these conversations help employees succeed “by ensuring that we consistently set the right goals, align expectations, and encourage ongoing communication between employees and managers.” These conversations are documented through an online platform called [Trakstar Perform](#).

Similarly, each staff member and his/her supervisor are to have a “merit increase conversation” each June, during which the supervisor informs the employee of the merit pay raise they will receive, if any, for the following fiscal year. These conversations are not formally documented.

We note that some supervisors fail to meet these basic obligations to their employees, with no apparent consequence (Department administration, which receives a report on how many performance conversations are completed every six months, estimates that our department’s completion percentage for these conversations is between 30% and 80%). Missing these conversations negatively affects the employee’s ability to meet expectations, grow professionally, and understand their own financial situation. Widespread noncompliance has also led to confusion among staff members, many of whom wonder if performance conversations are, in fact, mandatory. Communications on these obligations have not led to uniform compliance.

University of Nebraska Administration’s Human Resources Handbook for Policies sets forth the requirements for performance evaluations: All employees must have at least one evaluation each year; employees must have the opportunity to submit a written response to their evaluation; employees must receive a copy of the completed evaluation; and the evaluation must carry the employee’s signature. However, there is no provision for what should happen when any of these requirements are not met.



Limited discussion with supervisors indicates that they often do not feel equipped to fulfill their merit increase conversation obligations. It seems that, prior to 2023, the final salary-increase information that the supervisor is supposed to provide to their employee during their merit conversation has not been sent to supervisors by Human Resources. Prior to 2023, it appears that merit increase information was only passively uploaded onto each employee's Firefly account (our employee self-service portal), which the employee must seek out themselves. The IANR Human Resources is urged to either (1) make it possible for employees to comply with its policies as written, or (2) change its policies such that employees can comply with them.

It is also noted that the discretionary power given to supervisors for the benefit of their employees is being underutilized. According to IANR Human Resources, the simplest way to ensure department staff are being paid fair wages is the "internal equity analysis" process. At any time, a supervisor can request that IANR Human Resources conduct an analysis of their employee's pay compared to other university employees with the same job title, which, if warranted, can result in an equalizing pay bump. Perhaps, supervisors are not fully aware of this option. Recent market analyses (a similar but more time-consuming Human Resources process evaluating wages across the entire labor market) undertaken on behalf of some department staff resulted in wage increases of up to 20%. Lastly, supervisor training is available, but it is optional and may not be a priority for supervisors.

Considerations

- How can supervisor-focused, department-level policies contribute to improving staff retention?
- What kind of mechanism could be used to ensure all supervisors are meeting their obligations with respect to performance conversations and merit conversations?
- How can the department help supervisors be their best?
- How can the department provide clarity to its personnel regarding IANR Human Resources policies?
- Regarding factors that are beyond the department's control, how should the department elevate these things to IANR?

Short-term goals

- Combine the spring performance conversation with the merit conversation
- Implement a mechanism to document the completion of merit conversations

Medium-term goal

- Evaluate IANR merit policies to determine whether they are being followed at the unit level, and if not, why. Elevate the findings to IANR.

Establish a framework for handling work requests.

The department's staff data for 2017 through 2022 are listed in [Staff Appendix 1](#). Staff FTE in the department has declined while faculty FTE has remained relatively steady (Figure 2). In this context, some staff have expressed concerns about the faculty-staff power dynamic with respect to work requests that are not routed through a staff member's direct supervisor. Staff feel powerless to say 'no' when asked to do things outside their job purview or normal work hours, or when faced with requests with unreasonably short timelines.

Many staff job descriptions include vague phrases such as "other duties as assigned" or "other duties as

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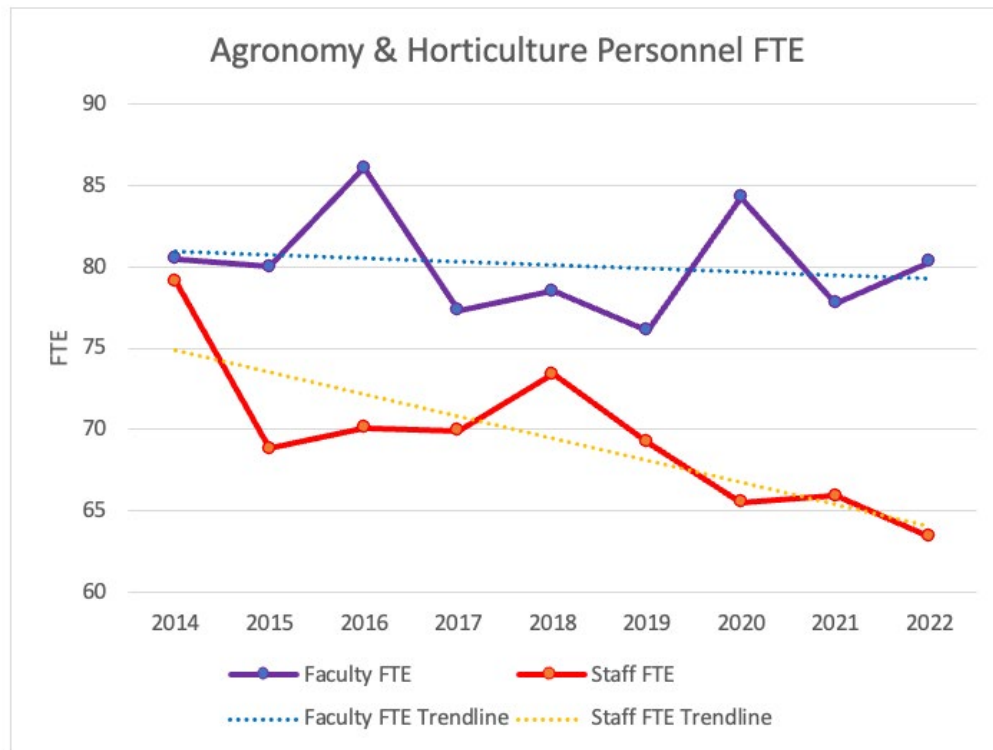


Figure 2. Faculty and staff full-time equivalent with trendlines (2014-2022).
Source: UNL Institutional Effectiveness and Analytics.

needed,” which means that virtually nothing could be considered outside one’s job purview. We recognize the need for a degree of flexibility in job descriptions, however, when a staff member leaves the unit for another job, that person’s duties are assigned to another staff member on top of that employee’s existing duties, sometimes for extended periods. UNL Human Resource policy allows for temporary pay increases when employees assume additional duties which are at a higher level or scope than their normal duties. Work overload is not considered eligible for a temporary pay increase and has contributed to burnout and the department’s inability to retain talented staff.

Among job seekers, a major draw for employment at UNL is the benefits it offers, including paid time off. Work overload due to staff departure has led some staff to feel unable to use the paid time off they have earned for fear that they will fall behind on work or that they will saddle co-workers with their duties while they are gone.

Considerations

- How can we balance the needs of faculty with ensuring reasonable workload and time sensitive request?
- How can job descriptions be written or rewritten to provide reasonable flexibility without causing or allowing overwork and/or duty creep?
- Are there groups, either within the university system or outside it, with existing frameworks that could be used to inform a departmental framework?
 - How can such a framework accommodate staff use of paid time off?
- How can the department make staff employees’ job duties more visible to others?

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Short-term goals

- Distribute a notice at the beginning of each semester to all department personnel regarding the ground rules for staff work requests.
- Study HAPPI Business Center's framework for handling work requests.

Medium-term goals

- Office professionals collaborate with department administration to develop an operating framework that balances work requests with reasonable workloads for these personnel.
- Institute policies that establish boundaries for staff work requests, specifically: respecting staff's normal work hours and requiring at least two weeks of advanced notice for all work requests.

Establish a sustainable mentoring program for department staff

Mentoring can be a key driver of personal and professional growth. Formal faculty mentoring exists in the department, and while staff certainly informally mentor one another, there is no formal staff mentoring program. A staff-to-staff mentoring program would be valuable for both the department and

individual staff members. A flexible program driven by mentees that can meet needs such as:

- Acquainting new employees with department and/or university processes, facilities, and people;
- Advising employees on long-term career planning;
- Fostering personal and professional growth; or
- Improving employee engagement and building department connectivity, culture, and sense of belonging.

We are keenly aware that such a program would require a certain time commitment from both mentors and mentees. Therefore, department support for a staff mentoring program will be vital to its success.

Considerations

- How can the department and supervisors support staff mentors?
- How can we demonstrate the value of participating in the program?
- How can we develop the program so as to make it sustainable in the long run, accounting for factors such as staff turnover?
- Thinking outside of formal mentoring, are there university or department barriers that can be overcome to encourage or enable time overlap between when an employee departs or moves within the department and when a replacement employee takes over?

Short-term goals

- Host a staff-focused seminar (topic could be almost anything)

Medium-term goals

- Begin a pilot program for one-on-one staff mentoring with those staff who expressed interest
- Explore a department mentoring framework
- Hold future staff retreats

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Key Questions to the Review Team

- How can supervisor-focused, department-level policies contribute to increasing compliance with HR policies and improving staff retention?
- How can the department maximize transparency regarding the staff performance/merit process?
- Given the diminishing ratio of staff FTE to faculty FTE, how can the department balance the needs of faculty with the need for reasonable staff workloads and work/life balance?
- How can the department support staff mentoring or community building so as to make these efforts sustainable in the long run, accounting for factors such as understaffing?





SPECIAL CONTRIBUTION AWARD

is hereby granted to

Fran tenBensel Benne

for going above and beyond her usual job duties in a way that greatly benefited the Department of Agronomy and Horticulture and/or the University

Certificate granted May 6, 2020

Martha Mamo
Department Head

Michael Carlson
SAC Chair



DIVERSITY, EQUITY, INCLUSION, AND BELONGING



Overview

Activities, initiatives, and priorities focused on increasing diversity, equity, and inclusion (DEIB) are relatively new in the Department of Agronomy and Horticulture, as is the case in many workplaces over the past few years. The words “diversity,” “equity,” and “inclusion” were rarely mentioned in our 2017 APR self-study document, but the “DEIB” abbreviation is now part of our professional vocabulary, and we are only beginning to grapple with how to integrate DEIB throughout our departmental mission. As a first step, we created a DEIB Committee in 2020 (<https://agronomy.unl.edu/diversity-equity-and-inclusion-committee>) with a broad charge to “actively pursue diversity, equity, and inclusion” in the unit by:

- Providing opportunities for unit personnel to engage in professional development at local, IANR, and UNL level
- Evaluate the departmental climate
- Make recommendations for incorporating DEIB into our mission

As a relatively new committee, impacts thus far have been limited as we continue to explore our role relative to university- and IANR-level DEIB efforts and the grass-roots efforts happening in many individual labs and teams throughout the unit. Broader

efforts at the university, college, extension, and institute level are summarized on the webpages below:

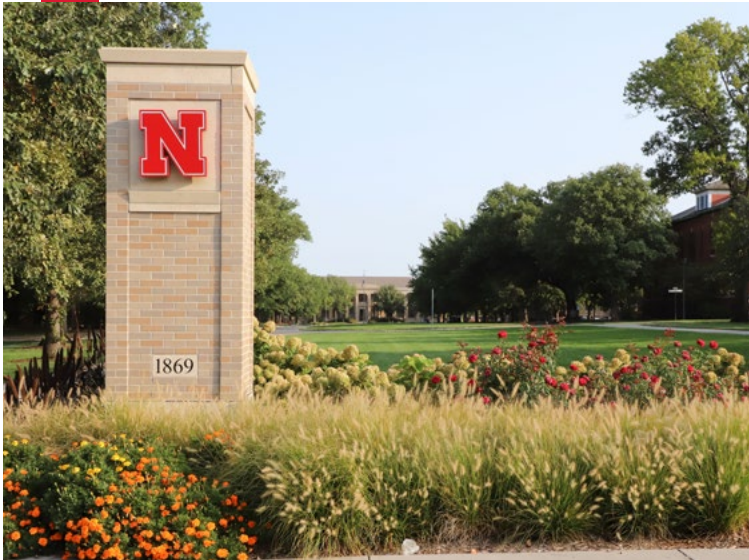
- UNL: <https://diversity.unl.edu/>
- IANR: <https://ianr.unl.edu/belonging-in-IANR>
- CASNR: <https://casnr.unl.edu/diversity-inclusion>
- Extension: <https://extension.unl.edu/nebraska-extension-diversity-equity-inclusion-and-belonging-plan/>

How do we move DEIB forward in our unit without duplicating the efforts and initiatives at these broader levels? How do we encourage greater engagement and participation in these existing initiatives (e.g., attendance at workshops, seminars, book clubs, etc.)?

In the past year, the committee has discussed the following goals and priority action areas:

- Efforts to establish a clear framework of why DEIB matters to our discipline and the mission of our department.
- Recommend establishment of a recruitment fellowship for online graduate students to increase accessibility.
- Review departmental committee bylaws and guidelines and make recommendations to the department head and faculty/staff advisory committees about elevating DEIB priorities at the individual committee level (e.g., diversity in the invited speakers for seminar series).
- Strategize on efforts to increase recruitment and retention of black, indigenous, and people of color (BIPOC).
- Recommend changes to departmental graduate seminar series to provide opportunities for students to share information about their culture (especially as it relates to agriculture and natural resources) while strengthening their communication skills.
- Recommended a new student learning outcome (SLO) for the Plant and Landscape Systems (PLAS) degree program related to leadership and stewardship of the earth and fellow humans and content learning outcomes (CLOs) related to appreciation for diverse human

DIVERSITY, EQUITY, INCLUSION, AND BELONGING



perspectives and values in plant and landscape systems.

- Organize teacher brown bag sessions focused on creating inclusive classrooms and teaching principles of DEIB (including finding new ways to understand the culture and experiences of underrepresented individuals, students, faculty, and staff in the unit).

While there are many excellent DEIB initiatives, activities, and learning opportunities across campus, it has been noted by many faculty, staff, and graduate students that they do not have enough time to participate and that there is no encouragement, expectation, or incentive from their supervisors to participate. There is no clear structure for recognizing important contributions from those leading DEIB initiatives or even those participating (e.g., annual evaluation and promotion and tenure). If we want to increase the value of DEIB and improve the culture in the department, then we need to value it, prioritize the time, resources, and professional development for our faculty and staff to participate.

Our graduate students want to be prepared to promote diversity, equity, and inclusion (DEIB) in their current positions and future careers. The department graduate program needs to consistently provide opportunities (and/or expectations) for graduate students to learn about DEIB. Although there are many opportunities to learn about DEIB across campus,

instructors in the department need to emphasize the importance of these activities and encourage graduate students to attend and participate in these activities.

How do we create the time capacity (FTE) and reporting structure to better promote participation in and advancement of DEIB initiatives? Do other institutions have consistent expectations for professional development in areas beyond our disciplinary expertise (e.g., DEIB)?

Departmental Diversity

One goal of these DEIB efforts is to make our department a place where we can attract and retain the best students, staff, and faculty, regardless of their gender, race, ethnicity, or how they identify. We also acknowledge that our departmental mission and culture is enriched when we increase the diversity of people and experiences in our unit. The diversity of our faculty hires has increased since the last APR (e.g., proportion of female faculty has increased), but it is less clear if we have been successful in increasing the diversity of our staff and students. The demographics information of faculty, staff, and students for fall 2014, 2018, and 2022 are presented in [DEIB Appendix 1](#) and [DEIB Appendix 2](#).

How can we, as a department, work with the college, institute, and university to enhance diversity in our faculty, staff, and students?

Why are the number of female and underrepresented minorities particularly low in our undergraduate student population? What can we do more effectively to recruit and retain a more diverse student population?

Departmental Culture

Throughout this self-study, it was noted several times that the department has not recently (or perhaps ever) assessed our climate and culture. This has been studied at the university level and the [UNL Climate Survey](#) and [Mental Health and Well Being](#) survey data provides university-wide insights into the culture and state of DEIB; however, this data provides limited insights about what is happening in our unit.

Cultural expectations of any organization can be

DIVERSITY, EQUITY, INCLUSION, AND BELONGING

defined in part through a code of conduct, but the university code of conduct is not clearly communicated or available to all faculty, staff, and students, beyond the optional employee resources on supervisor training and DEIB (Ouch Training for example). There are things in the [University bylaws](#) related to conduct and how certain types of inappropriate conduct may result in disciplinary action or termination, but because these bylaws are not visible or inconsistently communicated to staff/faculty, it is not explicitly part of our culture. Faculty are required to complete Title IX training and sexual misconduct training, which covers important parts of the university code of conduct, but not everything.

We consider that an assessment of our departmental climate is a high-priority DEIB goal. This assessment should be aided by professional internal or external facilitators to gather experimentally valid and thoughtful input from our departmental community (faculty, students, staff) that will help us to determine the needs to advance inclusivity, diversity, equity, and justice in our department. Secondly, the results of this survey could be used to guide the development of a concise, tailored code of conduct expectations for our department that will be publicly available, and which should include a reporting structure. This document will help our department to hold us accountable and commit to offering a safe, welcoming, and inclusive environment for working and learning. As an example, the department of Plant Pathology at UNL recently developed a publicly available [code of conduct](#). As such, we recommend a climate assessment of the department as an immediate priority goal.

What are other institutions doing directly or indirectly to improve the culture of their departmental work and learning environments?

Pay Equity

Faculty in the unit are increasingly concerned about pay equity of technical, business, and administrative staff in the department. In recent years, the department has lost staff at seemingly higher rates than other units, and many of these staff members are taking jobs in other units on campus for higher wages. We are losing talented people and the opportunity cost of searching for and onboarding new

staff is significant. Similarly, faculty are concerned about the rigidity and inflexibility of the promotional pathways for staff at the university. In some cases, the only way to promote a staff member into a new job category is to post for a new position and require that individual to apply and compete for it, which everyone thinks is not a fair and equitable way to treat long-time staff members. These issues are above the department level and require buy-in and implementation at the Institute (IANR) and University levels. That has been an important historical impediment to successful implementation of any staff career path and reward system. More details are outlined under the Staff APR section.

How can we advocate at the university system level for more competitive and equitable compensation and promotional pathways for staff in our unit? Are there examples of creative solutions at other institutions?

Service

One of the subtle ways that inequity manifests in a university department is in the distribution of service among faculty and staff. Service is not typically an officially apportioned part of positions, yet it is an explicit expectation in most position descriptions. However, it is not clear what mechanisms or safeguards are in place to ensure equitable distribution of service within the unit.

Do we have consistent, equitable service expectations of faculty and staff regardless of rank, gender, race, etc.? Are we collecting any data or providing transparency for this distribution of service? How is this issue handled at other institutions?

Conclusion

There are many important DEIB issues on a college campus and within our unit, but questions related to barriers to engagement in current initiatives, departmental culture and conduct, and equity of pay and service have emerged as priority goals for exploration in this APR.

Key Questions to the Review Team

DIVERSITY, EQUITY, INCLUSION, AND BELONGING



- How do we move DEIB forward in our unit without duplicating the efforts and initiatives at these broader levels? How do we encourage greater engagement and participation in these existing initiatives (e.g., attendance at workshops, seminars, book clubs, etc.)?
- What are other institutions doing directly or indirectly to improve the culture of their departmental work and learning environments?
- How do we create the time capacity (FTE) and reporting structure to better promote participation in and advancement of DEIB initiatives? Do other institutions have consistent expectations for professional development in areas beyond our disciplinary expertise (e.g., DEIB)?
- Do we have consistent, equitable service expectations of faculty and staff regardless of rank, gender, race, etc.? Are we collecting any data or providing transparency for this distribution of service? How is this issue handled at other institutions?



FACILITIES AND RESOURCES



Overview

The two primary buildings on the UNL campus that house the majority of Departmental laboratory and office spaces are Keim Hall and Plant Science Hall. Keim Hall was completely renovated 14 years

ago and Plant Science has had most of the classrooms renovated within the last five years (Table 1).

Building Facilities

Keim Hall has approximately 14,000 sq ft of laboratory space and 12,000 sq ft of office space. A footprint of the office space within Keim Hall is occupied by the Unit Head's Office, and personnel within the HAPPI Business Center, in addition to the faculty staff and student use. Plant Science Hall, a facility that needs a major upgrade, but provides office and laboratory space for the department's activities within its approximate 8,000 sq/ft and 11,000 sq/ft of office and laboratory space, respectively.

Kiesselbach Hall has approximately 4,000 and 3000 sq ft of laboratory and office space, respectively, and is currently used to provide office and lab space for four faculty members. Kiesselbach is also in need of renovation to provide growing room for the department as it is currently shared with the School of Natural Resources. A facility that has been targeted as

Table 1. Renovation or upgrade projects, 2017-2021.

Facilities Renovation	Details	Est Cost	Year
Agronomy Research Farm - ARDC	New roof on building	\$ 56,000.00	2017
385 Plant Science	Renovate to writing lab	\$ 24,000.00	2017
279M Plant Science	Soundproofing	\$ 5,000.00	2018
KCR 105B	Renovate Grad Room	\$ 9,500.00	2018
275 Plant Science	Renovate Classroom	\$ 70,000.00	2019
274 Plant Science	Cameras & Microphones	\$ 14,000.00	2019
279M Plant Science	AV Upgrade	\$ 15,000.00	2020
371 Plant Science	Renovate Lab	\$ 7,000.00	2020
Sorghum/Phys Building	New roof on building	\$ 25,000.00	2020
KCR Dock	Rebuild dock for gas deliveries	\$ 10,000.00	2020
280B Soils Lab	Renovate Lab	\$ 104,000.00	2020
362 Plant Science	Carpet, Paint, Chairs & Table	\$ 9,500.00	2021
274 275 280A Goodding Soils Lab	Distance Learning upgrade	\$ 45,000.00	2021
Kiosk	Directional /Room finder	\$ 12,000.00	2021
Keim 105	Furniture, Distance Learning Upgrade	20,000.00	2021
Total		\$ 426,000.00	

FACILITIES AND RESOURCES



a priority for upgrade/expansion by the Department is the Stewart Seed Laboratory. This facility houses research, office, and seed storage capacity within its approximate 10,500 sq ft footprint. This facility is critical for the departments' breeding and genetics programs where the footprint is utilized for processing harvests, and cold room storage space that maintains germplasm developed by the respective programs. Directly west of the Stewart Seed Laboratory resides Crop Physiology Building with an approximate 5,000 sq ft footprint split between USDA and the Department. This facility is another structure that needs an upgrade/expansion. It currently houses a large cold room utilized for maintenance of a sorghum germplasm collection, along with two walk-in cold room spaces and small seed processing equipment, used solely for the processing and storage of regulated seeds developed by both USDA and UNL researchers. The latter capacity is essential to ensure research efforts at UNL in the biotechnology trait development space is identity preserved, a key component of compliance under USDA/APHIS guidelines that govern the movement and release of these biologicals.

Agronomy and Horticulture personnel are also housed within the George W. Beadle Center, a multidisciplinary facility, that in addition to the members of the department, accommodates the entire Department of Biochemistry and a portion of the School of Biological Sciences research programs, along with classroom and laboratory instructional spaces. The

Beadle Center is home to the Center for Biotechnology (biotech.unl.edu), which provides state-of-the-art Core Research Facilities. These Core Facilities provide expertise and training activities for researchers in the areas of single cell omics, microscopy, metabolomics/proteomics, cell sorting and bioinformatics.

Research Farms

The Department has four research farms located on East Campus, 84th St. and Havelock, (Lincoln, NE) and two areas at the Eastern Nebraska Research, Extension, and Education Center (ENREEC, Mead, NE). The Research Farms are managed as a service center (service for fee) and staffed with experienced research managers and staff ([Facilities Appendix 1](#) and [Facilities Appendix 2](#)). The Farms are used by over 30 faculty and extension educators and are a great resource for training of graduate and undergraduate learners. The Agronomy Research Farm at ENREEC consists of approximately 900 acres, of which 350 acres are under irrigation. Also located at ENREEC is the JSA Turfgrass Research Facility, one of the largest public sector turfgrass research field facilities in the United States. This turfgrass research space has approximately 30 irrigated acres across its 70 acre footprint. The facility has historically been used by faculty from several departments at UNL, including Agronomy and Horticulture, Plant Pathology, Entomology and Biological Systems Engineering. It has been used for faculty and graduate and undergraduate student research and education in breeding, physiology, integrated pest management and modified rootzones studies.

The Havelock Research Farm, located on the eastern edge of Lincoln, consists of approximately 650 acres of which 240 acres are leased. The footprint consists of 40 acres of drip irrigation and the balance is non-irrigated. The East Campus field site is approximately 60 acres with 40 acres irrigated. The East Campus Turfgrass Research Facility component of the farm opened in 2014 and has grown to almost 5 acres of an irrigated footprint used for both research, Extension, and educational activities.

Embedded with the ENREEC location is the Plant Biotechnology Field Facility (PBFF). This is a 25-acre footprint, with irrigation capacity. The PBFF is a dedicated transgenic trait field-testing facility

FACILITIES AND RESOURCES



that strengthens UNL's stewardship with regulated plants. This infrastructure is designed to ensure identity preservation, containment, and chain of custody tracking of the regulated seed. These resources include a Field Coordinator, along with two field technologists, who are responsible for training of personnel and oversight of all field-testing of the regulated material, isolated storage facility, separate planting and harvesting equipment. The PBFF has a second footprint consisting of an additional 10 acres at our High Plains Ag Laboratory, situated in western part of the state. The PBFF is certified under the APHIS's, Biotechnology Quality Management System (BQMS), a compliance assistance program that aids participants to properly address the guidelines governing the movement and release of regulated plants.

Directly east of the PBFF site at ENREEC resides a one-acre footprint that houses UNL's field phenotyping module. The field phenotyping module consists of 130, 15x20-ft microplots, equipped with independently controllable drip irrigation, positioned under a robotic wire matrix with capacity to house instrumentation for various data capture technologies, including thermal, RGB, NIR, and multi-spectral instruments (<https://ard.unl.edu/phenotyping>).

The Agronomy and Horticulture farm at ENREEC is equipped with a large shop/office area, a 220 x 60 machine storage shed, and an additional 50,000 sq/ft storage space. Other buildings contain dryers, offices, and lunch areas. The Havelock farm also contains a dryer building, Quonset storage building, walk-in cooler, shop/office area, and a relatively new 10,000

sq ft machine shed. The East Campus farm includes a machine shed along with a small shop and office/lunch area.

The farms are excellent resource for the Department, and while much of the infrastructure is properly maintained, and in reasonable condition, there are some critical needs that have been identified by the Department.

1. Irrigation infrastructure upgrading at the ENREEC farm location
2. Improvements in our connectivity capacity at the respective farms that reside in proximity to the UNL campus, with reliable linkages for both data transmission and video communications to the Lincoln campus and among our extension centers across the state (<https://ard.unl.edu/research-sites>).
3. The third is upgrading office, lounge, restrooms at ENREEC Agronomy farms.

Controlled Growth Environments

The UNL has extensive greenhouse and growth chamber facilities within its Agriculture Research Division (ARD) Plant Growth Facilities (<https://ard.unl.edu/greenhouses>), that encompass three operations. The mission of these facilities is to, "Provide customers and their teams access to state-of-the-art facilities and services to advance research discoveries, education, and extension programs, and contribute to the University of Nebraska and the IANR mission for resilient food systems."

The first operation resides adjacent to the Beadle Center (Beadle Center Greenhouse). This operation has 16 bays with evaporative coolers, nine walk-in growth chambers and 17 reach-in growth chambers and a LemnaTec Scanalyzer HTS imaging platform. The second operation is situated on Nebraska Innovation Campus (NIC), designated the Greenhouse Innovation Center. The NIC location has 12,800 sq ft completely environmentally controlled bays. NIC greenhouse facility houses a LemnaTec Scanalyzer 3D system, which is a high throughput conveyor belt platform with a 372 pot capacity. This phenotyping platform is completely automated, equipped with data capture image collection instruments including

FACILITIES AND RESOURCES



RGB, infrared, fluorescent, and hyper spectral cameras (<https://ard.unl.edu/phenotyping>). The third greenhouse operation is the East Campus Greenhouse. These are situated on the east side of East Campus, with 60 bays, 11 walk-in growth chambers, three of which have CO2 level adjustment level functions. In addition, there are nine reach-in chambers.

Both the Beadle and NIC greenhouse operations are in high quality condition. The largest of the three, East Campus Greenhouse operations was built in the late 1960s and needs significant upgraded. To assess the growth facilities infrastructure development needs, a self-study exercise was carried that was followed up with an external review of UNL's Plant Growth and Plant Phenomics Facilities in the spring of 2019. The outcome of the external review exercise is provided in [Facilities Appendix 3](#). A notable finding from this review process is the following: the current state of the East campus Greenhouse "...is a life safety concern, with electrical issues and ageing infrastructure.", with the review committee recommending complete replacement.

Business and HR Support

The ENREEC and Havelock Farms are each managed individually by a Farm Research Manager who is overseen by the Department's Facilities Coordinator. The latter position reports to the Department Head. The Turfgrass Facilities within the department Farms at ENREEC and east Campus are managed separately, with the Turfgrass Farm Operations Manager reporting to a PI within the turfgrass team in the Department.

The organization flow chart for Business and Human Resources activities for the Department routes through Heartland Business Center Group and the Great Plains Business Center Group. The former manages four Business Centers, one of which is the Beadle Business Center, while the latter oversees three Business Centers, one of which is the HAPPI Business Center. It is the Beadle and HAPPI Business Centers that cover most of the finance and HR functions for the Department. The Heartland and Great Plains Business Center Groups are managed by "Operational Managers" who the respective "Business Manager" of the Beadle and HAPPI Business Center, report to. This organizational flow of command within the IANR Finance and Personnel leadership team was in 2017 ([Facilities Appendix 4](#)).

Agronomy and Horticulture faculty are supported by two different business centers located in Keim Hall and the Beadle Center. Each business center plays a key role in supporting the faculty and staff of Agronomy and Horticulture. These roles include finance management, grant submissions (pre and post award management), hiring of new faculty/staff, processing forms for travel/non-travel reimbursements and budgetary actions. Each business center consists of the following FTE presented in Table 2.

Table 2 – HAPPI and Beadle Business Support Staff*

	HAPPI	Beadle
Business Manager**	1	1
HR/Payroll Coordinator	1	1
Payroll Associate	1	-
Finance Associate	2	1
Finance Specialist	3	2
Grants Specialist	1	1

*All positions report to their respective business manager.

**Reports to operation manager.

FACILITIES AND RESOURCES



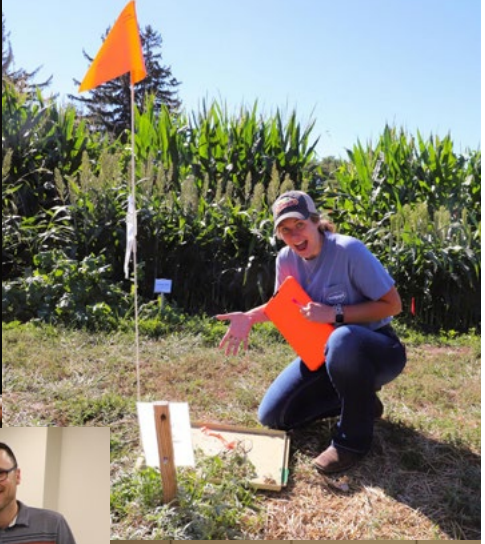
Due to a high volume of turnover in recent years, a major challenge faced by the business centers is retaining staff that have expertise in their area of responsibility and train new staff members for their smooth onboarding. The turnover has led to a short-fall of support and service to the Agronomy and Horticulture faculty which in turn has led to slower turnaround time and more time spent training new staff.

Key Questions to the Review Team

- What opportunities do you see to optimize use of current facilities?
- What suggestions do you have for recruitment-retention of business staff and efficiency in field operations?









I ❤️ PLANTS